TEAR UP OUR INVOICE AND JOIN IN AN EPIC ADVENTURE

5 TERRIFIC FREE GIFTS

YES! IT'S SO SIMPLE TO DISCOVER THE SECRETS OF WAR IN THE AIR

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IMAGINE COMMANDING A TORNADO!

Learn the secrets of the SR 76 spy plane... recognise the planes that made history... preview the planes of the future. By understanding the machines, you will appreciate the top-secret strategies of war in the air. Because you're fascinated by the devastating power of warplanes, you'll enjoy everything about the Warplanes Collectors Club.

- comprehensive full-colour card collection
- facts and figures compiled by international experts
- unique classification system for instant reference
- authentic squadron stickers
- superb posters and memorabilia
- press releases with news and activities
- concessionary entries to museums and air displays

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742/06

WARPLANES COLLECTORS' CLUB

USER MANUAL

HOW TO USE THE FILING SYSTEM

On the front of each card in the space above the photograph there are a number of symbols to help you classify your Warplanes cards.

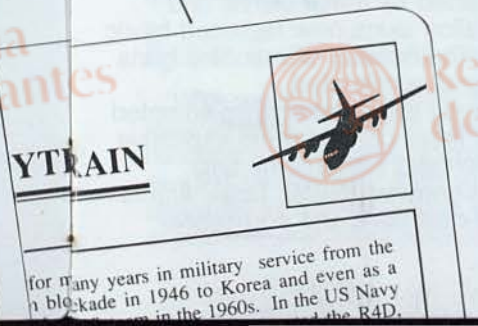
Type of plane

Manufacturer's name and name of the plane shown in the photograph below

Fuselage or wingmarking from the country of the designer or manufacturer

The silhoutte indicates the type of plane. The color of the square indicates the historical period of the plane

The back gives the technical details, use, performance, armament and the history of its design



1914-1918

1918-1939

1939-1945

1945-present day

HISTORICAL PERIODS AND THEIR COLOR CODES

The plane is a very recent invention, so much so that to speak of or write about heavier-than-air warplanes even in the late nineteenth century was the stuff of science fiction writers, inventors and engineers. Even after the Wright brothers' historic flight in 1903 the full significance of their achievement was not realized. It was not until the First World War that aeronautics became important and plane development took a great leap forward. The ninety-odd years that separate us from the first successful heavier-than-air flight can be broken into four distinct periods of evolution.

However, some planes span several periods. For example, the Soviet Polikarpov U-2 was first built in 1927 and the last in 1952; similary the Douglas C-47/DC-3 began life in 1935 and was built until 1945. Both types are still flying, and in such cases we have classified them in the period when the plane was used intensively.

1914–1918

The first military planes were direct descendants of sporting planes, with their designs adapted for military use. In spite of wood, string and cloth being the main elements in the construction of the fuselage and wings, the lines of the machines became more and more refined in aerodynamic terms. As well as the propellers, the engine performance improved to a new level of reliability and power. The latter, in fact, quadrupled in four years and made possible a near doubling of speed. But the most spectacular advance was in armament and destructive power. On board the planes the rifle was replaced by a hand-controlled machine gun, then by a single and finally twin fixed machine gun synchronized to fire through the disk swept by the propeller without hitting the blades. Ground attack weapons were basic, ranging from hand grenades thrown over the sides of open cockpits to bombs released from cradles by hand-operated triggers and elementary air-dropped torpedoes.

1918–1939

This period was notable for the slow progress made in the first decade in aeronautical design and technique. It was followed, however, by rapid advances as the Second World War came closer.

Biplanes were replaced by low-wing monoplanes with closed cockpits and retractable undercarriages. The traditional structural materials had already been replaced by metal alloys, and stressed alloy skins now replaced fabric covering. The number of machine guns doubled and quadrupled.

Sometimes these were supplemented by one or more cannon firing explosive shells. Improved fuel, engine and armament enabled longer, faster flights and more defensive and aggressive power.

1939–1945

The Second World War marked the end of machines equipped with piston engines as this period saw the development and introduction into service of new fighters and bombers equipped with the revolutionary jet engine. Other far reaching developments were taking place at the same time in electronics: radar for defense and attack, both on the ground and in the air, plus new electronic navigational and landing aids.

At the same time new types of flying machines were being perfected, and both the USA and Germany brought the helicopter into service.

1945 to the present day

With world conflicts like the Korean War, military aviation in East and West reached a new stage of evolution in the second half of the 1950s. Continued progress in aerodynamics, engines, armament and electronics combined to improve performance in all areas: speed, operating ceiling and fire power.

Together they have also meant that new types of plane could be developed to fulfill specific functions or multi-role purposes. Recent dramatic developments in electronics generally have heralded the introduction of a new type of plane used for electronic reconnaissance and even electronic warfare. The development and adoption of the armed rather than transport helicopter is the result of two main factors. Firstly, its ability to maneuver in small spaces and difficult terrain allow it to be used as a gunship in close support of ground forces where artillery cannot be used, and also against supply columns. And, secondly, it has a vital role carrying missiles as an anti-tank weapon and against massed armor attacks.

COUNTRY EMBLEMS

The emblems shown are the national markings carried on the wings or the fuselage of the military planes of countries which designed and developed the plane. Over the last 80 years for political, technical or design reasons these symbols have evolved or changed radically. However, for simplicity, we have decided to illustrate only those in use today whenever possible.


U.S.A.


Brazil


Italy


Israel


Germany


U.S.S.R.


Poland


France


Sweden


Canada


Great Britain


Switzerland

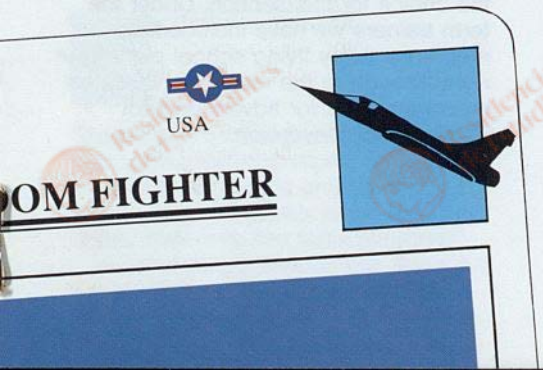
MANUFACTURERS

At the top center of each card the name of the plane is always preceded by the name or initials of the manufacturer. As a result of industry changes, however, several companies that designed and first manufactured some plane types no longer survive in their original forms. So we have decided to ignore the company which designed and made the plane and follow current industrial convention by opting for the company or companies which made most or still make the plane. As an example, the CM170 Magister trainer was originally designed by the Air Fouga company which was then sold to the Potez group which was then absorbed into Aérospatiale, in this instance it is the last name Aérospatiale, which is used on the cards.

THE SILHOUETTES

Finally, to add another valuable category to the analysis and classification of your cards, we have divided Warplanes into eight main categories, each portrayed by the silhouette of the plane which most represents the type.

So for all bombers, all fighters or all helicopters you can easily classify your cards into numerous sub-categories by sorting into type by using the silhouette.



BOMBERS

The bomber has been symbolized by the Boeing B-52 Stratofortress. This category has the most sub-categories, five in total. These five divisions are almost self-evident, coming as they do from the machines themselves according to type and weight of bombs carried, size and speed of the plane, and also any specialist use.

They are:

a) Heavy bombers
b) Medium bombers
c) Light bombers
d) Torpedo bombers
e) Dive bombers

If we take the performance of a heavy bomber of 1914-18 with that of a present day light bomber then there is no comparison as we are not comparing like with like. It is really only possible to make comparisons within the same period.

FIGHTERS

These are represented by the Dassault-Breguet Mirage 2000. Fighters also break down into sub-categories, four in all. This time the category is by the basic use of the plane, namely:

a) Fighters up to 1945. These were the police force of the air, protecting bombers from enemy fighters, and were also used for frontal attack on enemy planes - a multi-role type.

b) Air superiority fighters. The task of these planes is to ensure mastery of the skies over the war zone by eliminating all enemy aircraft and thus protecting their own attacking ground forces.

c) Interceptors. These are designed to provide aerial defense for home territory and are equipped to intercept and destroy enemy bombers before they can cause any damage.

d) Attack and close support. These are built to give close support to troops on the ground by destroying defensive positions and armor. However, once they have made and completed an attack if armed appropriately they fulfill the old multi-purpose role of the fighter.

TRAINERS

The Aérospatiale SM17 Magister is the choice for this section. Under the term trainers we have included elementary military flying school planes right through to the most sophisticated machines used for advanced pilot training and conversion.

ELECTRONIC WARFARE

Recognizable by the image of a Boeing E-3 Sentry, this type of plane covers an extensive field of interest. It brings together all the machines which make primary use of electronics, and in particular electronics for surveillance with passive and active systems capable of listening to and jamming other electronic devices. It also covers early warning systems.

HELICOPTERS

The McDonnell Douglas AH-64 APACHE has been chosen to represent these machines, which are an extension of the concept of mobility in the air. They break down into two sub-categories:

a) Land-based helicopters: there is a great variety of machines, most of which can be used for the transportation of ground forces to and from the battle and airlifting out the wounded. Some of these machines also have a firepower which can be used against tanks or for close support.

b) Naval helicopters: these workhorses of the fleet are used for air sea rescue and recovery. They also find and attack enemy ships and submarines using missiles, torpedoes and depth-charges.

SEAPLANES

The silhouette of the Consolidated PBY Catalina, one of the world's most famous seaplanes symbolizes this category, which also includes flying boats and floatplanes. Before 1945 these planes were the eyes and ears of warships, the terror of submarines and the saviours of pilots shot down over the sea. They contributed greatly to oceanic exploration and coastal surveys, and also protected naval convoys.

RECONNAISSANCE AND OBSERVATION

Shaped like a knife blade, the Lockheed SR-71 represents this category. Sent to reconnoiter deep behind the enemy lines, these planes gather the information that enables military intelligence to plan and guide friendly forces to the optimum effect. The planes undertake short-range local observation and also long-range tactical and strategic surveillance.

TRANSPORT AND UTILITY

The Lockheed C-130 Hercules is the emblem of this family of planes. Last but not least these servants of the war machine perform their duties, ferrying men, materials, armor, fuel and provisions for armies, navies and air forces throughout the world.

FAMOUS DOGFIGHTS AND RAIDS

The epic battles of the air war in Europe and elsewhere, which have changed the course of history.

ACES, ENGINEERS AND BUILDERS

Biographies of the men who made military aviation history, whose individual daring and determination made it all possible.

Note to readers. This is a joint Anglo-American publication, and for practical reasons American spelling has been used throughout.

HOW TO USE THE INDEX

As well as plane cards in your Welcome Pack there are 18 large divider cards. These are the index cards which help you to classify your collection and file it in an easily accessible order.

The index cards are numbered from I to X in Roman numerals (I for bombers and II for fighters and so on). This number is on the left side of the blue band at the top of the card immediately before the type of plane.

On the right side of the blue band in the white square is a silhouette showing the group to which the plane belongs.

The index cards were designed in this way so that you could adopt the method of classification used in the major plane reference books. However, you will find that you can chose further main classifications within each section. We suggest that the three main ones should be 'age', 'country', and 'name' of the plane.

WARPLANES COLLECTORS' CLUB

List of Museums

Aces High Flying Museum,
Hangar 4,
North Weald Airfield,
Epping, Essex, CM16 6AA.

Open: By prior arrangement
Admission:- Adults £2.00, Children £1.00
Contact No: 0276 856384
Location: Mll Junction 7

The Aeroplane Collection,
Warmington Craft Centre,
The Old Mill,
Warmington,
Cheshire.

Open: 10.00 to 17.00 weekdays,10.00 to 18.00 weekends. Closed Mondays
Admission:- Free
Location: South of Middlewich in between A530 and A533

Aerospace Museum,
Cosford,
Shifnal,
Shropshire,
TFll 8UP.

Open: 10.00 to 18.00 daily (April to October) 10.00 to 17.00 daily (November to March)
Admission:- Adults £3.00, Children £1.50
Contact No: 090722 4872/4112
Location: M54 Junction 3

Airborne Forces Museum,
Browning Barracks,
Aldershot,Hants,
GUll 2BU.

Open: 10.00 to 16.00 Tuesdays to Sundays
Admission:- Adults £1.00, Children 50p
Contact No: 0252 24431
Location: South of Farnborough, off A325

Battle of Britain Memorial
Flight Visits,
RAF Coningsby,
Lincoln,
LN4 4SY.

Open: 10.00 to 17.00 Monday to Friday
Admission:- Adults £1.50 Children £0.75p
Contact No: 0526 44041
Location: South of A153 at Coningsby

Birmingham Museum of Science
and Industry,
Newhall Street,
Birmingham,
B3 IRZ.

Open: 10.00 to 17.00 Monday to Friday
Admission Free
Contact No: 021 236 1022
Location: Off A38 near Civic Centre

Booker Aircraft Museum,
Wycombe Air Park,
Clay Lane,
Booker,
High Wycombe,Bucks.

Open: 10.30 to 17.30 Weekends and Bank Holidays
Admission: Adults £1.00, Children £0.50p
Contact No:0494 452320 (David King)
Location: M40 Junction 4

Brenzett Aeronautical
Museum Trust,
Ivychurch Road,
Brenzett,
Romney Marsh,
Kent.

Open: 11.00 to 17.30 Sundays and Bank Holidays (Easter to the end of October)
14.00 to 17.00 Tuesday, Wednesday and Thursday (July to the end of September)
Admission:- Adults £1.00, Children 50p
Contact No: 0679 20606
Location: On A21 NW of Hastings

Bristol Industrial Museum,
Princes Wharf,
City Docks,
Bristol,BSI 4RN.

Open: 10.00 to 13.00 Saturday to Wednesday
Admission free
Contact No: 0272 251470
Location: Near Docks and The Great Britain

City of Bristol
Museum and Art Gallery,
Queen's Road,
Clifton,
Bristol, BS8 IRL.

Open: 10.00 to 17.00 Museum Monday to Saturday
Admission free
Contact No: 0272 299771
Location: Close to University Students Union, Clifton.

Brooklands Museum,
The Clubhouse,
Brooklands Road,
Weybridge,
Surrey, KT13 OQN.

Open: Tours available by prior arrangement only
Contact No: 0932 857381

Caernarfon Air Museum,
Caernarfon Airport,
Dinas Dinlle,
near Caernarfon,
Gwynedd, LL57 5TP.

Open: 09.00 to 17.00 (March to November)
Admission:- Adults £2.50
Children £1.50
Contact No: 0286 830800
Location: Near Caernarfon, also known as Llandwrog Airfield.

Derby Industrial Museum,
The Silk Mill,
Full Street,
Derby,
DEI 3AR.

Open: 10.00 to 17.00 Tuesday to Saturday
14.00 to 17.00 Sundays and Ban~ Holidays
Admission: 30p
Contact No. 0332 255308
Location: Near A52 northern Ring Road

Dumfries & Galloway
Aviation Museum,
Heathall Industrial Estate,
Tinwald Downs,
Dumfries, Scotland.

Open: 10.00 to 17.00 Saturday and Sunday (Easter to October)
Admission: £0.75p
Contact: David Reid, 11 Ninian Court, Lochside, Dumfries, DG2 9PS.

East Midlands Aeropark
and Visitor Centre,
East Midlands Airport,
Castle Donnington,
Derby, DE7 2SA.

Open: 10.00 to 17.00 Monday to Friday
11.00 to 18.00 Saturday and Sunday (April to October 31) 11.00 to 16.00 Monday to Sunday (November 1 to March 31)
Admission: £1 per Car
Contact: 0332 810621 ext 3361
Location: MI Junction 24.

Fenland Aviation Museum,
Bambers Garden Centre,
Old Lynn Road,
West Walton,
Wisbech, PE14 7DA.

Open: 09.30 to 17.00 Saturday, Sunday Good Friday and Bank Holidays, (March to September)
Admission: Adults 50p, Children 25p
Contact: Robert Willatt, 62 Queens Road Wisbech, Cambs, PE13 2PQ

Flambards Triple Theme Park,
Culdrose Manor,Clodgey Lane,
Helston,
Cornwall, TR12 OGA.

Open: 10.00 to 16.00 daily (Easter to October)
Admission: Adults £5.98, Children £4.98
Contact: 0326 573404
Location: Off A3083 on Helston side of RNAS Culdrose.

Fleet Air Arm Museum,
RNAS Yeovilton,
Somerset,
BA22 8HT.

Open: 10.00 to 17.30 daily
Admission: Adults £3.70, OAPs £3.00 Children £2.00 Family £10.50
Contact: 0935 840565
Location: Off A303/A47 near Ilchester

RNAY Fleetlands Museum,
Gosport,
Fareham,
Hants.

Open: By prior application only
Contact: Graham Cooper 0705 822351

Glasgow Museum of Transport,
Kelvin Hall,
1 Bunhouse Road,
Glasgow, G3 8DP.

Open: 10.00 to 17.00 Monday to Saturday
14.00 to 17.00 Sunday
Contact: 041 357 3929

Imperial War Museum Duxford,
Duxford Airfield,
Cambridge,
CB2 4QR

Open: 10.00 to 18.00 daily (March to October)
10.00 to 16.00 daily (November to February)
Admission: Adults £4.50, Children £2.25
Contact: 0223 833963
Location: MII Junction 10

Imperial War Museum London,
Lambeth Road,
London,
SEI 6HZ.

Open: 10.00 to 18.00 daily
Admission: Adults £2.50, Children £1.25
Contact: 071 735 8922
Location: Near Waterloo Station, nearest Underground Lambeth North

International Helicopter Museum,
The Airport,
Locking Moor Road,
Weston-super-Mare,
Avon, BS24 8PP.

Open: 10.00 to 18.00 daily (April to September) 10.30 to 16.00 Wednesdays, Thursdays, Saturdays and Sundays (October to March)
Admission: Adults £2.00, Children £1.00
Contact: 0934 635227
Location: On A371 west of Weston-S-Mare

Kent Battle of Britain Museum,
Hawkinge Airfield,
Aerodrome Road,
Hawkinge, Folkestone,
Kent, CT18 7AG.

Open: 10.00 to 17.00 daily (Easter to September 30) 11.00 to 16.00 daily (October)
Admission: To be announced
Contact: 030 389 3140
Location: On A620 north of Folkestone

Lashenden Air Warfare Museum,
Headcorn Aerodrome,
Headcorn,
Ashford,
Kent, TN27 9HX.

Open: 10.30 to 18.00 Sundays and Bank Holidays, (Easter to October)
Admission Free
Contact: 0622 890226
Location: South of Maidstone on A274

Leicestershire Museum
of Technology
Corporation Road,
Leicester,
LE4 5PX.

Open: By prior appointment only
Contact: Peter Stoddart 0533 765532

Lincolnshire Aviation
Heritage Centre,
The Airfield,
East Kirby, Spilsby, Lincs,
PE23 4DE.

Open: 10.00 to 17.00 Monday to Saturday (Easter to October)
Contact: 07903 207

Llanbedr Museum of Memorabilia,
Maes Artro Craft Village
& Visitor Centre,
Reception Building,
Maes Artro, Llanbedr,
Gwynedd, LL45 2PZ.

Open: 10.00 to 17.30 daily (Easter to October)
Admission: Adults £2.00 Children £1.50
Contact: 0341 23467
Location: On A496 south of Harlech

Manchester Museum of
Science and Industry,
Liverpool Road,
Castlefield,
Manchester, M3 4JP.

Open: 10.00 to 17.00 daily
Admission: Adults £2.00, Concessions £1.00
Contact: 061 832 2244
Location: Off Deansgate

Manston Memorial Building,
RAF Manston,
Ramsgate,
Kent, CR12 SBS

Open: 10.00 to 17.00 daily
Admission Free
Contact: 084389 351
Location: North of A253 west of Ramsgate

Midland Air Museum,
Coventry Airport,
Bagington,
Warwickshire
CV8 3AZ.

Open: 10.00 to 16.00 Monday to Saturday
11.00 to 18.00 Sundays and Bank Holidays
(April to October) 11.00 to 16.00 Saturday
and Sunday (November to March)
Admission: Adults £1.75, Children £0.75p
Contact: 0203 301033
Location: North side of Coventry Airport

Mosquito Aircraft Museum,
PO Box 107,
Salisbury Hall,
London Colney,
St. Albans, Herts, AL2 IBU.

Open: 10.30 to 17.30 Sundays/Bank Holidays
(Easter to end of October) 14.00 to 17.30
Thursdays (July to end of September)
Admission: Adults £1.00, Children £0.40p
Location: Close to M25/AI junction, off
B556 south of St. Albans

Museum of Army Flying,
Middle Wallop,
Stockbridge,
Hants,
S020 8DY.

Open: 10.00 to 16.30 daily
Admission: Adults £2.50, Children £1.50
Contact: 0264 62121 ext 4421
Location: Middle Wallop airfield on A343
south west of Andover

Museum of Army Transport,
Flemingate,
Beverley,
Humberside,
HU17 ONG.

Open: 10.00 to 17.00 daily
Contact: 0482 860445

Museum of Artillery,
The Rotunda,
Repository Road,
Woolwich,
London, SE118 3AZ.

Open: 12.00 to 17.00 Monday to Friday
13.00 to 17.00 Saturday and Sunday
Admission Free
Contact: 081 854 2242 ext 3127

National Museum of Scotland,
Chambers Street,
Edinburgh,
EHI IJF.

Open: 10.00 to 17.00 Monday to Saturday
14.00 to 17.00 Sunday
Admission Free
Contact: 031 225 7534
Location: West of A7, near University

Museum of Flight,
East Fortune Airfield,
North Berwick,
East Lothian,
EH39 5LF.

Open: 10.00 to 16.00 daily (July and August)
Other times by prior appointment
Admission Free
Contact: 062 088 308
Location: South of North Berwick on B1347

Newark Air Museum,
The Airfield,
Winthorpe,
Newark,
Notts,
NG24 2NY.

Open: 10.00 to 17.00 Monday to Friday
11.00 to 17.00 Saturday 10.00 to 18.00
Sunday (April to October) Saturday 11.00 to
dusk and Sunday 10.00 to dusk (November to
March)
Admission: Adults £2.00, Children £1.00
Contact: 0636 707170
Location: On A46 NE of Newark, signs on AI

Norfolk & Suffolk
Aviation Museum,
Flixton,
Bungay,
Suffolk.

Open: 10.00 to 17.00 Sunday and Bank Holidays
(April, May, September and October) 19.00 to
21.00 Wednesday and Thursday (July and August)
10.00 to 21.00 Sunday (June, July and August)
11.00 to 17.00 Thursday (July and August)
Admission Free
Location on B1062 south west of Bungay

North East Aircraft Museum,
Washington Road,
Sunderland,
Tyne and Wear,
SR5 3HZ.

Open: 11.00 to 18.00 daily
Admission: Adults £1.00, Children £0.50p
Contact: 091 519 0662
Location: Close to AI9 near junction with
AI, follow signs to Nissan plant

City of Norwich
Aviation Museum,
Old Norwich Road,
Horsham St Faith,
Norwich, Norfolk.

Open: 10.00 to 17.00 daily (April to October)
10.00 to 16.00 daily (November to March)
Thursday evenings 19.00 to dusk (June, July,
August)
Admission seasonal charges apply
Contact: 0603 625309
Location: East of A140 to north of airport

Rebel Air Museum,
Earls Colne Airfield,
Colchester,
Essex.

Open: 10.00 to 18.00 weekends/Bank Holidays
Admission: Adults £1.00 (provisional)
Contact: 081 690 0917
Location: South of A604, west of
Colchester

Royal Air Force Museum,
Grahame Park Way,
Hendon,
London,
NW9 SLL.

Open: 10.00 to 18.00 daily
Admission: Adults £3.60, Children £1.80
Contact: 081 205 2266
Location: Well signposted from A406 and MI
Nearest tube is Colindale

Royal Marines Museum,
Eastney Barracks,
Portsmouth, Hants.

Open: By prior arrangement only
Contact: 0705 819385

The Science Museum,
Exhibition Road,
South Kensington,
London,
SW7 2DD.

Open: 10.00 to 18.00 Monday to Saturday
11.00 to 18.00 Sunday
Admission: Adults £2.50, Children £1.00
Contact: 071 939 8000
Location: Off Cromwell Road (A4), nearest tube South Kensington

Second World War
Aircraft Preservation Society,
Lasham Airfield,
Lasham, Alton
Nr Alton, Hants.

Open: 10.00 to dusk Sundays/Bank Holidays
Admission Free
Location: Between A339 and A32 north of

The Shuttleworth Collection,
Old Warden Aerodrome,
Biggleswade,
Bedfordshire,
SG18 9ER.

Open: 10.00 to 16.00 daily (April to October)
10.00 to 15.00 daily (November to March)
Admission: Adults £3.0, Concessions £1.50
Contact: 076 727 288
Location: Signposted from A1

Southampton Hall of Aviation,
Albert Road South,
Southampton,
Hants,
SOI IFR.

Open: 10.00 to 17.00 Tuesday to Saturday
14.00 to 17.00 Sunday
Contact: 0703 635830
Location: On B3038 near BBC studios and Ocean Village Marina

Stanford Hall,
Stanford-on-Avon,
Lutterworth,
Leics.

Open: 14.30 to 18.00 Thursday, Saturday,
Sunday and Bank Holidays,
Admission: Adults £1.75, Children £0.85p
Contact: 0788 860250
Location: South of B5414 near Swinford,
Close to MI Junction 20

Stoke City Museum
and Art Gallery,
Bethesda Street,
Hanley,
Stoke-on-Trent, STI 3DE.

Open: 10.30 to 17.00 Monday to Saturday
14.00 to 17.00 Sunday
Admission Free
Contact: 0782 202173
Location: Close to A50

Stratford Aircraft Collection,
Long Marston Airfield,
Stratford-upon-Avon,
Warwickshire.

Open: 10.00 to 17.00 Weekends/Bank Holidays
(April to October) 10.00 to dusk Sundays only
(November to March)
Admission: Adults £1.25 Children £0.50p
Contact: 0527 21723

Tangmere Military
Aviation Museum,
Tangmere Airfield,
Chichester,
West Sussex.

Open: 10.30 to 17.00 daily (March to 1st October)
Admission: Adults £1.50
Contact: 0243 775223
Location: South of A27 east of Chichester

Ulster Folk & Transport Museum,
Cultra Manor,
Holywood,
BT18 OEU,
County Down, Northern Ireland.

Open: 11.00 to 17.00 Monday to Saturday
14.00 to 17.00 Sunday
Admission: Adults £2.00, Children £1.00
Contact: 0232 428426

Wales Aircraft Museum,
Cardiff-Wales Airport,
Rhoose,
South Glamorgan,
Wales.

Open: Daily (May to August)
Contact: 19 Clos Glyndr, Hendy, Dyfed,
SA4 IFW
Location: South of A4226 west of Barry

Windermere Steamboat Museum,
Rayrigg Road,
Windermere,
Cumbria.

Open: 10.00 to 17.00 daily
Admission: Adults £2.00, Children £1.80
Contact: 09662 5565
Location: Signposted in the town

Yorkshire Air Museum,
Elvington Airfield,
Elvington,
York,
Y04 SAT.

Open: 11.00 to 17.00 daily
Admission: Adults £1.50
Contact: 0504 85535
Location: South east of York

IRIS Publishing Ltd., Unit 8, Kingsmead, King's Cliffe, Peterborough PE8 6YH

741/ML

Italy

Piaggio PD-808

Piaggio PD-808

American origins
This attractive type was designed by the Douglas Aircraft Company of Long Beach, California, as a business jet. No orders were received, and the complete project was bought by Piaggio, which flew the first prototype in August 1965. Piaggio also failed to secure any worthwhile commercial intrest, but a few examples were taken by the Italian air force.

An electronic warfare specialist
Only 27 examples of this type, with low-set wings and aft-mounted turbojet engines, were produced, and 25 of these went to the Italian air force. The first aircraft were configured for the utility role (navaid calibration, navigation training for three pupils, and light transport of up to eight passengers or an equivalent freight load), but the last six aircraft were completed as electronic warfare platforms with cabin accommodation for specialist Elint (electronic intelligence) equipment and its three operators.

Principal versions
PD-808TA (utility version) and PD-808ECM (electronic warfare version).

Principal user
Italy

TECHNICAL DATA

Type: Piaggio PD-808ECM five-seat electronic warfare plane.
Engines: two 3,360-lb (1,524-kg) thrust Piaggio-built Rolls-Royce (Bristol Siddeley) Viper Mk 526 turbojets.
Performance: maximum speed 529 mph (851 km/h) at 19,685 ft (6,000 m); initial climb rate 5,415 ft (1,650 m) per minute; service ceiling 44,950 ft (13,700 m); range 1,322 miles (2,128 km).
Weights: empty 10,648 lb (4,830 kg); maximum take-off 18,001 lb (8,165 kg).
Dimensions: span 43 ft 3.75 in (13.20 m); length 42 ft 2 in (12.85 m); height 15 ft 9 in (4.80 m); wing area 224.97 sq ft (20.90 m^2).
Armament: none.

Except for its antennae and other special features, the PD-808ECM is very similar to the PD-808TA utility model.

Photo M. Rostaing
D1 075 02.20
Printed in Italy

Italy

Aeritalia G222

Aeritalia G222

An impractical NATO specification

In 1962 NATO issued a requirement for a tactical transport with STOVL (Short Take-Off and Vertical Landing) capability. This proved impossible for a number of technical reasons, but from Fiat's experience with the project Aeritalia produced the G222 tactical light transport to replace the Italian air force's fleet of aged Fairchild C-119 aircraft. The G222 prototype flew in July 1970, and entered service in 1976.

A capable utility transport

The G222 is a simple yet effective tactical airlifter. The plane is typical of its type, with a large-volume hold accessed by a rear ramp/door arrangement for the straight-in loading of bulky items. The manufacturer had plans for a family of special-purpose variants, but these came to nothing and production was completed in 1989 with the 90th plane. The type's major operator is the Italian air force, though smaller quantities were exported to several countries, of which the single largest operator is Libya with a special version produced to avoid export restrictions on American engines and equipment.

Principal versions

G222 (basic tactical transport), G222RM (navaid calibration model), G222SAA (firefighting model), G222T (version for Libya with European avionics and 4,860-shp/3,624-kW Rolls-Royce Tyne Mk 801 turboprops for improved hot-and-high performance), G222VS (electronic warfare model).

Principal users

Argentina, Italy, Libya, Nigeria, Somalia, United Arab Emirates, and Venezuela.

TECHNICAL DATA

Type: Aeritalia G222 three-crew tactical transport.
Engines: two 3,400-shp (2,535-kW) Fiat-built General Electric T64-GE-P4D turboprops.
Performance: maximum speed 336 mph (540 km/h) at 15,010 ft (4,575 m); initial climb rate 1,706 ft (520 m) per minute; service ceiling 25,000 ft (7,620 m); range 851 miles (1,370 km) with maximum payload.
Weights: empty 32,165 lb (14,590 kg); maximum take-off 61,729 lb (28,000 kg).
Dimensions: span 94 ft 2 in (28.70 m); length 74 ft 5.75 in (22.70 m); height 32 ft 2 in (9.80 m); wing area 882.67 sq ft (82.00 m^2).
Payload: 53 troops, or 40 paratroops, or 19,841 lb (9,000 kg) of freight.

A G222 tactical transport of the Italian air force.

Photo M. Rostaing
D1 075 02.19
Printed in Italy

Italy

Aeritalia (Fiat) G91R

Aeritalia (Fiat) G91R

A NATO design competition

Aeritalia was created in 1969 by a merger of Fiat's aviation divisions with two smaller companies. One of the new company's inherited tasks was logistic support of the G91R, a light attack and reconnaissance fighter designed by Fiat to meet a 1954 NATO requirement. The first prototype had flown in August 1956, and the G91 light attack model began to enter limited squadron service in February 1959.

From attack to reconnaissance

Later in the year there appeared the definitive G91R version which added a tactical reconnaissance capability through the installation of three cameras in a shortened and revised nose. This model was adopted in differing subvariants by West Germany as well as Italy, and some aircraft were later passed on to Portugal, which left a few examples in Angola when it granted that country full independence.

Principal versions

G91 (initial light attack model), G91R/1 (attack and reconnaissance model), G91R/1A (verdsion with improved navigation system), G91R/1B (strengthened and updated version of the G91R/1A), G91R/3 (West German model with two 30-mm cannon, Doppler navigation and other improvements), G91R/4 (G91R/3 variant with the armament of the G91R/1), G91T/1 (Italian two-seat trainer with two 0.5-in/12.7-mm machine guns), and G91T/2 (West German version of the G91T/1).

Principal users

Angola, Italy, Portugal, and West Germany.

TECHNICAL DATA

Type: Aeritalia (Fiat) G91R/1 single-seat light attack and reconnaissance fighter.
Engine: one 5,000-lb (2,268-kg) thrust Fiat-built Rolls-Royce (Bristol Siddeley) Orpheus Mk 803 turbojet.
Performance: maximum speed 675 mph (1,086 km/h) at 4,920 ft (1,500 m); initial climb rate 6,005 ft (1,830 m) per minute; service ceiling 42,980 ft (13,100 m); radius 199 miles (320 km).
Weights: empty 6,834 lb (3,100 kg); maximum take-off 12,125 lb (5,500 kg).
Dimensions: span 28 ft 1 in (8.56 m); length 33 ft 9.5 in (10.30 m); height 13 ft 1.5 in (4.00 m); wing area 176.75 sq ft (16.42 m^2).
Armament: four 0.5-in (12.7-mm) machine guns and up to 1,500 lb (680 kg) of disposable stores.

A G91R in service with the West German air force, which has now replaced this trim little warplane with the altogether superior Panavia Tornado.

Photo M. Rostaing
D1 075 02.17
Printed in Italy

Land based helicopter

USA

Italy

Agusta-Bell AB.205

Agusta-Bell AB.205

American ancestry

Built by Agusta under license from Bell, the AB.205 is a direct counterpart of the UH-1H Iroquois (Model 205) military helicopter. This differs from the earlier Model 204 versions of the celebrated "Huey" in having a longer fuselage and larger cabin for the accommodation of a heavier payload carried with the aid of a more powerful engine. In its basic form, the AB.205 is similar to the US Army's UH-1D and UH-1H, but can be configured for specialist roles such as SAR with a door-mounted rescue hoist.

Civil and military service

The AB.205 is equipped for all-weather operation in its military utility role, and can be fitted with protective armor as well as any of several armament kits. In 1969 Agusta started licensed production of the Model 205A-1 civil version as the AB.205A-1 and, like its American counterpart, this is powered by the 1,400-shp (1,044-kW) T5313B civil version of the military turboshaft derated, in this application, to 1,250 shp (932 kW). Production of the AB.205A-1 totalled 290 helicopters.

Principal versions

AB.205 (military version) and AB.205A-1 (civil version).

Principal users

Greece, Iran, Israel, Italy, Morocco, Oman, Saudi Arabia, Singapore, Spain, Tanzania, Tunisia, Turkey, Uganda, United Arab Emirates, Yemen, Zambia, and Zimbabwe.

TECHNICAL DATA

Type: Agusta-Bell AB.205 one-crew utility transport helicopter.
Engine: one 1,400-shp (1,044-kW) Lycoming T53-L-13 turboshaft derated to 1,100 shp (820 kW).
Performance: maximum speed 138 mph (222 km/h) at sea level; initial climb rate 1,680 ft (512 m) per minute; service ceiling 15,010 ft (4,575 m); range 360 miles (580 km).
Weights: empty 4,800 lb (2,177 kg); maximum take-off 9,500 lb (4,309 kg).
Dimensions: main rotor diameter 48 ft 3.25 in (14.71 m); length overall, rotors turning 57 ft 0.75 in (17.39 m); height 14 ft 8.5 in (4.48 m); main rotor disc area 1,829.36 sq ft (169.95 m^2).
Payload: 14 troops, or six litters and one attendant, or freight.

An AB.205 utility helicopter of the Italian army.

Photo M. Rostaing
D1 075 02.15
Printed in Italy

France

Maurice Farman M.F.11 "SHORTHORN"

Maurice Farman M.F.11 "SHORTHORN"

Family history
The M.F.11 retained the same basic configuration as Maurice Farman's preceeding M.F.7, but introduced a number of refinements and one radical change: the forward elevator that had led the British to give the nickname "Longhorn" to the M.F.7 was abandoned, and the British inevitably dubbed the M.F.11 the "Shorthorn". Another visually notable change was an alteration in the position of the nacelle, which was raised from the upper surface of the lower wing to a point between the upper and lower wings.

A type much in demand
The M.F.11 first flew in 1914 and entered service in 1915 with an assortment of engine types delivering anything between 70 and 130 hp (52 and 97 kW), though the most common units were De Dion or Renault engines; aircraft licence-built in Italy by S.I.A. had Renault or Fiat A.10 engines. In the basic M.F.11 the pilot was seated in front of the observer, but in the M.F.11bis developed by Maurice's brother, Henry Farman, the observer was given a better field of fire for his gun by being seated in front of the pilot. The type was used mainly for observation, but was occasionally and successfully pressed into service as a bomber.

Principal versions
M.F.11 (basic model) and M.F.11bis (revised version with reversed seating).

Principal users
France, Great Britain, Italy, and Russia.

TECHNICAL DATA

Type: Maurice Farman M.F.11 "Shorthorn" two-seat observation plane and light bomber.
Engine: one 70-hp (52-kW) Renault inline piston engine. Performance: maximum speed 62 mph (100 km/h) at sea level; initial climb rate not revealed; service ceiling 12,470 ft (3,800 m); endurance 3 hours 45 minutes.
Weights: empty 1,213 lb (550 kg); maximum take-off 1,874 lb (840 kg).
Dimensions: span 53 ft 0 in (16.15 m); length 31 ft 2 in (9.50 m); height 12 ft 9.5 in (3.90 m); wing area 613.56 sq ft (57.00 m^2).
Armament: one 8-mm (0.315-in) machine-gun and (bomber version) 288 lb (131 kg) of bombs.

In French service called the "barge" because of the shape of its central nacelle, the M.F.11 was withdrawn from first-line service during 1916 because of its low speed.

Photo: S.H.A.A.
D1 075 03.16
Printed in Italy

Naval helicopter

France

Aerospatiale SA 321 SUPER FRELON

Aerospatiale SA 321 SUPER FRELON

A helicopter of great promise

Designed as an improved version of the SA 3200 Frelon (hornet) with the suport of Sikorsky, which was largely responsible for the rotor system, the SA 3210 Super Frelon first flew in December 1962. Prototypes were produced in land-based troop transport and naval anti-submarine forms, the latter forming the basis of the SA 321G initial production model, which entered service in 1966. Carrying weapons in addition to search radar and sonar, the SA 321Gs are used to patrol the seaward approaches to the French navy's nuclear submarine base at Brest.

Limited production

Only 24 SA 321Gs were built, but the production total was boosted by small-scale production of several other variants, notably the SA 321K assault transport for Israel (12 helicopters) and the SA 321J/L/M transport exported to China, South Africa, and Libya. Total production was 99 helicopters.

Principal versions

SA 321F (airline version for 37 passengers), SA 321G (French navy version able to carry 27 passengers or freight in its alternative transport role), SA 321J (improved civil model able to carry 27 passengers or 11,023 lb/5,000 kg of freight), SA 321K (Israeli assault transport, later re-engined with General Electric T58 turboshafts), SA 321L (development of the SA 321K for other export markets), SA 321M (Libyan version of the SA 321L), and Changhe Zhishengji-8 (Chinese development of the SA 321J with Chinese turboshafts).

Principal users

China, France, Iraq, Israel, Libya, South Africa, and Zaire.

TECHNICAL DATA

Type: Aerospatiale SA 321G Super Frelon five-seat anti-submarine and anti- ship helicopter.
Engines: three 1,570-shp (1,171-kW) Turbomeca Turmo IIIC6 turboshafts.
Performance: maximum speed 154 mph (248 km/h) at sea level; initial climb rate 984 ft (300 m) per minute; service ceiling 10,170 ft (3,100 m); range 506 miles (815 km).
Weights: empty 15,130 lb (6,863 kg); maximum take-off 28,660 lb (13,000 kg).
Dimensions: main rotor diameter 62 ft 0 in (18.90 m); length overall, rotors turning 75 ft 6.75 in (23.03 m); height 22 ft 2 in (6.76 m); main rotor disc area 3,019.94 sq ft (280.55 m^2).
Armament: four homing torpedoes or (in the anti-ship role) two AM.39 Exocet missiles.

This is one of nine SA 321L Super Frelons operated by the Libyan air force.

Photo M. Rostaing
D1 075 02.14
Printed in Italy

Trainer

France

Aerospatiale EPSILON

Aerospatiale EPSILON

A forced decision

Faced with the problem of increased training costs, the French air force decided at the end of the 1970s to rethink its training program. The result was a decision that pilot candidates would have to prove their basic skills on a low-performance type before proceeding to full training on a more expensive military aircraft. The decision demanded the development of a new piston-engined trainer.

The first-step trainer

The resulting TB.30 Epsilon first flew in December 1979. The test program proceeded smoothly but revealed the need for a number of modifications to improve control and the crew's fields of vision, and these were incorporated in the second prototype. Production was authorized in 1982 and deliveries began in July 1983. Despite being piston engined, the Epsilon has a cockpit layout modelled on that of a fast jet to acclimatize the trainee pilot to the concept of military aircraft, and so ease conversion onto more advanced types. An armed version, with four underwing hardpoints, has been sold to Togo. Aerospatiale is now offering a turboprop-powered model for higher performance: this Omega model flew in prototype form during November 1985.

Principal versions

Epsilon (piston-engined trainer) and Omega (upgraded version under offer with the 450-shp/336-kW Turbomeca TP 319 turboprop derated to 350 shp/261 kW for higher performance).

Principal users

France, Portugal, and Togo.

TECHNICAL DATA

Type: Aerospatiale Epsilon two-seat primary/basic trainer.
Engine: one 300-hp (224-kW) Lycoming AEIO-540-L1B5D flat-six piston engine.
Performance: maximum speed 236 mph (378 km/h) at sea level; initial climb rate 1,850 ft (564 m) per minute; service ceiling 23,000 ft (7,010 m); range 792 miles (1,275 km).
Weights: empty 2.055 lb (932 kg); maximum take-off 2,755 lb (1,250 kg).
Dimensions: span 25 ft 11.75 in (7.92 m); length 24 ft 10.75 in (7.59 m); height 8 ft 8.85 in (2.66 m); wing area 96.9 sq ft (9.00 m^2).
Armament: up to 661 lb (300 kg) of disposable stores.

The two-seat Epsilon has taken its place as the French air force's primary and basic trainer, and is expected to remain in service for many years.

Photo Aerospatiale
D1 075 02.13
Printed in Italy

Air superiority fighter

France

Dassault-Breguet MIRAGE 2000C

Dassault-Breguet MIRAGE 2000C

Descended from a long tradition

After developing the Mirage F1 with its swept wings, Dassault-Breguet reverted to its traditional delta format, as in the Mirage III/5 series, for the Mirage 2000 high-performance fighter. The poor field, low-altitude, and maneuvering performance of the large delta wing in the earlier aircraft was overcome by the use of a design with relaxed stability, a variable-camber wing (produced by two-section leading-edge slats and trailing-edge elevons) and a "fly-by-wire" computerized control system in an airframe that makes extensive use of composite materials. The prototype flew in March 1978, and the type entered service in 1983.

A sophisticated weapon system

The Mirage 2000 has been developed in several variants, but the dedicated air-defense model is the Mirage 2000C with an advanced electronic countermeasures system, a "look-down/shoot-down" radar, and a mix of air-to- air missiles with infra-red or semi-active radar guidance, with an active radar-guided type to follow. The type can also be used in the attack role. Orders for this basic model total some 316 aircraft.

Principal versions

Mirage 2000B (combat-capable two-seat trainer), and Mirage 2000C (baseline air-defense model also produced in a number of differently suffixed subvariants for export).

Principal users

Abu Dhabi, Egypt, France, Greece, Jordan, India, and Peru.

TECHNICAL DATA

Type: Dassault-Breguet Mirage 2000C single-seat multi-role interceptor and air superiority warplane.
Engine: one 21,385-lb (9,700-kg) reheated thrust SNECMA M53-P2 turbofan.
Performance: maximum speed 1,453+ mph (2,338+ km/h) or Mach 2.2+ at 36,090 ft (11,000 m); initial climb rate 56,000 ft (17,060 m) per minute; service ceiling 59,055 ft (18,000 m); range 920 miles (1,480 km).
Weights: empty 16,534 lb (7,500 kg); maximum take-off 37,480 lb (17,000 kg).
Dimensions: span 29 ft 11.5 in (9.13 m); length 47 ft 1.25 in (14.36 m); height 17 ft 0.75 in (5.20 m); wing area 441.3 sq ft (41.00 m^2).
Armament: two 30-mm cannon and up to 13,890 lb (6,300 kg) of disposable stores.

A Mirage 2000C armed with Super 530 and Magic air-to-air missiles.

Photo SIRPA/air
D1 075 02.11
Printed in Italy

Fighter

France

Dewoitine D.520

Dewoitine D.520

Under the threat of war

The D.520 resulted from a 1937 specification, and was a neat fighter of very clean monoplane configuration. Under pressure of war with Germany, and rightly confident of the type's basic capabilities, the French air force had ordered 200 examples even before the prototype's first flight in October 1938.

High speed

The new fighter owed its designation to the required maximum speed of 520 km/h (323 mph), and was comparable with the best fighters of its time though it was perhaps less endowed with development potential than could have been desired. By the time of the German invasion of May 1940, D.520 orders had risen to 2,320 but only 36 had been delivered. Rapid production meant that five air force groupes and three naval escadrilles were equipped with the type before the French surrender, scoring 114 "kills" against 85 losses. Captured aircraft were used by Germany as trainers or passed to allies, and production continued for the Vichy French forces. Many variants were proposed or produced in prototype form, but none of these came to anything. Total production was 910 aircraft.

Principal version

D.520

Principal users

Bulgaria, France, Germany, Italy, and Romania.

TECHNICAL DATA

Type: Dewoitine D.520 single-seat fighter.
Engine: one 920-hp (686-kW) Hispano-Suiza HS 12Y-45 inline piston engine.
Performance: maximum speed 332 mph (535 km/h) at 19,685 ft (6,000 m); climb to 13,125 ft (4,000 m) 5 minutes 49 seconds; service ceiling 36,090 ft (11,000 m); range 553 miles (900 km).
Weights: empty 4,612 lb (2,092 kg); maximum take-off 6,134 lb (2,783 kg).
Dimensions: span 33 ft 5.5 in (10.20 m); length 28 ft 8.75 in (8.76 m); height 8 ft 5.25 in (2.57 m); wing area 171.69 sq ft (15.95 m^2).
Armament: one 20-mm cannon and four 7.5-mm (0.295-in) machine guns.

Restored to pristine condition by the Musee de l'Air, this D.520 bears the markings of Groupe de Chasse I/3, which in May 1940 was based at Cannes under the Zone d'Operations Aeriennes des Alpes (Alps air operations zone)

Photo Musee Air
D1 075 02.06
Printed in Italy

Fighter

France

Morane-Saulnier Type AI

Morane-Saulnier Type AI

Fighter with a short career

The Type AI was a monoplane fighter of the parasol type with its wing raised above the fuselage on cabane struts and braced by parallel struts running from the outer wings to the landing gear attachment points on the lower fuselage. A first flight was made in the summer of 1917, and the new fighter entered service at the beginning of 1918 with an armament of one or two machine guns synchronized to fire through the propeller disc. In May 1918, however, the type was withdrawn from first-line service after a string of structural failures and engine problems.

Aerobatic trainer

The manufacturer tried to revive the fighter with a modified structure and the 150-hp (112-kW) Gnome rotary, but further production was concentrated on two advanced trainer models without armament. Production of the series exceeded 1,200 aircraft, and after the First World War many were sold to other countries. In February 1928 a French pilot, Alfred Fronval, looped an orange and blue Type AI 1,111 consecutive times in 4 hours 56 minutes over Villacoublay!

Principal versions

MoS.27 (fighter with one machine gun), MoS.29 (fighter with two machine guns), MoS.30 (trainer with 120-hp/89-kW Le Rhone 9Jb or 135-hp/101-kW Le Rhone 9Jby rotary engine), and Mos.30bis (trainer with 90-hp/67-kW Le Rhone 9Jby).

Principal users

Belgium, France, Great Britain, Japan, Switzerland, USA, and USSR.

TECHNICAL DATA

Type: Morane-Saulnier Type AI (MoS.27) single-seat fighter.
Engine: one 150-hp (112-kW) Gnome Monosoupape 9N rotary piston engine.
Performance: maximum speed 141 mph (225 km/h) at sea level; climb to 13,125 ft (4,000 m) in 11 minutes 15 seconds; service ceiling 22,965 ft (7,000 m); endurance 1 hour 45 minutes.
Weights: empty 928 lb (421 kg); maximum take-off 1,431 lb (649 kg).
Dimensions: span 27 ft 11 in (8.51 m); length 18 ft 6.5 in (5.65 m); height 7 ft 10.5 in (2.40 m); wing area 144.13 sq ft (13.39 m^2).
Armament: one 0.303-in (7.7-mm) machine gun.

Sporting the colors of Escadrille SPA-156, this Type AI is still airworthy.

Photo Robineau.
D1 075 02.04
Printed in Italy

Light bomber

France

Voisin TYPE LA (TYPE III)

Voisin TYPE LA (TYPE III)

Pre-war origins
The first Type LA (otherwise Type III) flew with a 120-hp (89.5-kW) Salmson radial engine in February 1914, several months before the start of the First World War. Despite its somewhat fragile appearance, this multi-role warplane was remarkably strong and was an important French asset in the first months of the war.

First aerial "kill" of history
When the First World War began in August 1914, the use of aircraft for military purposes was limited, and the potential of the warplane only dimly perceived. Initial employment was limited to observation, but soon the more enterprising crews took to arming their aircraft. The world's first air-to-air "kill" was scored on October 5, 1914, when one Quenault, the gunner of a Type LA flown by Sergeant Joseph Frantz, downed an Aviatik two-seater with an 8-mm (0.315-in) Hotchkiss machine gun. Production amounted to about 1,000 Type LAs in France, 12 in Italy, 50 in Great Britain, and many in Russia, and the machine was used for observation and bombing up to 1916.

Principal versions
Type LA (original version) and Type LAS (version with airframe modifications and greater power to create the Type V with the 150-hp/112-kW Salmson and the Type VI with the 155-hp/115.5-kW Salmson).

Principal users
France, Great Britain, Italy, and Russia.

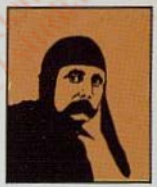
TECHNICAL DATA

Type: Voisin Type LA two-seat light bomber and observation plane.
Engine: one 120-hp (89.5-kW) Salmson/Canton-Unne 9M radial piston engine.
Performance: maximum speed 75 mph (120 km/h) at sea level; initial climb rate not revealed; service ceiling 11,485 ft (3,500 m); range 311 miles (500 km).
Weights: empty not revealed; maximum take-off 2,965 lb (1,345 kg).
Dimensions: span 48 ft 4.75 in (14.75 m); length 31 ft 3.25 in (9.53 m); height 11 ft 11 in (3.63 m); wing area not revealed.
Armament: one machine gun and up to 265 lb (120 kg) of bombs.

First used for reconnaissance, observation and artillery spotting, the Type LA was promoted to bomber status because of its sturdy structure. However, from mid-1915 onward aircraft of this type were withdrawn from first-line daylight use as they lacked the performance and agility to deal with newly developed German fighters.

Photo: French Air Museum
D1 075 03.03
Printed in Italy

Germany



Manfred von RICHTHOFEN

Manfred von RICHTHOFEN

A budding military career

Manfred, Freiherr von Richthofen was born on May 2, 1892 in the city of Breslau. After an education in several schools and military academies, he was commissioned in Uhlan Regiment Nr. 1. Posted to the Eastern Front with this lancer regiment at the First World War's start, the future ace led just a few patrols before being transferred to Alsace on the Western Front. Posted to the infantry, the young Richthofen requested transfer to the flying service, a request granted in May 1915. In the following month Richthofen began his flying career as an observer, and was soon posted to the Eastern Front before returning to the Western Front, this time in Belgium, during August 1915. Richthofen's desire to become a pilot was firmly kindled early in October, when he met the great ace and tactician, Oswald Boelcke.

The making of the "Red Baron"

After some 20 training flights, Richthofen flew solo at the beginning of 1916 and shifted seats to become the pilot of a C-class two-seater during the ghastly Battle of Verdun. Posted again to the Eastern Front, Richthofen was then selected by Boelcke as one of his pilots and returned to the Western Front. Here Richthofen scored his first official "kill" during September 1916, though he had already downed three aircraft whose fates could not be confirmed. Flying aircraft painted largely red, Richthofen went from strength to strength. By January 1917 he had chalked up 16 "kills", including a redoubtable British ace, Major Lanoe G.Hawker VC, and was awarded Germany's premier decoration, the Pour le Merite.

The Richthofen brothers

Two days earlier he had been apppointed commander of Jagdstaffel 11, in which he was soon joined by his younger brother, Lothar. During April 1917 the brothers scored prolifically: Manfred downed 21 aircraft and Lothar another 15. By June 1917 Manfred had achieved 56 "kills" and was the war's leading ace. Wounded in the head, Manfred refused to stop flying, and increased his score further during March and April 1918 at the controls of a Fokker Dr I triplane. With his score on 80, a total unexcelled by any other First World War ace, Manfred von Richthofen was killed on April 21, 1918, by a bullet through the heart while in combat against six British fighters.

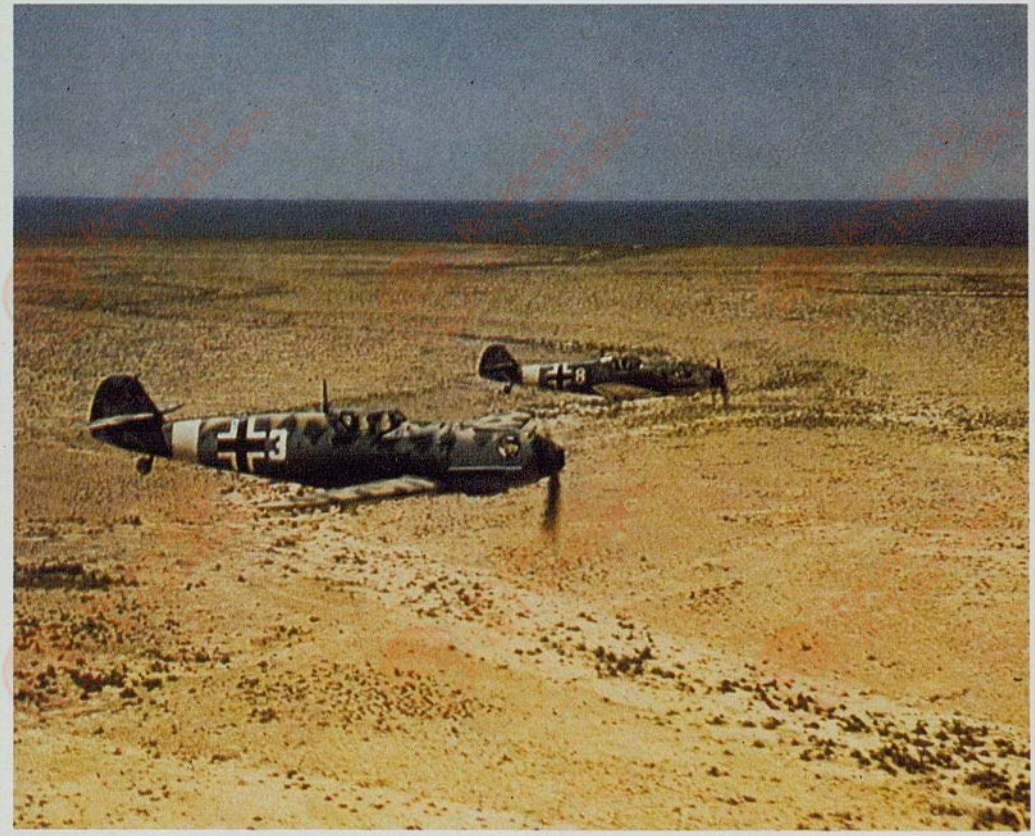
Posing in the cockpit of an Albatros fighter, Manfred von Richthofen is surrounded by other pilots of his greatest command, Jagdgeschwader Nr 1, known to the British and Americans as "The Flying Circus".

Photo: S.H.A.A.
D1 075 03.01
Printed in Italy

Fighter

Germany

Messerschmitt Bf 109



Messerschmitt Bf 109

Workhorse of the Luftwaffe

The Bf 109 prototype first flew in May 1935. Of the several early variants, the Bf 109B was evaluated operationally in the Spanish Civil War (1936-39). The definitive Jumo 210-engined version was the Bf 109C, but the Bf 109D introduced the DB 600 series engine with which this early monoplane fighter became a real winner. In 1938 Messerschmitt moved on to the Bf 109E-0, a pre-production model powered by the 1,100-hp (820-kW) DB 601A featuring direct fuel injection and an improved supercharger.

E for Emile

The Bf 109E was dubbed Emile by its pilots, and large-scale production was undertaken from 1939. The type was Germany's fighter mainstay in 1940 and acquitted itself well in the Battle of Britain. Production totalled 1,868, and the Bf 109E was being superseded by the Bf 109F as Germany invaded the USSR in mid-1941. Desert models, carrying the suffix "Trop" and fitted with sand filters, served longer in North Africa.

Principal versions

Bf 109E-0 (pre-production variant with four 7.92-mm/0.312-in machine guns), Bf 109E-1 (production variant with two machine guns and two 20-mm cannon), Bf 109E-1/B (fighter-bomber), Bf 109E-3 (more power and armament), Bf 109E-4 (with E-1 armament), Bf 109E-4/B (fighter-bomber), Bf 109E-5 (reconnaissance fighter with DB 601Aa), Bf 109E-6 (reconnaissance fighter with 1,200-hp/895- kW DB 601N), Bf 109E-8 (1,350-hp/1,007-kW DB 601E), and Bf 109E-9 (reconnaissance fighter).

Principal users

Bulgaria, Croatia, Germany, Romania, Slovakia, Spain, Switzerland, and Yugoslavia.

TECHNICAL DATA

Type: Messerschmitt Bf 109E-3 single-seat fighter.
Engine: one 1,175-hp (876-kW) Daimler-Benz DB 601Aa inline piston engine.
Performance: maximum speed 348 mph (560 km/h) at 14,560 ft (4,440 m); climb to 3,290 ft (1,000 m) in 1 minute 6 seconds; service ceiling 34,450 ft (10,500 m); range 410 miles (660 km).
Weights: empty 4,189 lb (1,900 kg); maximum take-off 5,875 lb (2,665 kg).
Dimensions: span 32 ft 4.5 in (9.87 m); length 28 ft 4.5 in (8.64 m); height 8 ft 2.25 in (2.50 m); wing area 174.05 sq ft (16.17 m^2).
Armament: two or three 20-mm cannon and two 7.92-mm (0.312-in) machine guns.

A Bf 109E of the Luftwaffe in flight over the Mediterranean coast of North Africa in 1941.

Photo D.R.
D1 075 02.05
Printed in Italy

Fighter

USA

McDonnell Douglas F/A-18A HORNET

McDonnell Douglas F/A-18A HORNET

Low-cost solution
After its YF-17 had lost to the General Dynamics YF-16 in the US Air Force's Light-Weight Fighter competition, Northrop teamed with McDonnell Douglas to produce a considerably revised machine designed to meet an ambitious naval requirement. This envisaged a single type to replace the McDonnell Douglas F- 4 and Vought A-7 in the multi-role fighter and attack roles respectively.

Changed production leadership
The first example flew in November 1978 and was considerably different from the YF-17 in size, configuration and, most importantly of all, the very advanced electronics providing capability in the two apparently conflicting roles merely by software alterations. With McDonnell Douglas as prime contractor, deliveries began in 1980 for service from 1983 after a protracted development phase. Deliveries for the US Navy and Marine Corps totalled 410 including two-seaters.

Principal versions
F/A-18A (initial dual-role fighter), F/A-18B (two-seat conversion and continuation trainer retaining full combat capability), AF-18A and ATF-18A (75 land based single and two-seat models for Australia), CF-18A and CF-18B (138 land based single- and two-seat models for Canada), and EF-18A and EF- 18B (75 land based single- and two-seat models for Spain).

Principal users
Australia, Canada, Spain, and USA.

TECHNICAL DATA

Type: McDonnell Douglas F/A-18A Hornet single-seat carrierborne and land based fighter and attack warplane.
Engines: two 16,000-lb (7,257-kg) reheated thrust General Electric F404-GE- 400 turbofans.
Performance: maximum speed 1,188+ mph (1,912+ km/h) or Mach 1.8+ at 40,000 ft (12,190 m); initial climb rate 45,000 ft (13,715 m) per minute; service ceiling 50,000+ ft (15,240+ m); radius 662 miles (1,965 km) on a typical attack mission.
Weights: empty 23,050 lb (10,455 kg); maximum take-off 49,224 lb (22,328 kg).
Dimensions: span 37 ft 6 in (11.43 m); length 56 ft 0 in (17.07 m); height 15 ft 3.5 in (4.66 m); wing area 400.0 sq ft (37.16 m^2).
Armament: one 20-mm multi-barrel cannon and up to 17,000 lb (7,711 kg) of disposable stores.

The F/A-18 Hornet offers remarkable capabilities as an all-weather multi- mission fighter and attack warplane.

Photo: D.R.
D1 075 10.01
Printed in Italy

Interceptor

Sweden

Saab 35 DRAKEN

Saab 35 DRAKEN

Demanding program

In 1949, when European supersonic aircraft were all research types, Sweden asked its aircraft industry for an interceptor possessing supersonic performance, an exceptional climb rate, and the ability to operate from dispersed sites such as short lengths of road. Saab came up with its remarkable single-engined Draken (dragon) of double-delta design offering large fuel capacity with minimal drag, and capable of the same performance as the twin-engined English Electric Lightning.

First-class interceptor

The Saab 35 prototype flew in October 1955, and the type entered service in March 1960 as the world's finest all-weather interceptor. The Draken is still in limited service in an updated variant, and total production amounted to 606 aircraft.

Principal versions

J 35A (initial model with 15,432-lb/7,000-kg reheated thrust RM6B), J 35B (improved model with data-link), Sk 35C (two-seat trainer), J 35D (improved interceptor with RM6C and enhanced electronics), S 35E (reconnaissance model), J 35F (definitive fighter with one rather than two cannon, and collision-course fire-control), J 35J (J 35F reworked to more modern standard), J 35Oe (24 Swedish aircraft refurbished for Austria), and Saab 35X (58 export aircraft for Denmark and Finland in interceptor, fighter-bomber, reconnaissance, and trainer variants).

Principal users

Austria, Denmark, Finland, and Sweden.

TECHNICAL DATA

Type: Saab J 35F Draken single-seat interceptor with secondary attack capability.

Engine: one 17,262-lb (7,830-kg) reheated thrust Volvo Flygmotor RM6C (licensed Rolls-Royce Avon with Swedish afterburner) turbojet.

Performance: maximum speed 1,320 mph (2,124 km/h) or Mach 2.0 at 36,090 ft (11,000 m); initial climb rate 34,450 ft (10,500 m) per minute; service ceiling 62,300+ ft (19,000+ m); radius 348 miles (560 km).

Weights: empty 16,369 lb (7,425 kg); maximum take-off 35,274 lb (16,000 kg).

Dimensions: span 30 ft 10 in (9.40 m); length 50 ft 4.25 in (15.35 m); height 12 ft 9 in (3.89 m); wing area 529.6 sq ft (49.20 m^2).

Armament: one 30-mm cannon and up to 6,393 lb (2,900 kg) of disposable stores.

The J 35 Draken has been in service since 1960, but with updating the later models are still effective intereptors.

Photo: Salamander
D1 075 10.02
Printed in Italy

Fighter

France

Wibault Wib.72

Wibault Wib.72

Work of genius

Michel Wibault's first fighter was the Wib.1, which was evaluated in November 1918. At the end of 1919 the Société des Avions Michel Wilbault was created, and this produced the Wib.2 night bomber and Wib.3 fighter prototypes in 1921 and 1923 respectively. In 1924 there appeared the Wib.7 parasol-wing fighter based on the Wib.3 but of all-metal construction and powered by a 480-hp (358-kW) Gnome-Rhône 9Ad radial.

From France to Poland

The production model was the Wib.72, which featured strengthened wing bracing but a slightly lower-powered engine. From 1929 60 of these high-altitude fighters entered service with two regiments of the French air force. Some 26 similar aircraft were built for Chile as Vickers Type 121 Wibault Scouts, Wibault having become a consultant to the British manufacturer. Another 29 fighters were built in Poland by PZL as 26 Wib.72s and three Wib.7s, the latter with Wright radials. In 1927 the company also produced the Wib.73 with the 450-hp (336-kW) Lorraine 12Eb inline, and seven of these were produced for Paraguay. Naval versions of the Wib.73 for French naval aviation were 18 Wib.74 arrester-hooked fighters and 18 Wib.75 reconnaissance aircraft.

Principal versions

Wib.72 (basic fighter), Wib.73 (different engine), Wib.74 (naval fighter), and Wib.75 (naval reconnaissance plane).

Principal users

Chile, France, Paraguay, and Poland.

TECHNICAL DATA

Type: Wibault Wib.72C.1 single-seat fighter.
Engine: one 420-hp (313-kW) Gnome-Rhône 9Ac Jupiter radial piston engine.
Performance: maximum speed 155 mph (250 km/h) at optimum altitude; climb to 13,125 ft (4,000 m) in less than 11 minutes 0 seconds; service ceiling 26,245 ft (8,000 m); range 373 miles (600 km).
Weights: empty not revealed; maximum take-off 3,186 lb (1,445 kg).
Dimensions: span 35 ft 9.5 in (10.90 m); length 24 ft 9.25 in (7.55 m); height 11 ft 5.75 in (3.50 m); wing area 236.81 sq ft (22.00 m^2).
Armament: two 0.303-in (7.7-mm) machine-guns.

A Wib.72 of the French air force photographed in 1932. The all-metal construction was quite advanced for the time of the Wib.7 series' design. This structure was not of the stressed-skin type, being designed instead for ease of manufacture and long airframe life.

Photo: S.H.A.A.
D1 075 10.04
Printed in Italy

Fighter

Italy

Macchi MC.202 FOLGORE

Macchi MC.202 FOLGORE

Inline replaces radial engine

Designer Mario Castoldi was convinced that despite its early promise, the MC.200 Saetta was limited in performance by the comparatively low power and high drag of its radial engine. He therefore revised the basic airframe with an improved fuselage with an enclosed cockpit, retractable tailwheel and, most importantly of all, an imported Daimler-Benz DB 601A inline. The resultant MC.202 Folgore (thunderbolt) flew in August 1940 as an altogether improved warplane that offered much enhanced performance without sacrifice of the MC.200's agility and precise handling.

Into production

The type was ordered into production alongside the MC.200 by Macchi, and was also built by two more companies initially with German engines until the Italian licence built version was available. The MC.202 entered service in November 1941, and production totalled about 1,100 aircraft for service in North Africa, the southern USSR, and Italy.

Principal versions

MC.202 (initial fighter model), MC.202AS (tropicalized version with sand/dust filters), MC.202CB (fighter-bomber version with provision for two 705-lb/320- kg bombs or drop tanks).

Principal users

Germany and Italy.

TECHNICAL DATA

Type: Macchi MC.202 Folgore single-seat fighter.
Engine: one 1,175-hp (876-kW) Alfa Romeo RA.1000 RC 41-I Monsone inline piston engine.
Performance: maximum speed 370 mph (595 km/h) at 16,405 ft (5,000 m); climb to 19,685 ft (6,000 m) in 5 minutes 55 seconds; service ceiling 37,730 ft (11,500 m); range 475 miles (765 km).
Weights: empty 5,181 lb (2,350 kg); maximum take-off 6,636 lb (3,010 kg).
Dimensions: span 34 ft 8.5 in (10.58 m); length 29 ft 0.5 in (8.85 m); height 9 ft 11.5 in (3.04 m); wing area 180.84 sq ft (16.80 m^2).
Armament: two 12.7-mm (0.5-in) machine guns and, in later aircraft, two 7.7- mm (0.303-in) machine guns; some aircraft also had two 20-mm cannon under the wings.

An MC.202 Folgore, guided by the men sitting on its wings, taxies on a rough Italian airstrip during the Second World War. The Folgore was one of Italy's best fighters of that war, and production on a larger scale was prevented only by a shortage of engines.

Photo: Salamander
D1 075 10.06
Printed in Italy

Fighter

USA

Grumman F6F HELLCAT

Grumman F6F HELLCAT

Evolution from the Wildcat

Grumman was able to draw on the lessons of the F4F Wildcat's operational experience as it began the process of designing a successor. The new fighter had considerably more power, and resembled its predecessor in everything but the adoption of a low wing. This allowed the main landing gear units to retract into the center section rather than the lower fuselage. Four prototypes with different engines were ordered, and the first of these flew in June 1942.

Deadly weapon

The XF6F-3 formed the basis of the F6F-3 production model, and the Hellcat's similarity to the Wildcat paid handsome dividends in an accelerated build rate that saw the first production machine fly in October 1942 and the last of 12,275 in November 1945. The Hellcat downed 4,947 enemy aircraft and was also a powerful ground-attack fighter.

Principal versions

F6F-3 and, in British service, Hellcat Mk I (initial model), F6F-3N (night fighter version with wing-mounted radar), F6F-E (different radar), F6F-5 and Hellcat Mk II (improved model with a redesigned cowling and provision for underwing stores), F6F-5N and Hellcat NF.Mk II (night fighter) and, F6F-5P (photo- reconnaissance conversion).

Principal users

Great Britain and USA.

TECHNICAL DATA

Type: Grumman F6F-5 Hellcat single-seat carrier-borne fighter and fighter- bomber.
Engine: one 2,000-hp (1,491-kW) Pratt & Whitney R-2800-10W radial piston engine.
Performance: maximum speed 380 mph (612 km/h) at 23,400 ft (7,130 m); initial climb rate 2,980 ft (908 m) per minute; service ceiling 37,300 ft (11,370 m); range 1,530 miles (2,462 km) with one drop tank.
Weights: empty 9,153 lb (4,152 kg); maximum take-off 15,413 lb (6,991 kg).
Dimensions: span 42 ft 10 in (13.06 m); length 33 ft 7 in (10.24 m); height 13 ft 6 in (4.11 m); wing area 334.0 sq ft (31.03 m^2).
Armament: six 0.5-in (12.7-mm) machine guns or, in late aircraft, two 20-mm cannon and four 0.5-in (12.7-mm) machine guns and two 1,000-lb (454-kg) bombs or six 5-in (127-mm) rockets).

Operating in partnership from mid-1944, the F6F Hellcat and the Vought F4U Corsair were instrumental in completing the destruction of Japanese air power in the Pacific Ocean Areas that were the primary responsibility of the US Navy.

Photo: Salamander
D1 075 10.07
Printed in Italy

Fighter

USA

Curtiss P-40E WARHAWK

Curtiss P-40E WARHAWK

A promising design

In April 1939 the US Army Air Corps awarded what was at that time the service's largest ever fighter contract, covering 524 examples of the P-40. This was in essence the P-36 revised with an inline engine, and the XP-40 prototype that flew in October 1938 was the first American fighter capable of exceeding 300 mph (483 km/h).

Proved in combat

High hopes were entertained for the P-40 series, which was produced in many forms for the American and export markets. It soon became clear, however, that with the Allison engine the series lacked the altitude performance required of a first-line interceptor, and the P-40 was rapidly relegated to the fighter-bomber role, where its ruggedness and stability made it a real asset to the Allies. The P-40 series was used in nearly every theater, and was later improved with the Merlin (and upgraded Allison) engine.

Principal versions

P-40 and, in British service, Tomahawk Mk I (339 aircraft with the 1,160- hp/865-kW V-1710-19 engine), P-40B and Tomahawk Mk IIA (241 aircraft with heavier armament), P-40C and Tomahawk Mk IIB (1,123 aircraft with a revised fuel system), P-40D and Kittyhawk Mk I (582 aircraft of a P-40C version with 1,150-hp/857-kW V-1710-39, shorter fuselage and shorter landing gear legs), and P-40E and Kittyhawk Mk IA (3,820 aircraft with two additional wing guns).

Principal users

Australia, Canada, China, Egypt, France, Great Britain, the Netherlands, South Africa, Turkey, USA, and USSR.

TECHNICAL DATA

Type: Curtiss P-40E Warhawk single-seat fighter-bomber.

Engine: one 1,150-hp (857-kW) Allison V-1710-39 inline piston engine.

Performance: maximum speed 335 mph (539 km/h) at 5,000 ft (1,525 m); climb to 10,000 ft (3,050 m) in 4 minutes 48 seconds; service ceiling 29,000 ft (8,840 m); range 850 miles (1,368 km).

Weights: empty 6,350 lb (2,880 kg); maximum take-off 9,200 lb (4,173 kg).

Dimensions: span 37 ft 4 in (11.38 m); length 31 ft 2 in (9.50 m); height 10 ft 7 in (3.22 m); wing area 236.0 sq ft (21.92 m^2).

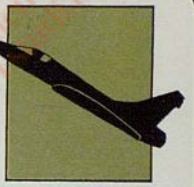
Armament: six 0.5-in (12.7-mm) machine guns and up to 700 lb (318 kg) of bombs.

The shape of the P-40's nose and chin radiator lent itself readily to the shark's mouth insignia much favored by pilots in China and North Africa.

Photo: Robineau
D1 075 03.06
Printed in Italy

Fighter

Great Britain



Supermarine SPITFIRE F.Mk IX

Supermarine SPITFIRE F.Mk IX

Prestigious heritage
The Spitfire was the most important British air-combat fighter from the beginning of the Second World War, and was steadily improved in performance and firepower without any loss of maneuverability.

An "interim" development becomes definitive
In the fall of 1941 the new Focke-Wulf Fw 190A appeared over the Channel front and immediately displayed its superiority to the Spitfire Mk V. Plans were put in hand for a stopgap fighter based on the Mk V but fitted with a Merlin 60 series engine and, entering service in June 1942, this Spitfire F.Mk IX proved very successful. No fewer than 5,665 were built within the total of 20,351 Spitfires. At one time equipping just under 100 squadrons, the type remained in service until after the end of the war. Subvariants were the Spitfire LF.Mk IX and HF.Mk IX with clipped and extended wings for the low- and high-altitude roles respectively, and E-suffixed versions with two 0.5-in (12.7-mm) machine guns in place of the quartet of smaller-caliber guns.

Principal versions
Spitfire F.Mk IX (three main subvariants), Spitfire PR.Mk IX, (photo-reconnaissance conversion), Spitfire PR.Mk X (77 examples of an unarmed but pressurized PR version with the Merlin 77), and Spitfire PR.Mk XI (PR conversion).

Principal users
Australia, Canada, Great Britain, New Zealand, South Africa, USA and USSR.

TECHNICAL DATA

Type: Supermarine Spitfire F.Mk IX single-seat fighter and fighter-bomber.
Engine: one 1,650-hp (1,230-kW) Rolls-Royce Merlin 63 inline piston engine.
Performance: maximum speed 408 mph (655 km/h) at 25,000 ft (7,620 m); initial climb rate 3,950 ft (1,204 m) per minute; service ceiling 43,000 ft (12,105 m); range 980 miles (1,576 km).
Weights: empty 5,610 lb (2,545 kg); maximum take-off 9,500 lb (4,309 kg).
Dimensions: span 36 ft 10 in (11.22 m); length 31 ft 0 in (9.46 m); height 12 ft 7.75 in (3.85 m); wing area 242.0 sq ft (22.48 m^2).
Armament: two 20-mm cannon and four 0.303-in (7.7-mm) machine guns in a fixed installation, and up to 1,000 lb (454 kg) of bombs carried under the wings.

This Spitfire F.Mk IX carries the black/white "invasion stripes" characteristic of aircraft involved in the D-Day landings of June 6, 1944.

Photo: Robineau
D1 075 01.05
Printed in Italy

Fighter

France

Morane-Saulnier TYPE N

Morane-Saulnier TYPE N

Allies' first fighter

The Type N was first displayed at an air meeting in Austria during July 1914, and was a shoulder-wing monoplane braced by wires to a kingpost and the landing gear. In combination with a circular-section fuselage and moderaterly powerful rotary engine, this gave the Type N good performance. The plane was tricky to handle, however, and this caused a number of accidents in the first production run of 49 aircraft. The French also adopted a revised Type V with the 110-hp (82-kW) Le Rhône rotary, greater span, and a deeper forward fuselage accommodating extra fuel. Most of these French air force machines were fitted with a forward-firing machine gun and deflector plates on the propeller blades, and were the Allies' first real fighters.

Useful but limited service

The Type N was useful in its time despite its oversensitive controls and high landing speed, but was really an interim type pending the advent of purpose designed fighters. A few aircraft were delivered to the British, who knew the type as the Morane-Saulnier Bullet.

Principal versions

Type N (basic model), Type Nm (revised rear fuselage with modified tail unit), Type I (Type Nm with the 110-hp/82-kW Le Rhône 9J rotary), and Type V (revised fuselage and longer endurance).

Principal users

France, Great Britain, and Russia.

TECHNICAL DATA

Type: Morane-Saulnier Type N single-seat fighter.
Engine: one 80-hp (60-kW) Le Rhône 9C rotary piston engine.
Performance: maximum speed 90 mph (144 km/h) at sea level; climb to 6,560 ft (2,000 m) in 10 minutes 0 seconds; service ceiling 13,135 ft (4,000 m); endurance 1 hour 30 minutes.
Weights: empty 633 lb (287 kg); maximum take-off 979 lb (444 kg).
Dimensions: span 26 ft 8.75 in (8.146 m); length 19 ft 1.5 in (5.83 m); height 7 ft 4.5 in (2.25 m); wing area 118.4 sq ft (11.0 m^2).
Armament: one 0.303-in (7.7-mm) or 8-mm (0.315-in) machine gun.

The Type N had a reputation amongst pilots as a "flying coffin" because its tricky handling required considerable pilot skill, yet with its forward-firing machine gun it was the Allied pioneer of the true fighter.

Photo: S.H.A.A.
D1 075 10.08
Printed in Italy

Dive bomber

USA

Douglas SBD DAUNTLESS

Douglas SBD DAUNTLESS

Northrop input
The Dauntless was the most successful American dive bomber of the Second World War, and could trace its origins to the Northrop BT-1 scout/dive bomber, which entered service in 1938. A BT-2 was planned, but in 1940 Northrop became a subsidiary of Douglas and the improved model became the SBD.

Decisive in turning the Japanese tide
The SBD-1 entered US Marine Corps service in late 1941, and provided invaluable in the defeat of the Japanese in the Battle of Midway, turning point of the Pacific war. The Dauntless was phased out of carrierborne service in 1944, but remained operational as a land based type to the end of the war. Total production was 5,937 including the US Army's A-24 variant.

Principal versions
SBD-1 (initial model with 1,000-hp/746-kW Wright R-1820-32 radial), SBD-2 (heavier armament and more fuel), SBD-3 (first major model with R-1820-52 engine, heavier firepower, and self-sealing fuel tanks of greater capacity), SBD-4 (revised electrics), SBD-5 and, in British service, Dauntless DB.Mk I (definitive model with greater power), and SBD-6 (1,350-hp/1,007-kW R-1820-66 and increased fuel capacity).

Principal users
France, Great Britain, Mexico, New Zealand, and USA.

TECHNICAL DATA

Type: Douglas SBD-5 Dauntless two-seat carrierborne and land based scout and dive bomber.
Engine: one 1,200-hp (895-kW) Wright R-1820-60 Cyclone radial piston engine.
Performance: maximum speed 255 mph (410 km/h) at 14,000 ft (4,265 m); initial climb rate 1,700 ft (518 m) per minute; service ceiling 25,530 ft (7,780 m); range 1,115 miles (1,795 km).
Weights: empty 6,404 lb (2,905 kg); maximum take-off 10,700 lb (4,853 kg).
Dimensions: span 41 ft 6.5 in (12.66 m); length 33 ft 1.25 in (10.09 m); height 13 ft 7 in (4.14 m); wing area 325.0 sq ft (30.19 m^2).
Armament: two 0.5-in (12.7-mm) machine guns in the forward fuselage and two 0.3-in (7.62-mm machine guns in the dorsal position, and up to 2,250 lb (1,021 kg) of bombs.

SBD Dauntlesses in formation. During the Pacific war the type sank 18 major Japanese warships, including six aircraft carriers and one battleship in 1942 alone. Dauntlesses additionally destroyed much of Japan's merchant tonnage, and also supported Marine Corps amphibious operations.

Photo: Salamander
D1 075 10.03
Printed in Italy

Dive bomber

Germany

Junkers Ju 87 STUKA

Junkers Ju 87 STUKA

Stuka shock

During the first stages of the Second World War, the Ju 87 proved a decisive weapon. Abbreviated from Sturzkampfflugzeug (dive bomber), the word Stuka entered the general vocabulary as a vital component of the Blitzkrieg, the "lightning war". In the summer of 1940 the lie was put to the Stuka myth by catastrophic losses to British fighters in the Battle of Britain.

The Stuka at war

The Ju 87 prototype flew in 1935 with a tailplane sporting endplate vertical surfaces, but the second prototype and all later aircraft had a single fin and rudder assembly. Early aircraft were evaluated in the Spanish Civil War (1936-39), and in September 1939 the Luftwaffe had 336 Ju 87Bs. From late 1940 the type was steadily relegated to areas of negligible air opposition. For lack of a replacement the type remained in production long after it became obsolete, and production totalled 5,709.

Principal versions

Ju 87A (first production model in three subvariants with the 680-hp/507-kW Jumo 210 engine), Ju 87B (definitive early model in three subvariants with the 1,200-hp/895-kW Jumo 211 engine), Ju 87D (improved model in seven subvariants optimized for a range of roles), Ju 87G (anti-tank version of the Ju 87D), and Ju 87R (anti-shipping version of the Ju 87B).

Principal users

Bulgaria, Croatia, Germany, Hungary, Italy, and Romania.

TECHNICAL DATA

Type: Junkers Ju 87D-1 two-seat dive-bomber and assault aeroplane.
Engine: one 1,410-hp (1,051-kW) Junkers Jumo 211J-1 inline piston engine.
Performance: maximum speed 255 mph (410 km/h) at 12,600 ft (3,480 m); climb to 16,405 ft (5,000 m) in 19 minutes 49 seconds; service ceiling 23,950 ft (7,300 m); range 954 miles (1,535 km).
Weights: empty 8,598 lb (3,900 kg); maximum take-off 14,550 lb (6,600 kg).
Dimensions: span 45 ft 3.5 in (13.80 m); length 37 ft 8.75 in (11.50 m); height 12 ft 9.5 in (3.90 m); wing area 343.38 sq ft (31.90 m^2).
Armament: four 7.92-mm (0.312-in) machine guns (two fixed and two trainable) and up to 3,968 lb (1,800 kg) of bombs.

The Ju 87 Stuka gained its awesome reputation in the first part of the Second World War, but was then revealed as a second-rate warplane.

Photo R.D.
D1 075 02.01
Printed in Italy

Torpedo bomber

USA

Grumman TBF AVENGER

Grumman TBF AVENGER

First of many

In 1940 the US Navy initiated a design competition for a modern carrierborne torpedo bomber, and such was the urgency of the situation that an order was placed for 286 examples of the TBF even before the prototype first flew in December 1941. Of the 9,839 aircraft finally produced, 2,293 were built by Grumman, and the balance by the Eastern Division of General Motors under the basic designation TBM and in the same subvariants as the baseline TBF series.

Pacific hero

The type had an inauspicious combat debut in the Battle of Midway (June 1942), but then went on to become the Allies' most potent torpedo bomber of the Second World War. The Avenger was involved in sinking the Japanese *Musashi* and *Yamato*, the world's two largest battleships, and the type served through to 1954 in later variants optimized for a number of different roles.

Principal versions

TBF-1 and, in British service, Avenger Mk I (initial model with 1,700-hp/1,268-kW Wright R-2600-8 radial), TBF-1C (with two extra wing guns and additional fuel), TBM-1 (General Motors production), TBM-1C and Avenger Mk II (General Motors production), and TBM-3 and Avenger Mk III (definitive model with more power).

Principal users

Great Britain, New Zealand, and USA.

TECHNICAL DATA

Type: General Motors TBM-3 Avenger three-seat carrierborne torpedo bomber.
Engine: one 1,750-hp (1,305-kW) Wright R-2600-20 Cyclone radial piston engine.
Performance: maximum speed 267 mph (430 km/h) at 15,000 ft (4,570 m); initial climb rate 2,060 ft (628 m) per minute; service ceiling 23,400 ft (7,130 m); range 1,130 miles (1,819 km).
Weights: empty 10,700 lb (4,853 kg); maximum take-off 18,250 lb (8,278 kg).
Dimensions: span 54 ft 2 in (16.51 m); length 40 ft 0 in (12.19 m); height 16 ft 5 in (5.00 m); wing area 490.0 sq ft (45.52 m^2).
Armament: two 0.5-in (12.7-mm) fixed forward-firing machine-guns, one 0.5-in (12.7-mm) machine gun in the dorsal turret, one 0.3-in (7.62-mm) machine gun in the ventral position, and one torpedo or up to 2,000 lb (907 kg) of bombs.

The TBF Avenger was the US Navy's standard torpedo bomber from mid-1942 to the end of the Second World War. Torpedo attack demanded low-level flight straight at the enemy.

Photo: Salamander
D1 075 10.05
Printed in Italy

Trainer

Spain

CASA C-101 AVIOJET

CASA C-101 AVIOJET

Internation cooperation

In 1975 CASA received a contract for a jet trainer to replace the Hispano HA 200. Teamed with MBB of West Germany and Northrop of the USA for design of complex features of the airframe and its associated aerodynamics, CASA flew the first C-101 in June 1977 as the prototype of a trainer that can also double as a light attack warplane. The straight flying surfaces limit outright flight performance, but the combination of a turbofan engine and large fuel capacity provide sufficient range that no provision is made for drop tanks.

Into service

The type was adopted by the Spanish air force as the E.25 Mirlo (blackbird) and entered service in 1981. Other nations have bought more powerful variants with steadily enhanced attack capability, and licensed assembly is undertaken in Chile, which has adapted its variant for anti-ship attack with the British Aerospace Sea Eagle missile. Total production was 153 aircraft.

Principal versions

C-101EB (initial model with the 3,500-lb/1,588-kg thrust TFE731-2-2J), C- 101BB (armed export version with the 3,700-lb/1,678-kg thrust TFE731-3-1J), C-101CC (upgraded export model with the 4,700-lb/2,131-kg thrust TFE731-5- 1J), and C-101DD (enhanced trainer with much improved electronics).

Principal users

Chile, Honduras, Jordan, and Spain.

TECHNICAL DATA

Type: CASA C-101CC Aviojet two-seat basic/advanced flying and weapon trainer with secondary attack capability.

Engine: one 4,700-lb (2,131-kg) thrust Garrett TFE731-5-1J turbofan.

Performance: maximum speed 501 mph (806 km/h) at 25,000 ft (7,620 m); initial climb rate 6,100 ft (1,859 m) per minute; service ceiling 42,000 ft (12,800 m); radius 322 miles (519 km) on an attack mission.

Weights: empty 7,716 lb (3,500 kg); maximum take-off 13,890 lb (6,300 kg).

Dimensions: span 34 ft 9.5 in (10.60 m); length 41 ft 0 in (12.50 m); height 13 ft 11.25 in (4.25 m); wing area 215.3 sq ft (20.00 m^2).

Armament: one 20-mm cannon or two 0.5-in (12.7-mm) machine guns in a lower- fuselage bay and up to 4,690 lb (2,250 kg) of disposable stores.

The C-101 is used by the Spanish air force only for training, but the type's other operators exploit the Aviojet's weapon capabilities for armament training and operational purposes.

Photo: Photo: Salamander
D1 075 10.09
Printed in Italy

Medium bomber

USSR

Tupolev Tu-16 "BADGER-A"

Medium bomber

Tupolev Tu-16 "BADGER-A"

Far-sighted design

After the Second World War the USSR thought its extremely important to match the USA in strategic bombing capability. In the late 1940s the development of the RD-3 (Mikulin AM-3) as a powerful turbojet opened new possibilities for Soviet aircraft designers, and in the summer of 1950 the Tupolev design bureau was ordered to proceed with three Tu-88 prototypes, powered by two of these engines, for evaluation against the smaller Ilyushin Il-46. The first plane flew in the initial quarter of 1952 and development produced the Tu-16 production model that entered service in 1955.

Great capabilities

Production continued up to 1959, and it is thought that about 2,000 aircraft were built, excluding a growing number (now about 150) still being built in China as the Xian H-6. The main production model was the "Badger-A" medium strategic bomber. Many of these were later converted for other roles, but about 515 remain in Soviet service (275 with Long-Range Aviation and 240 with Naval Aviation) as bombers and inflight refueling tankers. The latter are of two types, using a wingtip-to-wingtip system for other Tu-16s and a ventral hose- and-drogue system for other aircraft types.

Principal version

Tu-16 "Badger-A" (initial model in the strategic free-fall bombing role, and later adapted for in-flight refueling).

Principal users

China, Egypt, Iraq, and USSR.

TECHNICAL DATA

Type: Tupolev Tu-16 "Badger-A" six-seat medium strategic bomber.
Engines: two 20,944-lb (9,500-kg) thrust Mikulin AM-3M turbojets.
Performance: maximum speed 652 mph (1,050 km/h) at 19,685 ft (6,000 m); initial climb rate not revealed; service ceiling 49,215 ft (15,000 m); range 3,000 miles (4,850 km) with maximum warload.
Weights: empty 88,845 lb (40,300 kg); maximum take-off 167,110 lb (75,800 kg).
Dimensions: span 108 ft 0.5 in (32.93 m); length 114 ft 2 in (34.80 m); height 35 ft 5.25 in (10.80 m); wing area 1,772.34 sq ft (164.65 m^2).
Armament: seven 23-mm cannon (one fixed forward-firing, two each in dorsal and ventral barbettes, and two in the tail turret), and up to 19,842 lb (9,000 kg) of bombs.

A Tu-16 "Badger-A" of Naval Aviation, the air arm of the Soviet navy which uses the Tu-16 for strike and inflight refueling.

Photo: Salamander
D1 075 10.10
Printed in Italy

Seaplane

USSR

Beriev Be-12 CHAIKA "MAIL"

Beriev Be-12 CHAIKA "MAIL"

Naval requirement
The USSR is one of the few countries still using flying boats, and it is thought that 100 Be-12 (otherwise known as M-12 Chaika, or seagull) amphibian boats are still in service with Naval Aviation for the maritime reconnaissance and anti-submarine roles from shore bases in areas where it would be difficult or superfluous to construct ordinary airfields.

Optimized design
First flown in the late 1950s for service from the early 1960s, the Be-12 resulted from the design bureau's experience with a number of earlier flying boats powered by piston and turbojet engines, and in its first 10 years of service the type captured many world records. The amphibian has retractable tailwheel landing gear for land operation, while the gull-wing configuration with the engines in the angle of the inner and outer panels keeps the tips of the large-diameter propellers clear of the water and the engine inlets free of spray ingestion. Sensors include nose radar, sonobuoys, and a magnetic anomaly detector in the tail "sting". The main weapon load (torpedoes and depth charges) is carried in a lower-fuselage bay, but can be supplemented by missiles and rockets on two underwing hardpoints. The Be-12 is probably to be replaced by a version of the new Beriev A-40 flying boat.

Principal versions
Be-12 (only production model).

Principal user
USSR.

TECHNICAL DATA

Type: Beriev Be-12 six-seat maritime reconnaissance and anti-submarine flying boat with secondary SAR capability.
Engines: two 4,190-ehp (3,124-kW) Ivchyenko AI-20D turboprops.
Performance: maximum speed 378 mph (608 km/h) at optimum altitude; initial climb rate 2,990 ft (912 m) per minute; service ceiling 37,000 ft (11,280 m); range 2,485 miles (4,000 km).
Weights: empty 39,680 lb (18,000 kg); maximum take-off 64,925 lb (29,450 kg).
Dimensions: span 97 ft 5.75 in (29.71 m); length 101 ft 6.5 in (30.95 m); height 22 ft 11.5 in (7.00 m); wing area 1,130.2 sq ft (105.00 m^2).
Armament: up to 11,023 lb (5,000 kg) of disposable stores.

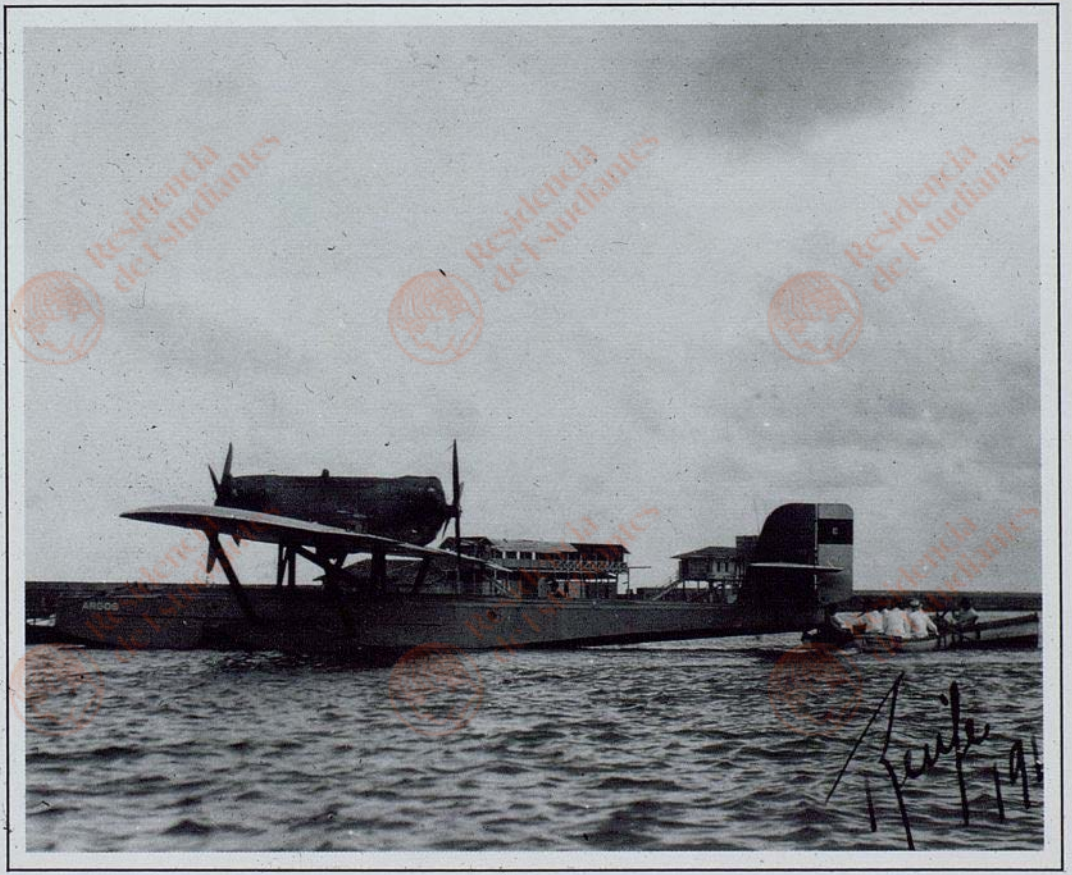
For more than 25 years the Be-12 "Mail" has provided the Soviet navy with an important capability from bases in areas such as the Black Sea, the Baltic, and around the Kola peninsula.

Photo: Salamander
D1 075 10.11
Printed in Italy

Seaplane

Germany

Dornier Do J WAL



Dornier Do J WAL

Flying boat with fine lines
Without doubt, the Wal (whale) was one of the most important flying boats of the 1920s and first flew in November 1922. The long metal hull was surmounted by a strut-supported parasol wing braced by more struts to hull sponsons that provided waterborne stability. The 300-hp (224-kW) Hispano-Suiza engines were located as a push/pull pair in a long nacelle on the wing center section. The hull was of considerable volume, and this enhanced the type's capability in its joint civil and military applications.

Treaty restrictions
The Treaty of Versailles prohibited German manufacture of military aircraft, so military Wals were built in Italy and Spain, and later in Japan and the Netherlands. About 300 of the Wal series were built in four main variants with a large number of engine types.

Principal versions
Do J Wal (initial civil and military models with different engines and wing spans/areas), Do J II Wal (improved model in subvariants with 8- and 10-tonne maximum take-off weights), Do 15 Wal (post-1934 designation of the 8-tonne Wal in military form), Do R Super-Wal (improved version with greater wing span and hull length, and built in Do R2 form with two 650-hp/485-kW Rolls-Royce Condor inlines and in Do R4 form with four 525-hp/391-kW Siemens-built Bristol Jupiter radials).

Principal users
Germany, Japan, the Netherlands, and Spain.

TECHNICAL DATA

Type: Dornier Do 15 Wal four-seat maritime reconnaissance flying boat.
Engines: two 750-hp (559-kW) BMW VI inline piston engines.
Performance: maximum speed 124 mph (200 km/h) at optimum altitude; climb to 3,280 ft (1,000 m) in 7 minutes 0 seconds; service ceiling 9,845 ft (3,000 m); range 1,180 miles (1,900 km).
Weights: empty 10,362 lb (4,700 kg); maximum take-off 17,637 lb (8,000 kg).
Dimensions: span 76 ft 1.5 in (23.20 m); length 60 ft 0.5 in (18.30 m); height 17 ft 6.75 in (5.35 m); wing area 1,033.34 sq ft (96.00 m^2).
Armament: three 7.92-mm (0.312-in) machine guns in bow and two dorsal positions, and up to 441 lb (200 kg) of bombs.

Used for civil and military tasks, the Do J series proved itself an important plane in aviation history with a number of record-breaking flights as well as pioneering civil operations.

Photo: S.H.A.A.
D1 075 10.12
Printed in Italy

USA

Grumman E-2 HAWKEYE

Grumman E-2 HAWKEYE

Early warning comes of age
After the Second World War airborne surveillance radar made rapid progress, making it possible to detect increasingly smaller objects at ever lengthening ranges. This led to the concept of airborne early warning planes, including the Grumman E-1 Tracer for the US Navy. To succeed this plane, Grumman produced the E-2. The prototype flew in October 1960, and the E-2A entered service in January 1964.

Advanced electronics
The late 1960s and the 1970s saw a revolution in electronic miniaturization, allowing the creation of more capable radars and advanced computers to aid in the assessment of radar and other data. This turned the Hawkeye from an AEW platform into a true warning and command system able to watch airspace to a radius of 300 miles (483 km), tracking more than 2,000 surface and air targets, and directing 40 friendly fighters. More than 215 aircraft have been ordered.

Principal versions
E-2A (initial model with APS-96 radar capable of overwater operation), E-2B (conversion with APS-120 radar and a more capable computer system adding overland capability), E-2C (definitive model delivered from 1973 with APS-125 radar and ALR-59 electronic support measures, being replaced by APS-138/139 radar and ALR-73 ESM, to be replaced by APS-145 radar), and TE-2C (trainer).

Principal users
Egypt, Israel, Japan, Singapore, and USA.

TECHNICAL DATA

Type: Grumman E-2C Hawkeye five-seat carrier-borne and land based airborne early warning and command system plane.
Engines: two 4,910-ehp (3,663-kW) Allison T56-A-425 turboprops.
Performance: maximum speed 374 mph (602 km/h) at optimum altitude; initial climb rate not revealed; service ceiling 30,800 ft (9,390 m); radius 200 miles (322 km) for a 4-hour patrol.
Weights: empty 38,063 lb (17,265 kg); maximum take-off 51,933 lb (23,556 kg).
Dimensions: span 80 ft 7 in (24.56 m); length 57 ft 6.75 in (17.54 m); height 18 ft 3.75 in (5.58 m); wing area 700.0 sq ft (65.03 m^2).
Armament: none.

The E-2C Hawkeye provides the US Navy's carriers with superb aerial surveillance and command capabilities, and has also been adopted for land based use.

Photo: Salamander
D1 075 10.13
Printed in Italy

Land based helicopter

USA

Boeing Helicopters CH-47 CHINOOK

Boeing Helicopters CH-47 CHINOOK

Birth of a lifter

The Western world's most important medium/heavy-lift helicopter, the CH-47 is a lineal descendant of the twin-rotor Piasecki helicopters of the late 1940s, for Piasecki became Vertol, which became Boeing Vertol and finally Boeing Helicopters. Development of the Chinook began in 1956 and the first prototype flew in September 1961.

Vietnam service and rebirth

The CH-47A, B, and C variants performed with great distinction in the Vietnam War, especially for tasks such as moving artillery. The Chinook is still a vital part of the US Army's inventory, and from 1976 large numbers of older CH-47s have been remanufactured as much improved CH-47Ds, the first being redelivered in 1982 in a program to complete 436 machines by 1993.

Principal versions

CH-47A (354 with 2,200-shp/1,641-kW T55-L-5 turboshafts), CH-47B (108 with 2,850-shp/2,125-kW T55-L-7Cs), CH-47C (270 with 3,750-shp/2,796-kW T55-L-11As, strengthened transmission, and greater fuel capacity), CH-47D (remanufactured type with 13 major improvements), MH-47E (50 of an armored and armed version for the US Special Forces), CH-47D International Chinook (main export variant), CH-147 (nine CH-47Cs for Canada), and Chinook HC.Mk 1 (41 British helicopters to CH-147 standard but with greater power).

Principal users

Argentina, Australia, Canada, Great Britain, Japan, Spain, Taiwan, Thailand, and USA.

TECHNICAL DATA

Type: Boeing Helicopters CH-47D Chinook two/three-crew medium-lift helicopter.
Engines: two 4,500-shp (3,356-kW) Lycoming T55-L-712 turboshafts.
Performance: maximum speed 188 mph (302 km/h) at sea level; initial climb rate 1,490 ft (454 m) per minute; service ceiling 22,100 ft (6,735 m); radius 115 miles (185 km) with an 18,000-lb (8,164-kg) load.
Weights: empty 23,903 lb (10,475 kg); maximum take-off 54,000 lb (24,494 kg).
Dimensions: rotor diameter, each 60 ft 0 in (18.29 m); length overall, rotors turning 99 ft 0 in (30.18 m); height 18 ft 7.75 in (5.68 m); rotor disc area, total 5,655.0 sq ft (525.3 m^2).
Payload: 28,000 lb (12,701 kg).

A typical CH-47D payload weighs 23,000 lb (10,433 kg) and comprises a slung M198 155-mm (6.1-in) howitzer plus its 11-man crew and 32 rounds of ammunition in the cabin.

Photo: Salamander
D1 075 10.14
Printed in Italy

Land based helicopter

Germany

Messerschmitt-Bölkow-Blohm BO 105

Messerschmitt-Bölkow-Blohm BO 105

Key government contract

Design work on the BO 105 began in 1962 as a five-seat utility helicopter with twin turboshaft engines, and this was one of West Germany's first aeronautical projects with government support. The first prototype flew in February 1967 with MAN engines and a conventional articulated rotor, though the second and third prototypes were more typical of the definitive standard with Allison turboshafts and a rigid main rotor.

Military variants

The specifically military variants, which entered service in 1975, are the BO 105M that serves the West German army as the VBH (100 helicopters) for scouting and liaison, and the BO 105P (212 helicopters) in service as the PAH-1 for the anti-tank role with an armament of six anti-tank missiles and their associated stabilized sight. Comparatively small numbers of the civil BO 105C, BO 105CB, and BO 105LS variants with steadily more powerful engines have been adapted for a number of military roles (including the anti-tank, anti-submarine, and SAR tasks) in the service other other nations.

Principal versions

VBH (observation and liaison model) and PAH-1 (dedicated anti-tank model).

Principal users

Bahrain, Brunei, Chile, Colombia, Indonesia, Iraq, Lesotho, Mexico, the Netherlands, Nigeria, Peru, Philippines, Spain, Sudan, Sweden, West Germany, and United Arab Emirates.

TECHNICAL DATA

Type: MBB PAH-1 two-seat anti-tank helicopter.
Engines: two 420-shp (313-kW) Allison 250-C20B turboshafts.
Performance: maximum speed 137 mph (220 km/h) at sea level; initial climb rate 1,770 ft (540 m) per minute; service ceiling 13,950 ft (4,250 m); range 357 miles (575 km).
Weights: empty 4,217 lb (1,913 kg); maximum take-off 5,291 lb (2,400 kg).
Dimensions: main rotor diameter 32 ft 3.5 in (9.84 m); length overall, rotors turning 38 ft 11 in (11.86 m); height 9 ft 10 in (3.00 m); main rotor disc rea 818.6 sq ft (76.05 m^2).
Armament: six Euromissile HOT heavy anti-tank missiles.

Military versions of the BO 105 are widely used in West Germany, and are also in smaller-scale service with several other countries, including Indonesia where the type is made under license.

Photo: Salamander
D1 075 10.15
Printed in Italy

Land based helicopter

USA

McDonnell Douglas AH-64 APACHE

McDonnell Douglas AH-64 APACHE

Anti-armor priority

After cancelling the Lockheed AH-56 Cheyenne, the US Army badly needed a new attack helicopter offering a high level of survivability during all-weather day/night operations against Soviet armor on the high-intensity battlefield. Late in 1972, competition began between Bell and Hughes for an Advanced Attack Helicopter, and in December 1976 the Hughes (now McDonnell Douglas Helicopters) type was declared winner.

Complex capabilities

The AH-64 is a very complex machine: it must not only survive defensive ground fire through the use of a sturdy structure and the protection of key features inside an armor "bath", but also maintain full capability with its trainable underfuselage cannon (to suppress ground fire) and 16 Rockwell AGM-114 Hellfire laser-homing anti-tank missiles. The keys to the AH-64's capabilities are the Martin Marietta Target Acquisition and Designation System (for optical, optronic and thermal acquisition of targets that are then laser-ranged and laser-designated) and Pilot's Night Vision System (for all-weather nap-of-the-earth flight). Production totals of this costly helicopter have varied considerably, but current plans envisage 675 for the US Army, plus other for possible export customers such as Great Britain and Israel.

Principal versions

AH-64A (sole production model).

Principal user

USA.

TECHNICAL DATA

Type: McDonnell Douglas AH-64A Apache two-seat battlefield attack and anti- tank helicopter.
Engines: two 1,536-shp (1,145-kW) General Electric T700-GE-700 turboshafts.
Performance: maximum speed 192 mph (309 km/h) at optimum altitude; initial climb rate 2,880 ft (878 m) per minute; service ceiling 20,500 ft (6,250 m); range 380 miles (611 km).
Weights: empty 10,268 lb (4,657 kg); maximum take-off 17,650 lb (8,006 kg).
Dimensions: main rotor diameter 48 ft 0 in (14.63 m); length overall, rotors turning 58 ft 3 in (17.76 m); height 15 ft 3.5 in (4.66 m); main rotor disc area 1,809.5 sq ft (168.11 m^2).
Armament: one 30-mm cannon and up to 3,880 lb (1,760 kg) of disposable stores.

The AH-64A offers unrivalled all-weather day/night capability against tanks and other battlefield targets. Improved variants are under active consideration.

Photo: Salamander
D1 075 10.16
Printed in Italy

France

Salmson 2

Salmson 2

Late start

Though founded in 1912 at the Société des Moteurs Salmson to make water-cooled radial engines using Canton-Unné design features, in 1916 the Salmson company produced its first plane, which was unsuccessful. The same cannot be said of the Salmson 2 which first flew in April 1917 and entered service in 1918. The type had a rectangular-section fuselage aft of the circular-section engine section with its nose radiator, and the wings were of two-bay structure with four sets of interplane struts. Though designed as a two-seat reconnaissance and observation type, the Salmson 2 proved so rugged that it was also used for ground attack with light anti-personnel bombs.

Large-scale production

Some 3,200 aircraft were built, and the type proved very successful over the Western Front, though two French squadrons also served in Italy. For its time the Salmson 2 was comparatively low in performance, but this was more than balanced by its twin abilities to absorb punishment and inflict its own damage with its nicely balanced offensive and defensive guns: one American pilot became an eight-victory ace with the fixed gun of his Salmson 2. After the First World War, a few Salmson 2s were modified into Salmson Limousine civil transports with enclosed accommodation for two passengers.

Principal version

Salmson 2A.2 (sole production model).

Principal users

France, Japan, and USA.

TECHNICAL DATA

Type: Salmson 2A.2 two-seat observation and reconnaissance plane.
Engine: one 260-hp (194-kW) Salmson Canton-Unné radial piston engine.
Performance: maximum speed 115 mph (185 km/h) at 6,560 ft (2,000 m); initial climb rate not revealed; service ceiling 20,505 ft (6,250 m); endurance 3 hours 0 minutes.
Weights: empty 1,676 lb (760 kg); maximum take-off 2,954 lb (1,340 kg).
Dimensions: span 38 ft 8.5 in (11.80 m); length 27 ft 10.75 in (8.50 m); height 9 ft 6.25 in (2.90 m); wing area not revealed.
Armament: three 0.303-in (7.7-mm) machine guns (one fixed and two trainable) and provision for a light bombload.

A Salmson 2A.2 in the markings of the SAL 28 squadron. The elegant, dressed up elephant is said to have been inspired by the advertising for Le Nil cigarettes.

Photo: S.H.A.A.
D1 075 10.17
Printed in Italy

USA

Grumman OV-1 MOHAWK

Grumman OV-1 MOHAWK

Eyes for the army
The Mohawk was designed to meet combined US Army and US Marine Corps requirements of the mid-1950s for a battlefield surveillance plane. The type first flew in prototype form during April 1959, offering high survivability through features such as aluminium armor, bulletproof windscreens, and flak curtains on fore and aft bulkheads, together with very considerable agility. The marines then pulled out of the program, leaving the army to order the OV-1A for optical reconnaissance with cameras and the OV-1B for electronic reconnaissance with a side-looking airborne radar and span increased by 6 ft (1.83 m).

Developed versions
The Mohawk proved its capabilities in the Vietnam War, where some aircraft were fitted with hardpoints for four light armament. This capability was rarely used, however, for the Mohawk's real utility lies in its reconnaissance facility, which is much improved and diversified in later variants. Total production was 329 aircraft.

Principal versions
OV-1A (optical reconnaissance model), OV-1B (radar reconnaissance model), OV- 1C (OV-1A development with an infra-red surveillance system), OV-1D (multi- sensor variant able to accept infra-red, radar, or other sensors), RV-1C and RV-1D (aircraft modified permanently for electronic reconnaissance), and EV-1E (aircraft modified for electronic intelligence gathering).

Principal users
Israel and USA.

TECHNICAL DATA

Type: Grumman OV-1D Mohawk two-seat multi-sensor reconnaissance and observation plane.
Engines: two 1,400-shp (1,044-kW) Lycoming T53-L-701 turboprops.
Performance: maximum speed 305 mph (409 km/h) at 10,000 ft (3,050 m); initial climb rate 3,618 ft (1,103 m) per minute; service ceiling 25,000 ft (7,620 m); range 1,011 miles (1,627 km).
Weights: empty 12,054 lb (5,468 kg); maximum take-off 18,109 lb (8,214 kg).
Dimensions: span 48 ft 0 in (14.63 m); length 41 ft 0 in (12.50 m); height 12 ft 8 in (3.86 m); wing area 360.0 sq ft (33.44 m^2).
Armament: generally none.

The OV-1 was the US Army's first fixed-wing plane with turboprop power. The type was developed for battlefield reconnaissance, and is seen here in the form of an OV-1D with APS-94 SLAR (side-looking airborne radar) in a long package under the nose.

Photo: Salamander
D1 075 10.18
Printed in Italy

USSR

Antonov An-22 ANTEI "COCK"

Antonov An-22 ANTEI "COCK"

Giant of the skies

Faced with the twin problems of opening up the natural resources of its unexploited Siberian hinterland and moving heavy military equipment over substantial distances, the USSR has produced a remarkable series of heavy-lift transports able to operate from semi-prepared airstrips. Most of these aircraft have come from the Antonov design bureau, and typical of its thinking in the early 1960s is the An-22 Antei (Antheus) that first flew in February 1965 with straight flying surfaces, double-slotted trailing edge flaps, four powerful turboprops driving contra-rotating propeller units, multi-wheel main landing gear units retracting into blisters on the outside of the substantial fuselage, and an upswept tail unit above the rear ramp/door arrangement.

Limited production

The An-22 entered production in 1967. About 100 aircraft were built up to 1974, equal quantities going to the civil and military authorities though the civil machines are available to the military in emergencies. The type was the heaviest plane of its day, and the only transport able to accommodate a main battle tank. The type has now been supplanted by the same design bureau's An-124 "Condor", but it is thought that some 55 aircraft remain in military service.

Principal version

An-22 (sole production model).

Principal user

USSR.

TECHNICAL DATA

Type: Antonov An-22 Antei "Cock" five-crew heavy transport plane.
Engines: four 15,000-shp (11,186-kW) Kuznetsov NK-12MA turboprops.
Performance: maximum speed 460 mph (740 km/h) at optimum altitude; initial climb rate not revealed; service ceiling 24,605 ft (7,500 m); range 3,107 miles (5,000 km) with maximum payload.
Weights: empty 251,323 lb (114,000 kg); maximum take-off 551,146 lb (250,000 kg).
Dimensions: span 211 ft 4 in (64.40 m); length 190 ft 0 in (57.92 m); height 41 ft 1.5 in (12.53 m); wing area 3,713.7 sq ft (345.00 m^2).
Payload: 176,367 lb (80,000 kg) of freight and 28 passengers.

The An-22 was the world's heaviest plane when first revealed to the West in the 1965 Paris Air Show.

Photo: Salamander
D1 075 10.19
Printed in Italy

Germany

Erich HARTMANN

Erich HARTMANN

A natural pilot

Born on April 22, 1922, at Weissach in Württemburg, Erich Hartmann spent his childhood and adolescence amongst a family whose overriding passion was aviation. After winning two glider pilot licenses, at the age of 14 the young Hartmann became an instructor in a sailplane flight group of the Hitler Youth movement. In September 1939 Germany started the Second World War with its invasion of Poland, and Hartmann joined the Luftwaffe in April 1940, just before Germany's western campaign of May 1940. By the time Hartmann had completed his training, Germany had taken the decisive and ultimately fatal step of invading the USSR during July 1941. In October 1942 Hartmann received his first operational posting to the 9.Staffel of Jagdgeschwader 52, a Messerschmitt Bf 109 fighter unit on the Ukrainian sector of the Eastern Front. Hartmann was to spend his entire operation career up to 1945 with JG52.

Incredible record

Hartmann was a slow starter by the standards of the Eastern Front, winning his first victory only on November 5, 1942. By April 1943 Hartmann had flown 100 missions but gained only seven "kills". What Hartmann was perfecting, however, were his skills as a fighter pilot, including a calculated assessment of the tactical situation before he committed himself, excellent coordination of hand and eye in piloting and shooting, economy of fire (usually at very short range), and resistance of the urge to try to score too quickly. Soon Hartmann's "kill" rate began to accelerate, and on July 7, 1943, he scored seven victories in three sorties while covering Germany's last major strategic offensive on the Eastern Front, Operation "Zitadelle" in the Kursk salient. These were his 22nd to 28th victories. By September 20 of the same year his total had risen to 100, and in the period he had been shot down, captured, and escaped. On October 29, 1943, he scored his 148th victory and was awarded the Knight's Cross of the Iron Cross. Higher grades in Germany's top decoration followed: the Oak Leaves on March 2, 1944, with his 200th victory, and the Swords on July 4, 1944, with his 239th victory. In the summer of 1944 Hartmann went through another high-scoring period, during four weeks downing 78 Soviet aircraft including eight on August 23 and 11 on August 24. This latter brought Hartmann's total tally to 301. This made Hartmann the first of only two pilots to achieve 300 air combat victories, and also brought him the award of the Diamonds to the Knight's Cross. As the German forces retreated into Germany, Hartmann's score continued to rise, and by the time this "ace of aces" surrendered to the Americans in Czechoslovakia on May 8, 1944, his score stood at 352, including five North American P-51 Mustangs destroyed during a short posting to Romania.

The "Black Devil"

Hartmann was handed over by the Americans to the Soviets, who called Hartman the "Black Devil of the South". Sentenced to 10 years for "war crimes", Hartmann was released in 1955 and returned to West Germany. Hartmann joined the re-formed Luftwaffe as a colonel (his highest rank in the Second world War having been major), and retired in 1970 after rising to high rank.

Oberleutnant Erich Hartmann in the cockpit of his Messerschmitt Bf 109G. The fighter carries Hartmann's personal marking, a red heart pierced by an arrow and underlined with the name "Karaya".

Photo: Bundesarchiv.
D1 075 10.20
Printed in Italy

Fighter

Germany

Fokker D VII

Fokker D VII

A classic bloodline
The D VII was a biplane fighter conceived by Reinhold Platz, the gifted designer of the Dr I triplane fighter. The D VII had a fuselage of welded steel tube covered with aluminum and fabric, and thick-section wooden wings covered with plywood and fabric. The V 11 prototype revealed the need for a longer fuselage and fixed fin in addition to the comma-shaped moving rudder. So revised, the V 11 was entered in the January 1918 fighter competition held at Johannisthal airfield, and proved the unanimous choice of the fighter pilots. Large production contracts were placed with Fokker and, somewhat ironically, with Fokker's great rival Albatros.

A champion emerges
The D VII entered combat in April 1918 with a 160-hp (119-kW) Mercedes D III inline with an auto-type radiator (the first in a German fighter) and proved an immediate winner against the best British and French fighters. Late in the year a more powerful BMW engine replaced the Mercedes unit, much improving the fighter's rate of climb. The D VII possessed good performance, and was easy to fly yet responsive to the controls right up to its ceiling, where the type could hang on its propeller without loss of control. Some 700 D VIIs were in service at the time of the Armistice, and the type was the only aeroplane specifically mentioned in the Treaty of Versailles for surrender to the Allies. After the First World War, Anthony Fokker returned to the Netherlands and resumed limited production of the D VII.

Principal version
D VII.

Principal users
Germany and the Netherlands.

TECHNICAL DATA

Type: Fokker D VII single seat fighter.
Engine: one 185-hp (138-kW) BMW IIIa inline piston engine.
Performance: maximum speed 117 mph (187 km/h) at 3,280 ft (1,000 m); climb to 16,405 ft (5,000 m) in 16 minutes 0 seconds; service ceiling 22,965 ft (7,000m); endurance 1 hour 30 minutes.
Weights: empty 1,477 lb (670 kg); maximum take-off 2,112 lb (960 kg).
Dimensions: span 29 ft 3.5 in (8.90 m); length 22 ft 11.5 in (6.954 m); height 9 ft 2.25 in (2.75 m); wing area 221.4 sq ft (20.50 m^2).
Armament: two 7.92-mm (0.312-in) fixed machine guns.

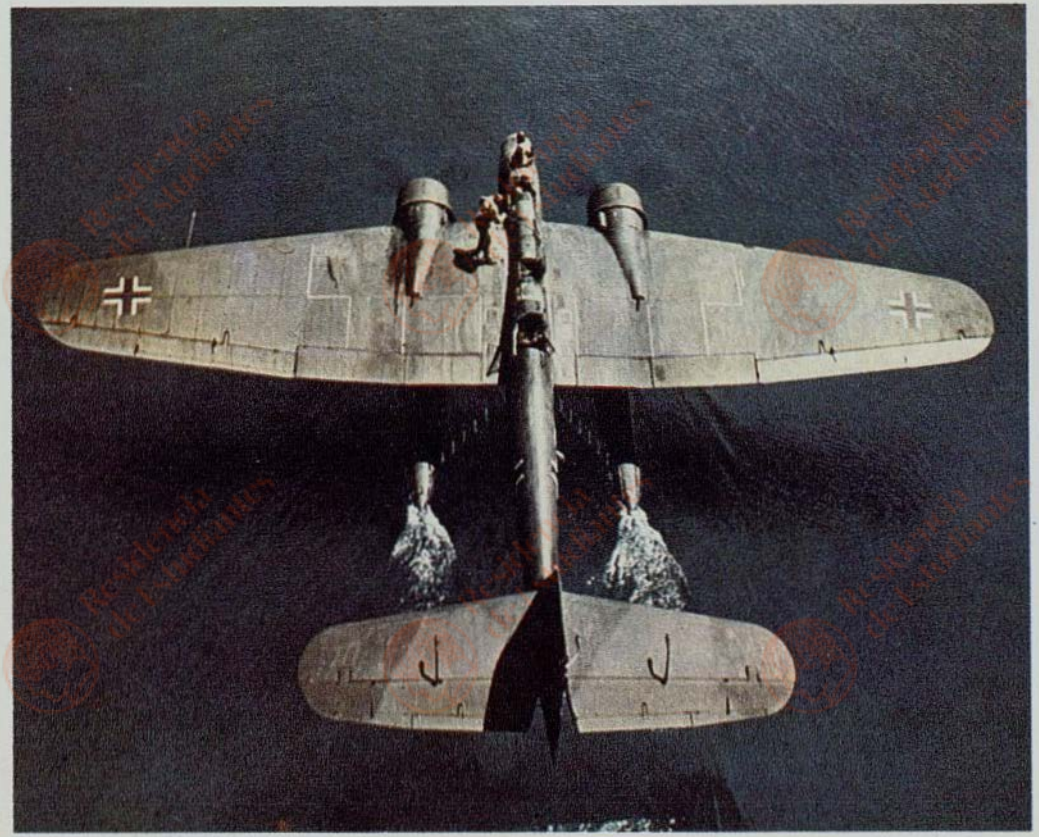
A replica D VII of Jasta 4 (4th squadron) in the colors of Germany's second ranking ace, Ernst Udet.

Photo: D.R.
D1 075 01.04
Printed in Italy

Seaplane

Germany

Heinkel He 115



Heinkel He 115

A promising design

First flown in 1936, the He 115 was designed as a torpedo bomber to replace the He 59 float seaplane. The type proved its capabilities with eight world payload/speed records on the same day in March 1938. The third prototype introduced the long "glasshouse" canopy which became standard on the production model, while the fourth prototype pioneered the struts that replaced the float bracing wires of the earlier machines.

Reduced to secondary roles

It became clear once the He 115A was in service that the type lacked the payload and performance to operate as a first-line torpedo bomber and, after the beginning of the Second World War, the type was relegated to secondary tasks such as coastal patrol and the laying of coastal mines. The He 115 was retired at the end of 1944, several months before the end of the war. Production totalled about 500 aircraft.

Principal versions

He 115A (initial model in four variants), He 115B (much upgraded version with greater fuel capacity and floats strengthened to allow operations on ice, built in two variants and several subvariants), He 115C (version with heavier armament, built in four variants and several subvariants), and He 115E (armament revisions, built in one variant).

Principal users

Germany, Norway, and Sweden.

TECHNICAL DATA

Type: Heinkel He 115C-1 three-seat general-purpose and torpedo bomber seaplane.
Engines: two 960-hp (872-kW) BMW 132K radial piston engines.
Performance: maximum speed 186 mph (300 km/h) at 3,280 ft (1,000 m); climb to 3,280 ft (1,000 m) in 5 minutes 6 seconds; service ceiling 18,040 ft (5,500 m); range 1,740 miles (2,800 km).
Weights: empty 15,146 lb (6,870 kg); maximum take-off 23,545 lb (10,680 kg).
Dimensions: span 73 ft 1 in (22.28 m); length 56 ft 9.25 in (17.30 m); height 21 ft 7.25 in (6.59 m); wing area 933.23 sq ft (86.70 m^2).
Armament: one 15-mm cannon and two 7.92-mm (0.312-in) machine guns in fixed installations, two 7.92-mm guns in trainable installations, and up to 2,756 lb (1,250 kg) of bombs or mines, or one 1,102-lb (500-kg) torpedo.

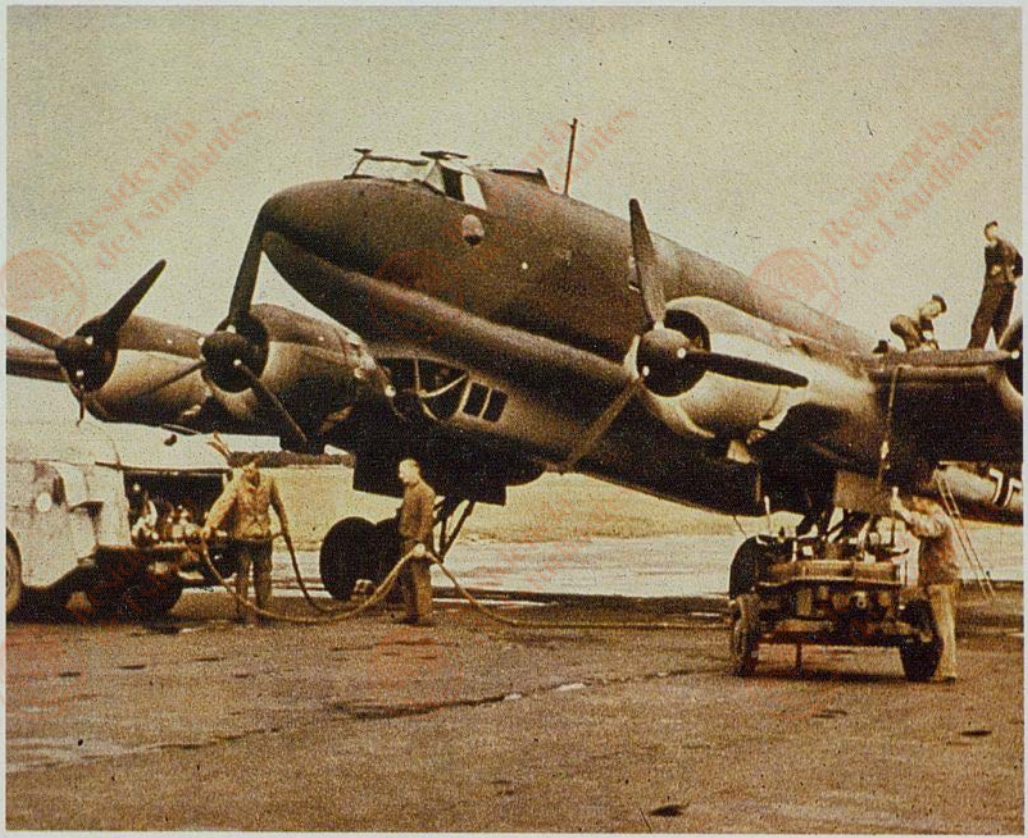
The He 115's most useful role was coastal minelaying at night and at very low level.

Photo: D.R
D1 075 01.16
Printed in Italy

Reconnaissance and observation

Germany

Focke-Wulf Fw 200 CONDOR



Focke-Wulf Fw 200 CONDOR

Long range the primary requirement

The Fw 200 Condor flew in July 1937 in the form of the first prototype for a 26-passenger long-range airliner. In 1938 the type confirmed its potential by capturing several world records, and about 10 airliners had been delivered to Brazilian, Danish and German airlines before the outbreak of the Second World War. A few Nazi VIP transports had also been delivered.

Maritime predator

Thereafter, development was concentrated on the Fw 200C maritime version. In this role the Condor's long range was decisive, but there were constant problems with the integrity of the military version's fuselage, which had a tendency to break in heavy landings. Total production was 276 aircraft.

Principal versions

Fw 200A (pre-production airliner), Fw 200B (production airliner with 850- hp/634-kW BMW 132 radials), Fw 200C-0 (pre-production military model), Fw 200C-1 (production type with 3,757-lb/1,750-kg bombload), Fw 200C-2 (improved C-1 with revised nacelles and underwing bomb racks), Fw 200C-3 (first major version with BMW Bramo 323 Fafnir radials and different armament in several subvariants), Fw 200C-4 (definitive production model with search radar), Fw 200C-6 (model with two Henschel Hs 293 anti-ship missiles), and Fw 200C-8 (revised missile-carrier).

Principal users

Brazil, Denmark, and Germany.

TECHNICAL DATA

Type: Focke-Wulf Fw 200C-8 Condor six-seat long-range maritime reconnaissance bomber with missile capability.

Engines: four 1,200-hp (895-kW) BMW Bramo 323R-2 Fafnir radial piston engines.

Performance: maximum speed 224 mph (360 km/h) at 15,750 ft (4,800 m); initial climb rate not revealed; service ceiling 19,030 ft (5,800 m); range 2,175 miles (3,500 km).

Weights: empty 29,367 lb (12,950 kg); maximum take-off 50,044 lb (22,700 kg).

Dimensions: span 109 ft 1 in (33.25 m); length 78 ft 3 in (23.85 m); height 20 ft 4 in (6.20 m); wing area 1,270.2 sq ft (118.00 m^2).

Armament: one 20-mm cannon, four 13.1-mm (0.52-in) machine guns, and one 7.92-mm (0.312-in) machine gun in nose, dorsal, beam and ventral positions, and two HS 293A missiles.

Rightly called the "scourge of the Atlantic", the Condor was at times countered by Allied fighters operating from aircraft carriers.

Photo: D.R.
D1 075 03.02
Printed in Italy

Fighter

Germany

Albatros D V

Albatros D V

Aerodynamic refinement

Early in 1917 the Allies began to field a new generation of high-performance fighters, and to meet this threat Albatros responded with a drag-reduced development of its current D III fighter featuring a deeper oval-section fuselage, a head rest (often removed as it interfered with the pilot's rearward view), reduction of the gap between the top of the fuselage and the upper wing, revision of the rudder, a different aileron-control system, and a larger spinner that provided a better entry line for the elegantly streamlined fuselage.

Large-scale production

The new D V entered service in May 1917 and was soon joined by the slightly different D Va. Total production figures no longer exist, but more than 1,000 examples of the two similar variants were in service during May 1918 over the Western, Italian and Palestinian fronts. Despite its aerodynamic refinement over the D III, the D V was no real match for the best of Allied fighters, and the major production program can only be construed as an effort to beat quality with quantity. Losses to Allied fighters were heavy, and the type also suffered a heavy accident rate as the lower wing had an alarming tendency to break away in highly stressed maneuvers.

Principal versions

D V (basic version) and D Va (derivative with the upper wing and aileron control system of the D III).

Principal users

Austria-Hungary, Germany, and Turkey.

TECHNICAL DATA

Type: Albatros D V single-seat fighter.
Engine: one 180/200-hp (134/149-kW) Mercedes D.IIa inline piston engine.
Performance: maximum speed 116 mph (186 km/h) at 3,280 ft (1,000 m); climb to 3,280 ft (1,000 m) in 4 minutes 0 seconds; service ceiling 18,700 ft (5,700 m); endurance 2 hours 0 minutes.
Weights: empty 1,515 lb (687 kg); maximum take-off 2,066 lb (937 kg).
Dimensions: span 29 ft 8.25 in (9.05 m); length 24 ft 0.5 in (7.33 m); height 8 ft 10.25 in (2.70 m); wing area 228.2 sq ft (21.20 m^2).
Armament: two 7.92-mm (0.312-in) machine guns.

This is a replica of a D Va in the personal colors of Leutnant (lieutenant) H.J. von Hippel of Jasta 5 (5th Squadron) in the spring of 1918.

Photo: D.R.
D1 075 03.04
Printed in Italy

Land based helicopter

USSR

Mil Mi-24 "HIND"

Mil Mi-24 "HIND"

A powerful warplane

Since it entered service in 1974, the Mi-24 has proved itself a formidable helicopter. The type was derived from the Mi-8 with the dynamic system of the Mi-14, but is considerably more agile and has stub wings for the carriage of varied ordnance whose capabilities have been demonstrated in wars as far apart as Cambodia and Angola.

Two development streams

The Mi-24 has been developed in parallel forms as an assault transport with a crew of three and accommodation for an eight-man infantry squad, and as a battlefield helicopter with tandem cockpits for the gunner and pilot, a revised cabin for an armorer and reload missiles, and improved sensors for the delivery of more specialized ordnance.

Principal versions

"Hind-A" (main troop-carrying model), "Hind-B" (pre-production model), "Hind-C" (unarmed "Hind-A" for training), "Hind-D" (gunship helicopter), "Hind-E" (upgraded "Hind-D"), "Hind-F" ("Hind-E" variant with the undernose machine gun replaced by a twin-barrel 30-mm cannon on the fuselage side), "Hind-G" (radiation-sampling version), Mi-25 (export "Hind-D" with inferior electronics), and Mi-35 (improved protective features).

Principal users

Afghanistan, Algeria, Angola, Bulgaria, Cambodia, Cuba, Czechoslovakia, East Germany, Ethiopia, Hungary, India, Iraq, Libya, Mozambique, Nicaragua, North Korea, Peru, Poland, Syria, USSR, Vietnam, and Yemen.

TECHNICAL DATA

Type: Mil Mi-24 "Hind-D" three-seat battlefield helicopter.

Engines: two 2,200-shp (1,640-kW) Isotov TV3-117 turboshafts.

Performance: maximum speed 193 mph (310 km/h) at optimum altitude; initial climb rate 2,460 ft (750 m) per minute; service ceiling 14,765 ft (4,500 m); radius 99 miles (160 km) with maximum warload.

Weights: empty 18,519 lb (8,400 kg); maximum take-off 27,557 lb (12,500 kg).

Dimensions: main rotor diameter 55 ft 9 in (17.00 m); length overall, rotors turning 70 ft 6.5 in (21.50 m); height 21 ft 4 in (6.50 m); main rotor disc area 2,443.3 sq ft (226.98 m^2).

Armament: one 12.7-mm (0.5-in) multi-barrel machine gun and up to 5,732 lb (2,600 kg) of disposable stores.

The "Hind-F" is distinguishable from the otherwise similar "Hind-D" by the twin-barrel cannon faired onto the starboard fuselage side.

Photo: Novosti
D1 075 03.13
Printed in Italy

Fighter

USSR

Yakovlev Yak-23 "FLORA"

Yakovlev Yak-23 "FLORA"

Inspired by wartime experience

The design bureau headed by Aleksandr Yakovlev had begun to consider jet-powered aircraft before the end of the Second World War, but its first true jet fighter was the Yak-23 that flew in June 1947. This type resulted from an October 1946 requirement, and as one of the bureau's first all-metal stressed-skin designs was based on a "stepped" fuselage with the RD-500 engine (in essence a British unit, the Rolls-Royce Derwent V centrifugal-flow turbojet, built in the USSR) located in the forward fuselage and exhausting below the fuselage in line with the cockpit and trailing edges of the unswept wing. This kept the engine installation as short as possible, and so avoided the efficiency losses associated with a long jetpipe.

An early Soviet jet fighter

Production was authorized early in 1948, but was terminated at the 310th example because of the higher combat capability offered by the Mikoyam-Gurevich MiG-15 "Fagot", though it is worth noting that the Yak-23 possessed better climb performance than the MiG-15. After short service with the Soviet air force, the Yak-23 was passed on to Warsaw Pact air arms, where it proved popular.

Principal versions

Yak-23 (basic fighter model) and Yak-23UTI (two-seat conversion trainer whose production is unconfirmed).

Principal users

Czechoslovakia, Poland, Romania, USSR, and possibly other Warsaw Pact countries.

TECHNICAL DATA

Type: Yakovlev Yak-23 single-seat fighter.
Engine: one 3,505-lb (1,590-kg) thrust RD-500 turbojet.
Performance: maximum speed 606 mph (975 km/h) at optimum altitude; initial climb rate 9,252 ft (2,820 m) per minute; service ceiling 48,555 ft (14,800 m); range 746 miles (1,200 km).
Weights: empty 4,409 lb (2,000 kg); maximum take-off 7,460 lb (3,384 kg).
Dimensions: span 28 ft 7.75 in (8.37 m); length 26 ft 7.75 in (8.12 m); height not revealed; wing area 145.32 sq ft (13.50 m^2).
Armament: two 23-mm cannon and up to two 132-lb (60-kg) bombs.

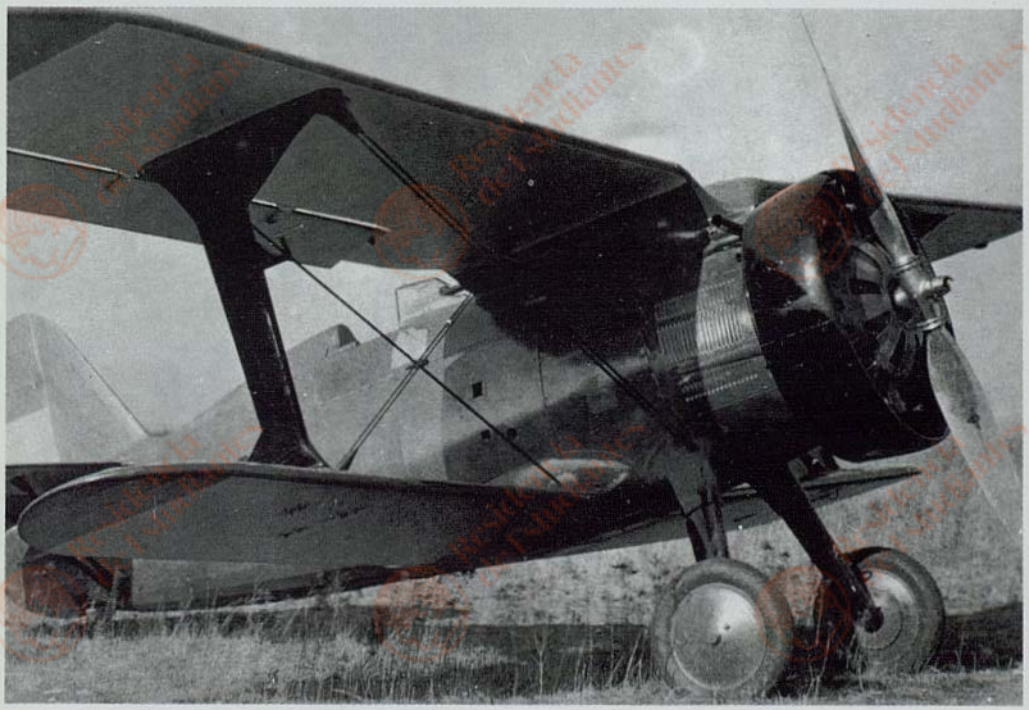
This is one of the last series-built Yak-23s, now on display at the Polish Army Museum in Warsaw.

Photo: M. Hodeir
D1 075 03.08
Printed in Italy

Fighter

USSR

Polikarpov I-15 CHAIKA



Polikarpov I-15 CHAIKA

Obsolescent yet effective

Developed from the I-5 biplane fighter with more power, cantilever landing gear legs with faired wheels, and the upper wing gulled into the fuselage to provide the pilot with good forward and upward fields of vision, the TsKB-3 prototype flew in October 1933 with an imported 710-hp (529-kW) Wright SGR- 1820-F3 Cyclone radial. The resulting I-15 Chaika (gull) entered service in the following year with the 480-hp (358-kW) M-22 for a maximum speed of 199 mph (320 km/h). These 404 low-performance aircraft were followed by 59 with the SGR-1820, and by 270 with the 710-hp (529-kW) M-25, a Soviet development of the Cyclone.

A dramatic career

The I-15 was robust, maneuverable, and an excellent gun platform. The type performed well on the Republican side in the Spanish Civil War (1936-39), when 287 aircraft were built in Spain, and during border incidents with Japan (1938-39). Further development produced the I-15bis, of which 2,408 were built with a revised upper wing and greater fuel capacity. More than 1,000 aircraft were still in service at the time of the German invasion of the USSR in July 1941, and these obsolete aircraft fought on into early 1942.

Principal versions

I-15 (initial model with gulled upper wing) and I-15bis (revised model with straight upper wing and more powerful engine).

Principal users

China, Finland, Spain, and USSR.

TECHNICAL DATA

Type: Polikarpov I-15bis single-seat fighter.
Engine: one 775-hp (578-kW) M-25V radial piston engine.
Performance: maximum speed 230 mph (370 km/h) at optimum altitude; climb to 3,280 ft (1,000 m) in 1 minute 0 seconds; service ceiling 31,170 ft (9,500 m); range 329 miles (530 km).
Weights: empty 2,910 lb (1,320 kg); maximum take-off 4,189 lb (1,900 kg).
Dimensions: span 33 ft 5.5 in (10.20 m); length 20 ft 6.75 in (6.27 m); height 7 ft 2.25 in (2.19 m); wing area 242.52 sq ft (22.53 m^2).
Armament: four 7.62-mm (0.3-in) machine guns and up to 331 lb (150 kg) of bombs or six 82-mm (3.2-in) rockets.

Powered in its definitive forms by an imported American radial or its Soviet licensed equivalent, the I-15 was built in large numbers and used operationally in the turbulent years between 1936 and 1942.

Photo: D.R.
D1 075 03.05
Printed in Italy

Interceptor

USSR

Mikoyan-Gurevich MiG-25 "FOXBAT"

Mikoyan-Gurevich MiG-25 "FOXBAT"

A direct response to the B-70

When the USSR learnt that the USA had started work on the North American B-70 Valkyrie as a Mach 3 strategic bomber, it undertook the design of a fighter intended specifically to counter the US high-altitude bomber. The B-70 was cancelled in 1961, but the Soviets pushed ahead with their new fighter, which first flew in April 1965 as the Ye-266 and later set several world records.

Service debut

The MiG-25 "Foxbat-A" entered service in 1970. The new inteceptor was made largely of steel and titanium to withstand the effect of kinetic heating, and sported an old-fashioned but very powerful radar as well as four examples of the largest air-to-air missile yet deployed. Total production was in the order of 600 aircraft in several variants, and the type has seen limited service in the Middle East.

Principal versions

MiG-25 "Foxbat-A" (high-altitude interceptor), MiG-25R "Foxbat-B" (reconnaissance version with cameras and a side-looking airborne radar), MiG- 25U "Foxbat-C" (two-seat trainer), MiG-25R "Foxbat-D" (reconnaissance version with a larger SLAR but no cameras), MiG-25M "Foxbat-E" (conversion of the "Foxbat-A" with a more modern radar/missile combination and more powerful R- 31F engines for better performance at lower altitude in the "look-down/shoot- down" role), and MiG-25 "Foxbat-F" (conversion of older aircraft with AS-11 "Kilter" missiles for the anti-radar role).

Principal users

Algeria, India, Iraq, Libya, Syria, and USSR.

TECHNICAL DATA

Type: Mikoyan-Gurevich MiG-25 "Foxbat-A" single-seat interceptor.

Engines: two 27,010-lb (12,250-kg) reheated thrust Tumanskii R-31 turbojets.

Performance: maximum speed 2,115 mph (3,404 km/h) or Mach 3.2 at 36,090 ft (11,000 m); initial climb rate 41,010 ft (12,500 m) per minute; service ceiling 80,050 ft (24,400 m); radius 702 miles (1,130 km).

Weights: empty 44,092 lb (20,000 kg); maximum take-off 37,425 lb (17,011 kg).

Dimensions: span 45 ft 9 in (13.95 m); length 78 ft 1.75 in (23.82 m); height 20 ft 0.25 in (6.10 m); wing area 611.7 sq ft (56.83 m^2).

Armament: up to four AAMs including AA-6 "Acrid" weapons.

Photographed from a US Navy plane, this Libyan MiG-25 is armed with AA-6 "Acrid" and far smaller AA-8 "Aphid" AAMs.

Photo B. Thouanel from USN
D1 075 02.18
Printed in Italy

Fighter

USSR

Yakovlev Yak-3

Yakovlev Yak-3

A fighter worth waiting for
This air-combat dogfighter resulted from the belief of Aleksandr Yakovlev that excellence in this role could be provided only by small size, rugged strength, and good handling characteristics combined with the right powerplant. Development got under way in 1941 but was delayed by engine problems. The resulting fighter was a cousin to the Yak-7 and Yak-9 types through being derived from the Yak-1. The specific parent for the Yak-3 was the Yak-1M with a cut-down rear fuselage and a canopy providing the pilot with all-round vision.

Powerful combat performer
The Yak-3 first flew in 1943 and entered service in July 1944, but was then produced to the extent of 4,848 aircraft. The Yak-3 was perhaps the most agile single-seat fighter of the Second World War, and was notable for the ease and precision with which maneuvers could be executed. The Yak-3 was superior to all German fighters at low and medium altitudes, and once deployed in large numbers was instrumental in gaining air superiority for the Soviet tactical air forces. There were several experimental models that failed to enter service.

Principal versions
Yak-3 (production model with mixed metal and wood structure) and Yak-3U (improved model with the 1,650-hp/1,230-kW Klimov VK-107A engine and all- metal structure).

Principal users
France and USSR.

TECHNICAL DATA

Type: Yakovlev Yak-3 single-seat fighter.
Engine: one 1,300-hp (969-kW) Klimov VK-105PF-2 inline piston engine.
Performance: maximum speed 410 mph (660 km/h) at 10,500 ft (3,200 m; initial climb rate 3,806 ft (1,160 m); service ceiling 38,715 ft (11,800 m); range 440 miles (710 km).
Weights: empty 4,641 lb (2,105 kg); maximum take-off 5,864 lb (2,660 kg).
Dimensions: span 30 ft 2.25 in (9.20 m); length 27 ft 10.25 in (8.49 m); height 7 ft 11.15 in (2.42 m); wing area 159.85 sq ft (14.85 m^2).
Armament: one 20-mm cannon and two 12.7-mm (0.5-in) machine guns.

Particularly good use was made of the Yak-3 by the Normandie-Niemen Regiment, manned by French pilots but fighting beside Soviet units on the Eastern Front.

Photo S.H.A.A
D1 075 02.07
Printed in Italy

USSR

Antonov An-2 "COLT"

Antonov An-2 "COLT"

A new beginning

The An-2 first flew in August 1947 as the SKh-1 (rural economy-1). This large biplane was of mixed construction, and though regarded in the West as an anachronism even at that time, has emerged as one of the truly great aircraft of all time. Some 5,000 were built in the USSR before production was switched in 1960 to Poland, where more than 11,200 more have been built. The type is also made in China as the Yunshuji-5.

Limited performance but great versatility

The An-2 has pedestrian flight performance, but possesses remarkable ruggedness and adaptability. The type has therefore been used by air forces and civil operators alike in a host of applications. The NATO reporting name for the An-2 is "Colt", and in the 1970s Antonov developed the upgraded An-3 version with a 1,450-shp (1,081-kW) Glushenkov TVD-20 turboprop.

Principal versions

An-2T (utility transport), An-2TP (12-passenger airliner), An-2P (14-passenger airliner), An-2S (air ambulance), An-2TD (parachute trainer), An-2SKh (agricultural plane), An-2V (float-equipped seaplane), An-2PP (floatplane firebomber), An-2L (land-based firebomber), and a large number of Polish-developed variants.

Principal users

Civil operators in many parts of the world, and the air forces of Afghanistan, Albania, Bulgaria, China, Cuba, East Germany, Egypt, Ethiopia, Hungary, Iraq, Mali, Mongolia, North Korea, Poland, Romania, Somalia, Sudan, Syria, Tanzania, Tunisia, USSR, and Vietnam.

TECHNICAL DATA

Type: Antonov An-2 "Colt" two-crew utility transport.
Engine: one 1,000-hp (746-kW) Shvetsov ASh-62IR radial piston engine.
Performance: maximum speed 160 mph (258 km/h) at 5,740 ft (1,750 m); initial climb rate 689 ft (210 m) per minute; service ceiling 14,435 ft (4400 m); range 559 miles (900 km).
Weights: empty 7,606 lb (3,450 kg); maximum take-off 12,125 lb (5,500 kg).
Dimensions: span 59 ft 7.75 in (18.18 m); length 41 ft 9.5 in (14.24 m); height 13 ft 1.5 in (4.00 m); wing area 770.72 sq ft (71.60 m^2).
Payload: 12 passengers or 2,866 lb (1,200 kg) of freight.

The An-2 served with the air forces of several Warsaw Pact countries until recently. This example carries Polish markings.

Photo: P. Bigel
D1 075 01.19
Printed in Italy

Trainer

USSR

Yakovlev Yak-11 "MOOSE"

Yakovlev Yak-11 "MOOSE"

An easy birth

The first prototype of this advanced trainer flew in 1945 as the Yak-3UTI. Despite the designation's suggestion that the type was the trainer version of the Yak-3 fighter, in fact it used nothing more than components from the fighter. In 1946 there appeared a second prototype, and this Yak-11 revealed a number of refinements as well as less use of standard Yak-3 components. Trials were completed in October 1946 and the type was ordered into production.

A highly successful aeroplane

Entering service in 1947, the Yak-11 is of mixed construction (all-metal wings and a steel fuselage covered in plywood and fabric) and has retractable tailwheel landing gear. Production totalled 3,859 in the USSR and, from 1953, another 707 C-11 aircraft in Czechoslovakia. In 1958 there appeared the Yak- 11U (Czech C-11U) version with retractable tricycle landing gear. The Yak-11 has enjoyed a long and very successful career not only in the USSR and its Warsaw Pact allies, but also in the Middle East and China.

Principal versions

Yak-11 (baseline model) and Yak-11U (later model with tricycle landing gear).

Principal users

Afghanistan, Albania, Angola, Bangladesh, Bulgaria, Cambodia, China, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Romania, Somalia, USSR, Vietnam, and Yemen.

TECHNICAL DATA

Type: Yakovlev Yak-11 two-seat advanced flying trainer and liaison plane.
Engine: one 570-hp (425-kW) Shvetsov ASh-21 radial piston engine.
Performance: maximum speed 289 mph (465 km/h) at 8,200 ft (2,500 m); initial climb rate not revealed; service ceiling 23,295 ft (7,100 m); range 795 miles (1,280 km).
Weights: empty 4,189 lb (1,900 kg); maximum take-off 5,379 lb (2,440 kg).
Dimensions: span 30 ft 10 in (9.40 m); length 27 ft 10.5 in (8.50 m); height 10 ft 9 in (3.28 m); wing area 165.77 sq ft (15.40 m^2).
Armament: one 12.7-mm (0.5-in) or 7.62-mm (0.3-in) machine gun in a fixed installation, and up to two 110-lb (50-kg) practise bombs.

This Yak-11, representing a type only rarely seen in the West, was restored by a collector and displayed in France.

Photo: P. Guerin
D1 075 01.12
Printed in Italy

Interceptor

USSR

Mikoyan-Gurevich MiG-21 "FISHBED"

Mikoyan-Gurevich MiG-21 "FISHBED"

Air-defense fighter

In 1953 the Soviets issued the requirement for a new clear-weather air defense fighter. Conventional swept and tailed delta layouts were tested in the Ye-2 and Ye-2 prototypes respectively. The latter found favor, and the Ye-6 pre-production model led to the MiG-21F that entered service in 1959 as the first full production variant.

Many variants and great numbers

Production up to 1988 totalled about 11,000 aircraft in at least 14 single-seat and three "Mongol" two-seat trainer models. The R-11 turbojet of initial models gave way to the R-13 in the MiG-21MF and to the R-25 in the MiG-21bis, while the series became a dual-role interceptor/ground-attack fighter in the MiG-21PFMA, and a genuine multi-role type in the MiG-21bis. Production was also undertaken in China, Czechoslovakia and India.

Principal versions

MiG-21F "Fishbed-C" (R-11F), MiG-21PF "Fishbed-D" (radar in inlet centerbody), MiG-21PFM "Fishbed-F" (R-11-30 and blown flaps), MiG-21PFMA "Fishbed-J" (dual-role type), MiG-21R "Fishbed-H" (tactical reconnaissance), MiG-21MF "Fishbed-J" (R-13-300), MiG-21bis "Fishbed-L" (multi-role type with R-25) and MiG-21bisF "Fishbed-N" (re-engineered airframe).

Principal users

Afghanistan, Algeria, Angola, Bulgaria, Burkina-Fasso, China, Cuba, Czechoslovakia, East Germany, Egypt, Ethiopia, Finland, Guinea, Hungary, India, Iraq, Laos, Libya, Madagascar, Mongolia, Mozambique, Nigeria, North Korea, Poland, Romania, Somalia, Sudan, Syria, USSR, Vietnam, and Yugoslavia.

TECHNICAL DATA

Type: Mikoyan-Gurevich MiG-21bisF "Fishbed-N" single-seat multi-role fighter.
Engine: one 16,535-lb (7500-kg) reheated thrust Tumanskii R-25 turbojet.
Performance: maximum speed 1,385 mph (2,229 km/h) or Mach 2.1 at 36,090 ft (11,000 m); initial climb rate 57,990 ft (17,675 m) per minute; service ceiling 50,030 ft (15,250 m); range 721 miles (1,160 km).
Weights: empty 11,464 lb (5,200 kg); maximum take-off 17,549 lb (7,960 kg).
Dimensions: span 23 ft 5.5 in (7.15 m); length 51 ft 8.5 in (15.76 m) including probe; height 13 ft 5.5 in (4.10 m); wing area 247.58 sq ft (23.00 m^2).
Armament: one 23-mm twin-barrel cannon and up to 4,409 lb (2,000 kg) of disposable stores.

A MiG-21F of the Finnish air force.

Photo: P. Bigel
D1 075 01.09
Printed in Italy

Seaplane

Great Britain

Short SHETLAND

Short SHETLAND

Successor for the Sunderland

When the Sunderland flying boat was well established in production in the spring of 1938, the British Air Ministry started the process of finding a successor. The prototype suggestions from Saunders-Roe and Short Brothers failed to find favor, but in 1941, with the Second World War well under way, the two companies agreed to the official suggestion for a collaborative venture, the S.45 Shetland. Construction of the first of two prototypes was started in 1943, and in December 1944 the plane had it's first flight. By this time the Shetland's role had been altered from maritime reconnaissance to transport, so the planned defensive gun turrets were never installed in the nose, dorsal and tail positions, and no provision was made for the planned 4,000-lb (1,814-kg) bombload.

Destroyed by fire

Trials proceeded only slowly, and the first machine was destroyed by fire during January 1946 while lying at its mooring. The second prototype was completed to Shetland Mk II standard as a civil transport able to accommodate between 30 and 70 passengers according to the level of comfort provided, and this machine flew in September 1947. British Overseas Airways Corporation was not interested in the type, which was then used as a test bed for the Napier Nomad compound engine.

Principal versions

Shetland Mk I (military prototype) and Shetland Mk II (civil propotype).

Principal user

Great Britain.

TECHNICAL DATA

Type: Short Shetland Mk I eight-crew transport flying boat.
Engines: four 2,500-hp (1,864-kW) Bristol Centaurus XI radial piston engines.
Performance: maximum speed 263 mph (423 km/h) at 6,500 ft (1,980 m); initial climb rate not revealed; service ceiling not revealed; range 4,000 miles (6,437 km).
Weights: empty 75,860 lb (34,410 kg); maximum take-off 125,000 lb (56,700 kg).
Dimensions: span 150 ft 4 in (45.82 m); length 110 ft 0 in (33.53 m); height not revealed; wing area 2,400.0 sq ft (222.96 m^2).
Payload: not revealed.

Intended as a replacement for the Sunderland, the Shetland Mk I appeared too late for its role and also suffered a number of development problems such as inadequate longitudinal stability and poor control harmonization.

Photo: RAF Museum
D1 075 03.19
Printed in Italy

Great Britain

Avro SHACKLETON

Avro SHACKLETON

Scouting the oceans
To succeed its Lancaster heavy bomber, Avro developed the Type 694 Lincoln, and from this was evolved the Type 696 that first flew in March 1949 as the prototype of a new long-range maritime reconnaissance plane. This entered service in 1951 as the Shackleton MR.Mk 1, which was soon complemented by the Shackleton MR.Mk 1A.

Steady improvements
The radar of the early Shackleton was inadequate, and the Shackleton MR.Mk 2 introduced a new forward fuselage which retained two 20-mm cannon but relegated the radar from a chin radome to a semi-retractable "dustbin" under the fuselage behind the bomb bay. The definitive Shackleton MR.Mk 3 introduced tricycle landing gear, a revised wing and, as a retrofit, extra power from two 2,500-lb (1,134-kg) thrust Rolls-Royce Viper Mk 203 turbojets in underwing nacelles. The last model was the Shackleton AEW.Mk 2 conversion of the MR.Mk 2 for airborne early warning with APS-20 radar in a large "guppy" radome under the forward fuselage. The last seven of these 12 aircraft should be retired in the early 1990s.

Principal versions Shackleton
MR.Mk 1 (two Griffon 57 and two Griffon 57A engines), Shackleton MR.Mk 1A (four Griffon 57A engines), Shackleton MR.Mk 2 (upgraded model), Shackleton MR.Mk 3 (definitive maritime reconnaissance model), and Shackleton AEW.Mk 2 (early warning conversion of MR.Mk 2).

Principal users
Great Britain and South Africa.

TECHNICAL DATA

Type: Avro Shackleton MR.Mk 3 10-seat long-range maritime reconnaissance plane.
Engines: four 2,455-hp (1,831-kW) Rolls-Royce Griffon 57A inline piston engines.
Performance: maximum speed 302 mph (408 km/h) at optimum altitude; initial climb rate not revealed; service ceiling 19,200 ft (5,850 m); range 3,660 miles (5,890 km).
Weights: empty 57,800 lb (26,218 kg); maximum take-off 98,000 lb (44,452 kg).
Dimensions: span 119 ft 10 in (36.52 m); length 92 ft 6 in (28.19 m); height 23 ft 4 in (7.11 m); wing area 1,421.0 sq ft (132.01 m^2).
Armament: two 20-mm cannons and up to 10,000 lb (4,536 kg) of bombs.

The surviving Shackleton AEW.Mk 2s are now operated by No.8 Squadron of the Royal Air Force, which is to replace these ancient machines with Boeing Sentry AEW.Mk 1s from 1991.

Photo: M. Rostaing
D1 075 03.15
Printed in Italy

Fighter

Great Britain

de Havilland SEA MOSQUITO

de Havilland SEA MOSQUITO

A prestigious family
The Mosquito was developed as a private venture using de Havilland's unique wooden structure (stressed skins of plywood sandwiched round a balsa wood core), and first flew in November 1940. The type displayed excellent performance and versatility, and was developed in parallel light bomber, fighter-bomber, night-fighter, photo-reconnaissance, and trainer variants.

Navalized version
The Royal Navy operated a number of Mosquito FB.Mk VI and T.Mk 3 land-based aircraft in the anti-ship attack and trainer roles, but its most important type was the Sea Mosquito TR.Mk 33 carrierborne torpedo and reconnaissance fighter. This model first flew in November 1945 and entered service in August 1946. The variant was based on the FB.Mk VI with larger propellers, American radar, and naval features such as folding wings and an arrester hook. With the Second World War over, deliveries of this model totalled just 50, though there were also six examples of the related Sea Mosquito TR.Mk 37.

Principal versions
Sea Mosquito TR.Mk 33 (initial model with American ASH surface search radar), Sea Mosquito TR.Mk 37 (derived model with British ASV surface search radar), and Mosquito TT.Mk 39 (naval target-tug model based on the B.Mk XVI bomber).

Principal user
Great Britain.

TECHNICAL DATA

Type: de Havilland Sea Mosquito TR.Mk 33 two-seat carrierborne torpedo and reconnaissance fighter.
Engines: two 1,640-hp (1,223-kW) Rolls-Royce Merlin 25 inline piston engines.
Performance: maximum speed 385 mph (620 km/h) at 13,500 ft (4,115 m); initial climb rate 3,000 ft (914 m) per minute; service ceiling 30,000 ft (9,145 m); range 1,260 miles (2,028 km).
Weights: empty 17,165 lb (7,786 kg); normal take-off 22,500 lb (10,206 kg).
Dimensions: span 54 ft 2 in (16.51 m); length 42 ft 3 in (12.88 m); height 13 ft 6 in (4.11 m); wing area 454.0 sq ft (42.18 m^2).
Armament: four 20-mm cannon and up to 2,000 lb (907 kg) of bombs or one 18-in (457-mm) torpedo.

The Sea Mosquito TR.Mk 33 was distinguishable from its land-based brethren by its thimble radome, folding wings, and arrester hook.

Photo: RAF Museum
D1 075 03.11
Printed in Italy

Attack and close support

Great Britain

British Aerospace BUCCANEER

British Aerospace BUCCANEER

Saved at the last minute

In 1957 the British decided that the concept of manned warplanes was obsolete and cancelled most projects already under way. One type that avoided the cut was the Blackburn Buccaneer, which was almost ready for its first flight. This took place in April 1958, and the Buccaneer S.Mk 1 entered Royal Navy service as a carrierborne strike/attack warplane. From 1965 the Mk 1 with de Havilland Gyron Junior turbojets was replaced by the altogether more capable Buccaneer S.Mk 2 with turbofan engines.

A happy surprise

When the Royal Navy's large carriers were phased out of service from the late 1960s, the Buccaneer was passed to a reluctant Royal Air Force. Once the type was in service, however, the RAF found that the transonic Buccaneer was an excellent low-level attack type, and ordered additional aircraft. Total production was 183 aircraft, and the survivors were extensively upgraded in the late 1980s.

Principal versions

Buccaneer S.Mk 1 (turbojet-powered naval version), Buccaneer S.Mk 2 (turbofan-powered model suffixed A or B without or with capability for the Martel air-to-surface missile), and Buccaneer S.Mk 50 (S.Mk 2 derivative for South Africa with rocket boost pack).

Principal users

Great Britain and South Africa.

TECHNICAL DATA

Type: British Aerospace Buccaneer S.Mk 2B two-seat low-level strike and attack plane.
Engines: two 11,100-lb (5,035-kg) thrust Rolls-Royce Spey RB168-1A Mk 101 turbofans.
Performance: maximum speed 645 mph (1,038 km/h) at 200 ft (61 m); initial climb rate 7,000 ft (2,134 m) per minute; service ceiling 40,000+ ft (12,190+ m); radius 1,150 miles (1,851 km).
Weights: empty 30,000 lb (13,608 kg); maximum take-off 62,000 lb (28,123 kg). <C2>Dimensions: span 44 ft 0 in (13.41 m); length 63 ft 5 in (19.33 m); height 16 ft 3 in (4.95 m); wing area 514.7 sq ft (47.82 m^2).
Armament: up to 16,000 lb (7,258 kg) of disposable stores carried internally and externally.

From its naval origins as a carrierborne type, the Buccaneer matured into a first-class low-level attack warplane for the RAF.

Photo: P. Buigel
D1 075 03.10
Printed in Italy

Great Britain

British Taylorcraft Auster Mk I to V

British Taylorcraft Auster Mk I to V

A touring plane in military service

In 1936 the Taylorcraft Aviation Company was established in the USA to design and built light planes for civil use. In 1938 the company established its Taylorcraft Aeroplanes (England) Ltd as its British subsidiary. British production was mainly of the Plus C and Plus D models, and in 1939 the Royal Air Force impressed 24 of the 32 aircraft for evaluation as observation and artillery spotter aircraft. The evaluation confirmed the soundness of the concept, and a derivative of the Plus D was ordered into production as the Auster Mk I. This entered service in August 1942.

Eyes for the army

Production during the Second World War covered variants up to the Auster Mk V and totalled 1,663 aircraft. These equipped 19 British as well as several Canadian and Dutch squadrons, and the type served mainly in the Italian and North-West European campaigns.

Principal versions

Auster Mk I (100 aircraft with the 90-hp/67-kW de Havilland Cirrus Minor I engine), Auster Mk II (two aircraft with a 130-hp/97-kW Lycoming engine), Auster Mk III (470 aircraft with the 130-hp/97-kW de Havilland Gipsy Major I engine), Auster Mk IV (254 aircraft based on the Mk II but with a larger cabin for one extra person), and Auster Mk V (804 aircraft, including three floatplanes, based on the Mk IV but with an improved instrument panel for blind and night flying capability).

Principal users

Canada, Great Britain, and the Netherlands.

TECHNICAL DATA

Type: British Taylorcraft Auster Mk IV three-seat air observation post plane.
Engine: one 130-hp (97-kW) Lycoming O-290-3 flat-four piston engine.
Performance: maximum speed 130 mph (209 km/h) at sea level; initial climb rate not revealed; service ceiling not revealed; range 250 miles (402 km).
Weights: empty 1,100 lb (499 kg); maximum take-off 1,850 lb (839 kg).
Dimensions: span 36 ft 0 in (10.97 m); length 22 ft 5 in (6.83 m); height 8 ft 0 in (2.44 m); wing area 167.0 sq ft (15.51 m^2).
Armament: none.

A comparatively large number of Austers survive, this being an example of the Auster Mk IV photographed during a 1979 display at Biggin Hill.

Photo M. Hodeir
D1 075 02.16
Printed in Italy

Interceptor

Great Britain

Hawker HUNTER

Hawker HUNTER

A great success

Conceived to a 1948 requirement, the Hunter was a major British success in the 1950s. Production totalled 1,985 aircraft including 445 made under license in Belgium and the Netherlands. The prototype flew in July 1951 with a 6,500-lb (2948-kg) thrust Avon 100 series turbojet, and was supersonic in a shallow dive. The Hunter F.Mk 1 entered production in 1953 and service in the following year.

Long and varied life

The Avon-engined F.Mk 1 was succeeded by the Hunter F.Mk 4 with greater fuel capacity and provision for underwing stores, while a parallel series with the Armstrong Siddeley Sapphire turbojet comprised the Hunter F.Mk 2 and F.Mk 5. Next came the Hunter F.Mk 6 with the 10,000-lb (4536-kg) thrust Avon 200 series engine and dogtoothed wing leading edges. The Hunter FGA.Mk 9 was the ultimate operational variant, recast for the ground-attack role. There were also trainer, reconnaissance and many export variants.

Principal versions

Hunter F.Mk 1 (Avon Mk 113 turbojet), Hunter F.Mk 2 (Sapphire Mk 101 turbojet), Hunter F.Mk 4 (Avon Mk 115), Hunter F.Mk 5 (Sapphire Mk 101), Hunter F.Mk 6 (Avon Mk 203), Hunter T.Mk 7 (side-by-side two-seat trainer based on F.Mk 4), Hunter T.Mk 8 (naval equivalent of T.Mk 7), Hunter FGA.Mk 9 (beefed-up ground-attack fighter), Hunter FR.Mk 10 (reconnaissance fighter).

Principal users

Abu Dhabi, Chile, Denmark, Great Britain, India, Iraq, Jordan, Kenya, Kuwait, Lebanon, Oman, Peru, Qatar, Singapore, Sweden, Switzerland and Zimbabwe.

TECHNICAL DATA

Type: Hawker Hunter FGA.Mk 9 single-seat ground-attack fighter.
Engine: one 10,150-lb (4,604-kg) thrust Rolls-Royce Avon Mk 207 turbojet.
Performance: maximum speed 702 mph (1,130 km/h) at sea level; initial climb rate 17,200 ft (5,243 m) per minute; service ceiling 52,000 ft (15,850 m); radius 443 miles (713 km).
Weights: empty 14.400 lb (6,532 kg); maximum take-off 24,600 lb (11,158 kg).
Dimensions: span 33 ft 8 in (10.25 m); length 45 ft 10.5 in (13.93 m); height 13 ft 2 in (4.02 m); wing area 349.0 sq ft (32.42 m^2).
Armament: four 30-mm cannon and up to 6,000 lb (2,722 kg) of disposable stores.

A Hunter F.Mk 58 of the Swiss air force comes in to land.

Photo: P. Bigel
D1 075 01.10
Printed in Italy

USA

Douglas C-47 SKYTRAIN

Douglas C-47 SKYTRAIN

Airliner turned warhorse

The C-47 was the military development of the epoch-making DC-3 airliner, and appeared after the US forces had gained experience with a number of transports based on the preceeding DC-2. By comparison with the airliner, the C-47 was fitted with more powerful engines, structural strengthening around the large cargo door, a sturdier floor, and strengthened landing gear, while the cabin was extensively revised. Vast production was undertaken in the USA, where the 10,000th of 10,349 aircraft was delivered in May 1945, and in addition to pre-war production in Japan the type was built under licence in the USSR.

An authentic warrior

The C-47 was used in every theater of the Second World War in its basic C-47, naval R4D and British Dakota forms. The type was used, and remained in service, for many years after that time. The type was used for trooping and freighting, and secured immortal fame as the transport and glider-tug used by the Allied airborne forces.

Principal versions

C-47, R4D-1 and Dakota Mk I (initial model), C-47A, R4D-5 and Dakota Mk III (revised electrical system), C-47B, R4D-6 and Dakota Mk IV (high-altitude blowers), Lisunov (2,000+ Soviet-built aircraft), and Nakajima/Showa L2D "Tabby" (485 Japanese aircraft).

Principal users

Australia, Canada, Great Britain, India, Japan, USA, and USSR.

TECHNICAL DATA

Type: Douglas C-47 Skytrain three-crew utility transport.
Engines: two 1,200-hp (895-kW) Pratt & Whitney R-1830-92 radial piston engines.
Performance: maximum speed 229 mph (368 km/h) at 7,500 ft (2,290 m); initial climb rate 1,130 ft (345 m) per minute; service ceiling 23,200 ft (7,075 m); range 1,500 miles (2,401 km).
Weights: empty 16,970 lb (7,705 kg); maximum take-off 26,000 lb (11,805 kg).
Dimensions: span 95 ft 0 in (28.90 m); length 64 ft 5.5 in (19.63 m); height 16 ft 11 in (5.20 m); wing area 987.0 sq ft (91.70 m2).
Payload: 28 troops, or 18 litters, or 10,000 lb (4,536 kg) of freight.

This C-47 sports the black and white wing bands that indicate its involvement in Operation "Overlord", the Allied landings in Normandy on June 6, 1944.

Photo: M. Rostaing
D1 075 03.17
Printed in Italy

Seaplane

USA

Grumman HU-16 ALBATROSS

Grumman HU-16 ALBATROSS

Fruit of great experience

Profiting from its wartime experience with the little Goose, Grumman decided in 1944 to begin work on a similarly configured but larger amphibian as the G-64. This first flew in prototype form during October 1947, and offered greater payload than the Goose, while performance was considerably improved by the more powerful engines in combination with an airframe of exemplary aerodynamic cleanliness.

Popular in military service

The type was ordered first by the US Navy, the initial UF-1 being joined later by the UF-2 with a longer-span wing of revised section, larger ailerons and tail surfaces, and a number of system improvements. Similar aircraft were ordered for the US Air Force as the SA-16A and SA-16B, and in 1962 these four models were redesignated HU-16A to HU-16D respectively. The UF-1F (HU-16E) was the US Coast Guard version. The type was used mainly for SAR, though some smaller nations employ the type for coastal patrol. Some ex-military aircraft have entered service as airliners.

Principal versions

UH-16A (short-span navy model), UH-16B (long-span navy model), UH-16C (short- span air force model), UH-16D (long-span air force model), and UH-16F (coast guard model).

Principal users

Argentina, Brazil, Canada, Chile, Indonesia, Italy, Japan, Philippines, Portugal, Spain, Taiwan, and USA.

TECHNICAL DATA

Type: Grumman HU-16D Albatross four/six-crew utility amphibian.
Engines: two 1,425-hp (1,063-kW) Wright R-1820-76 Cyclone radial piston engines.
Performance: maximum speed 236 mph (380 km/h) at optimum altitude; initial climb rate not revealed; service ceiling 21,500 ft (6,555 m); range 2,850 miles (4,587 km).
Weights: empty 22,883 lb (10,380 kg); maximum take-off 35,700 lb (16,193 kg).
Dimensions: span 96 ft 8 in (29.46 m); length 61 ft 3 in (18.67 m); height 25 ft 10 in (7.87 m); wing area 1,035.0 sq ft (96.15 m^2).
Armament: generally none, but the coastal anti-submarine model has provision for depth charges.

An HU-16 Albatross of the Italian air force, which operated the type in the SAR role.

Photo: M. Rostaing
D1 075 03.14
Printed in Italy

Interceptor

USA

Lockheed F-104 STARFIGHTER

Lockheed F-104 STARFIGHTER

"Cold War" warrior

In 1952 Lockheed began work on a single-seat interceptor capable of besting any Soviet bloc warplane, priority being given to maneuverability and performance in terms of speed and climb rate. What emerged for a first flight in March 1954 was instantly dubbed a "manned missile": the long fuselage was tailored round the J79 engine, and the flying surfaces were small, unswept and very thin.

Dropped by the USAF

Development was difficult, and when the first F-104As entered service in 1958 the US Air Force had already lost interest in the type and took only 296 Starfighters. The type was then saved by the creation of the F-104G multi- role version for production by a multi-national European consortium as well as for Japan. Total Starfighter production was 2,282 units.

Principal versions

F-104A (interceptor), F-104B (two-seat trainer), F-104C (tactical strike), F- 104D (two-seat trainer), F-104G (definitive multi-role warplane with a strengthened structure, more power, and revised electronics), RF-104G (tactical reconnaissance), TF-104G (F-104G trainer), F-104J (F-104G version for Japan), F-104S (improved air defense version developed in Italy), CF-104 (Canadian-built F-104G), and CF-104D (CF-104 two-seat trainer).

Principal users

Belgium, Canada, Denmark, Italy, Japan, Jordan, the Netherlands, Norway, Pakistan, Taiwan, Turkey, USA, and West Germany.

TECHNICAL DATA

Type: Lockheed F-104G Starfighter single-seat multi-role fighter.
Engine: one 15,800-lb (7,167-kg) reheated thrust General Electric J79-GE-11A turbojet.
Performance: maximum speed 1,450 mph (2,333 km/h) or Mach 2.2 at 36,000 ft (10,975 m); initial climb rate 55,000 ft (15,765 m) per minute; service ceiling 58,000 ft (17,680 m); range 1,550 miles (2,495 km).
Weights: empty 14,900 lb (6,758 kg); maximum take-off 28,779 lb (13,054 kg).
Dimensions: span 21 ft 11 in (6.68 m); length 54 ft 9 in (16.69 m); height 13 ft 6 in (4.11 m); wing area 196.1 sq ft (18.22 m^2).
Armament: one 20-mm multi-barrel cannon and up to 4,310 lb (1,955 kg) of disposable stores.

Conceived in the early 1950s, the F-104 was controversial at times but proved its effectiveness during a long service life in several countries.

Photo: M. Rostaing
D1 075 03.09
Printed in Italy

Fighter

USA

McDonnell Douglas F-4J PHANTOM II

McDonnell Douglas F-4J PHANTOM II

Replacement for the F-4B

In 1963 the US Navy began looking for a successor to the F-4B, its primary fleet defense and multi-role fighter of the period. The decision inevitably fell on an improved Phantom II variant, the F-4J that began to enter combat over Vietnam during 1967.

Limited but important modifications

The F-4J was based on the F-4B but used a more powerful variant of the J79 turbojet, and featured modifications such as drooping ailerons and a slotted tailplane to shorten the take-off distance and reduce the approach speed. The F-4J also replaced the F-4B's APQ-72 fire-control radar with the more advanced AWG-10 system, and introduced the AJB-7 bombing system for enhanced attack capability. Production of the variant up to 1972 was 522, and two comparable models for Great Britain were 52 F-4Ks and 118 F-4Ms for the Royal Navy and Royal Air Force respectively. These models had different equipment and were powered by Rolls-Royce Spey turbofans.

Principal versions

F-4J (US Navy multi-role fighter), F-4K (export naval interceptor known as the Phantom FG.Mk 1 in British service), and F-4M (export land-based ground- attack and reconnaissance fighter known as the Phantom FGR.Mk 2 in British service).

Principal users

Great Britain and USA.

TECHNICAL DATA

Type: McDonnell Douglas F-4J Phantom II two-seat carrierborne multi-role fighter.
Engines: two 17,900-lb (8,119-kg) reheated thrust General Electric J79-GE-10 turbojets.
Performance: maximum speed 1,485 mph (2,390 km/h) or Mach 2.25 at 40,000 ft (12,190 m); initial climb rate 61,400 ft (18,715 m) per minute; service ceiling 62,250 ft (18,975 m); radius 600 miles (966 km).
Weights: empty 28,000 lb (12,701 kg); maximum take-off 58,000 lb (26,309 kg).
Dimensions: span 38 ft 5 in (11.71 m); length 58 ft 2.5 in (17.74 m); height 16 ft 3 in (4.95 m); wing area 530.0 sq ft (49.239 m^2).
Armament: up to 16,000 lb (7,258 kg) of disposable stores.

After 20 years of service and many updates, the F-4 Phantom II is no longer a first-line warplane with the US regular forces, but is still going strong in many other countries.

Photo: M. Rostaing
D1 075 03.07
Printed in Italy

Air superiority fighter

USA

General Dynamics F-16 FIGHTING FALCON

Air superiority fighter

General Dynamics F-16 FIGHTING FALCON

A ruthless competition

During 1971 the US Air Force asked five companies to produce concepts for a lightweight fighter using advanced aerodynamics and a "fly-by-wire" control system for high maneuverability. Finally, contracts were let for General Dynamics YF-16 and Northrop YF-17 prototypes, and the YF-16 was declared winner of the Light-Weight Fighter competition during January 1975.

A windfall for industry

From the YF-16 emerged the Fighting Falcon that entered service in 1978 in its F-16A and F-16B forms with the F100-P-200 engine. The program will run to some 3,250 aircraft, and in addition to US production there is a European four-nation construction consortium. The F-16 is on the cutting edge of technology especially in its sophisticated avionics that include, in later versions, sensors for low-level navigation and night attack. These later models are the F-16C and F-16D which possess, in addition to better electronics and more modern weapons for multi-role use, the capability to accommodate either of two engine types.

Principal versions

F-16A (single-seat fighter), F-16B (two-seat combat-capable trainer), F-16C (electronically improved single-seater) and F-16D (electronically improved two-seater).

Principal users

Bahrain, Belgium, Denmark, Egypt, Greece, Indonesia, Israel, Netherlands, Norway, Pakistan, Singapore, South Korea, Thailand, Turkey, USA, and Venezuela.

TECHNICAL DATA

Type: General Dynamics F-16C Fighting Falcon single-seat multi-role fighter.
Engine: one 27,600-lb (12,519-kg) or 23,450-lb (10,637-kg) reheated thrust General Electric F110-GE-100 or Pratt & Whitney F100-P-220 turbofan.
Performance: maximum speed 1,320+ mph (2,124+ km/h) or Mach 2+ at 40,000 ft (12,190 m); initial climb rate 50,000+ ft (15,240+ m) per minute; service ceiling 50,000+ ft (15,240+ m); radius 575+ miles (925+ km).
Weights: empty 18,335 lb (8,316 kg); maximum take-off 42,300 lb (19,187 kg).
Dimensions: span 32 ft 9.75 in (10.00 m); length 49 ft 4 in (15.03 m); height 16 ft 8.5 in (5.09 m); wing area 300.0 sq ft (27.87 m^2).
Armament: one 20-mm multi-barrel cannon and up to 20,450 lb (9,276 kg) of disposable stores.

Two F-16s of the U.S. Air Force in tight formation.

Photo: General Dynamics

IRIS Publishing Ltd., Kettering, Northants NN14 4EL Reg No. 2161709

TEAR HERE

Land based helicopter

USA

McDonnell Douglas Helicopters OH-6 CAYUSE

McDonnell Douglas Helicopters OH-6 CAYUSE

Light observation helicopter contest
First flown in February 1963, the Hughes Model 369 prototype won the US Army's Light Observation Helicopter contest against Bell and Hiller helicopters, and was ordered into large-scale production. The OH-6 entered service in September 1966. Production was curtailed at 1,434 units out of a planned 4,000, however, when costs rose and production rate fell.

A long military career
The Cayuse proved well suited to the Vietnam War, where it flew armed missions with a multi-barrel machine gun or 40-mm grenade launcher. Some surviving helicopters have been upgraded to OH-6D standard with more advanced electronics and heavier armament. The OH-6 was exported as the Model 500, which can be configured in any of several armed forms. There is also the improved Model 530 now marketed by McDonnell Douglas Helicopters, as Hughes Helicopters became in January 1984.

Principal versions
OH-6A (initial production model), OH-6D (improved version), Model 500 Defender (export version of the OH-6A with better sensor and armament options), Model 530 Defender (variant with refined aerodynamics and more power), and AH-6 (Model 530 version for US Special Forces).

Principal users
Argentina, Bahrain, Bolivia, Brazil, Colombia, Costa Rica, Denmark, Dominican Republic, El Salvador, Finland, Greece, Haiti, Indonesia, Israel, Italy, Japan, Jordan, Kenya, Mauritania, Nicaragua, North Korea, Philippines, South Korea, Spain, Taiwan, and USA.

TECHNICAL DATA

Type: McDonnell Douglas Helicopters (Hughes) OH-6A Cayuse two-seat light observation helicopter.
Engine: one 317-shp (236-kW) Allison T63-A-5A turboshaft derated to 215 shp (160 kW).
Performance: maximum speed 150 mph (241 km/h) at sea level; initial climb rate 1,840 ft (561 m) per minute; service ceiling 15,800 ft (4,815 m); range 413 miles (665 km).
Weights: empty 1,156 lb (524 kg); maximum take-off 2,700 lb (1,225 kg).
Dimensions: main rotor diameter 26 ft 4 in (8.03 m); length overall, rotors turning 30 ft 9.5 in (9.39 m); height 8 ft 1.5 in (2.48 m); main rotor disc area 544.63 sq ft (50.60 m^2).
Payload: four passengers or freight.

Clad in three-tone camouflage, this is an OH-6 in Japanese air force service.

Photo B. Thouanel
D1 075 02.12
Printed in Italy

Attack and close support

USA

North American F-100 SUPER SABRE

North American F-100 SUPER SABRE

A Mach 1 fighter

Designed from 1949 as a supersonic successor to the F-86 Sabre, the Super Sabre first flew in prototype form during May 1953 and incorporated the tactical lessons learnt by the Americans early in the Korean War (1950-53). The initial production model was the first of the US Air Force's "century series" fighters and, with the almost exactly contemporary MiG-19, was the world's first supersonic warplane when it entered service in September 1954. However, this F-100A interceptor was grounded in November 1954 because of transonic control problems.

Successful revisions

Extensive revisions to the basic design, including a taller fin and longer wings, resulted in much improved models that were produced in comparatively large numbers for several roles. The Super Sabre was used in the Vietnam War for ground attack, electronic warfare, and forward air control. Total production was 2,294 aircraft when the line closed in October 1959.

Principal versions

F-100A (unsuccessful initial interceptor model), F-100C (revised fighter- bomber with flight-refueling capability), F-100D (nuclear strike and conventional attack model with the Low-Altitude Bombing System, flapped wings, and electronic countermeasures), and F-100F (two-seat trainer often converted for combat roles).

Principal users

Denmark, France, Taiwan, Turkey, and USA.

TECHNICAL DATA

Type: North American F-100D Super Sabre single-seat strike/attack fighter.
Engine: one 17,000-lb (7,711-kg) reheated thrust Pratt & Whitney J57-P-21A turbojet.
Performance: maximum speed 864 mph (1,390 km/h) or Mach 1.3 at 35,000 ft (10,670 m); initial climb rate 16,000 ft (4,877 m) per minute; service ceiling 46,000 ft (14,020 m); range 600 miles (966 km).
Weights: empty 21,000 lb (9,525 kg); maximum take-off 34,832 lb (15,800 kg).
Dimensions: span 38 ft 9.5 in (11.82 m); length 47 ft 1.25 in (14.36 m); height 16 ft 3 in (4.95 m); wing area 385.0 sq ft (35.77 m^2).
Armament: four 20-mm cannon and up to 7,500 lb (3,402 kg) of disposable stores.

An F-100D Super Sabre strike/attack fighter of the Danish air force.

Photo P. Bigel
D1 075 02.10
Printed in Italy

Attack and close support

USA

Northrop F-5 FREEDOM FIGHTER

Northrop F-5 FREEDOM FIGHTER

A low-cost fighter

In the mid-1950s Northrop started development of its N-156 as a light and easily maintained yet supersonic fighter suitable for supply to friendly nations under the USA's Military Assistance Program. The N-156F flew in July 1959, and was ordered into production as the Freedom Fighter in single- and two-seat variants. The first of these flew in October 1963, and though a few were bought for the US Air Force (for limited use in Vietnam) most went to American allies, who use the type mainly for attack and close support.

A favored mount for pilots

The performance of the Freedom Fighter is adequate, and the type's maintancne and airfield requirements are minimal. On the other side of the coin the Freedom Fighter lacks radar. Even so, the type's beautiful handling have made it a favorite with pilots, and most of the 1,108 aircraft are still in service.

Principal versions

F-5A (single-seat fighter), CF-5A (Canadian-built improved single-seater), NF-5A (Canadian-built single-seater for the Netherlands), RF-5A (single-seat reconnaissance variant), SF-5A (Spanish-built single-seater), F-5B (two-seat trainer), NF-5B (Canadian-built two-seater for the Netherlands), SF-5B (Spanish two-seater), and CF-5D (Canadian-built two-seater).

Principal users

Canada, Greece, Iran, Libya, Moroccco, Netherlands, Norway, Phlippines, South Korea, Spain, Taiwan, Thailand, Turkey, and Venezuela.

TECHNICAL DATA

Type: Northrop F-5A Freedom Fighter single-seat multi-role fighter.
Engines: two 4,080-lb (1,851-kg) reheated thrust General Electric J85-GE-13 turbojets.
Performance: maximum speed 924 mph (1,487 km/h) or Mach 1.4 at 36,000 ft (10,975 m); initial climb rate 28,700 ft (8,760 m); service ceiling 50,500 ft (15,390 m); radius 195 miles (314 km).
Weights: empty 8,085 lb (3,667 kg); maximum take-off 20,677 lb (9,379 kg).
Dimensions: span 25 ft 3 in (7.70 m); length 47 ft 2 in (14.38 m); height 13 ft 2 in (4.01 m); wing area 170.0 sq ft (15.79 m^2).
Armament: two 20-mm cannon and up to 6,200 lb (2,812 kg) of disposable stores.

An F-5A of the Moroccan air force being refueled. The F-5's ability to operate successfully with little background support made the type ideal for developing countries.

Photo M. Rostaing
D1 075 02.08
Printed in Italy

Heavy bomber

USA

Boeing B-52 STRATOFORTRESS

Boeing B-52 STRATOFORTRESS

Exceptionally long life

Despite its obsolescence in terms of its airframe and powerplant, the B-52 remains in service as a major element of the USA's strategic triad of nuclear weapon delivery vehicles. It was at first thought that the Rockwell B-1 would supplant the B-52, but the limitation of the later type's production to 100 means that the two aircraft now complement each other. Surviving B-52s have been structurally revised for low-altitude operation and have been upgraded electronically, and now serve mainly as launchers for the AGM-86B air-launched cruise missile.

War over Vietnam

The B-52 was planned as a high-altitude bomber and flew in April 1952. Production ended in 1962 after the delivery of 744 aircraft. Other than the current B-52G and B-52H models, the variant that saw the greatest service was the B-52D used as a conventional bomber in the Vietnam War.

Principal versions

B-52B and B-52C (essentially pre-production models built in small numbers for evaluation and reconnaissance), B-52D (tail armament of four 0.5-in/12.7-mm machine guns), B-52E (more advanced nav/attack system), B-52F (increased power), B-52G (definitive turbojet-powered model with integral wing tanks, remotely controlled tail guns under a shorter fin/rudder, and provision for two AGM-28 Hound Dogs), and B-52H (last model with many improvement including a new tail gun).

Principal user

USA.

TECHNICAL DATA

Type: Boeing B-52H Stratofortress six-seat long-range strategic heavy bomber.
Engines: eight 17,000-lb (7,711-kg) thrust Pratt & Whitney TF33-P-3 turbofans.
Performance: maximum speed 595 mph (958 km/h) at 36,000 ft (10,975 m); initial climb rate not revealed; service ceiling 55,000 ft (16,765 m); range 10,000 miles (16,093 km).
Weights: empty not revealed; maximum take-off 488,000 lb (221,353 kg).
Dimensions: span 185 ft 0 in (56.39 m); length 160 ft 11 in (49.05 m); height 40 ft 8 in (12.40 m); wing area 4,000.0 sq ft (371.60 m^2).
Armament: one 20-mm multi-barrel cannon and up to 20 AGM-69 SRAM or AGM-86 missiles, or free-fall bombs.

B-52 bombers unload long strings of conventional bombs over North Vietnam as part of the American effort of the late 1960s to drive the North Vietnamese to the negotiating table.

Photo U.S. Air Force
D1 075 02.03
Printed in Italy

Heavy bomber

USA

Consolidated B-24 LIBERATOR

Consolidated B-24 LIBERATOR

Long-range bomber for the US Army Air Corps
The Model 32 flew in December 1939 as the XB-24 prototype of a long-range bomber and used many features pioneered in the preceeding Model 31 flying boat, including the high aspect ratio wing. Beginning at the end of 1940, production by four companies totalled 18,482 aircraft, a greater total than any other American plane of the period.

Multi-role use
In service the Liberator proved to possess good handling, considerable structural strength, and enormous versatility to allow the type's use as a bomber, maritime reconnaissance and transport plane. The type was extensively used as a bomber in the Pacific, Mediterranean and European theaters. The Liberator's most famous single exploit was a daylight raid against the Romanian oilfields at Ploesti, when 174 aircraft took off, 54 were lost and only 33 were flyable.

Principal versions
B-24D and, in British service, Liberator Mk III (first large-scale production model with glazed nose and R-1830-43 engines), B-24E (different propellers), B-24G (first model with nose turret), B-24H (improved B-24G), B-24J and Liberator Mk VI/VII (B-24H model with superior bombsight and autopilot), B-24L (B-24J version with manually operated guns in place of a tail turret), and B-24M (revised B-24J).

Principal users
Australia, Canada, Great Britain, and USA.

TECHNICAL DATA

Type: Consolidated B-24H Liberator 8/12-seat long-range heavy bomber.
Engines: four 1,200-hp (895-kW) Pratt & Whitney R-1830-65 radial piston engines.
Performance: maximum speed 290 mph (467 km/h) at 25,000 ft (7,620 m); climb to 20,000 ft (6,095 ft) in 25 minute 0 seconds; service ceiling 28,000 ft (8,535 m); range 2,100 miles (3,380 km).
Weights: empty 36,500 lb (16,556 kg); maximum take-off 71,200 lb (32,296 kg).
Dimensions: span 110 ft 0 in (33.53 m); length 67 ft 2 in (20.47 m); height 18 ft 0 in (5.49 m); wing area 1,048.0 sq ft (97.36 m^2).
Armament: 10 0.5-in (12.7-mm) machine guns in nose, dorsal, ventral and tail turrets, and two beam positions, and up to 12,800 lb (5,806 kg) of bombs.

The B-24 Liberator served in most theaters and in many operational forms.

Photo U.S. Air Force
D1 075 02.02
Printed in Italy

Trainer

USA

Curtiss JN-4 JENNY

Curtiss JN-4 JENNY

Huge production run
Developed from the JN-2 via the JN-3, the JN-4 appeared in July 1916 and retained the latter's unequal-span wings. The type was sold first to the UK and the US Army. Production was initially slow, but after the USA's entry into the first World War in April 1917 the production rate accelerated enormously to yield vast numbers of aircraft.

Post-war conversions
After the end of the First World War, and in the face of severely restricted budgets, the aviation arm of the US Army decided to modernize its Jennies rather than buy new aircraft, and a program between 1918 and 1926 updated its aircraft and standardized them with a more powerful engine. The type was phased out of military service in 1927, but remained in widespread civil use for many years to come as a utility and "barnstorming" plane.

Principal versions
JN-4 (original model), JN-4A (larger tailplane), JN-4B (different engine), JN-4Can ("Canuck" model built in Canada), JN-4D (normal stick rather than original Deperdussin controls), JN-4H (150-hp/112-kW Hispano-Suiza engine), and JN-6H (strengthened airleron control system).

Principal users
Canada, Great Britain, and USA.

TECHNICAL DATA

Type: Curtiss JN-4D two-seat primary trainer.
Engine: one 90-hp (67-kW) Curtiss OX-5 inline piston engine.
Performance: maximum speed 75 mph (121 km/h) at sea level; climb to 2,000 ft (609 m) in 7 minutes 30 seconds; service ceiling 6,500 ft (1,980 m); range not revealed.
Weights: empty 1,390 lb (630 kg); maximum take-off 1,920 lb (871 kg).
Dimensions: span 43 ft 7.75 in (13.30 m); length 27 ft 4 in (8.33 m); height 9 ft 10.5 in (3.01 m); wing area 352.0 sq ft (32.70 m^2).
Armament: none.

A trainer for the US Army during and after the First World War, the Jenny became a legend and was also used in huge numbers during the 1920s and early 1930s as a civil trainer and "barnstormer".

Photo: S.H.A.A
D1 075 01.18
Printed in Italy

USA

Boeing KC-135 STRATOTANKER

Boeing KC-135 STRATOTANKER

A refueler for the US Air Force
In August 1954 the USAF chose a derivative of the Model 387-80 prototype as replacement for its Boeing KC-97 tanker. The first KC-135 flew in August 1956, and deliveries of 732 aircraft began in June 1957. The KC-135 has a narrower fuselage than the Model 707 airliner derived from the same prototype, and a different interior including the tanks that feed the Boeing "flying boom" refueling system.

Good beyond the year 2020
In the early 1990s there are still more than 640 of these valuable aircraft in service. The fleet is being slowly but steadily improved in two programs for a continued operational viability into the next century. The designation KC-135E covers Air Force Reserve and Air National Guard aircraft modified with reskinned wing under surfaces as well as the tail units, anti-skid brakes, and Pratt & Whitney JT3D-3B turbofans (plus their pylons and nacelles) removed from surplus Model 707 airliners. The designation KC-135R covers USAF aircraft with similar airframe modifications but also new 22,000-lb (9,979-kg) thrust CFM International F108-CF-100 turbofans.

Principal versions
KC-135A (basic model), KC-135B (few aircraft with TF33-P-5 turbofans), KC-135E (updated AFR and ANG aircraft), KC-135R (updated USAF aircraft), and C-135FR (11 French aircraft updated from C-135F standard).

Principal users
France and USA.

TECHNICAL DATA

Type: Boeing KC-135A Stratotanker five-crew in-flight refueling tanker.
Engines: four 13,750-lb (6,237-kg) thrust Pratt & Whitney J57-P-59W turbojets.
Performance: maximum speed 585 mph (941 km/h) at 30,000 ft (9,145 m); initial climb rate 1,290 ft (393 m) per minute; service ceiling 50,000 ft (15,240 m); radius 3,450 miles (5,552 km) to offload 24,000 lb (10,886 kg) of fuel.
Weights: empty 106,306 lb (48,220 kg); maximum take-off 316,000 lb (143,338 kg).
Dimensions: span 130 ft 10 in (39.88 m); length 134 ft 6 in (40.99 m); height 41 ft 8 in (12.69 m); wing area 2,433.0 sq ft (226.03 m^2).
Payload: about 120,000 lb (54,532 kg) of fuel offloaded at a radius of 1,150 miles (1,850 km) or, in the secondary transport role, 160 troops or 83,000 lb (37,650 kg) of freight.

A French C-135F refuels SEPECAT Jaguar tactical aircraft.

Photo: SIRPA/air
D1 075 01.20
Printed in Italy

Heavy bomber

USA

Rockwell B-1B

Rockwell B-1B

B-52 replacement
In 1969 the US Air Force issued a requirement for a strategic bomber to replace the the B-52. On December 23, 1974 the prototype of the "swing-wing" B-1A first flew, and this was also the first flight for the new General Electric F101 reheated turbofan. Three other prototypes soon joined the program, but the B-1A was cancelled in June 1977.

Another president: another chance
In October 1981 the B-1 program was revived. But whereas the original B-1A had been a Mach 2.2+ medium/high-altitude bomber, the new B-1B was to be a far "stealthier" low-altitude type with only limited supersonic capability. The airframe was beefed up for higher weights and the rigors of low-altitude flight at high subsonic speed, the engine nacelles were simplified, and "stealthiness" was added by the use of radar-absorbent materials, an advanced electronic suite, and modification of the nacelles to prevent radar energy reaching the faces of the engine compressors. The B-1B flew in September 1984, and 100 aircraft were delivered between July 1985 and April 1988.

Principal version
B-1B

Principal user
USA

TECHNICAL DATA

Type: B-1B four seat strategic bomber and missile carrier.
Engines: four 30,780-lb (13,692-kg) reheated thrust General Electric F101-GE- 102 turbofans.
Performance: maximum speed 825 mph (1,328 km/h) or Mach 1.15 at 36,000 ft (10,975 m); initial climb rate and service ceiling not revealed; range 7,455 miles (12,000 km) without refueling.
Weights: empty 192,000 lb (87,091 kg); maximum take-off 477,000 lb (216,367 kg).
Dimensions: span 136 ft 8.5 in (41.67 m) spread and 78 ft 2.5 in (23.84 m) swept; length 147 ft 0 in (44.81 m); height 34 ft 0 in (10.36 m); wing area 1,950.0 sq ft (181.2 m^2).
Armament: two forward and one aft weapon bays can carry 75,000 lb (34,020 kg) of bombs and/or missiles, and six hardpoints under the fuselage can carry 59,000 lb (26,762 kg) of bombs and/or missiles; the maximum normal weapon load is 64,000 lb (29,030 kg).

Shown in its suit of black camouflage, which also helps to absorb radar energy, the B-1B was flown across the Atlantic Ocean for its first appearance in Europe at the Paris Air Show of 1987.

Photo: P.Bigel
D1 075 01.01
Printed in Italy

Medium bomber

USA

North American B-25 MITCHELL

Medium bomber

North American B-25 MITCHELL

A new medium bomber

In the later 1930s the US Army Air Corps needed a new attack bomber. Built as a private venture, the NA-40-1 prototype flew in January 1939. The design was then improved as the NA-62, and in September 1939 the USAAC placed its first order.

The Mitchell

The first of these 184 B-25 Mitchells entered service in 1941, and the USA's entry into the Second World War saw a rapid growth in production. Throughout a career that saw the building of 9,816 aircraft, the Mitchell remained essentially unaltered in airframe and powerplant but was revised with heavier and more varied offensive payload, improved defensive firepower, protective armor, and more fuel in self-sealing tanks. The most important models were the B-25C, B-25H and B-25J, of which 1,619, 1,000 and 4,318 were built. The B-25G and B-25H were specialist attack and anti-ship types with a 75-mm (2.95-in) gun in the nose. The Mitchell was used in all theaters.

Principal versions

B-25 (initial model), B-25B (dorsal and ventral turrets), B-25C and B-25D (ventral bomb racks), B-25G (heavy nose gun), B-25H (improved B-25G), and B-25J (improved B-25H initially with the B-25D's glazed nose and later with a "solid" eight-gun nose).

Principal users

Australia, Brazil, Canada, China, France, Great Britain, Netherlands, USA, USSR

TECHNICAL DATA

Type: North American B-25H Mitchell five-seat medium attack bomber.

Engines: two 1,700-hp (1,268-kW) Wright R-2600-13 radial piston engines.

Performance: maximum speed 275 mph (442 km/h) at 13,000 ft (3,960 m); climb to 15,000 ft (4,570 m) in 19 minutes 0 seconds; service ceiling 23,800 ft (7,255 m); range 2,700 miles (4,344 km).

Weights: empty 19,975 lb (9,061 kg); maximum take-off 36,047 lb (16,351 kg).

Dimensions: span 67 ft 7 in (20.60 m); length 51 ft 0 in (15.54 m); height 15ft 9 in (4.80 m); wing area 610.0 sq ft (56.67 m^2).

Armament: one 75-mm (2.95-in) gun, 14 0.5-in (12.7-mm) machine guns (eight fixed in nose, and six trainable in two twin-gun turrets and two beam installations), and up to 3,200 lb (1,452 kg) of bombs or one 2,000-lb (907- kg) torpedo.

The Mitchell was used for the one-way "Doolittle raid" on Japan, which was launched from an aircraft carrier on April 8, 1942.

Photo: M. Hodeir
D1 075 01.02
Printed in Italy

Heavy bomber

USA

Boeing B-17 FLYING FORTRESS

Boeing B-17 FLYING FORTRESS

Program slow to mature
In June 1934 Boeing began work on a four-engined heavy bomber for the US Army Air Corps. The Model 299 prototype was built as a private venture and first flew in July 1935. Initial production up to the B-17D was only in small numbers, for these first variants were in effect pre-production batches to evaluate the type's steadily improving capabilities. The company's gamble with the prototype eventually paid off, however, in production of 12,731 aircraft of all variants.

Defensive firepower steadily increased
At the beginning of 1941 the Royal Air Force received a few B-17Cs, and their operatioms over Germany confirmed the need for greater defensive firepower. This was provided in the B-17E, which also featured a revised tail unit for greater stability in the standard high-altitude bombing role. The B-17F was an improved B-17E, and the final B-17G (8,680 aircraft) was the definitive model with a chin turret to deter head-on fighter attacks. The Flying Fortress operated in several theaters, but is best remembered as the mainstay of the 8th Army Air Force in its daylight raids against Germany with steadily strengthened fighter escort.

Principal versions
XB-17 to B-17D (pre-production and limited-production early models), B-17E (heavier armament and new tail unit), B-17F (improved B-17E) and B-17G (chin turret).

Principal users
Great Britain and USA.

TECHNICAL DATA

Type: Boeing B-17G Flying Fortress 10-seat heavy bomber.
Engines: four 1,200-hp (895-kW) Wright R-1820-97 radial piston engines.
Performance: maximum speed 302 mph (486 km/h) at 25,000 ft (7,620 m); climb to 20,000 ft (6,095 m) in 37 minutes 0 seconds; service ceiling 35,600 ft (10,850 m); range 3,400 miles (5,470 km).
Weights: empty 36,135 lb (16,391 kg); maximum take-off 72,000 lb (32,660 kg).
Dimensions: span 103 ft 9.25 in (31.62 m); length 74 ft 9 in (22.78 m); height 19 ft 1 in (5.82 m); wing area 1,420.0 sq ft (131.92 m^2).
Armament: 13 0.5-in (12.7-mm) machine guns in chin, cheek, dorsal, ventral, beam and tail installations, and up to 17,600 lb (7,983 kg) of bombs.

Two USAAF B-17Gs fly over England before departing on a bombing mission over Germany.

Photo: US Air Force
D1 075 01.03
Printed in Italy

Fighter

USA

North American P-51D MUSTANG

North American P-51D MUSTANG

"Dutch" Kindelburger's plane

The Mustang resulted from a British fighter requirement that specified the construction of the prototype within 120 days. The NA-73 prototype was produced under the overall control of North American's president, J.H. "Dutch" Kindelburger, and was rolled out after 117 days. Fitted with an Allison V-1710 engine, the aeroplane first flew in October 1940 and was soon ordered by the British and Americans as the Mustang and P-51 respectively.

From Allison to Rolls-Royce

The initial P-51 and P-51A variants proved only moderately successful. To improve medium/high-altitude performance the British suggested use of the great Merlin. This produced the P-51B with four machine guns and the P-51C with more power and a bubble canopy. The definitive fighter was the P-51D with a number of refinements, and this variant amounted to 7,966 of the 15,469 Mustangs. The P-51D was the classic multi-role fighter of the Second World War, and was the main escort for US bombers flying deep into Germany.

Principal versions

Mustang Mk I (reconnaissance fighter), Mustang Mk IA and P-51 (cannon armament), Mustang Mk II and P-51A (longer-range version of Mk I), P-51B/C and Mustang Mk III (Merlin engine), P-51D and Mustang Mk IV (definitive fighter), P-51H (lightweight version), and P-51K (P-51D with different propeller).

Principal users

Australia, China, Great Britain, the Netherlands, New Zealand, South Africa, and USA.

TECHNICAL DATA

Type: North American P-51D Mustang single-seat fighter.
Engine: one 1,510-hp (1,126-kW) Packard V-1650-7 (Rolls-Royce Merlin) inline piston engine.
Performance: maximum speed 437 mph (703 km/h) at 25,000 ft (7,620 m); climb to 30,000 ft (9,145 m) in 13 minutes 0 seconds; service ceiling 41,900 ft (12,770 m); range 2,300 miles (3,701 km).
Weights: empty 7,125 lb (3,232 kg); maximum take-off 11,600 lb (5,262 kg).
Dimensions: span 37 ft 0.25 in (11.89 m); length 32 ft 3.25 in (9.85 m); height 13 ft 8 in (4.16 m); wing area 233.2 sq ft (21.65 m2).
Armament: six 0.5-in (12.7-mm) fixed machine guns, and up to 2,000 lb (907 kg) of bombs or six 5-in (127-mm) rockets.

Four P-51s of the 8th Army Air Force's 361st Fighter Group in formation.

Photo: Salamander
D1 075 01.06
Printed in Italy

Air superiority fighter

USA

General Dynamics F-16 FIGHTING FALCON

Air superiority fighter

General Dynamics F-16 FIGHTING FALCON

A ruthless competition

During 1971 the US Air Force asked five companies to produce concepts for a lightweight fighter using advanced aerodynamics and a "fly-by-wire" control system for high maneuverability. Finally, contracts were let for General Dynamics YF-16 and Northrop YF-17 prototypes, and the YF-16 was declared winner of the Light-Weight Fighter competition during January 1975.

A windfall for industry

From the YF-16 emerged the Fighting Falcon that entered service in 1978 in its F-16A and F-16B forms with the F100-P-200 engine. The program will run to some 3,250 aircraft, and in addition to US production there is a European four-nation construction consortium. The F-16 is on the cutting edge of technology especially in its sophisticated avionics that include, in later versions, sensors for low-level navigation and night attack. These later models are the F-16C and F-16D which possess, in addition to better electronics and more modern weapons for multi-role use, the capability to accommodate either of two engine types.

Principal versions

F-16A (single-seat fighter), F-16B (two-seat combat-capable trainer), F-16C (electronically improved single-seater) and F-16D (electronically improved two-seater).

Principal users

Bahrain, Belgium, Denmark, Egypt, Greece, Indonesia, Israel, Netherlands, Norway, Pakistan, Singapore, South Korea, Thailand, Turkey, USA, and Venezuela.

TECHNICAL DATA

Type: General Dynamics F-16C Fighting Falcon single-seat multi-role fighter.

Engine: one 27,600-lb (12,519-kg) or 23,450-lb (10,637-kg) reheated thrust
General Electric F110-GE-100 or Pratt & Whitney F100-P-220 turbofan.

Performance: maximum speed 1,320+ mph (2,124+ km/h) or Mach 2+ at 40,000 ft (12,190 m); initial climb rate 50,000+ ft (15,240+ m) per minute; service ceiling 50,000+ ft (15,240+ m); radius 575+ miles (925+ km).

Weights: empty 18,335 lb (8,316 kg); maximum take-off 42,300 lb (19,187 kg).

Dimensions: span 32 ft 9.75 in (10.00 m); length 49 ft 4 in (15.03 m); height 16 ft 8.5 in (5.09 m); wing area 300.0 sq ft (27.87 m^2).

Armament: one 20-mm multi-barrel cannon and up to 20,450 lb (9,276 kg) of disposable stores.

Three F-16s of the Belgian air force in tight formation.

Photo: M. Rostaing
D1 075 01.07
Printed in Italy

Trainer

Sweden

Saab 105

Saab 105

A family of aircraft

The Saab 105 was conceived in 1958 as a multi-role type with civil and military applications, but did not fly until June 1963 because of problems in finding an appropriate engine type. The prototype used two 1,642-lb (745-kg) thrust Turbomeca Aubisque turbofans, and such engines were retained for the initial production aircraft for the Swedish air force, which took the type as the Sk 60 in three variants. The type entered service in 1965, and the light attack model can carry a 1,543-lb (700-kg) warload.

Successful development

The Saab 105 is an attractive high-wing monoplane with a T-tail, but failed to win civil orders. However, the 150 aircraft for the Swedish air force were complemented by 40 Saab 105Oe multi-role aircraft for Austria. This latter model was derived from the Saab 105XT prototype, which introduced higher- powered engines of the turbojet variety for better performance with a heavier warload, and first flew in April 1967. A new version has recently been proposed to meet a US Air Force trainer requirement.

Principal versions

Sk 60A (four-seat training and liason version), Sk 60B (two-seat light attack version), Sk 60C (two-seat light attack and reconnaissance version), and Saab 105Oe (upgraded attack version for Austria).

Principal users

Austria and Sweden.

TECHNICAL DATA

Type: Saab 105Oe two-seat light attack plane.
Engines: two 2,850-lb (1,293-kg) thrust General Electric J85-GE-17B turbojets.
Performance: maximum speed 603 mph (970 km/h) at sea level; climb to 32,810 ft (10,000 m) in 4 minutes 30 seconds; service ceiling 42,650 ft (13,000 m); range 513 miles (825 km) with a 3,000-lb (1,361-kg) warload.
Weights: empty 5,534 lb (2,550 kg); maximum take-off 14,330 lb (6,500 kg). <C2>Dimensions: span 31 ft 2 in (9.50 m); length 34 ft 5 in (10.50 m); height 8 ft 10 in (2.70 m); wing area 175.46 sq ft (16.30 m^2).
Armament: up to 4,409 lb (2,000 kg) of disposable stores.

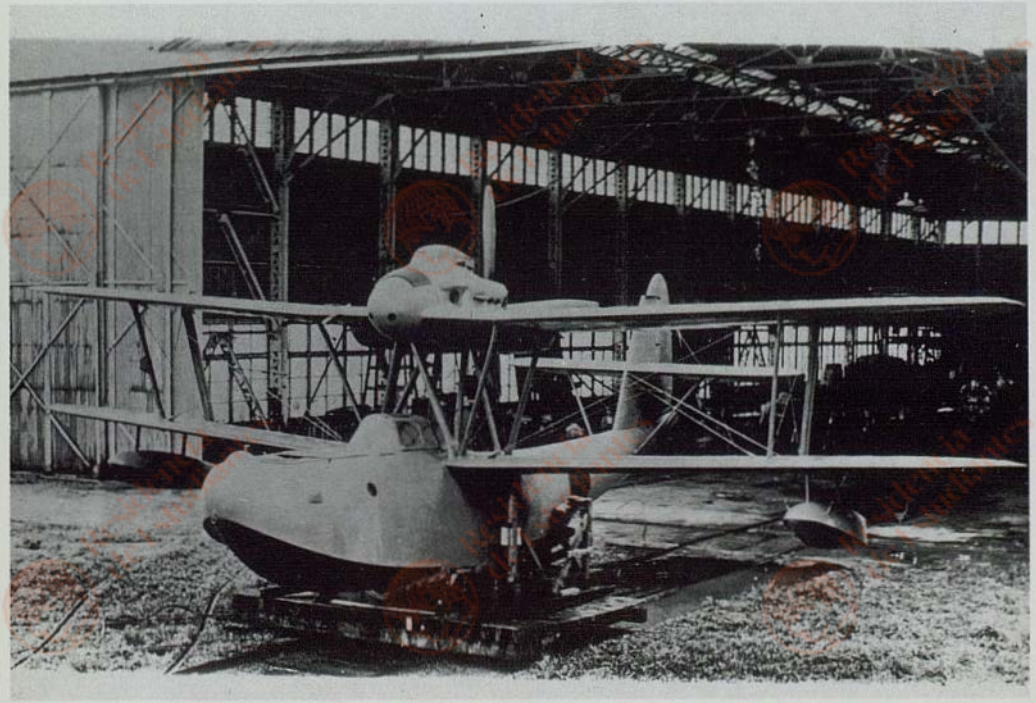
A Saab 105Oe of the Austrian air force, which uses the type in the genuine multi-role fashion for air defense, light attack, reconnaissance, and operational conversion.

Photo: M. Rostaing
D1 075 03.12
Printed in Italy

Seaplane

Japan

Aichi E11A "LAURA"



Aichi E11A "LAURA"

Competitive selection

The E11A was planned to a 1936 requirement for a successor to the same company's E10A as the nocturnal spotter carried by Japanese battleships and cruisers, and first flew in June 1937. The Aichi prototype was evaluated competitively against the Kawanishi E11K, and ordered into production during April 1938 with the full designation Navy Type 98 Night Reconnaissance Seaplane, and the short designation E11A1 (reconnaissance seaplane, 11th in series, built by Aichi, 1st model).

A short operational career

The E11A1 production model was an attractive flying boat with biplane wings (featuring bracing wires as well as interplane and cabane struts) and a braced tailplane set comparatively high on the vertical tail to keep it clear of spray during take-off and landing. The lower wing was attached to the upper longerons of the two-step hull, which had an enclosed pilot's cockpit, and the engine was located in pusher layout on the center section of the upper wing; in the bow was an open position for the single defensive machine-gun. Including prototypes, production up to 1940 amounted to just 17 aircraft, and these saw limited operational service in the opening rounds of Japan's Pacific campaign in the Second World War.

Principal version

E11A1 (shipborne spotter flying boat).

Principal user

Japan.

TECHNICAL DATA

Type: Aichi E11A1 three-seat shipborne spotter flying boat.
Engine: one 620-hp (462-kW) Hiro Type 91 Model 11 inline piston engine.
Performance: maximum speed 135 mph (217 km/h) at 7,875 ft (2,400 m); climb to 9,845 ft (3,000 m) in 18 minutes 32 seconds; service ceiling 14,520 ft (4,425 m); range 1,209 miles (1,945 km).
Weights: empty 4,248 lb (1,927 kg); maximum take-off 7,275 lb (3,300 kg).
Dimensions: span 47 ft 6.5 in (14.49 m); length 35 ft 1.75 in (10.71 m); height 18 ft 0.5 in (5.50 m); wing area not revealed.
Armament: one 7.7-mm (0.303-in) machine-gun.

Known to the Allies as the "Laura", the E11A1 had only a very short operational career as a short-range night reconnaissance type before being pulled out of first-line service.

Photo: Musee Air
D1 075 03.20
Printed in Italy

France West Germany

Transall C-160

Transall C-160

Fruits of cooperation

In the late 1950s France and West Germany arrived at a joint requirement for a tactical airlifter to replace their Nord 2501 Noratlas and Douglas C-47 piston-engined transports. To meet this requirement a consortium was created by companies that now form parts of the Aerospatiale and MBB aerospace giants. The resulting C-160 (so named for its Cargo role and its wing area in square meters) is typical of its type, with a pressurized hold accessed by a rear ramp/door, and first flew in March 1963.

Production in two series

Production ended in 1972 after the delivery of 179 aircraft including four postal machines for Air France. Production was then relaunched in 1977 to meet a French requirement for additional airlift capability, and 35 new aircraft were delivered from 1981. Apart from six machines used for inter- island migration by Indonesia, these are 25 airlifters (all with flight refueling probes, 10 of them fitted out as refueling tankers and five more with capability for such a modification) and four communications relay aircraft. Proposals for other special-purpose variants have come to nothing.

Principal versions

C-160 (airlifter) and C-160 Astarte (communications relay aircraft)

Principal users

France, Indonesia, South Africa, Turkey, and West Germany.

TECHNICAL DATA

Type: Arbeitsgemeinschaft Transall C-160 three-crew tactical transport.

Engines: two 6,100-ehp (4,549-kW) Rolls-Royce Tyne RTy.20 Mk 22 turboprops.

Performance: maximum speed 319 mph (513 km/h) at 16,000 ft (4,875 m); initial climb rate 1,300 ft (396 m) per minute; service ceiling 27,000 ft (8,230 m); range 1,150 miles (1,853 km) with maximum payload.

Weights: empty 63,935 lb (29,000 kg); maximum take-off 112,435 lb (51,000 kg).

Dimensions: span 131 ft 3 in (40.00 m); length 106 ft 3.5 in (32.40 m); height 38 ft 2.75 in (11.65 m); wing area 1,722.3 sq ft (160.00 m2).

Payload: 93 troops, or 88 paratroops, or 62 litters and four attendants, or 35,273 lb (16,000 kg) of freight.

A C-160 of the second series disgorges paratroops. Palleted freight, weapons, and even light vehicles can be parachuted off the rear ramp.

Photo: SIRPA/air
D1 075 03.18
Printed in Italy

Seaplane

Canada

Canadair CL-215

Canadair CL-215

A worthy purpose

Now part of the Bombardier group, Canadair decided in the early 1960s to produce a purpose-designed "firebomber" amphibian with a primary role of bombing forest fires with water, and a secondary capability as a utility passenger/freight transport. The first machine flew in October 1967, and despite its use of elderly piston engines the type enjoyed small but steady sales. The CL-215's two fuselage tanks hold 1,412 US gal (5,345 litres) of water: this quantity can be scooped up in 10 seconds as the plane skims the surface of a lake or even the sea, and can be dumped in 1 second. More than 100 dumps per day are standard, and one Yugoslav CL-215 managed 225 dumps in a single day.

Rejuvenated model

The CL-215 has also be adopted for coastal patrol and transport, and production was completed with the 112th aeroplane to allow the company to concentrate on the CL-215T version. This first flew in 1989 and, powered by two 2,380-shp (1,775-kW) Pratt & Whitney Canada PW123AF turboprops, can carry 1,620 US gal (6,132 litres) of water.

Principal versions

CL-215 (basic model) and CL-215T (turboprop-powered model).

Principal users

Canada, France, Greece, Italy, Spain, Thailand, Venezuela and Yugoslavia.

TECHNICAL DATA

Type: Canadair CL-215 two-crew firebomber and utility transport amphibian.
Engines: two 2,100-hp (1,566-kW) Pratt & Whitney R-2800-CA3 radial piston engines.
Performance: maximum speed 181 mph (291 km/h) at 10,000 ft (3,050 m); initial climb rate 1,000 ft (305 m) per minute; service ceiling not revealed; range 1,301 miles (2,094 km).
Weights: empty 28,082 lb (12,738 kg); maximum take-off 43,500 lb (19,731 kg).
Dimensions: span 93 ft 10 in (28.60 m); length 65 ft 0.25 in (19.82 m); height 29 ft 5.5 in (8.98 m) on land; wing area 1,080.0 sq ft (100.33 m^2).
Payload: 12,000 lb (5,443 kg) as a firebomber or 8,518 lb (3,864 kg) as a utility aeroplane with freight or 26 passengers.

This is one of the five CL-215s used to good effect by the government of Yugoslavia for the fighting of forest fires.

Photo: B. Thouanel
DI 075 01.17
Printed in Italy

Naval helicopter

Great Britain France

Westland LYNX

Westland LYNX

Franco-British coproduction

The Lynx was designed by the British firm Westland but built in collaboration with Aerospatiale, which has a 30% share in the program. The prototype flew in March 1971, and helicopters have been produced for naval and military roles. The Lynx entered service in 1978, and the specifically naval variant differs from the military model in having naval equipment and wheeled tricycle landing gear in place of the land model's twin skids.

Exceptional maneuverability

The Lynx's semi-rigid rotor and clean design combine to produce high agility and performance. To these are added the sensors and weapons that make the naval Lynx a potent helicopter for destroyers and frigates. The type's primary tasks are anti-submarine and anti-ship warfare, and its secondary tasks SAR, vertical replenishment, and transport of 10 troops or 2,000 lb (907 kg) of freight. More than 210 naval Lynxes have been produced, and development continues with the Super Lynx, an updated model powered by Gem 42-1s.

Principal versions

Lynx HAS.Mk 2 (basic British helicopter), Lynx Mk 2 (French equivalent of the HAS.Mk 2), Lynx HAS.Mk 3 (British model with more powerful Gem 41-1 engines), Lynx Mk 4 (French equivalent of the HAS.Mk 3), and comparable export helicopters with different designations.

Principal users

Argentina, Brazil, Denmark, France, Great Britain, the Netherlands, Nigeria, Norway, South Korea, and West Germany.

TECHNICAL DATA

Type: Westland Lynx HAS.Mk 2 four seat multi-role naval helicopter.

Engines: two 900-shp (671-kW) Rolls-Royce Gem 2 turboshafts.

Performance: maximum speed 144 mph (232 km/h) at sea level; initial climb rate 2,170 ft (661 m) per minute; hovering ceiling 8,450 ft (2,575 m); range 368 miles (593 km).

Weights: empty 7,370 lb (3,343 kg); maximum take-off 10,500 lb (4,763 kg).

Dimensions: main rotor diameter 42 ft 0 in (12.80 m); length overall, rotors turning 49 ft 9 in (15.163 m); height 11 ft 5 in (3.48 m); main rotor disc area 1,385.4 sq ft (128.7 m^2).

Armament: provision for two lightweight homing torpedoes, or four light anti-ship missiles, or other weapons.

An effective hunter/killer of submarines, the Lynx serves with several navies. This is a Lynx in service with the French navy.

Photo: M. Rostaing
D1 075 01.14
Printed in Italy

Trainer

West Germany France

Dassault-Breguet/Dornier ALPHA JET

Dassault-Breguet/Dornier ALPHA JET

Franco-German cooperation
In 1969 the French and West Germans announced a joint requirement for a new plane able to undertake the basic/advanced trainer and the light attack and reconnaissance roles. In 1970 the current consortium's Alpha Jet was selected for full-scale development, the first prototype flew in October 1973, and service entry followed in 1978.

Explosion of variants
The original Alpha Jet A warplane and Alpha Jet E trainer for West Germany and France have now been supplemented by other models, though some of these have yet to achieve production status. Some 512 aircraft were ordered, and the last of these was completed in 1988 though production could be resumed.

Principal versions
Alpha Jet A (now Close Support Version for West Germany), Alpha Jet E (now Advanced Trainer/Light Attack Version for France and several export customers), Alpha Jet Alternative Close Support Version (export model with more advanced nav/attack system), Alpha Jet 2 (proposed upgraded trainer with more power), Lancier (proposed extended-capability version of the Alpha Jet 2), and Alpha Jet 3 (proposed trainer with state of the art cockpit).

Principal users
Belgium, Cameroun, Egypt, France, Ivory Coast, Morocco, Nigeria, Qatar, Togo, and West Germany.

TECHNICAL DATA

Type: Dassault-Breguet/Dornier Alpha Jet E two-seat basic/advanced flying and weapons trainer.
Engines: two 2,976-lb (1350-kg) thrust SNECMA/Turbomeca Larzac 04-C5 turbofans.
Performance: maximum speed 621 mph (1,000 km/h) at sea level; climb to 30,000 ft (9,145 m) in less than 7 minutes 0 seconds; service ceiling 48,000 ft (14,630 m); radius 764 miles (1,230 km).
Weights: empty 7,374 lb (3,345 kg); maximum take-off 17,637 lb (8,000 kg).
Dimensions: span 29 ft 10.75 in (9.11 m); length 38 ft 6.5 in (11.75 m); height 13 ft 9 in (4.19 m); wing area 188.4 sq ft (17.50 m^2).
Armament: provision for more than 5,511 lb (2,500 kg) of disposable stores carried externally.

This Alpha Jet E is on the strength of the French fighter school based at Tours.

Photo: MDBA
D1 075 01.13
Printed in Italy

Fighter

Poland

PZL P.11

PZL P.11

Great expectations
The P.11 was in essence the P.7 fighter with a number of refinements including a more powerful engine in the hope that performance would be greatly improved. The first of three prototypes flew in 1931 with a French-built Bristol Jupiter IXAsb, the two following aircraft having the Mercury IVA. Production totalled about 330 aircraft.

Steady development
The P.11a entered service with the 517-hp (385-kW) Mercury IVS.2 and two 7.7-mm (0.303-in) machine guns. Then came the P.11b for Romania with the 525-hp (391-kW) Gnome-Rhone 9K radial. The main production variant was the P.11c with greater power (initially the 560-hp/418-kW Skoda-built Mercury VS.2), revised inner wing panels, modifications to the rear fuselage and vertical tail, and revised armament including provision for bomb racks. The P.11d and P.11e were projects for a navalized P.11c. The P.11f was a version of the P.11c built under license in Romania with the 595-hp (444-kW) Gnome-Rhone 9Krse. Finally, the P.11g was the prototype for a planned model with enclosed cockpit, four guns, and the 840-hp (626-kW) Mercury VIII.

Principal versions
P.11a (pre-production model), P.11b (first full production model), P.11c (definitive Polish fighter), and P.11f (built under license by IAR in Romania).

Principal users
Latvia, Poland and Romania.

TECHNICAL DATA

Type: PZL P.11c single-seat fighter.
Engine: one 645-hp (481-kW) Skoda-built Bristol Mercury VIS.2 radial piston engine.
Performance: maximum speed 242 mph (390 km/h) at 18,050 ft (5,500 m); climb to 16,405 ft (5,000 m) in 6 minutes 0 seconds; service ceiling 26,250 ft (8,000 m); range 435 miles (700 km).
Weights: empty 2,529 lb (1,147 kg); maximum take-off 3,968 lb (1,800 kg).
Dimensions: span 35 ft 2 in (10.72 m); length 24 ft 9.25 in (7.55 m); height 9 ft 4.5 in (2.85 m); wing area 192.68 sq ft (17.90 m^2).
Armament: two 7.7-mm (0.303-in) machine guns and provision for light bombs.

This PZL P.11c is seen in the colors of the 122nd Squadron of the 2nd Krakow Aviation Regiment.

Photo: M. Hodeir
D1 075 01.11
Printed in Italy

Attack and close support

Israel

Israel Aircraft Industries KFIR

Israel Aircraft Industries KFIR

An Israeli Mirage
Making its first appearance in April 1975, the Kfir-C1 was the airframe of the IAI Nesher (itself an unlicensed and simplified copy of the Dassault Mirage III) with an American J79 turbojet and Israeli electronics. The result was a modestly successful fighter with ground-attack capability, and 27 aircraft were built.

Domestic backborne for the Israeli air force
Further development was already in hand, and in July 1976 the Israelis revealed the Kfir-C2 with small canard surfaces just behind the engine inlets for better field performance and agility, especially in the primary ground- attack role. The Kfir-TC2 was produced as a two-seat trainer equivalent with combat capability, and total production of these two variants was 185. The definitive model, revealed in 1983, is the Kfir-C7 conversion of the -C2 with a more powerful engine, greater weapon load, flight refueling capability, improved electronics, and a revised cockpit with HOTAS (Hands On Throttle And Stick) controls. The comparable two-seat version is the Kfir-TC7 used for specialist tasks such as electronic warfare.

Principal versions
Kfir-C1 (initial single-seater), Kfir-C2 (canarded single-seater), Kfir-TC2 (two-seater), Kfir-C7 (upgraded single-seater), Kfir-TC7 (upgraded two- seater), and F-21A (leased type in two versions for US Navy and US Marine Corps).

Principal users
Colombia, Ecuador, Israel, and USA.

TECHNICAL DATA

Type: IAI Kfir-C7 single-seat attack plane and fighter.
Engine: one 18,750-lb (8,505-kg) reheated thrust General Electric J79-GE-J1E turbojet.
Performance: maximum speed 1,516+ mph (2,440+ km/h) or Mach 2.3+ at 36,000 ft (10,975 m); initial climb rate 45,930 ft (14,000 m); service ceiling 58,000 ft (17,680 m); radius 548 miles (882 km).
Weights: empty 16,060 lb (7,285 kg); maximum take-off 36,376 lb (16,500 kg).
Dimensions: span 26 ft 11.5 in (8.22 m); length 51 ft 4.25 in (15.65 m); height 14 ft 11.75 in (4.55 m); wing area 392.47 sq ft (36.46 m^2) including canards.
Armament: two 30-mm cannon and up to 13,415 lb (6,085 kg) of disposable stores.

This F-21A served with the US Marine Corps' VMFT-401 "aggressor" squadron based at Yuma, Arizona, for dissimilar air combat maneuver training.

Photo I.A.I.
D1 075 02.09
Printed in Italy

Switzerland

Pilatus PC-6 PORTER & TURBO-PORTER

Pilatus PC-6 PORTER & TURBO-PORTER

A fortunate detour

While considering a new trainer to replace its PC-3, Pilatus sidetracked and in 1957 opted for the development of a STOL utility light transport with landing gear that could be adapted for land, snow and water operations. The PC-6 Porter flew in May 1959 with a 340-hp (254-kW) Lycoming GSO-480 piston engine, and from this beginning sprang a program that continues to the present.

Shift into high gear

Pilatus soon realized that the basic piston-engined model should be supplemented by a turboprop-engined type, and in May 1961 there flew the first PC-6/A Turbo-Porter with 523-shp (390-kW) Turbomeca Astazou II. This was the beginning of another series that includes a large number of variants as well as a licensed version made in the USA by Fairchild and further developed into the military AU-23A Peacemaker.

Principal versions

PC-6 (initial model), PC-6/350 (upgraded model with 350-hp/261-kW IGO-540 engine), PC-6/A (Astazou turboprop), PC-6/B (Pratt & Whitney Canada PT6A turboprop), and PC-6/C (Garrett TPE-331 turboprop).

Principal users

Just under 500 aircraft are used in about 50 countries.

TECHNICAL DATA

Type: Pilatis PC-6/B2-H2 Turbo-Porter one-crew STOL utility light transport.
Engine: one 680-hp (507-kW) Pratt & Whitney Canada PT6A-27 turboprop.
Performance: maximum speed 161 mph (260 km/h) at 10,000 ft (3,050 m); initial climb rate 941 ft (287 m) per minute; service ceiling 28,000 ft (8,535 m); range 652 miles (1,050 km).
Weights: empty 2,685 lb (1,218 kg); maximum take-off 6,107 lb (2,770 kg).
Dimensions: span 49 ft 8 in (15.13 m); length 35 ft 9 in (10.90 m); height 10 ft 6 in (3.20 m); wing area 310.01 sq ft (28.80 m^2).
Payload: up to 10 passengers or 2,491 lb (1,130 kg) of freight.

Particularly well suited to operation in mountainous areas, the PC-6 is employed in several countries for tasks where its STOL performance from rough airstrips is invaluable.

Photo: B. Thouanel
D1 075 01.15
Printed in Italy

Attack and close support

Brazil

Italy

Aeritalia/Aermacchi/EMBRAER AMX

Aeritalia/Aermacchi/EMBRAER AMX

Italian-Brazilian co-operation

During 1977 the Italian air force issued a requirement for a light attack warplane to replace its Aeritalia G91R and G91Y aircraft. In the same year the Brazilian air force recognized a similar requirement for an EMBRAER AT-26 Xavante replacement, and the two countries agreed on the collaborative development of the Italian MB-340 concept.

Multi-role capability

The type that resulted from the program is now called the AMX, and first flew in prototype form during May 1984 for a service debut in 1988. The AMX is conventional in design and construction, but is notably agile and, despite the lack of radar in its basic form, a highly capable attacker with otherwise advanced sensors. There is also an AMX(T) two-seat conversion trainer, and plans call for the development of a radar-fitted version for the anti-ship role with missile armament. Production is envisaged of 252 single-seat and 65 two-seat aircraft, 187 and 51 of them respectively for Italy.

Principal versions

AMX (single-seater) and AMX(T) (combat-capable two-seater).

Principal users

Brazil and Italy.

TECHNICAL DATA

Type: Aeritalia/Aermacchi/EMBRAER AMX single seat multi-role close air support, battlefield interdiction and reconnaissance warplane.

Engine: one 11,030-lb (5,003-kg) thrust Rolls-Royce Spey RB168 Mk 807 turbofan built under licence in Italy by Alfa Romeo Avio, Fiat and Piaggio.

Performance: maximum speed 568 mph (914 km/h) at 36,090 ft (11,000 m); initial climb rate 12,600 ft (3,840 m) per minute; service ceiling 42,650 ft (13,000 m); radius 550 miles (890 km).

Weights: empty 14,770 lb (6,700 kg); maximum take-off 27,558 lb (12,500 kg).

Dimensions: span 32 ft 9.75 in (10.00 m); length 44 ft 6.5 in (13.575 m); height 15 ft 0.25 in (4.576 m); wing area 226.04 sq ft (21.00 m^2).

Armament: one 20-mm multi-barrel cannon or (Brazilian aircraft) two 30-mm cannon, and up to 8,377 lb (3,800 kg) of disposable stores.

The AMX is a simple and affordable light warplane that nonetheless possesses good combat capability.

Photo: Aeritalia/Aermacchi/Embraer
D1 075 01.08
Printed in Italy

CARD DECKS WP

D1 075 10

Attack and close support

Great Britain France

SEPECAT JAGUAR A

SEPECAT JAGUAR A

Dual nationality and dual capability

In 1965 France and Great Britain decided that their requirements for a supersonic advanced training and attack/close support plane were so close that a common type would suit both operators and save considerable development cost. Developed by SEPECAT (a British Aircraft Corporation and Breguet consortium) on the basis of the latter company's Br.121 proposal, the Jaguar first flew in September 1968 with the Adour turbofan developed from the Turboméca Turmalet and Rolls-Royce RB.172.

French attack version

The single-seat variant accepted for first-line French service was the Jaguar A, which was based on the Jaguar E two-seat trainer with a shorter fuselage. The Jaguar A first flew in March 1969 and entered service in 1973. The French opted for a less comprehensive avionics suite than the British, including a less sophisticated nav/attack system based on a twin-gyro platform, Doppler navigation, and a modest SFIM 31 weapon-aiming system even though the accurate delivery of nuclear weapons was envisaged. The last 30 of the 160 warplanes have the ATLIS II designator pod allowing use of the AS.30L laser- homing air-to-surface missile.

Principal version

Jaguar A (French tactical fighter now upgraded with better electronic countermeasures).

Principal user

France.

TECHNICAL DATA

Type: SEPECAT Jaguar A single-seat tactical support warplane.
Engines: two 7,305-lb (3,313-kg) reheated thrust Rolls-Royce/Turboméca Adour Mk 102 turbofans.
Performance: maximum speed 990 mph (1,593 km/h) or Mach 1.5 at 36,090 ft (11,000 m); climb to 30,000 ft (9,145 m) in slightly more than 1 minute 30 seconds; service ceiling 45,930 ft (14,000 m); radius 357 miles (575 km) on a lo-lo-lo mission.
Weights: empty 15,432 lb (7,000 kg); maximum take-off 34,612 lb (15,700 kg).
Dimensions: span 28 ft 6.1 in (8.69 m); length 55 ft 2.6 in (16.83 m); height 16 ft 0.5 in (4.89 m); wing area 258.34 sq ft (24.00 m^2).
Armament: two 30-mm cannon and up to 10,000 lb (4,536 kg) of disposable stores.

Jaguar As of the French air force's 11e Escadre de Chasse over Chad, where French air support has been vital in preserving the status quo. Note the camouflage adopted for this theater.

Photo: Gilles Rolle/SIRPA Air
D1 075 11.01
Printed in Italy

Trainer

USA

Beech T-34 MENTOR

Beech T-34 MENTOR

A USAF success for Beech

In December 1948, Beech flew its Model 45 prototype trainer based on the Model 33 Bonanza. The new plane introduced tandem seating and, in place of the Bonanza's V-tail, a conventional tail unit. Early in 1950 the USAF acquired three Model 45s for evaluation as YT-34s. It was only in March 1953 that the first production order was placed for an eventual total of 450 T-34As powered by the 225-hp (168-kW) Continental O-470-13 piston engine. The US Navy then entered the program with a final total of 423 T-34B Mentors, and additional aircraft were built under license in Argentina, Canada, and Japan.

Second-generation derivative

Early in 1973, the US Navy decided to investigate a turboprop-powered variant of the Mentor, and the YT-34C prototype first flew in September 1973 with a PT6A turboprop, improved avionics, and an air-conditioning system. The US Navy took 334 of the T-34C, and Beech also produced as a private venture the T-34C-1 armed model for forward air control and light attack purposes.

Principal versions

T-34A (initial piston-engined version for the USAF and export), T-34B Mentor (initial naval version with 225-hp/168-kW O-470-4 engine), T-34C (turboprop-powered naval model), Turbine Mentor 34C (export version of the T-34C), and T-34C-1 (armed version of the T-34C).

Principal users

Algeria, Argentina, Chile, Colombia, Dominican Republic, Ecuador, El Salvador, Gabon, Indonesia, Japan, Mexico, Morocco, Peru, Philippines, Spain, Taiwan, Turkey, Uruguay, USA, and Venezuela.

TECHNICAL DATA

Type: Beech T-34C two-seat primary trainer.
Engine: one 715-shp (533-kW) Pratt & Whitney Cananda PT6A-25 turboprop flat-rated to 550 shp (410 kW).
Performance: maximum speed 246 mph (396 km/h) at 17,000 ft (5,180 m); initial climb rate 1,480 ft (451 m) per minute; service ceiling 30,000 ft (9,145 m); range 814 miles (1,310 km).
Weights: empty 2,960 lb (1,343 kg); maximum take-off 4,300 lb (1,950 kg).
Dimensions: span 33 ft 3.9 in (10.16 m); length 28 ft 8.5 in (8.75 m); height 9 ft 7 in (2.92 m); wing area 179.6 sq ft (16.68 m^2).
Armament: none.

T-34C-1s of the Algerian air force, which operates the type for primary training with a secondary tasking of weapon training and light attack.

Photo: Beech
D1 075 11.02
Printed in Italy

Canada

de Havilland Canada DHC-5 BUFFALO

de Havilland Canada DHC-5 BUFFALO

Inspired by the US Army

The Buffalo (initially Caribou II) was produced to meet a US Army requirement for a successor to the DHC-4 Caribou providing the same type of STOL capability with higher payload and flight performance. The type first flew in April 1964, but only four of the initial DHC-5 model were produced as the US Army placed no production contract. The design was typical of DHC twin-engined airlifters, with a high-set wing accommodating extensive high-lift devices, and an upswept tail allowing the incorporation of a rear ramp/door.

More power and higher weights

DHC then switched to the DHC-5A model with greater power and payload. Some 15 of these were ordered by Canada as CC-115s, and six were later converted for coastal patrol and SAR; another 18 and 16 were delivered to Brazil and Peru respectively. The definitive model was the DHC-5D with still more power and greater payload, and production of this model was completed in February 1987 to bring Buffalo production to a total of 123 aircraft.

Principal versions

DHC-5 Buffalo (pre-production model for the US Army), DHC-5A Buffalo (initial production model with an 11,200-lb/5,080-kg payload and CT64-810-1 turboprops), and DHC-5D Buffalo (definitive model).

Principal users

Abu Dhabi, Brazil, Cameroun, Canada, Ecuador, Egypt, Kenya, Mauritania, Mexico, Oman, Peru, Sudan, Tanzania, Togo, Zaire, and Zambia.

TECHNICAL DATA

Type: de Havilland Canada DHC-5D Buffalo three-crew STOL transport.

Engines: two 3,133-shp (2,336-kW) General Electric CT64-820-4 turboprops..

Performance: maximum speed 290 mph (467 km/h) at 10,000 ft (3,050 m); initial climb rate 1,820 ft (555 m) per minute; service ceiling 27,000 ft (8,380 m); range 691 miles (1,112 km) with maximum payload.

Weights: empty 25,160 lb (11,412 kg); maximum take-off 49,200 lb (22,316 kg).

Dimensions: span 96 ft 0 in (29.26 m); length 79 ft 0 in (24.08 m); height 28 ft 8 in (8.73 m); wing area 945.0 sq ft (87.8 m^2).

Payload: 41 troops, or 35 paratroops, or 24 litters plus six attendants, or 18,000 lb (8,165 kg) of freight.

The US Army evaluated the DHC-5 as the YAC-2 (later C-7A and finally C-8A), but then placed no production orders for this simple yet effective STOL airlifter.

Photo: De Havilland Canada
D1 075 11.03
Printed in Italy

Trainer

Great Britain

British Aerospace CANBERRA

British Aerospace CANBERRA

A new perspective for the Canberra

The English Electric Canberra was a pioneering turbojet-powered light bomber, and first flew in May 1949. No thought was given to a trainer model until the Canberra B.Mk 2 was already in service. Thus all the Canberra bomber units had formed by the time the Canberra T.Mk 4 first flew in June 1952 for a service debut in 1953.

A gamut of models

The T.Mk 4 featured side-by-side seating for the two pilots, with the navigator located behind the left-hand (pupil's) seat. Though the T.Mk 4 was the basic conversion trainer, there later appeared a number of more specialized trainer models, and these remain in valuable service up to the present.

Principal versions

Canberra T.Mk 4 (conversion trainer derived from the B.Mk 2), Canberra T.Mk 11 (B.Mk 2 conversion for training Gloster Javelin night fighter crews), Canberra T.Mk 13 (T.Mk 4 version for New Zealand), Canberra T.Mk 21 (B.Mk 20 conversion for Australia), Canberra T.Mk 17 (24 B.Mk 2 conversions for electronic countermeasures training with the ECM suite of the V-bombers), Canberra T.Mk 19 (eight T.Mk 11 conversions as "silent target" aircraft), Canberra T.Mk 22 (PR.Mk 7 conversions with Blue Parrot radar for naval training), Canberra T.Mk 64 (T.Mk 4 version for Australia), and Canberra T.Mk 84 (T.Mk 4 version for Venezuela).

Principal users

Argentina, Australia, Great Britain, India, New Zealand, Peru, South Africa, Venezuela, and Zimbabwe.

TECHNICAL DATA

Type: British Aerospace Canberra T.Mk 17 two/three-seat electronic warfare trainer.
Engines: two 6,500-lb (2,948-kg) thrust Rolls-Royce Avon Mk 101 turbojets.
Performance: maximum speed 570 mph (917 km/h) at medium altitude; initial climb rate 3,600 ft (1,097 m) per minute; service ceiling 48,000 ft (14,630 m); range 2,660 miles (4,280 km).
Weights: empty 22,900 lb (10,387 kg); maximum take-off 46,000 lb (20,865 kg).
Dimensions: span 64 ft 0 in (19.51 m) excluding tip tanks; length 68 ft 6 in (20.90 m); height 15 ft 8 in (4.78 m); wing area 960.0 sq ft (89.18 m^2).
Armament: none.

The Canberra T.Mk 17 is used for ECM training by No.360 (Joint Services) Squadron, one of the specialized Canberra operator units located at RAF Wyton.

Photo: coll. Bigel
D1 075 11.04
Printed in Italy

Fighter

Germany

Fokker Dr I

Fokker Dr I

Rapid response

As soon as the Sopwith Triplane appeared over the Western Front in the spring of 1917, German pilots were highly impressed by its agility and rate of climb. German designers responded swiftly with a number of triplane designs, including the Fokker V 3 prototype designed by Reinhold Platz with cantilever wings. These vibrated in flight, so the V 4 prototype added lightweight interplane struts as well as a number of aerodynamic features to improve the already high level of maneuverability produced by compact overall dimensions, large control surfaces, and the grouping of all weighty items close to the center of gravity.

A limited career

The plane entered production in the summer of 1917 as the F I, a designation soon altered to Dr I. The new fighter was produced to the extent of some 300 or more aircraft with either a German rotary engine or a Swedish license-built version of a French one. There were initially a number of wing structural failures because of manufacturing deficiencies, but once these had been remedied the type became the favorite mount of several aces, including Manfred von Richthofen. In the type of defensive operation forced on the Germans by this time in the first World War, the aces could exploit the type's supreme agility to offset its inferior flight performance. The last Dr Is were phased out of service in mid-1918.

Principal version

Dr I (only production model).

Principal user

Germany.

TECHNICAL DATA

Type: Fokker Dr I single-seat fighter.
Engine: one 110-hp (82-kW) Oberürsel Ur.II or Thulin-built Le Rhône 9 rotary piston engine.
Performance: maximum speed 103 mph (165 km/h) at 13,125 ft (4,000 m); climb to 3,280 ft (1,000 m) in 2 minutes 54 seconds; service ceiling 20,015 ft (6,100 m); endurance 1 hour 30 minutes.
Weights: empty 895 lb (406 kg); maximum take-off 1,290 lb (585 kg).
Dimensions: span 23 ft 7.5 in (7.20 m); length 18 ft 11.25 in (5.77 m); height 9 ft 8.25 in (2.95 m); wing area 201.29 sq ft (18.70 m^2).
Armament: two 0.312-in (7.92-mm) machine guns.

The Dr I was a warplane that has exercised a continuing fascination. The type has been quite widely reproduced in replica form (often with a radial engine), and this is just such a machine at a French air display.

Photo: F. Robineau
D1 075 11.05
Printed in Italy

Land based helicopter

France

Aérospatiale AS 350 ECUREUIL

Aérospatiale AS 350 ECUREUIL

Alouette successor

The Ecureuil (squirrel) was designed to succeed the Alouette, but in fact has been produced to complement rather than supplant the older type. Based on a simple dynamic system and a low-maintenance rotor design, the AS 350 first flew in prototype form during June 1974 and soon proved that its design team had succeeded in lowering noise levels and reducing both maintenance and operating costs.

Two basic models

The AS 350 is produced in two basic variants. For the North American market, the AS 350C Astar is powered by an American engine, the 616-shp (459-kW) Lycoming LTS101-660A2, while the AS 350B Ecureuil has a French engine. The two variants are offered with a wide assortment of optional avionics. Further development has produced military models, as well as civil variants with a twin-engined powerplant.

Principal versions

As 350B Ecureuil (standard civil helicopter), AS 350B-1 Ecureuil (version with the 684-shp/510-kw Arriel ID turboshaft), AS 350C Astar (initial version for the North American market), AS 350D Astar (version of the AS 350C available from 1978 with a more powerful engine), AS 350L-1 Ecureuil (military model with the Arriel ID and outriggers for armament), AS 350L-2 Ecureuil (improved military model with the 691-shp/515-kW Arriel ID1 turboshaft), and Helibras HB 350 Esquilo (AS 350B license-built in Brazil).

Principal users

many countries including Australia, Brazil, France, and USA.

TECHNICAL DATA

Type: Aérospatiale AS 350B Ecureuil one-crew utility light helicopter.
Engine: one 641-shp (478-kW) Turboméca Arriel IB turboshaft.
Performance: maximum speed 144 mph (232 km/h) at optimum altitude; initial climb rate 1,575 ft (480 m) per minute; service ceiling 16,000 ft (4,875 m); range 441 miles (710 km).
Weights: empty 2,304 lb (1,045 kg); maximum take-off 4,630 lb (2,100 kg).
Dimensions: main rotor diameter 35 ft 0.75 in (10.69 m); length overall, rotors turning 42 ft 8 in (13.00 m); height 10 ft 1.25 in (3.08 m); main rotor disc area 966.12 sq ft (89.75 m^2).
Payload: five passengers or 1,984 lb (900 kg) of freight.

Though designed as a civil helicopter, the Ecureuil has found favour with several military operators (such as the French army) for liaison.

Photo: Aérospatiale
D1 075 11.06
Printed in Italy

Light bomber

France

Breguet BRE.693 and BRE.695

Breguet BRE.693 and BRE.695

A family of warplanes

In 1935 the French air ministry wanted a twin-engined fighter with a crew of three, and Breguet responded with the Bre.690. The prototype flew in March 1938, but the Potez 630 was selected for production. The Breguet plane clearly had great potential, however, and the type was recast as a two-seat attack bomber, with the navigator's position replaced by internal bomb stowage.

Heavy armament

Other armament comprised one cannon and two machine guns that could be depressed by the pilot for ground-attack work, a trainable machine-gun for the radio operator/gunner, and a gun fixed in the fuselage (later supplemented by two more in the nacelles) to fire down and to the rear for strafing. This Bre.691 first flew in May 1939, and was ordered into production in Bre.693 and Bre.695 variants. Production totalled 254 and 50 respectively, the Bre.693s suffering heavily in the Battle of France and the Bre.695s entering service only in the closing stages of the campaign.

Principal versions

Bre.693 (initial model) and Bre.695 (alternative model with 825-hp/615-kW Pratt & Whitney SB4G Twin Wasp Junior radials).

Principal users

France, Germany, and Italy.

TECHNICAL DATA

Type: Breguet Bre.693AB.2 two-seat attack bomber.
Engines: two 700-hp (522-kW) Gnome-Rhône 14M-6/7 radial piston engines.
Performance: maximum speed 304 mph (490 km/h) at 16,405 ft (5,000 m); climb to 13,125 ft (4,000 m) in 7 minutes 12 seconds; service ceiling not revealed; range 839 miles (1,350 km).
Weights: empty 6,636 lb (3,010 kg); maximum take-off 10,803 lb (4,900 kg).
Dimensions: span 50 ft 5 in (15.37 m); length 31 ft 8.75 in (9.67 m); height 10 ft 5.75 in (3.19 m); wing area 314.32 sq ft (29.20 m^2).
Armament: one 20-mm cannon and four or six 0.295-in (7.5-mm) machine guns, and up to 882 lb (400 kg) of bombs.

A Bre.695AB.2 of the 1e Escadrille of GBA I/51. As indicated by the red and yellow bands, this photograph was taken during the unit's service with the Vichy French air force. In November 1942 all surviving Bre.693s and Bre.695s were taken over by Germany and later transferred to Italy for use as operational trainers.

Photo: S.H.A.A.
D1 075 11.07
Printed in Italy

Trainer

Italy

Aermacchi MB-339

Aermacchi MB-339

Multiple concepts

When the Italian air ministry requested a replacement for the Aermacchi MB-326 and Aeritalia G91T trainers, Aeronautica Macchi responded with nine proposals. Seven were rejected on grounds of inadequate performance or too high a cost, leaving as final contenders the MB-339L with a Turboméca Larzac turbofan and the MB-339V with a Viper turbojet. In February 1975, the latter was chosen for development as it offered considerable commonality of engine and airframe with the MB-326K.

Staggered seating

By comparison with the MB-326, the MB-339 has a deeper forward fuselage with the vertically staggered seats that provide the instructor with an excellent forward field of vision. The first prototype flew in August 1976, and the first MB-339A production aircraft flew in July 1978.

Principal versions

MB-339A (initial model), MB-339PAN (aerobatic display team model with smoke-generating equipment), MB-339B (improved model with Viper Mk 680, larger tip tanks, and greater weapon load), MB-339C (much upgraded model with Viper Mk 680-43 and the nav/attack system of the MB-339K single-seat attack variant), and MB-339D (proposed model with the Pratt & Whitney Canada JT15D turbofan).

Principal users

Argentina, Dubai, Ghana, Italy, Malaysia, New Zealand, Nigeria, and Peru.

TECHNICAL DATA

Type: Aermacchi MB-339A two-seat basic and advanced flying trainer with weapon training and/or light attack capability.

Engine: one 4,000-lb (1,814-kg) thrust Piaggio-built Rolls-Royce Viper Mk 632-43 turbojet.

Performance: maximum speed 559 mph (900 km/h) at sea level; initial climb rate 6,595 ft (2,010 m) per minute; service ceiling 48,000 ft (14,630 m); radius 168 miles (270 km) with a 1,361-kg (3,000-lb) warload.

Weights: empty 6,911 lb (3,135 kg); maximum take-off 12,996 lb (5,895 kg).

Dimensions: span 35 ft 7.5 in (10.858 m) over fixed tip tanks; length 36 ft 10 in (10.972 m); height 13 ft 1.25 in (3.994 m); wing area 207.75 sq ft (19.30 m^2).

Armament: up to 4,000 lb (1,814 kg) of disposable stores.

The MB-339 series has the advantages of considerable commonality with the preceding MB-326 family, but offers its crew a much improved cockpit with more advanced avionics and vertically staggered seating.

Photo: Aermacchi
D1 075 11.08
Printed in Italy

USA

Lockheed SR-71

Lockheed SR-71

Too high and fast for interception
Generally known as the "Blackbird" for its special radar-absorbing and heat-emitting black paint, the SR-71 was retired from first-line service in 1990 after a career in which its extraordinary speed and operating altitude rendered it all but immune to interception as it flew huge reconnaissance missions with its classified optical, thermal, and electronic sensors.

Long lineage
Piloted by two men wearing space suits, the SR-71 retains the distinction of having been the world's fastest operational plane, and was derived from an obscure program whose first fruits were the A-11 drone-carrying reconnaissance platform and the YF-12 interceptor. The SR-71 entered service in 1966. The keys to the type's performance were very clever aerodynamic and structural design using a blended fuselage/wing arrangement, titanium as the primary material and the special engines which at high speed generated their power more as inlet suction than as exhaust thrust. Although the type had good range on internal fuel, it was generally operated with a force of Boeing KC-135Q Stratotankers specially adapted to carry and transfer the unique fuel blend used by the SR-71's engines.

Principal versions
SR-71A (31 production aircraft), SR-71B (two pilot training aircraft with a raised rear cockpit), and SR-71C (one SR-71A converted to SR-71B standard).

Principal user
USA.

TECHNICAL DATA

Type: Lockheed SR-71A two-seat strategic reconnaissance plane.
Engines: two 32,500-lb (14,724-kg) reheated thrust Pratt & Whitney J58 (JT11D-20B) bleed turbojets.
Performance: maximum speed 2,250 mph (3,620 km/h) or Mach 3.4 at high altitude; initial climb rate not revealed; service ceiling 100,000 ft (30,480 m); range 2,980 miles (4,800 km).
Weights: empty 60,000 lb (27,216 kg); maximum take-off 170,000 lb (77,111 kg).
Dimensions: span 55 ft 7 in (16.94 m); length 107 ft 5 in (32.74 m); height 18 ft 6 in (5.64 m); wing area 1800.0 sq ft (167.3 m^2).
Armament: none

An SR-71A on final approach. All the "Blackbirds" were operated by the 9th Strategic Reconnaissance Wing at Beale Air Force Base, California, with detachments in Great Britain and on Okinawa.

Photo: DR
D1 075 11.09
Printed in Italy

Spain

CASA C-212 AVIOCAR

CASA C-212 AVIOCAR

Spanish air force requirement

Needing to replace its miscellany of obsolete transports, the Spanish air force requested a simple yet effective airlifter offering STOL capability, modest performance, and low purchase and operating costs. The first C-212 flew in March 1971 as a high-wing monoplane with an upswept tail to allow the incorporation of a rear ramp/door arrangement.

Indonesian co-production

The Aviocar is well suited to the needs of third-world countries, and much of this demand is serviced by licensed production in Indonesia. Although designed for the military, the type has secured limited civil sales.

Principal versions

C-212A (initial model with 750-shp/560-kW TPE331-5 turboprops and a 4,409-lb/2,000-kg payload), C-212 Series 100 (civil version), C-212B (photo-survey), C-212C (Series 100 aircraft in military service), C-212D (navigator trainer), C-212 Series 200 (1979 variant with greater power and higher payload in a stretched fuselage), and C-212 Series 300 (latest version with greater span, increased weights, and provision for electronics or armament in specialized models).

Principal users

Abu Dhabi, Angola, Bophuthatswana, Chad, Chile, Colombia, Djibouti, France, Indonesia, Jordan, Lesotho, Mexico, Nicaragua, Panama, Paraguay, Portugal, Somalia, Spain, Sudan, Sweden, Thailand, Uruguay, Venezuela, and Zimbabwe.

TECHNICAL DATA

Type: CASA C-212 Series 200 Aviocar two-crew STOL utility transport.

Engines: two 900-shp (671-kW) Garrett TPE331-10R turboprops.

Performance: maximum speed 233 mph (375 km/h) at 10,000 ft (3,050 m); initial climb rate 1,555 ft (474 m) per minute; service ceiling 28,000 ft (8,535 m); range 253 miles (408 km) with maximum payload.

Weights: empty 9,072 lb (4,115 kg); maximum take-off 16,424 lb (7,450 kg).

Dimensions: span 62 ft 4 in (19.00 m); length 49 ft 9 in (15.16 m); height 20 ft 8 in (6.30 m); wing area 430.56 sq ft (40.00 m^2).

Payload: 24 troops, or 23 paratroops, or 12 litters plus four attendants, or 6,107 lb (2,770 kg) of freight.

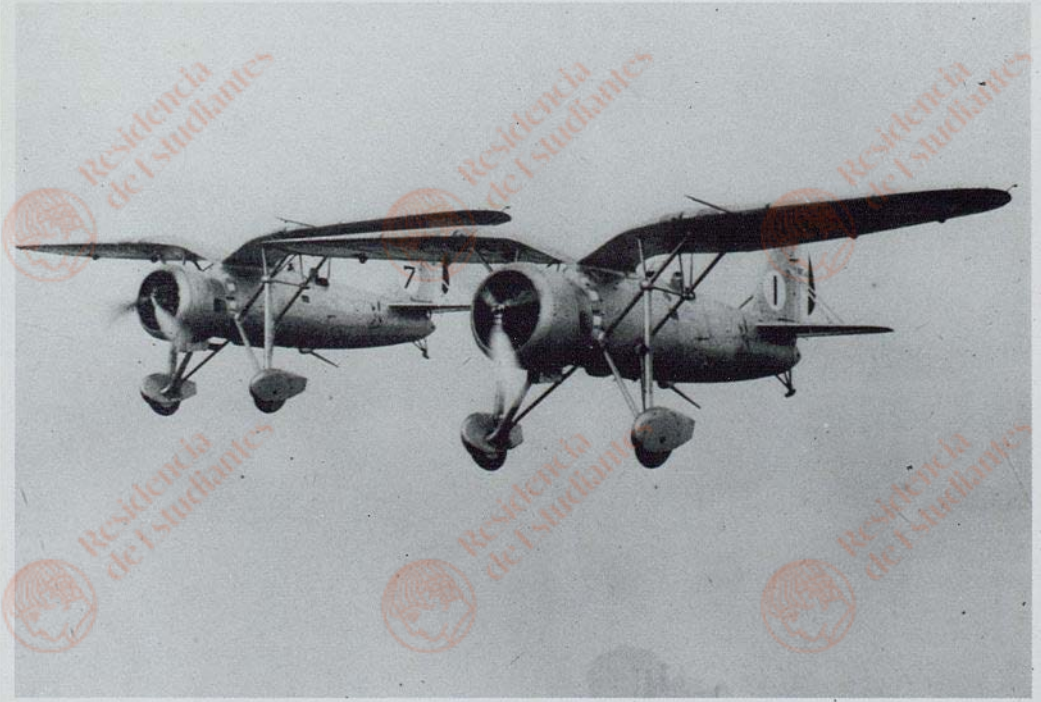
The Aviocar has been a considerable commercial success for CASA. This is an example of the C-212 Series 200 in service with the air arm of the Mexican navy for coastal patrol.

Photo: DR
D1 075 11.10
Printed in Italy

Fighter

France

Loire 46



Loire 46

Variants with inline and radial engines

In the early 1930s, the French air force called for a new fighter powered by the 690-hp (515-kW) Hispano-Suiza 12Xbrs inline engine, and one of the 10 competitors was the Loire 43, a braced gull-wing monoplane of stressed-skin metal construction with fixed tailwheel landing gear. This first flew in October 1932 but crashed in the following year. The company had already completed one example of a radial-engined version, the Loire 45 with the 740-hp (552-kW) Gnome-Rhône 14Kds, and this flew in February 1933.

Inbuilt obsolescence

Despite the fact that the first low-wing monoplanes with retractable landing gear were appearing, continued development of the Loire 45 resulted in the aerodynamically refined Loire 46 that first flew in September 1934. An order for 60 aircraft was placed in the spring of 1935. Five aircraft were delivered to the Republican side in the Spanish Civil War (1936-39), and the others served with French first-line units (notably the four escadrilles of the 6e Escadre at Chartres) until retired to the gunnery school at Cazaux during March 1939.

Principal version

Loire 46 (sole production model).

Principal users

France and Spain.

TECHNICAL DATA

Type: Loire 46C.1 single-seat fighter.
Engine: one 900-hp (671-kW) Gnome-Rhône 14Kfs Mistral-Major radial piston engine.
Performance: maximum speed 242 mph (390 km/h) at optimum altitude; climb to 3,280 ft (1,00 m) in 1 minute 26 seconds; service ceiling 38,550 ft (11,750 m); range 466 miles (750 km).
Weights: empty 2,998 lb (1,360 kg); maximum take-off 4,630 lb (2,100 kg).
Dimensions: span 38 ft 9.75 in (11.83 m); length 25 ft 10.25 in (7.88 m); height 13 ft 6.5 in (4.13 m); wing area 209.9 sq ft (19.50 m^2).
Armament: four 0.295-in (7.5-mm) machine guns, and provision for light bombs.

Technically obsolete at the time of its service debut in November 1936, the Loire 46 was allocated to only a few units. As indicated by the insignia of a winged helmet on the head of a Gaulish warrior, these two Loire 46s were machines of the 5e Escadrille of the 33e Regiment d'Aviation.

Photo: S.H.A.A.
D1 075 11.11
Printed in Italy

Seaplane

Italy

Savoia-Marchetti S.56

Savoia-Marchetti S.56

Giant seaplanes' smaller brother
Savoia-Marchetti was best known in the 1920s for its large multi-engined flying boats (especially the twin-hulled S.55), but in 1924 unveiled a dainty three-seat type intended for touring and training use. This S.56 was an unequal-span biplane, mainly of wooden construction, and the three occupants were located in separate cockpits: the pilot and co-pilot side-by-sude, with the third man between them and slightly to the rear. The 70-hp (52-kW) Anzani engine was located on the upper wing driving a tractor propeller.

American production
Comparatively small numbers of the family were produced in Italy, including four used by the Regia Aeronautica for training of military pilots, but the type proved very popular in the USA where it was license-built by the American Aeronautical Corporation from 1929. American development resulted in the S.56B model, as well as a single example of the all-metal Budd BB-1 version.

Principal versions
S.56 (initial flying boat model, produced in the USA with the 90-hp/67-kW Kinner K5 radial in two-and three-seat forms), S.56A (amphibian development with manually retractable landing gear, slightly increased span, and an assortment of engine types), S.56B (American development with the 125-hp/93-kW Kinner B5 including one example with an enclosed cockpit), and S.56C (one S.56B conversion to single-seat configuration with additional fuel capacity for a round-the-world flight).

Principal users
Italy and USA.

TECHNICAL DATA

Type: American Aeronautical Corporation (Savoia-Marchetti) S.56A two/three-seat touring and training amphibian.
Engine: one 90-hp (67-kW) Kinner B5 radial piston engine.
Performance: maximum speed 86 mph (138 km/h) at sea level; initial climb rate not revealed; service ceiling 5,480 ft (1,670 m); endurance 3 hours 0 minutes.
Weights: empty 1,450 lb (658 kg); maximum take-off 2,150 lb (975 kg).
Dimensions: span 35 ft 2 in (10.72 m); length 25 ft 7 in (7.80 m); height 9 ft 9.75 in (2.99 m); wing area 285.25 sq ft (26.50 m^2).
Armament: none.

The only example of the S.56 series still in airworthy condition belongs to an American collector.

Photo: F. Robineau
D1 075 11.12
Printed in Italy

Attack and close support

France

Dassault ETENDARD IVM

Dassault ETENDARD IVM

Dassault's risky development
In the mid-1950s, Dassault began work on three prototypes for its Etendard (banner) family. Designed to meet a NATO requirement for a land-based light attack fighter capable of operating from indifferent airfields, the Etendard II was powered by two Turboméca Gabizo turbojets and first flew in July 1956, while the Etendard VI was powered by one Bristol Siddeley Orpheus turbojet and flew in March 1957. Neither was notably successful, and both were abandoned.

Far-sighted evolution
Dassault considered the NATO specification too limiting, and as a private venture produced the larger and more powerful Etendard IV with potential for development into a carrierborne strike fighter. The Etendard IV first flew in July 1956. The type impressed the French navy, and development of an Etendard IVM naval model was soon in hand. Total production was 76 aircraft (including one prototype and six pre-production machines), and the 69 production aircraft served on the carriers ***Clemenceau*** and ***Foch*** from January 1962. These aircraft had features such as folding wingtips, catapult spools, and an arrester hook. The Etendard IVP was a photo-reconnaissance derivative of the Etendard IVM.

Principal versions
Etendard IVM (naval multi-role strike fighter) and Etendard IVP (photo-reconnaissance conversion).

Principal user
France.

TECHNICAL DATA

Type: Dassault Etendard IVM single-seat carrierborne strike fighter.
Engine: one 9,700-lb (4,400-kg) thrust SNECMA Atar 8B turbojet.
Performance: maximum speed 673 mph (1,093 km/h) at 36,090 ft (11,000 m); initial climb rate 19,685 ft (6,000 m) per minute; service ceiling not revealed; radius 435 miles (700 km) on a typical mission.
Weights: empty 13,503 lb (6,125 kg); maximum take-off 22,652 lb (10,275 kg).
Dimensions: span 31 ft 6 in (9.60 m); length 47 ft 3 in (14.40 m); height 14 ft 2 in (4.30 m); wing area 312.16 sq ft (29.00 m^2).
Armament: two 30-mm cannon, and up to 3,307 lb (1,500 kg) of disposable stores.

The Etendard IVM served the French navy admirably in the 1960s and 1970s, and paved the way for the much improved transonic Super Etendard. The slender nose housed only the Aida ranging radar.

Photo: E.C.P.A.
D1 075 11.13
Printed in Italy

USA

Beech Model 90 KING AIR

Beech Model 90 KING AIR

Beech finds its "King"
From its piston-engined Model 80 Queen Air, Beech evolved the Model 65-90T that first flew in May 1963 with PT6A-6 turboprops for better performance. Further development resulted in the Model 90 King Air. After trials with the Model 65-90T, the US Army ordered 48 (later 141) examples of the U-21A Ute as a hybrid type combining the unpressurized fuselage of the Model 65-80 Queen Air with the flying surfaces and engines of the Model 65-90T in the utility and communication roles.

A prolific family
There have been a large number of specialized U-21A variants, but in the transport role the next model was the U-21F, a version of the pressurized King Air A100 with 680-shp (507-kW) PT6A-28 engines and accommodation for 13 passengers. The US Army bought five, and 17 U-21As have been upgraded to similar standard as U-21Gs. Many civil aircraft have been bought by military operators.

Principal versions
VC-6A (USAF VIP version of the King Air A90 with PT6A-20 engines), VC-6B (USAF VIP version of the King Air C90 with PT6A-28 engines), T-44A (61 US Navy trainers based on the King Air E90 with PT6A-34B engines), U-21A Ute (initial military model), U-21F Ute (improved military model), and U-21G Ute (upgraded U-21A).

Principal users
Bolivia, Colombia, Ecuador, Japan, Malawi, Mexico, Peru, South Korea, Spain, Sudan, Thailand, USA, and Venezuela.

TECHNICAL DATA

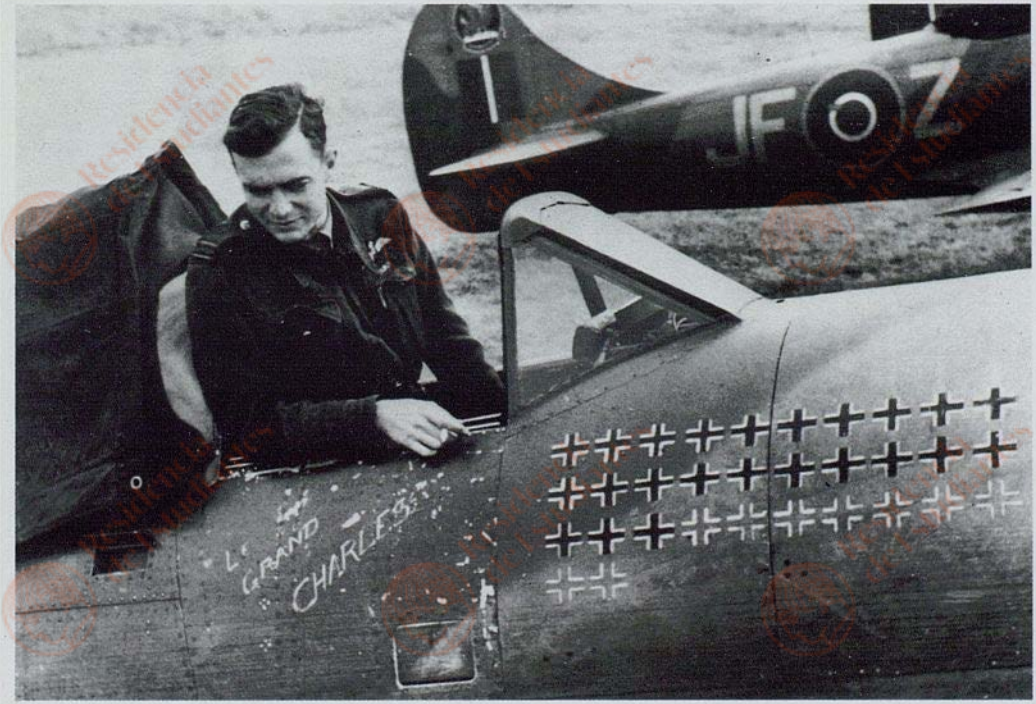
Type: Beech U-21A Ute two-crew utility transport.
Engines: two 550-shp (410-kW) Pratt & Whitney Canada PT6A-29 turboprops.
Performance: maximum speed 249 mph (401 km/h) at 10,000 ft (3,050 m); initial climb rate 2,000 ft (609 m) per minute; service ceiling 25,500 ft (7,770 m); range 1,167 miles (1,878 km) with maximum payload.
Weights: empty 5,464 lb (2,478 kg); maximum take-off 9,650 lb (4,377 kg).
Dimensions: span 45 ft 10.5 in (13.98 m); length 35 ft 6 in (10.82 m); height 14 ft 2.5 in (4.33 m); wing area 279.7 sq ft (25.98 m^2).
Payload: 10 troops, or six staff officers, or three litters and three seated casualties plus one attendant, or 3,000 lb (1,361 kg) of freight.

The US Navy's main trainer for pilots of multi-engined aircraft, and for navigators, is the T-44A minimum-change version of the King Air E90.

Photo: Beech
D1 075 11.14
Printed in Italy

France

Pierre CLOSTERMANN



Pierre CLOSTERMANN

France's "ace of aces"

Pierre H. Clostermann was France's most successful ace of the Second World War with 33 confirmed victories. Clostermann was born on February 28, 1921 at Curitiba in Brazil, where his father was serving as a French diplomat. The young Clostermann was drawn to flying at an early age. As an adolescent he started to take flying lessons, and Clostermann received his pilot's license in November 1937, shortly before his seventeenth birthday.

The Free French movement

Like many others in metropolitan France and its overseas empire, Clostermann refused to accept the finality of France's defeat in June 1940. Leaving South America, he travelled to Great Britain to join the Free French forces established and fostered by Major General Charles de Gaulle. In March 1942 Clostermann joined the Free French air force and, after a comparatively long training period, he joined the "Ile-de-France" fighter unit during January 1943. Despite the comparative shortage of targets in this period, when the Germans deployed only small checking forces in north-west Europe so that the bulk of their forces could be used on the Eastern Front against the USSR, the fledgling ace notched up five victories in the period up to October 1943.

Exceptional talent

Clostermann was then posted to the Royal Air Force's No.602 Squadron, a multi-national unit, and soon began to reveal the qualities of an exceptional fighter pilot. Flying the Supermarine Spitfire and then the Hawker Tempest, Clostermann continued to increase his score but was wounded in combat against a Junkers Ju 88. Clostermann returned to combat after recovery, and continued to amass "kills" in his Tempest, which he had named Le Vieux Charles. His success prompted the Royal Air Force to give Clostermann command of a complete fighter wing in the period leading up to the end of the Second World War. By May 1945, Squadron Leader Clostermann's tally of 33 confirmed victories included 19 "kills" in air combat and 14 aircraft destroyed on the ground, as well as five "probables".

Post-war career

France and other countries awarded several high decorations to Clostermann, who was elected a deputy in the French parliament in one of the post-war administrations. Clostermann served briefly on operations in the Algerian war of the early 1960s, but as the Algerians lacked air power there was no opportunity for Clostermann to increase his victory list. Clostermann then became a senior figure in the French aviation industry, notably with Reims Aviation (French licensee of Cessna) and Avions Marcel Dassault.

Flying first the Spitfire and then the Tempest, Pierre Clostermann scored 33 confirmed victories and five "probables" during the second half of the Second World War.

Photo: P. Clostermann
D1 075 11.15
Printed in Italy

Trainer

Switzerland

Pilatus P-2

Pilatus P-2

A Swiss trainer

In the early 1940s, Pilatus designed a trainer which it hoped might interest the Swiss air force, which had a requirement for an advanced flying and weapon trainer designed specifically for operation from Switzerland's comparatively high-altitude airfields. Inspired largely by the Arado Ar 96, the P-2 was a conventional machine for its time, with a mixed airframe centred on a slim aluminium alloy fuselage, low-set wooden wings with plywood skinning, fabric-covered control surfaces, retractable tailwheel landing gear, and a jettisonable "glasshouse" canopy over the pupil and instructor, who were seated in tandem. Power was provided by a German engine built in Czechoslovakia.

Full equipment standards

The P-2 first flew in April 1945, and in production form was fitted with radio and an oxygen system, full night-flying instrumentation being retrofitted in 1968. For weapon training the plane was provided with a single machine-gun, a gyro-stabilized gun sight, and a camera gun as well as underwing racks for light bombs and/or rockets. The rear cockpit could also be configured with a camera for observer training. The type was not built in very large numbers (52 aircraft in all), but gave valuable service in the Swiss air force up to 1982.

Principal version

P-2 (only production model).

Principal user

Switzerland.

TECHNICAL DATA

Type: Pilatus P-2 two-seat advanced flying and weapon training plane.
Engine: one 464-hp (347-kW) Argus As 410A-2 inline piston engine.
Performance: maximum speed 211 mph (340 km/h) at 8,200 ft (2,500 m); initial climb rate 1,280 ft (390 m) per minute; service ceiling 21,655 ft (6,600 m); range 537 miles (865 km).
Weights: empty 3,351 lb (1,520 kg); maximum take-off 4,343 lb (1,970 kg).
Dimensions: span 36 ft 1 in (11.00 m); length 29 ft 9 in (9.07 m); height 8 ft 10.25 in (2.70 m); wing area 182.99 sq ft (17.00 m^2).
Armament: one 0.3-in (7.62-mm) machine gun, and provision for light bombs or rockets under the wings.

Once retired from Swiss air force service, several P-2s were snapped up by private buyers. This is such a plane in German markings to simulate a fighter of the Second World War.

Photo: F. Robineau
D1 075 11.16
Printed in Italy

Air superiority fighter

USA

North American F-86F SABRE

North American F-86F SABRE

Definitive day fighter

Under the impetus of the Korean War (1950-53), North American established a second production line for its already classic F-86 Sabre fighter. The first product of this line at Columbus, Ohio, was the F-86F, a development of the F-86E with a more powerful engine and aerodynamic revision. This latter was the so-called "6-3" wing, in which the chord of the wing was extended by 6 in (15.2 cm) at the root and 3 in (7.62 cm) at the tip. Small boundary-layer fences were fitted for the first time.

Major improvement

The revised wing did wonders for the Sabre's manoeuvrability at high altitude, where the Mikoyan-Gurevich MiG-15 had previously enjoyed an advantage. The first F-86F was flown in March 1952, and total deliveries from Inglewood, California as well as from Columbus, were 2,540 fighters up to December 1956, when the American production lines for the Sabre were closed. Of this total 300 were assembled in Japan, and 365 aircraft were allocated to American allies under the Mutual Security Program.

Principal versions

F-86F Sabre (definitive fighter model), TF-86F (two examples of a two-seat trainer with the fuselage lengthened by 5 ft 3 in/1.60 m to allow the incorporation of a tandem-seat cockpit under a long canopy), and RF-86F (Japanese conversion for photo-reconnaissance with three cameras in the fuselage just forward of the wing leading edge).

Principal users

Argentina, Japan, South Africa, South Korea, Spain, and USA.

TECHNICAL DATA

Type: North American F-86F Sabre single-seat air-superiority fighter and fighter-bomber.
Engine: one 5,970-lb (2,708-kg) thrust General Electric J47-GE-27 turbojet.
Performance: maximum speed 690 mph (1,110 km/h) at sea level; initial climb rate 10,000 ft (3,050 m) per minute; service ceiling 50,000 ft (15,240 m); range 1,270 miles (2,044 km).
Weights: empty 10,950 lb (4,967 kg); maximum take-off 17,000 lb (7,711 kg).
Dimensions: span 37 ft 1 in (11.30 m); length 37 ft 6 in (11.43 m); height 14 ft 8 in (4.47 m); wing area 288.0 sq ft (26.76 m^2).
Armament: six 0.5-in (12.7-mm) machine guns, and up to two 1,000-lb (454-kg) bombs or sixteen 5-in (127-mm) rockets.

Spain was one of several US allies that received supplies of the F-86F Sabre.

Photo: DR
D1 075 11.17
Printed in Italy

France

Nord 1101 RAMIER

Nord 1101 RAMIER

German origins
In 1942, Germany transferred production of the Messerschmitt Bf 108 Taifun liaison plane to the Société Nationale de Constructions Aéronautiques at Mureaux. In the following year, the German authorities instructed Nord to built two prototypes of the Messerschmitt Me 208, the Bf 108's successor. The Me 208 was basically identical to its predecessor apart from its retractable tricycle landing gear in place of the Bf 108's retractable tailwheel landing gear. The Mureaux factory was bombed several times during the Second World War, and only one of the prototypes survived to the liberation of France in 1944. This prototype made its maiden flight at the beginning of 1945 with an Argus As 10C engine and the French designation Nord 1100 Noralpha.

French service
Further development of the Noralpha for military purposes resulted in the Ramier (wood pigeon) production type, which was powered by a French rather than a German engine. Some 200 of this model's two variants were ordered for service with the French forces as communication and liaison planes.

Principal versions
N.1101 Ramier I (version for the French air force with the Renault 6Q 10 engine) and N.1102 Ramier II (version for the French naval air force with the Renault 6Q 11 engine).

Principal user
France.

TECHNICAL DATA

Type: Nord 1101 Ramier I four-seat communication and liaison plane.
Engine: one 233-hp (174-kW) Renault 6Q 10 inline piston engine.
Performance: maximum speed 189 mph (305 km/h) at optimum altitude; initial climb rate not revealed; service ceiling 19,355 ft (5,900 m); range 746 miles (1,200 km).
Weights: empty 2,090 lb (948 kg); maximum take-off 2,315 lb (1,050 kg).
Dimensions: span 33 ft 6.25 in (11.48 m); length 28 ft 0 in (8.53 m); height 10 ft 8 in (3.25 m); wing area 187.0 sq ft (17.37 m^2).
Armament: none.

A lineal descendant of the Bf 108 Taifun, the Ramier was an unexceptional type that was nonetheless a valued asset of the French armed forces in the period after the Second World War.

Photo: DR
D1 075 11.18
Printed in Italy

USA

McDonnell Douglas KC-10A EXTENDER

McDonnell Douglas KC-10A EXTENDER

Needed: a long-range airlifter

Its difficulties in supplying Israel with equipment (including replacement aircraft) during the "Yom Kippur" War of 1973 persuaded the US Air Force that it lacked adequate long-range logistic transport capability. During the war, several countries had refused the USA transit rights for its ferry flights, and the USAF now decided that it needed an airlifter with very long range.

Derived from a civil transport

The type selected as the basis of this new transport was the DC-10-30CF convertible freighter, which offered the twin advantages of a capacious fuselage and very long range. The KC-10A first flew in July 1980 and began to enter service in March 1981 as a dual-role freighter and, via a ventral installation, tanker with separate boom and hose-and-drogue refueling capabilities. In this latter capacity the KC-10A can support long-range deployments by tactical aircraft, providing both fuel and "mother ship" navigation capability. Production totalled 60 aircraft, the last delivered in 1987, and the later aircraft have provision for two underwing hose-and-drogue refueling pods.

Principal version

KC-10A Extender (only production model).

Principal user

USA.

TECHNICAL DATA

Type: McDonnell Douglas KC-10A Extender six-crew logistical transport and inflight refueling tanker.
Engines: three 52,500-lb (23,814-kg) thrust General Electric CF6-50C2 turbofans.
Performance: maximum speed 610 mph (982 km/h) at 25,000 ft (7,620 m); initial climb rate 2,900 ft (884 m) per minute; service ceiling 33,400 ft (10,180 m); range 4,370 miles (7,032 km) with maximum payload.
Weights: empty 241,025 lb (196,329 kg); maximum take-off 590,000 lb (267,620 kg).
Dimensions: span 165 ft 4.4 in (50.41 m); length 181 ft 7 in (55.35 m); height 58 ft 1 in (17.70 m); wing area 3,858.0 sq ft (367.7 m^2).
Payload: up to 48,075 US gal (181,983 litres) of fuel, or 169,410 lb (76,843 kg) of freight, or passengers in various seating arrangements.

A KC-10A Extender refuels a McDonnell Douglas F-15 Eagle air-superiority fighter. The availability of boom and hose-and-drogue refueling systems allows the Extender to support all types of strategic and tactical aircraft.

Photo: McDonnell Douglas
D1 075 11.19
Printed in Italy

Land based helicopter

Italy

Agusta A 129 MANGUSTA

Agusta A 129 MANGUSTA

Italian requirement

The A 129 Mangusta (mongoose) was designed from the late 1970s to meet an Italian army requirement for a light attack helicopter able to tackle tanks and other battlefield targets under all weather conditions through the use of a stabilized sight system, with a FLIR (Forward-Looking Infra-Red) thermal imager and laser rangefinder, and twin mission computers to leave the crew free to assess the developing tactical situation around them.

A new start

The original design was based on the A 109, but this was soon abandoned in favour of a new type with separate, vertically staggered cockpits for the gunner and pilot. The resulting A 129 first flew in September 1983 as a small but agile helicopter with armour protection, high performance, and provision for a wide assortment of weapons (including eight TOW anti-tank missiles) carried externally under the stub wings. Deliveries of an initial 60 helicopters began in 1988, and currently under discussion is a Mk 2 version to be produced jointly by Agusta and an undetermined number of European partners.

Principal version

A 129 Mangusta (only production model).

Principal user

Italy.

TECHNICAL DATA

Type: Agusta A 129 Mangusta two-seat scout, attack, and anti-tank helicopter.

Engines: two 825-shp (615-kW) Piaggio-built Rolls-Royce Gem 2 Mk 1004D turboshafts.

Performance: maximum speed 196 mph (315 km/h) at 6,560 ft (2,000 m); initial climb rate 2,150 ft (655 m) per minute; hovering ceiling 12,305 ft (3,750 m) in ground effect; endurance 3 hours 0 minutes.

Weights: empty 5,575 lb (2,529 kg); maximum take-off 9,038 lb (4,100 kg).

Dimensions: main rotor diameter 39 ft 0.5 in (11.90 m); length overall, rotors turning 46 ft 10.6 in (14.29 m); height 10 ft 10.5 in (3.315 m); main rotor disc area 1,197.2 sq ft (111.22 m^2).

Armament: up to 2,646 lb (1,200 kg) of disposable stores.

Armed with eight BGM-71 TOW heavyweight anti-tank missiles controlled via the sophisticated Saab/Emerson HeliTOW stabilized day/night sight, the A 120 Mangusta is a small yet capable battlefield helicopter.

Photo: Agusta
D1 075 11.20
Printed in Italy

CARD DECKS WP

D1 075 11

Heavy bomber

USA

Rockwell B-1B

Rockwell B-1B

B-52 replacement
In 1969 the US Air Force issued a requirement for a strategic bomber to replace the the B-52. On December 23, 1974 the prototype of the "swing-wing" B-1A first flew, and this was also the first flight for the new General Electric F101 reheated turbofan. Three other prototypes soon joined the program, but the B-1A was cancelled in June 1977.

Another president: another chance
In October 1981 the B-1 program was revived. But whereas the original B-1A had been a Mach 2.2+ medium/high-altitude bomber, the new B-1B was to be a far "stealthier" low-altitude type with only limited supersonic capability. The airframe was beefed up for higher weights and the rigors of low-altitude flight at high subsonic speed, the engine nacelles were simplified, and "stealthiness" was added by the use of radar-absorbent materials, an advanced electronic suite, and modification of the nacelles to prevent radar energy reaching the faces of the engine compressors. The B-1B flew in September 1984, and 100 aircraft were delivered between July 1985 and April 1988.

Principal version
B-1B

Principal user
USA

TECHNICAL DATA

Type: B-1B four seat strategic bomber and missile carrier.
Engines: four 30,780-lb (13,692-kg) reheated thrust General Electric F101-GE- 102 turbofans.
Performance: maximum speed 825 mph (1,328 km/h) or Mach 1.15 at 36,000 ft (10,975 m); initial climb rate and service ceiling not revealed; range 7,455 miles (12,000 km) without refueling.
Weights: empty 192,000 lb (87,091 kg); maximum take-off 477,000 lb (216,367 kg).
Dimensions: span 136 ft 8.5 in (41.67 m) spread and 78 ft 2.5 in (23.84 m) swept; length 147 ft 0 in (44.81 m); height 34 ft 0 in (10.36 m); wing area 1,950.0 sq ft (181.2 m^2).
Armament: two forward and one aft weapon bays can carry 75,000 lb (34,020 kg) of bombs and/or missiles, and six hardpoints under the fuselage can carry 59,000 lb (26,762 kg) of bombs and/or missiles; the maximum normal weapon load is 64,000 lb (29,030 kg).

Shown in its suit of black camouflage, which also helps to absorb radar energy, the B-1B was flown across the Atlantic Ocean for its first appearance in Europe at the Paris Air Show of 1987.

Photos P.Bigel
DI 075 01.01
Printed in Italy

Medium bomber

USA

North American B-25 MITCHELL

North American B-25 MITCHELL

A new medium bomber

In the later 1930s the US Army Air Corps needed a new attack bomber. Built as a private venture, the NA-40-1 prototype flew in January 1939. The design was then improved as the NA-62, and in September 1939 the USAAC placed its first order.

The Mitchell

The first of these 184 B-25 Mitchells entered service in 1941, and the USA's entry into the Second World War saw a rapid growth in production. Throughout a career that saw the building of 9,816 aircraft, the Mitchell remained essentially unaltered in airframe and powerplant but was revised with heavier and more varied offensive payload, improved defensive firepower, protective armor, and more fuel in self-sealing tanks. The most important models were the B-25C, B-25H and B-25J, of which 1,619, 1,000 and 4,318 were built. The B-25G and B-25H were specialist attack and anti-ship types with a 75-mm (2.95-in) gun in the nose. The Mitchell was used in all theaters.

Principal versions

B-25 (initial model), B-25B (dorsal and ventral turrets), B-25C and B-25D (ventral bomb racks), B-25G (heavy nose gun), B-25H (improved B-25G), and B-25J (improved B-25H initially with the B-25D's glazed nose and later with a "solid" eight-gun nose).

Principal users

Australia, Brazil, Canada, China, France, Great Britain, Netherlands, USA, USSR

TECHNICAL DATA

Type: North American B-25H Mitchell five-seat medium attack bomber.
Engines: two 1,700-hp (1,268-kW) Wright R-2600-13 radial piston engines.
Performance: maximum speed 275 mph (442 km/h) at 13,000 ft (3,960 m); climb to 15,000 ft (4,570 m) in 19 minutes 0 seconds; service ceiling 23,800 ft (7,255 m); range 2,700 miles (4,344 km).
Weights: empty 19,975 lb (9,061 kg); maximum take-off 36,047 lb (16,351 kg).
Dimensions: span 67 ft 7 in (20.60 m); length 51 ft 0 in (15.54 m); height 15ft 9 in (4.80 m); wing area 610.0 sq ft (56.67 m^2).
Armament: one 75-mm (2.95-in) gun, 14 0.5-in (12.7-mm) machine guns (eight fixed in nose, and six trainable in two twin-gun turrets and two beam installations), and up to 3,200 lb (1,452 kg) of bombs or one 2,000-lb (907- kg) torpedo.

The Mitchell was used for the one-way "Doolittle raid" on Japan, which was launched from an aircraft carrier on April 8, 1942.

Photo: M. Hodeir
D1 075 01.02
Printed in Italy

Heavy bomber

USA

Boeing B-17 FLYING FORTRESS

Heavy bomber

Boeing B-17 FLYING FORTRESS

Program slow to mature
In June 1934 Boeing began work on a four-engined heavy bomber for the US Army Air Corps. The Model 299 prototype was built as a private venture and first flew in July 1935. Initial production up to the B-17D was only in small numbers, for these first variants were in effect pre-production batches to evaluate the type's steadily improving capabilities. The company's gamble with the prototype eventually paid off, however, in production of 12,731 aircraft of all variants.

Defensive firepower steadily increased
At the beginning of 1941 the Royal Air Force received a few B-17Cs, and their operatioms over Germany confirmed the need for greater defensive firepower. This was provided in the B-17E, which also featured a revised tail unit for greater stability in the standard high-altitude bombing role. The B-17F was an improved B-17E, and the final B-17G (8,680 aircraft) was the definitive model with a chin turret to deter head-on fighter attacks. The Flying Fortress operated in several theaters, but is best remembered as the mainstay of the 8th Army Air Force in its daylight raids against Germany with steadily strengthened fighter escort.

Principal versions
XB-17 to B-17D (pre-production and limited-production early models), B-17E (heavier armament and new tail unit), B-17F (improved B-17E) and B-17G (chin turret).

Principal users
Great Britain and USA.

TECHNICAL DATA

Type: Boeing B-17G Flying Fortress 10-seat heavy bomber.
Engines: four 1,200-hp (895-kW) Wright R-1820-97 radial piston engines.
Performance: maximum speed 302 mph (486 km/h) at 25,000 ft (7,620 m); climb to 20,000 ft (6,095 m) in 37 minutes 0 seconds; service ceiling 35,600 ft (10,850 m); range 3,400 miles (5,470 km).
Weights: empty 36,135 lb (16,391 kg); maximum take-off 72,000 lb (32,660 kg).
Dimensions: span 103 ft 9.25 in (31.62 m); length 74 ft 9 in (22.78 m); height 19 ft 1 in (5.82 m); wing area 1,420.0 sq ft (131.92 m^2).
Armament: 13 0.5-in (12.7-mm) machine guns in chin, cheek, dorsal, ventral, beam and tail installations, and up to 17,600 lb (7,983 kg) of bombs.

Two USAAF B-17Gs fly over England before departing on a bombing mission over Germany.

Photo: US Air Force
D1 075 01.03
Printed in Italy

Fighter

Germany

Fokker D VII

Fokker D VII

A classic bloodline

The D VII was a biplane fighter conceived by Reinhold Platz, the gifted designer of the Dr I triplane fighter. The D VII had a fuselage of welded steel tube covered with aluminum and fabric, and thick-section wooden wings covered with plywood and fabric. The V 11 prototype revealed the need for a longer fuselage and fixed fin in addition to the comma-shaped moving rudder. So revised, the V 11 was entered in the January 1918 fighter competition held at Johannisthal airfield, and proved the unanimous choice of the fighter pilots. Large production contracts were placed with Fokker and, somewhat ironically, with Fokker's great rival Albatros.

A champion emerges

The D VII entered combat in April 1918 with a 160-hp (119-kW) Mercedes D III inline with an auto-type radiator (the first in a German fighter) and proved an immediate winner against the best British and French fighters. Late in the year a more powerful BMW engine replaced the Mercedes unit, much improving the fighter's rate of climb. The D VII possessed good performance, and was easy to fly yet responsive to the controls right up to its ceiling, where the type could hang on its propeller without loss of control. Some 700 D VIIs were in service at the time of the Armistice, and the type was the only aeroplane specifically mentioned in the Treaty of Versailles for surrender to the Allies. After the First World War, Anthony Fokker returned to the Netherlands and resumed limited production of the D VII.

Principal version

D VII.

Principal users

Germany and the Netherlands.

TECHNICAL DATA

Type: Fokker D VII single seat fighter.
Engine: one 185-hp (138-kW) BMW IIIa inline piston engine.
Performance: maximum speed 117 mph (187 km/h) at 3,280 ft (1,000 m); climb to 16,405 ft (5,000 m) in 16 minutes 0 seconds; service ceiling 22,965 ft (7,000m); endurance 1 hour 30 minutes.
Weights: empty 1,477 lb (670 kg); maximum take-off 2,112 lb (960 kg).
Dimensions: span 29 ft 3.5 in (8.90 m); length 22 ft 11.5 in (6.954 m); height 9 ft 2.25 in (2.75 m); wing area 221.4 sq ft (20.50 m^2).
Armament: two 7.92-mm (0.312-in) fixed machine guns.

A replica D VII of Jasta 4 (4th squadron) in the colors of Germany's second ranking ace, Ernst Udet.

Photo: D.R.
D1 075 01.04
Printed in Italy

Fighter

Great Britain

Supermarine SPITFIRE F.Mk IX

Supermarine SPITFIRE F.Mk IX

Prestigious heritage
The Spitfire was the most important British air-combat fighter from the beginning of the Second World War, and was steadily improved in performance and firepower without any loss of maneuverability.

An "interim" development becomes definitive
In the fall of 1941 the new Focke-Wulf Fw 190A appeared over the Channel front and immediately displayed its superiority to the Spitfire Mk V. Plans were put in hand for a stopgap fighter based on the Mk V but fitted with a Merlin 60 series engine and, entering service in June 1942, this Spitfire F.Mk IX proved very successful. No fewer than 5,665 were built within the total of 20,351 Spitfires. At one time equipping just under 100 squadrons, the type remained in service until after the end of the war. Subvariants were the Spitfire LF.Mk IX and HF.Mk IX with clipped and extended wings for the low- and high-altitude roles respectively, and E-suffixed versions with two 0.5-in (12.7-mm) machine guns in place of the quartet of smaller-caliber guns.

Principal versions
Spitfire F.Mk IX (three main subvariants), Spitfire PR.Mk IX (photo-reconnaissance conversion), Spitfire PR.Mk X (77 examples of an unarmed but pressurized PR version with the Merlin 77), and Spitfire PR.Mk XI (PR conversion).

Principal users
Australia, Canada, Great Britain, New Zealand, South Africa, USA and USSR.

TECHNICAL DATA

Type: Supermarine Spitfire F.Mk IX single-seat fighter and fighter-bomber.
Engine: one 1,650-hp (1,230-kW) Rolls-Royce Merlin 63 inline piston engine.
Performance: maximum speed 408 mph (655 km/h) at 25,000 ft (7,620 m); initial climb rate 3,950 ft (1,204 m) per minute; service ceiling 43,000 ft (12,105 m); range 980 miles (1,576 km).
Weights: empty 5,610 lb (2,545 kg); maximum take-off 9,500 lb (4,309 kg).
Dimensions: span 36 ft 10 in (11.22 m); length 31 ft 0 in (9.46 m); height 12 ft 7.75 in (3.85 m); wing area 242.0 sq ft (22.48 m²).
Armament: two 20-mm cannon and four 0.303-in (7.7-mm) machine guns in a fixed installation, and up to 1,000 lb (454 kg) of bombs carried under the wings.

This Spitfire F.Mk IX carries the black/white "invasion stripes" characteristic of aircraft involved in the D-Day landings of June 6, 1944.

Photo: Robineau
D1 075 01.05
Printed in Italy

Fighter

USA

North American P-51D MUSTANG

North American P-51D MUSTANG

"Dutch" Kindelburger's plane

The Mustang resulted from a British fighter requirement that specified the construction of the prototype within 120 days. The NA-73 prototype was produced under the overall control of North American's president, J.H. "Dutch" Kindelburger, and was rolled out after 117 days. Fitted with an Allison V-1710 engine, the aeroplane first flew in October 1940 and was soon ordered by the Brtish and Americans as the Mustang and P-51 respectively.

From Allison to Rolls-Royce

The initial P-51 and P-51A variants proved only moderately successful. To improve medium/high-altitude performance the British suggested use of the great Merlin. This produced the P-51B with four machine guns and the P-51C with more power and a bubble canopy. The definitive fighter was the P-51D with a number of refinements, and this variant amounted to 7,966 of the 15,469 Mustangs. The P-51D was the classic multi-role fighter of the Second World War, and was the main escort for US bombers flying deep into Germany.

Principal versions

Mustang Mk I (reconnaissance fighter), Mustang Mk IA and P-51 (cannon armament), Mustang Mk II and P-51A (longer-range version of Mk I), P-51B/C and Mustang Mk III (Merlin engine), P-51D and Mustang Mk IV (definitive fighter), P-51H (lightweight version), and P-51K (P-51D with different propeller).

Principal users

Australia, China, Great Britain, the Netherlands, New Zealand, South Africa, and USA.

TECHNICAL DATA

Type: North American P-51D Mustang single-seat fighter.
Engine: one 1,510-hp (1,126-kW) Packard V-1650-7 (Rolls-Royce Merlin) inline piston engine.
Performance: maximum speed 437 mph (703 km/h) at 25,000 ft (7,620 m); climb to 30,000 ft (9,145 m) in 13 minutes 0 seconds; service ceiling 41,900 ft (12,770 m); range 2,300 miles (3,701 km).
Weights: empty 7,125 lb (3,232 kg); maximum take-off 11,600 lb (5,262 kg).
Dimensions: span 37 ft 0.25 in (11.89 m); length 32 ft 3.25 in (9.85 m); height 13 ft 8 in (4.16 m); wing area 233.2 sq ft (21.65 m2).
Armament: six 0.5-in (12.7-mm) fixed machine guns, and up to 2,000 lb (907 kg) of bombs or six 5-in (127-mm) rockets.

Four P-51s of the 8th Army Air Force's 361st Fighter Group in formation.

Photo: Salamander
D1 075 01.06
Printed in Italy

Air superiority fighter

USA

General Dynamics F-16 FIGHTING FALCON

Air superiority fighter

General Dynamics F-16 FIGHTING FALCON

A ruthless competition

During 1971 the US Air Force asked five companies to produce concepts for a lightweight fighter using advanced aerodynamics and a "fly-by-wire" control system for high maneuverability. Finally, contracts were let for General Dynamics YF-16 and Northrop YF-17 prototypes, and the YF-16 was declared winner of the Light-Weight Fighter competition during January 1975.

A windfall for industry

From the YF-16 emerged the Fighting Falcon that entered service in 1978 in its F-16A and F-16B forms with the F100-P-200 engine. The program will run to some 3,250 aircraft, and in addition to US production there is a European four-nation construction consortium. The F-16 is on the cutting edge of technology especially in its sophisticated avionics that include, in later versions, sensors for low-level navigation and night attack. These later models are the F-16C and F-16D which possess, in addition to better electronics and more modern weapons for multi-role use, the capability to accommodate either of two engine types.

Principal versions

F-16A (single-seat fighter), F-16B (two-seat combat-capable trainer), F-16C (electronically improved single-seater) and F-16D (electronically improved two-seater).

Principal users

Bahrain, Belgium, Denmark, Egypt, Greece, Indonesia, Israel, Netherlands, Norway, Pakistan, Singapore, South Korea, Thailand, Turkey, USA, and Venezuela.

TECHNICAL DATA

Type: General Dynamics F-16C Fighting Falcon single-seat multi-role fighter.
Engine: one 27,600-lb (12,519-kg) or 23,450-lb (10,637-kg) reheated thrust
General Electric F110-GE-100 or Pratt & Whitney F100-P-220 turbofan.
Performance: maximum speed 1,320+ mph (2,124+ km/h) or Mach 2+ at 40,000 ft (12,190 m); initial climb rate 50,000+ ft (15,240+ m) per minute; service ceiling 50,000+ ft (15,240+ m); radius 575+ miles (925+ km).
Weights: empty 18,335 lb (8,316 kg); maximum take-off 42,300 lb (19,187 kg).
Dimensions: span 32 ft 9.75 in (10.00 m); length 49 ft 4 in (15.03 m); height 16 ft 8.5 in (5.09 m); wing area 300.0 sq ft (27.87 m^2).
Armament: one 20-mm multi-barrel cannon and up to 20,450 lb (9,276 kg) of disposable stores.

Three F-16s of the Belgian air force in tight formation.

Photo: M. Rostaing
D1 075 01.07
Printed in Italy

Attack and close support

Brazil

Italy

Aeritalia/Aermacchi/EMBRAER AMX

Aeritalia/Aermacchi/EMBRAER AMX

Italian-Brazilian co-operation

During 1977 the Italian air force issued a requirement for a light attack warplane to replace its Aeritalia G91R and G91Y aircraft. In the same year the Brazilian air force recognized a similar requirement for an EMBRAER AT-26 Xavante replacement, and the two countries agreed on the collaborative development of the Italian MB-340 concept.

Multi-role capability

The type that resulted from the program is now called the AMX, and first flew in prototype form during May 1984 for a service debut in 1988. The AMX is conventional in design and construction, but is notably agile and, despite the lack of radar in its basic form, a highly capable attacker with otherwise advanced sensors. There is also an AMX(T) two-seat conversion trainer, and plans call for the development of a radar-fitted version for the anti-ship role with missile armament. Production is envisaged of 252 single-seat and 65 two-seat aircraft, 187 and 51 of them respectively for Italy.

Principal versions

AMX (single-seater) and AMX(T) (combat-capable two-seater).

Principal users

Brazil and Italy.

TECHNICAL DATA

Type: Aeritalia/Aermacchi/EMBRAER AMX single seat multi-role close air support, battlefield interdiction and reconnaissance warplane.

Engine: one 11,030-lb (5,003-kg) thrust Rolls-Royce Spey RB168 Mk 807 turbofan built under licence in Italy by Alfa Romeo Avio, Fiat and Piaggio.

Performance: maximum speed 568 mph (914 km/h) at 36,090 ft (11,000 m); initial climb rate 12,600 ft (3,840 m) per minute; service ceiling 42,650 ft (13,000 m); radius 550 miles (890 km).

Weights: empty 14,770 lb (6,700 kg); maximum take-off 27,558 lb (12,500 kg).

Dimensions: span 32 ft 9.75 in (10.00 m); length 44 ft 6.5 in (13.575 m); height 15 ft 0.25 in (4.576 m); wing area 226.04 sq ft (21.00 m^2).

Armament: one 20-mm multi-barrel cannon or (Brazilian aircraft) two 30-mm cannon, and up to 8,377 lb (3,800 kg) of disposable stores.

The AMX is a simple and affordable light warplane that nonetheless possesses good combat capability.

D1 075 01.08
Printed in Italy

Interceptor

USSR

Mikoyan-Gurevich MiG-21 "FISHBED"

Mikoyan-Gurevich MiG-21 "FISHBED"

Air-defense fighter

In 1953 the Soviets issued the requirement for a new clear-weather air defense fighter. Conventional swept and tailed delta layouts were tested in the Ye-2 and Ye-2 prototypes respectively. The latter found favor, and the Ye-6 pre-production model led to the MiG-21F that entered service in 1959 as the first full production variant.

Many variants and great numbers

Production up to 1988 totalled about 11,000 aircraft in at least 14 single-seat and three "Mongol" two-seat trainer models. The R-11 turbojet of initial models gave way to the R-13 in the MiG-21MF and to the R-25 in the MiG-21bis, while the series became a dual-role interceptor/ground-attack fighter in the MiG-21PFMA, and a genuine multi-role type in the MiG-21bis. Production was also undertaken in China, Czechoslovakia and India.

Principal versions

MiG-21F "Fishbed-C" (R-11F), MiG-21PF "Fishbed-D" (radar in inlet centerbody), MiG-21PFM "Fishbed-F" (R-11-30 and blown flaps), MiG-21PFMA "Fishbed-J" (dual-role type), MiG-21R "Fishbed-H" (tactical reconnaissance), MiG-21MF "Fishbed-J" (R-13-300), MiG-21bis "Fishbed-L" (multi-role type with R-25) and MiG-21bisF "Fishbed-N" (re-engineered airframe).

Principal users

Afghanistan, Algeria, Angola, Bulgaria, Burkina-Fasso, China, Cuba, Czechoslovakia, East Germany, Egypt, Ethiopia, Finland, Guinea, Hungary, India, Iraq, Laos, Libya, Madagascar, Mongolia, Mozambique, Nigeria, North Korea, Poland, Romania, Somalia, Sudan, Syria, USSR, Vietnam, and Yugoslavia.

TECHNICAL DATA

Type: Mikoyan-Gurevich MiG-21bisF "Fishbed-N" single-seat multi-role fighter.
Engine: one 16,535-lb (7500-kg) reheated thrust Tumanskii R-25 turbojet.
Performance: maximum speed 1,385 mph (2,229 km/h) or Mach 2.1 at 36,090 ft (11,000 m); initial climb rate 57,990 ft (17,675 m) per minute; service ceiling 50,030 ft (15,250 m); range 721 miles (1,160 km).
Weights: empty 11,464 lb (5,200 kg); maximum take-off 17,549 lb (7,960 kg).
Dimensions: span 23 ft 5.5 in (7.15 m); length 51 ft 8.5 in (15.76 m) including probe; height 13 ft 5.5 in (4.10 m); wing area 247.58 sq ft (23.00 m^2).
Armament: one 23-mm twin-barrel cannon and up to 4,409 lb (2,000 kg) of disposable stores.

A MiG-21F of the Finnish air force.

Photo: P. Bigel
D1 075 01.09
Printed in Italy

Interceptor

Great Britain

Hawker HUNTER

Hawker HUNTER

A great success

Conceived to a 1948 requirement, the Hunter was a major British success in the 1950s. Production totalled 1,985 aircraft including 445 made under license in Belgium and the Netherlands. The prototype flew in July 1951 with a 6,500-lb (2948-kg) thrust Avon 100 series turbojet, and was supersonic in a shallow dive. The Hunter F.Mk 1 entered production in 1953 and service in the following year.

Long and varied life

The Avon-engined F.Mk 1 was succeeded by the Hunter F.Mk 4 with greater fuel capacity and provision for underwing stores, while a parallel series with the Armstrong Siddeley Sapphire turbojet comprised the Hunter F.Mk 2 and F.Mk 5. Next came the Hunter F.Mk 6 with the 10,000-lb (4536-kg) thrust Avon 200 series engine and dogtoothed wing leading edges. The Hunter FGA.Mk 9 was the ultimate operational variant, recast for the ground-attack role. There were also trainer, reconnaissance and many export variants.

Principal versions

Hunter F.Mk 1 (Avon Mk 113 turbojet), Hunter F.Mk 2 (Sapphire Mk 101 turbojet), Hunter F.Mk 4 (Avon Mk 115), Hunter F.Mk 5 (Sapphire Mk 101), Hunter F.Mk 6 (Avon Mk 203), Hunter T.Mk 7 (side-by-side two-seat trainer based on F.Mk 4), Hunter T.Mk 8 (naval equivalent of T.Mk 7), Hunter FGA.Mk 9 (beefed-up ground-attack fighter), Hunter FR.Mk 10 (reconnaissance fighter).

Principal users

Abu Dhabi, Chile, Denmark, Great Britain, India, Iraq, Jordan, Kenya, Kuwait, Lebanon, Oman, Peru, Qatar, Singapore, Sweden, Switzerland and Zimbabwe.

TECHNICAL DATA

Type: Hawker Hunter FGA.Mk 9 single-seat ground-attack fighter.
Engine: one 10,150-lb (4,604-kg) thrust Rolls-Royce Avon Mk 207 turbojet.
Performance: maximum speed 702 mph (1,130 km/h) at sea level; initial climb rate 17,200 ft (5,243 m) per minute; service ceiling 52,000 ft (15,850 m); radius 443 miles (713 km).
Weights: empty 14.400 lb (6,532 kg); maximum take-off 24,600 lb (11,158 kg).
Dimensions: span 33 ft 8 in (10.25 m); length 45 ft 10.5 in (13.93 m); height 13 ft 2 in (4.02 m); wing area 349.0 sq ft (32.42 m^2).
Armament: four 30-mm cannon and up to 6,000 lb (2,722 kg) of disposable stores.

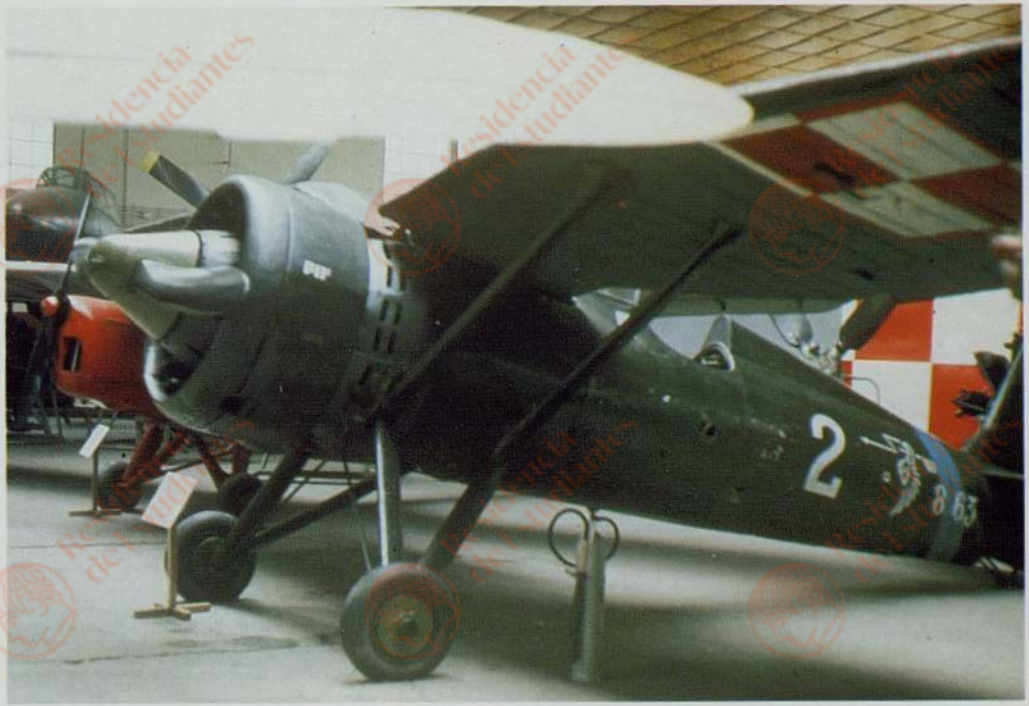
A Hunter F.Mk 58 of the Swiss air force comes in to land.

Photo: P. Bigel
D1 075 01.10
Printed in Italy

Fighter

Poland

PZL P.11



PZL P.11

Great expectations
The P.11 was in essence the P.7 fighter with a number of refinements including a more powerful engine in the hope that performance would be greatly improved. The first of three prototypes flew in 1931 with a French-built Bristol Jupiter IXAsb, the two following aircraft having the Mercury IVA. Production totalled about 330 aircraft.

Steady development
The P.11a entered service with the 517-hp (385-kW) Mercury IVS.2 and two 7.7-mm (0.303-in) machine guns. Then came the P.11b for Romania with the 525-hp (391-kW) Gnome-Rhone 9K radial. The main production variant was the P.11c with greater power (initially the 560-hp/418-kW Skoda-built Mercury VS.2), revised inner wing panels, modifications to the rear fuselage and vertical tail, and revised armament including provision for bomb racks. The P.11d and P.11e were projects for a navalized P.11c. The P.11f was a version of the P.11c built under license in Romania with the 595-hp (444-kW) Gnome-Rhone 9Krse. Finally, the P.11g was the prototype for a planned model with enclosed cockpit, four guns, and the 840-hp (626-kW) Mercury VIII.

Principal versions
P.11a (pre-production model), P.11b (first full production model), P.11c (definitive Polish fighter), and P.11f (built under license by IAR in Romania).

Principal users
Latvia, Poland and Romania.

TECHNICAL DATA

Type: PZL P.11c single-seat fighter.
Engine: one 645-hp (481-kW) Skoda-built Bristol Mercury VIS.2 radial piston engine.
Performance: maximum speed 242 mph (390 km/h) at 18,050 ft (5,500 m); climb to 16,405 ft (5,000 m) in 6 minutes 0 seconds; service ceiling 26,250 ft (8,000 m); range 435 miles (700 km).
Weights: empty 2,529 lb (1,147 kg); maximum take-off 3,968 lb (1,800 kg).
Dimensions: span 35 ft 2 in (10.72 m); length 24 ft 9.25 in (7.55 m); height 9 ft 4.5 in (2.85 m); wing area 192.68 sq ft (17.90 m²).
Armament: two 7.7-mm (0.303-in) machine guns and provision for light bombs.

This PZL P.11c is seen in the colors of the 122nd Squadron of the 2nd Krakow Aviation Regiment.

Photo: M. Hodeir
D1 075 01.11
Printed in Italy

Trainer

USSR

Yakovlev Yak-11 "MOOSE"

Trainer

Yakovlev Yak-11 "MOOSE"

An easy birth

The first prototype of this advanced trainer flew in 1945 as the Yak-3UTI. Despite the designation's suggestion that the type was the trainer version of the Yak-3 fighter, in fact it used nothing more than components from the fighter. In 1946 there appeared a second prototype, and this Yak-11 revealed a number of refinements as well as less use of standard Yak-3 components. Trials were completed in October 1946 and the type was ordered into production.

A highly successful aeroplane

Entering service in 1947, the Yak-11 is of mixed construction (all-metal wings and a steel fuselage covered in plywood and fabric) and has retractable tailwheel landing gear. Production totalled 3,859 in the USSR and, from 1953, another 707 C-11 aircraft in Czechoslovakia. In 1958 there appeared the Yak- 11U (Czech C-11U) version with retractable tricycle landing gear. The Yak-11 has enjoyed a long and very successful career not only in the USSR and its Warsaw Pact allies, but also in the Middle East and China.

Principal versions

Yak-11 (baseline model) and Yak-11U (later model with tricycle landing gear).

Principal users

Afghanistan, Albania, Angola, Bangladesh, Bulgaria, Cambodia, China, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Romania, Somalia, USSR, Vietnam, and Yemen.

TECHNICAL DATA

Type: Yakovlev Yak-11 two-seat advanced flying trainer and liaison plane.
Engine: one 570-hp (425-kW) Shvetsov ASh-21 radial piston engine.
Performance: maximum speed 289 mph (465 km/h) at 8,200 ft (2,500 m); initial climb rate not revealed; service ceiling 23,295 ft (7,100 m); range 795 miles (1,280 km).
Weights: empty 4,189 lb (1,900 kg); maximum take-off 5,379 lb (2,440 kg).
Dimensions: span 30 ft 10 in (9.40 m); length 27 ft 10.5 in (8.50 m); height 10 ft 9 in (3.28 m); wing area 165.77 sq ft (15.40 m^2).
Armament: one 12.7-mm (0.5-in) or 7.62-mm (0.3-in) machine gun in a fixed installation, and up to two 110-lb (50-kg) practise bombs.

This Yak-11, representing a type only rarely seen in the West, was restored by a collector and displayed in France.

Photo: P. Guerin
D1 075 01.12
Printed in Italy

Trainer

West Germany France

Dassault-Breguet/Dornier ALPHA JET

Dassault-Breguet/Dornier ALPHA JET

Franco-German cooperation

In 1969 the French and West Germans announced a joint requirement for a new plane able to undertake the basic/advanced trainer and the light attack and reconnaissance roles. In 1970 the current consortium's Alpha Jet was selected for full-scale development, the first prototype flew in October 1973, and service entry followed in 1978.

Explosion of variants

The original Alpha Jet A warplane and Alpha Jet E trainer for West Germany and France have now been supplemented by other models, though some of these have yet to achieve production status. Some 512 aircraft were ordered, and the last of these was completed in 1988 though production could be resumed.

Principal versions

Alpha Jet A (now Close Support Version for West Germany), Alpha Jet E (now Advanced Trainer/Light Attack Version for France and several export customers), Alpha Jet Alternative Close Support Version (export model with more advanced nav/attack system), Alpha Jet 2 (proposed upgraded trainer with more power), Lancier (proposed extended-capability version of the Alpha Jet 2), and Alpha Jet 3 (proposed trainer with state of the art cockpit).

Principal users

Belgium, Cameroun, Egypt, France, Ivory Coast, Morocco, Nigeria, Qatar, Togo, and West Germany.

TECHNICAL DATA

Type: Dassault-Breguet/Dornier Alpha Jet E two-seat basic/advanced flying and weapons trainer.
Engines: two 2,976-lb (1350-kg) thrust SNECMA/Turbomeca Larzac 04-C5 turbofans.
Performance: maximum speed 621 mph (1,000 km/h) at sea level; climb to 30,000 ft (9,145 m) in less than 7 minutes 0 seconds; service ceiling 48,000 ft (14,630 m); radius 764 miles (1,230 km).
Weights: empty 7,374 lb (3,345 kg); maximum take-off 17,637 lb (8,000 kg).
Dimensions: span 29 ft 10.75 in (9.11 m); length 38 ft 6.5 in (11.75 m); height 13 ft 9 in (4.19 m); wing area 188.4 sq ft (17.50 m^2).
Armament: provision for more than 5,511 lb (2,500 kg) of disposable stores carried externally.

This Alpha Jet E is on the strength of the French fighter school based at Tours.

Photo: MDBA
D1 075 01.13
Printed in Italy

Naval helicopter

Great Britain France

Westland LYNX

Westland LYNX

Franco-British coproduction
The Lynx was designed by the British firm Westland but built in collaboration with Aerospatiale, which has a 30% share in the program. The prototype flew in March 1971, and helicopters have been produced for naval and military roles. The Lynx entered service in 1978, and the specifically naval variant differs from the military model in having naval equipment and wheeled tricycle landing gear in place of the land model's twin skids.

Exceptional maneuverability
The Lynx's semi-rigid rotor and clean design combine to produce high agility and performance. To these are added the sensors and weapons that make the naval Lynx a potent helicopter for destroyers and frigates. The type's primary tasks are anti-submarine and anti-ship warfare, and its secondary tasks SAR, vertical replenishment, and transport of 10 troops or 2,000 lb (907 kg) of freight. More than 210 naval Lynxes have been produced, and development continues with the Super Lynx, an updated model powered by Gem 42-1s.

Principal versions
Lynx HAS.Mk 2 (basic British helicopter), Lynx Mk 2 (French equivalent of the HAS.Mk 2), Lynx HAS.Mk 3 (British model with more powerful Gem 41-1 engines), Lynx Mk 4 (French equivalent of the HAS.Mk 3), and comparable export helicopters with different designations.

Principal users
Argentina, Brazil, Denmark, France, Great Britain, the Netherlands, Nigeria, Norway, South Korea, and West Germany.

TECHNICAL DATA

Type: Westland Lynx HAS.Mk 2 four seat multi-role naval helicopter.
Engines: two 900-shp (671-kW) Rolls-Royce Gem 2 turboshafts.
Performance: maximum speed 144 mph (232 km/h) at sea level; initial climb rate 2,170 ft (661 m) per minute; hovering ceiling 8,450 ft (2,575 m); range 368 miles (593 km).
Weights: empty 7,370 lb (3,343 kg); maximum take-off 10,500 lb (4,763 kg).
Dimensions: main rotor diameter 42 ft 0 in (12.80 m); length overall, rotors turning 49 ft 9 in (15.163 m); height 11 ft 5 in (3.48 m); main rotor disc area 1,385.4 sq ft (128.7 m^2).
Armament: provision for two lightweight homing torpedoes, or four light anti-ship missiles, or other weapons.

An effective hunter/killer of submarines, the Lynx serves with several navies. This is a Lynx in service with the French navy.

Photo: M. Rostaing
D1 075 01.14
Printed in Italy

Switzerland

Pilatus PC-6 PORTER & TURBO-PORTER

Pilatus PC-6 PORTER & TURBO-PORTER

A fortunate detour

While considering a new trainer to replace its PC-3, Pilatus sidetracked and in 1957 opted for the development of a STOL utility light transport with landing gear that could be adapted for land, snow and water operations. The PC-6 Porter flew in May 1959 with a 340-hp (254-kW) Lycoming GSO-480 piston engine, and from this beginning sprang a program that continues to the present.

Shift into high gear

Pilatus soon realized that the basic piston-engined model should be supplemented by a turboprop-engined type, and in May 1961 there flew the first PC-6/A Turbo-Porter with 523-shp (390-kW) Turbomeca Astazou II. This was the beginning of another series that includes a large number of variants as well as a licensed version made in the USA by Fairchild and further developed into the military AU-23A Peacemaker.

Principal versions

PC-6 (initial model), PC-6/350 (upgraded model with 350-hp/261-kW IGO-540 engine), PC-6/A (Astazou turboprop), PC-6/B (Pratt & Whitney Canada PT6A turboprop), and PC-6/C (Garrett TPE-331 turboprop).

Principal users

Just under 500 aircraft are used in about 50 countries.

TECHNICAL DATA

Type: Pilatis PC-6/B2-H2 Turbo-Porter one-crew STOL utility light transport.
Engine: one 680-hp (507-kW) Pratt & Whitney Canada PT6A-27 turboprop.
Performance: maximum speed 161 mph (260 km/h) at 10,000 ft (3,050 m); initial climb rate 941 ft (287 m) per minute; service ceiling 28,000 ft (8,535 m); range 652 miles (1,050 km).
Weights: empty 2,685 lb (1,218 kg); maximum take-off 6,107 lb (2,770 kg).
Dimensions: span 49 ft 8 in (15.13 m); length 35 ft 9 in (10.90 m); height 10 ft 6 in (3.20 m); wing area 310.01 sq ft (28.80 m^2).
Payload: up to 10 passengers or 2,491 lb (1,130 kg) of freight.

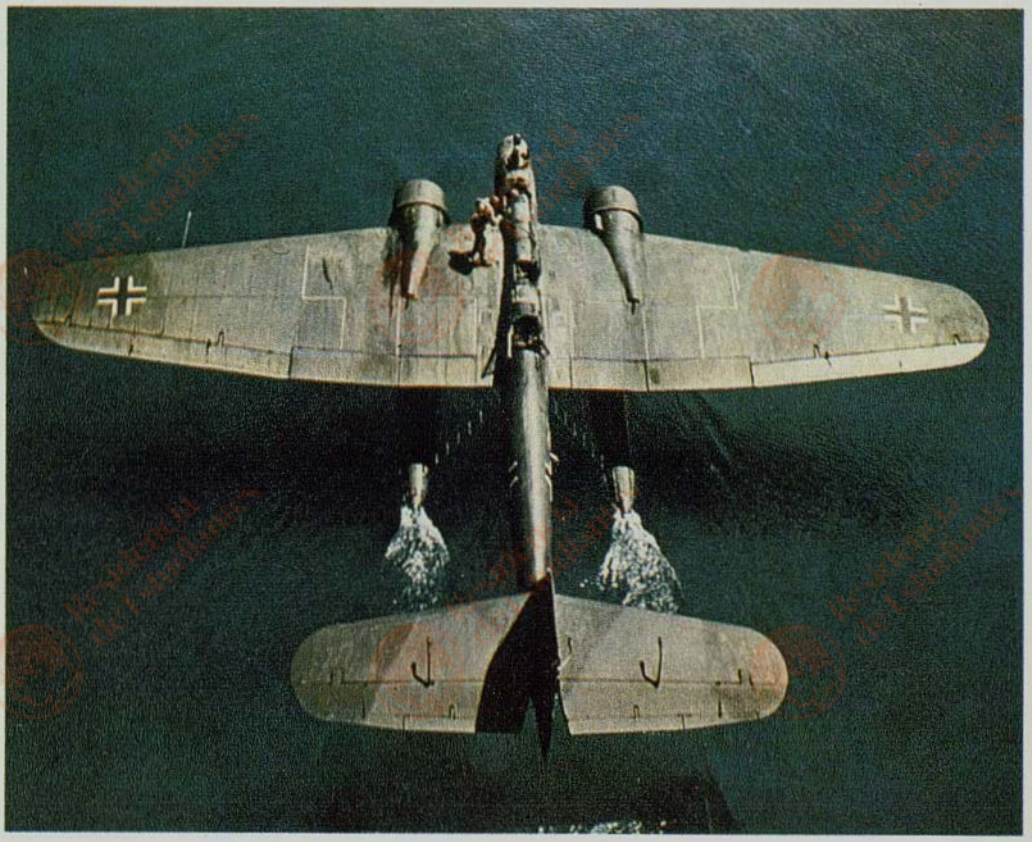
Particularly well suited to operation in mountainous areas, the PC-6 is employed in several countries for tasks where its STOL performance from rough airstrips is invaluable.

Photo: B. Thouanel
D1 075 01.15
Printed in Italy

Seaplane

Germany

Heinkel He 115



Heinkel He 115

A promising design

First flown in 1936, the He 115 was designed as a torpedo bomber to replace the He 59 float seaplane. The type proved its capabilities with eight world payload/speed records on the same day in March 1938. The third prototype introduced the long "glasshouse" canopy which became standard on the production model, while the fourth prototype pioneered the struts that replaced the float bracing wires of the earlier machines.

Reduced to secondary roles

It became clear once the He 115A was in service that the type lacked the payload and performance to operate as a first-line torpedo bomber and, after the beginning of the Second World War, the type was relegated to secondary tasks such as coastal patrol and the laying of coastal mines. The He 115 was retired at the end of 1944, several months before the end of the war. Production totalled about 500 aircraft.

Principal versions

He 115A (initial model in four variants), He 115B (much upgraded version with greater fuel capacity and floats strengthened to allow operations on ice, built in two variants and several subvariants), He 115C (version with heavier armament, built in four variants and several subvariants), and He 115E (armament revisions, built in one variant).

Principal users

Germany, Norway, and Sweden.

TECHNICAL DATA

Type: Heinkel He 115C-1 three-seat general-purpose and torpedo bomber seaplane.
Engines: two 960-hp (872-kW) BMW 132K radial piston engines.
Performance: maximum speed 186 mph (300 km/h) at 3,280 ft (1,000 m); climb to 3,280 ft (1,000 m) in 5 minutes 6 seconds; service ceiling 18,040 ft (5,500 m); range 1,740 miles (2,800 km).
Weights: empty 15,146 lb (6,870 kg); maximum take-off 23,545 lb (10,680 kg).
Dimensions: span 73 ft 1 in (22.28 m); length 56 ft 9.25 in (17.30 m); height 21 ft 7.25 in (6.59 m); wing area 933.23 sq ft (86.70 m^2).
Armament: one 15-mm cannon and two 7.92-mm (0.312-in) machine guns in fixed installations, two 7.92-mm guns in trainable installations, and up to 2,756 lb (1,250 kg) of bombs or mines, or one 1,102-lb (500-kg) torpedo.

The He 115's most useful role was coastal minelaying at night and at very low level.

Photo: D.R
D1 075 01.16
Printed in Italy

Seaplane

Canada

Canadair CL-215

Canadair CL-215

A worthy purpose

Now part of the Bombardier group, Canadair decided in the early 1960s to produce a purpose-designed "firebomber" amphibian with a primary role of bombing forest fires with water, and a secondary capability as a utility passenger/freight transport. The first machine flew in October 1967, and despite its use of elderly piston engines the type enjoyed small but steady sales. The CL-215's two fuselage tanks hold 1,412 US gal (5,345 litres) of water: this quantity can be scooped up in 10 seconds as the plane skims the surface of a lake or even the sea, and can be dumped in 1 second. More than 100 dumps per day are standard, and one Yugoslav CL-215 managed 225 dumps in a single day.

Rejuvenated model

The CL-215 has also be adopted for coastal patrol and transport, and production was completed with the 112th aeroplane to allow the company to concentrate on the CL-215T version. This first flew in 1989 and, powered by two 2,380-shp (1,775-kW) Pratt & Whitney Canada PW123AF turboprops, can carry 1,620 US gal (6,132 litres) of water.

Principal versions

CL-215 (basic model) and CL-215T (turboprop-powered model).

Principal users

Canada, France, Greece, Italy, Spain, Thailand, Venezuela and Yugoslavia.

TECHNICAL DATA

Type: Canadair CL-215 two-crew firebomber and utility transport amphibian.
Engines: two 2,100-hp (1,566-kW) Pratt & Whitney R-2800-CA3 radial piston engines.
Performance: maximum speed 181 mph (291 km/h) at 10,000 ft (3,050 m); initial climb rate 1,000 ft (305 m) per minute; service ceiling not revealed; range 1,301 miles (2,094 km).
Weights: empty 28,082 lb (12,738 kg); maximum take-off 43,500 lb (19,731 kg).
Dimensions: span 93 ft 10 in (28.60 m); length 65 ft 0.25 in (19.82 m); height 29 ft 5.5 in (8.98 m) on land; wing area 1,080.0 sq ft (100.33 m^2).
Payload: 12,000 lb (5,443 kg) as a firebomber or 8,518 lb (3,864 kg) as a utility aeroplane with freight or 26 passengers.

This is one of the five CL-215s used to good effect by the government of Yugoslavia for the fighting of forest fires.

Photo: B. Thouanel
D1 075 01.17
Printed in Italy

Trainer

USA

Curtiss JN-4 JENNY

Curtiss JN-4 JENNY

Huge production run

Developed from the JN-2 via the JN-3, the JN-4 appeared in July 1916 and retained the latter's unequal-span wings. The type was sold first to the UK and the US Army. Production was initially slow, but after the USA's entry into the first World War in April 1917 the production rate accelerated enormously to yield vast numbers of aircraft.

Post-war conversions

After the end of the First World War, and in the face of severely restricted budgets, the aviation arm of the US Army decided to modernize its Jennies rather than buy new aircraft, and a program between 1918 and 1926 updated its aircraft and standardized them with a more powerful engine. The type was phased out of military service in 1927, but remained in widespread civil use for many years to come as a utility and "barnstorming" plane.

Principal versions

JN-4 (original model), JN-4A (larger tailplane), JN-4B (different engine), JN-4Can ("Canuck" model built in Canada), JN-4D (normal stick rather than original Deperdussin controls), JN-4H (150-hp/112-kW Hispano-Suiza engine), and JN-6H (strengthened airleron control system).

Principal users

Canada, Great Britain, and USA.

TECHNICAL DATA

Type: Curtiss JN-4D two-seat primary trainer.
Engine: one 90-hp (67-kW) Curtiss OX-5 inline piston engine.
Performance: maximum speed 75 mph (121 km/h) at sea level; climb to 2,000 ft (609 m) in 7 minutes 30 seconds; service ceiling 6,500 ft (1,980 m); range not revealed.
Weights: empty 1,390 lb (630 kg); maximum take-off 1,920 lb (871 kg).
Dimensions: span 43 ft 7.75 in (13.30 m); length 27 ft 4 in (8.33 m); height 9 ft 10.5 in (3.01 m); wing area 352.0 sq ft (32.70 m^2).
Armament: none.

A trainer for the US Army during and after the First World War, the Jenny became a legend and was also used in huge numbers during the 1920s and early 1930s as a civil trainer and "barnstormer".

Photo: S.H.A.A
D1 075 01.18
Printed in Italy

USSR

Antonov An-2 "COLT"

Antonov An-2 "COLT"

A new beginning

The An-2 first flew in August 1947 as the SKh-1 (rural economy-1). This large biplane was of mixed construction, and though regarded in the West as an anachronism even at that time, has emerged as one of the truly great aircraft of all time. Some 5,000 were built in the USSR before production was switched in 1960 to Poland, where more than 11,200 more have been built. The type is also made in China as the Yunshuji-5.

Limited performance but great versatility

The An-2 has pedestrian flight performance, but possesses remarkable ruggedness and adaptability. The type has therefore been used by air forces and civil operators alike in a host of applications. The NATO reporting name for the An-2 is "Colt", and in the 1970s Antonov developed the upgraded An-3 version with a 1,450-shp (1,081-kW) Glushenkov TVD-20 turboprop.

Principal versions

An-2T (utility transport), An-2TP (12-passenger airliner), An-2P (14-passenger airliner), An-2S (air ambulance), An-2TD (parachute trainer), An-2SKh (agricultural plane), An-2V (float-equipped seaplane), An-2PP (floatplane firebomber), An-2L (land-based firebomber), and a large number of Polish-developed variants.

Principal users

Civil operators in many parts of the world, and the air forces of Afghanistan, Albania, Bulgaria, China, Cuba, East Germany, Egypt, Ethiopia, Hungary, Iraq, Mali, Mongolia, North Korea, Poland, Romania, Somalia, Sudan, Syria, Tanzania, Tunisia, USSR, and Vietnam.

TECHNICAL DATA

Type: Antonov An-2 "Colt" two-crew utility transport.
Engine: one 1,000-hp (746-kW) Shvetsov ASh-62IR radial piston engine.
Performance: maximum speed 160 mph (258 km/h) at 5,740 ft (1,750 m); initial climb rate 689 ft (210 m) per minute; service ceiling 14,435 ft (4400 m); range 559 miles (900 km).
Weights: empty 7,606 lb (3,450 kg); maximum take-off 12,125 lb (5,500 kg).
Dimensions: span 59 ft 7.75 in (18.18 m); length 41 ft 9.5 in (14.24 m); height 13 ft 1.5 in (4.00 m); wing area 770.72 sq ft (71.60 m^2).
Payload: 12 passengers or 2,866 lb (1,200 kg) of freight.

The An-2 served with the air forces of several Warsaw Pact countries until recently. This example carries Polish markings.

Photo: P. Bigel
D1 075 01.19
Printed in Italy

USA

Boeing KC-135 STRATOTANKER

Boeing KC-135 STRATOTANKER

A refueler for the US Air Force

In August 1954 the USAF chose a derivative of the Model 387-80 prototype as replacement for its Boeing KC-97 tanker. The first KC-135 flew in August 1956, and deliveries of 732 aircraft began in June 1957. The KC-135 has a narrower fuselage than the Model 707 airliner derived from the same prototype, and a different interior including the tanks that feed the Boeing "flying boom" refueling system.

Good beyond the year 2020

In the early 1990s there are still more than 640 of these valuable aircraft in service. The fleet is being slowly but steadily improved in two programs for a continued operational viability into the next century. The designation KC-135E covers Air Force Reserve and Air National Guard aircraft modified with reskinned wing under surfaces as well as the tail units, anti-skid brakes, and Pratt & Whitney JT3D-3B turbofans (plus their pylons and nacelles) removed from surplus Model 707 airliners. The designation KC-135R covers USAF aircraft with similar airframe modifications but also new 22,000-lb (9,979-kg) thrust CFM International F108-CF-100 turbofans.

Principal versions

KC-135A (basic model), KC-135B (few aircraft with TF33-P-5 turbofans), KC-135E (updated AFR and ANG aircraft), KC-135R (updated USAF aircraft), and C-135FR (11 French aircraft updated from C-135F standard).

Principal users

France and USA.

TECHNICAL DATA

Type: Boeing KC-135A Stratotanker five-crew in-flight refueling tanker.

Engines: four 13,750-lb (6,237-kg) thrust Pratt & Whitney J57-P-59W turbojets.

Performance: maximum speed 585 mph (941 km/h) at 30,000 ft (9,145 m); initial climb rate 1,290 ft (393 m) per minute; service ceiling 50,000 ft (15,240 m); radius 3,450 miles (5,552 km) to offload 24,000 lb (10,886 kg) of fuel.

Weights: empty 106,306 lb (48,220 kg); maximum take-off 316,000 lb (143,338 kg).

Dimensions: span 130 ft 10 in (39.88 m); length 134 ft 6 in (40.99 m); height 41 ft 8 in (12.69 m); wing area 2,433.0 sq ft (226.03 m²).

Payload: about 120,000 lb (54,532 kg) of fuel offloaded at a radius of 1,150 miles (1,850 km) or, in the secondary transport role, 160 troops or 83,000 lb (37,650 kg) of freight.

A French C-135F refuels SEPECAT Jaguar tactical aircraft.

Photo: SIRPA/air
D1 075 01.20
Printed in Italy

Dive bomber

Germany

Junkers Ju 87 STUKA

Junkers Ju 87 STUKA

Stuka shock

During the first stages of the Second World War, the Ju 87 proved a decisive weapon. Abbreviated from Sturzkampfflugzeug (dive bomber), the word Stuka entered the general vocabulary as a vital component of the Blitzkrieg, the "lightning war". In the summer of 1940 the lie was put to the Stuka myth by catastrophic losses to British fighters in the Battle of Britain.

The Stuka at war

The Ju 87 prototype flew in 1935 with a tailplane sporting endplate vertical surfaces, but the second prototype and all later aircraft had a single fin and rudder assembly. Early aircraft were evaluated in the Spanish Civil War (1936-39), and in September 1939 the Luftwaffe had 336 Ju 87Bs. From late 1940 the type was steadily relegated to areas of negligible air opposition. For lack of a replacement the type remained in production long after it became obsolete, and production totalled 5,709.

Principal versions

Ju 87A (first production model in three subvariants with the 680-hp/507-kW Jumo 210 engine), Ju 87B (definitive early model in three subvariants with the 1,200-hp/895-kW Jumo 211 engine), Ju 87D (improved model in seven subvariants optimized for a range of roles), Ju 87G (anti-tank version of the Ju 87D), and Ju 87R (anti-shipping version of the Ju 87B).

Principal users

Bulgaria, Croatia, Germany, Hungary, Italy, and Romania.

TECHNICAL DATA

Type: Junkers Ju 87D-1 two-seat dive-bomber and assault aeroplane.
Engine: one 1,410-hp (1,051-kW) Junkers Jumo 211J-1 inline piston engine.
Performance: maximum speed 255 mph (410 km/h) at 12,600 ft (3,480 m); climb to 16,405 ft (5,000 m) in 19 minutes 49 seconds; service ceiling 23,950 ft (7,300 m); range 954 miles (1,535 km).
Weights: empty 8,598 lb (3,900 kg); maximum take-off 14,550 lb (6,600 kg).
Dimensions: span 45 ft 3.5 in (13.80 m); length 37 ft 8.75 in (11.50 m); height 12 ft 9.5 in (3.90 m); wing area 343.38 sq ft (31.90 m²).
Armament: four 7.92-mm (0.312-in) machine guns (two fixed and two trainable) and up to 3,968 lb (1,800 kg) of bombs.

The Ju 87 Stuka gained its awesome reputation in the first part of the Second World War, but was then revealed as a second-rate warplane.

Photo R.D.
D1 075 02.01
Printed in Italy

Heavy bomber

USA

Consolidated B-24 LIBERATOR

Consolidated B-24 LIBERATOR

Long-range bomber for the US Army Air Corps
The Model 32 flew in December 1939 as the XB-24 prototype of a long-range bomber and used many features pioneered in the preceeding Model 31 flying boat, including the high aspect ratio wing. Beginning at the end of 1940, production by four companies totalled 18,482 aircraft, a greater total than any other American plane of the period.

Multi-role use
In service the Liberator proved to possess good handling, considerable structural strength, and enormous versatility to allow the type's use as a bomber, maritime reconnaissance and transport plane. The type was extensively used as a bomber in the Pacific, Mediterranean and European theaters. The Liberator's most famous single exploit was a daylight raid against the Romanian oilfields at Ploesti, when 174 aircraft took off, 54 were lost and only 33 were flyable.

Principal versions
B-24D and, in British service, Liberator Mk III (first large-scale production model with glazed nose and R-1830-43 engines), B-24E (different propellers), B-24G (first model with nose turret), B-24H (improved B-24G), B-24J and Liberator Mk VI/VII (B-24H model with superior bombsight and autopilot), B-24L (B-24J version with manually operated guns in place of a tail turret), and B-24M (revised B-24J).

Principal users
Australia, Canada, Great Britain, and USA.

TECHNICAL DATA

Type: Consolidated B-24H Liberator 8/12-seat long-range heavy bomber.
Engines: four 1,200-hp (895-kW) Pratt & Whitney R-1830-65 radial piston engines.
Performance: maximum speed 290 mph (467 km/h) at 25,000 ft (7,620 m); climb to 20,000 ft (6,095 ft) in 25 minute 0 seconds; service ceiling 28,000 ft (8,535 m); range 2,100 miles (3,380 km).
Weights: empty 36,500 lb (16,556 kg); maximum take-off 71,200 lb (32,296 kg).
Dimensions: span 110 ft 0 in (33.53 m); length 67 ft 2 in (20.47 m); height 18 ft 0 in (5.49 m); wing area 1,048.0 sq ft (97.36 m^2).
Armament: 10 0.5-in (12.7-mm) machine guns in nose, dorsal, ventral and tail turrets, and two beam positions, and up to 12,800 lb (5,806 kg) of bombs.

The B-24 Liberator served in most theaters and in many operational forms.

Photo U.S. Air Force
D1 075 02.02
Printed in Italy

Heavy bomber

USA

Boeing B-52 STRATOFORTRESS

Boeing B-52 STRATOFORTRESS

Exceptionally long life
Despite its obsolescence in terms of its airframe and powerplant, the B-52 remains in service as a major element of the USA's strategic triad of nuclear weapon delivery vehicles. It was at first thought that the Rockwell B-1 would supplant the B-52, but the limitation of the later type's production to 100 means that the two aircraft now complement each other. Surviving B-52s have been structurally revised for low-altitude operation and have been upgraded electronically, and now serve mainly as launchers for the AGM-86B air-launched cruise missile.

War over Vietnam
The B-52 was planned as a high-altitude bomber and flew in April 1952. Production ended in 1962 after the delivery of 744 aircraft. Other than the current B-52G and B-52H models, the variant that saw the greatest service was the B-52D used as a conventional bomber in the Vietnam War.

Principal versions
B-52B and B-52C (essentially pre-production models built in small numbers for evaluation and reconnaissance), B-52D (tail armament of four 0.5-in/12.7-mm machine guns), B-52E (more advanced nav/attack system), B-52F (increased power), B-52G (definitive turbojet-powered model with integral wing tanks, remotely controlled tail guns under a shorter fin/rudder, and provision for two AGM-28 Hound Dogs), and B-52H (last model with many improvement including a new tail gun).

Principal user
USA.

TECHNICAL DATA

Type: Boeing B-52H Stratofortress six-seat long-range strategic heavy bomber.
Engines: eight 17,000-lb (7,711-kg) thrust Pratt & Whitney TF33-P-3 turbofans.
Performance: maximum speed 595 mph (958 km/h) at 36,000 ft (10,975 m); initial climb rate not revealed; service ceiling 55,000 ft (16,765 m); range 10,000 miles (16,093 km).
Weights: empty not revealed; maximum take-off 488,000 lb (221,353 kg).
Dimensions: span 185 ft 0 in (56.39 m); length 160 ft 11 in (49.05 m); height 40 ft 8 in (12.40 m); wing area 4,000.0 sq ft (371.60 m²).
Armament: one 20-mm multi-barrel cannon and up to 20 AGM-69 SRAM or AGM-86 missiles, or free-fall bombs.

B-52 bombers unload long strings of conventional bombs over North Vietnam as part of the American effort of the late 1960s to drive the North Vietnamese to the negotiating table.

Photo U.S. Air Force
D1 075 02.03
Printed in Italy

Fighter

France

Morane-Saulnier Type AI

Morane-Saulnier Type AI

Fighter with a short career

The Type AI was a monoplane fighter of the parasol type with its wing raised above the fuselage on cabane struts and braced by parallel struts running from the outer wings to the landing gear attachment points on the lower fuselage. A first flight was made in the summer of 1917, and the new fighter entered service at the beginning of 1918 with an armament of one or two machine guns synchronized to fire through the propeller disc. In May 1918, however, the type was withdrawn from first-line service after a string of structural failures and engine problems.

Aerobatic trainer

The manufacturer tried to revive the fighter with a modified structure and the 150-hp (112-kW) Gnome rotary, but further production was concentrated on two advanced trainer models without armament. Production of the series exceeded 1,200 aircraft, and after the First World War many were sold to other countries. In February 1928 a French pilot, Alfred Fronval, looped an orange and blue Type AI 1,111 consecutive times in 4 hours 56 minutes over Villacoublay!

Principal versions

MoS.27 (fighter with one machine gun), MoS.29 (fighter with two machine guns), MoS.30 (trainer with 120-hp/89-kW Le Rhone 9Jb or 135-hp/101-kW Le Rhone 9Jby rotary engine), and Mos.30bis (trainer with 90-hp/67-kW Le Rhone 9Jby).

Principal users

Belgium, France, Great Britain, Japan, Switzerland, USA, and USSR.

TECHNICAL DATA

Type: Morane-Saulnier Type AI (MoS.27) single-seat fighter.
Engine: one 150-hp (112-kW) Gnome Monosoupape 9N rotary piston engine.
Performance: maximum speed 141 mph (225 km/h) at sea level; climb to 13,125 ft (4,000 m) in 11 minutes 15 seconds; service ceiling 22,965 ft (7,000 m); endurance 1 hour 45 minutes.
Weights: empty 928 lb (421 kg); maximum take-off 1,431 lb (649 kg).
Dimensions: span 27 ft 11 in (8.51 m); length 18 ft 6.5 in (5.65 m); height 7 ft 10.5 in (2.40 m); wing area 144.13 sq ft (13.39 m^2).
Armament: one 0.303-in (7.7-mm) machine gun.

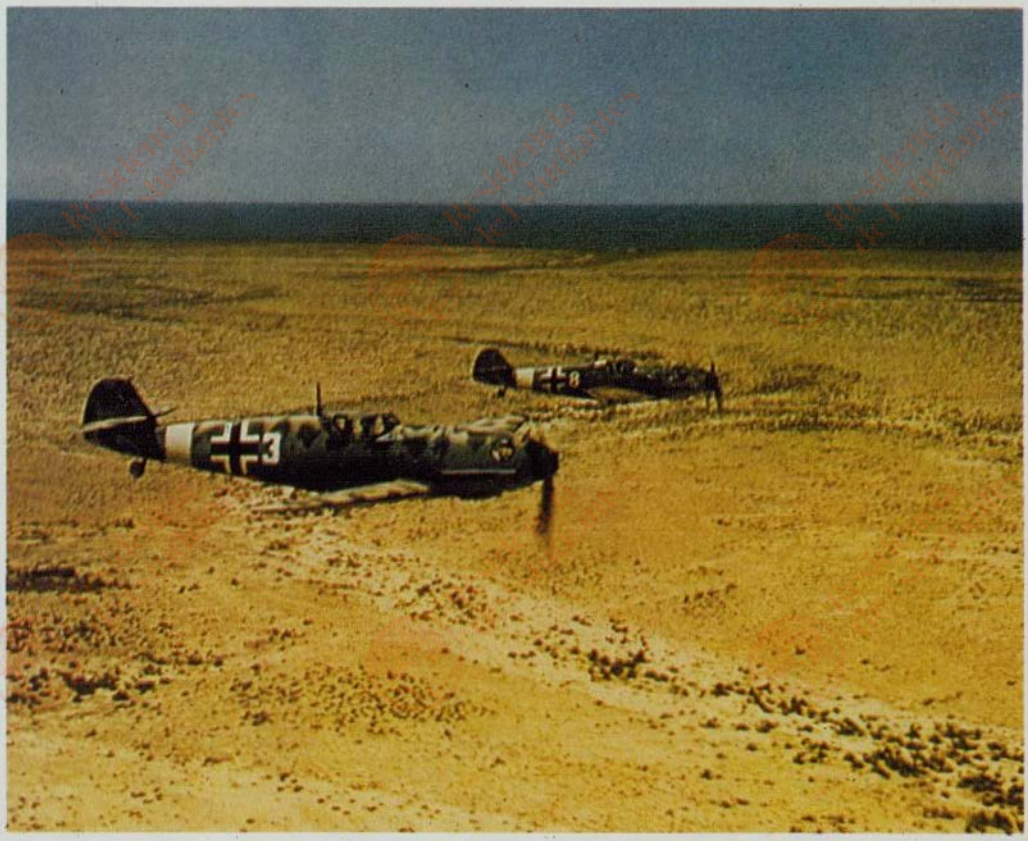
Sporting the colors of Escadrille SPA-156, this Type AI is still airworthy.

Photo Robineau.
D1 075 02.04
Printed in Italy

Fighter

Germany

Messerschmitt Bf 109



Messerschmitt Bf 109

Workhorse of the Luftwaffe

The Bf 109 prototype first flew in May 1935. Of the several early variants, the Bf 109B was evaluated operationally in the Spanish Civil War (1936-39). The definitive Jumo 210-engined version was the Bf 109C, but the Bf 109D introduced the DB 600 series engine with which this early monoplane fighter became a real winner. In 1938 Messerschmitt moved on to the Bf 109E-0, a pre-production model powered by the 1,100-hp (820-kW) DB 601A featuring direct fuel injection and an improved supercharger.

E for Emile

The Bf 109E was dubbed Emile by its pilots, and large-scale production was undertaken from 1939. The type was Germany's fighter mainstay in 1940 and acquitted itself well in the Battle of Britain. Production totalled 1,868, and the Bf 109E was being superseded by the Bf 109F as Germany invaded the USSR in mid-1941. Desert models, carrying the suffix "Trop" and fitted with sand filters, served longer in North Africa.

Principal versions

Bf 109E-0 (pre-production variant with four 7.92-mm/0.312-in machine guns), Bf 109E-1 (production variant with two machine guns and two 20-mm cannon), Bf 109E-1/B (fighter-bomber), Bf 109E-3 (more power and armament), Bf 109E-4 (with E-1 armament), Bf 109E-4/B (fighter-bomber), Bf 109E-5 (reconnaissance fighter with DB 601Aa), Bf 109E-6 (reconnaissance fighter with 1,200-hp/895- kW DB 601N), Bf 109E-8 (1,350-hp/1,007-kW DB 601E), and Bf 109E-9 (reconnaissance fighter).

Principal users

Bulgaria, Croatia, Germany, Romania, Slovakia, Spain, Switzerland, and Yugoslavia.

TECHNICAL DATA

Type: Messerschmitt Bf 109E-3 single-seat fighter.
Engine: one 1,175-hp (876-kW) Daimler-Benz DB 601Aa inline piston engine.
Performance: maximum speed 348 mph (560 km/h) at 14,560 ft (4,440 m); climb to 3,290 ft (1,000 m) in 1 minute 6 seconds; service ceiling 34,450 ft (10,500 m); range 410 miles (660 km).
Weights: empty 4,189 lb (1,900 kg); maximum take-off 5,875 lb (2,665 kg).
Dimensions: span 32 ft 4.5 in (9.87 m); length 28 ft 4.5 in (8.64 m); height 8 ft 2.25 in (2.50 m); wing area 174.05 sq ft (16.17 m^2).
Armament: two or three 20-mm cannon and two 7.92-mm (0.312-in) machine guns.

A Bf 109E of the Luftwaffe in flight over the Mediterranean coast of North Africa in 1941.

Photo D.R.
D1 075 02.05
Printed in Italy

Fighter

France

Dewoitine D.520

Dewoitine D.520

Under the threat of war

The D.520 resulted from a 1937 specification, and was a neat fighter of very clean monoplane configuration. Under pressure of war with Germany, and rightly confident of the type's basic capabilities, the French air force had ordered 200 examples even before the prototype's first flight in October 1938.

High speed

The new fighter owed its designation to the required maximum speed of 520 km/h (323 mph), and was comparable with the best fighters of its time though it was perhaps less endowed with development potential than could have been desired. By the time of the German invasion of May 1940, D.520 orders had risen to 2,320 but only 36 had been delivered. Rapid production meant that five air force groupes and three naval escadrilles were equipped with the type before the French surrender, scoring 114 "kills" against 85 losses. Captured aircraft were used by Germany as trainers or passed to allies, and production continued for the Vichy French forces. Many variants were proposed or produced in prototype form, but none of these came to anything. Total production was 910 aircraft.

Principal version

D.520

Principal users

Bulgaria, France, Germany, Italy, and Romania.

TECHNICAL DATA

Type: Dewoitine D.520 single-seat fighter.
Engine: one 920-hp (686-kW) Hispano-Suiza HS 12Y-45 inline piston engine.
Performance: maximum speed 332 mph (535 km/h) at 19,685 ft (6,000 m); climb to 13,125 ft (4,000 m) 5 minutes 49 seconds; service ceiling 36,090 ft (11,000 m); range 553 miles (900 km).
Weights: empty 4,612 lb (2,092 kg); maximum take-off 6,134 lb (2,783 kg).
Dimensions: span 33 ft 5.5 in (10.20 m); length 28 ft 8.75 in (8.76 m); height 8 ft 5.25 in (2.57 m); wing area 171.69 sq ft (15.95 m^2).
Armament: one 20-mm cannon and four 7.5-mm (0.295-in) machine guns.

Restored to pristine condition by the Musee de l'Air, this D.520 bears the markings of Groupe de Chasse I/3, which in May 1940 was based at Cannes under the Zone d'Operations Aeriennes des Alpes (Alps air operations zone)

Photo Musee Air
D1 075 02.06
Printed in Italy

Fighter

USSR

Yakovlev Yak-3

Yakovlev Yak-3

A fighter worth waiting for

This air-combat dogfighter resulted from the belief of Aleksandr Yakovlev that excellence in this role could be provided only by small size, rugged strength, and good handling characteristics combined with the right powerplant. Development got under way in 1941 but was delayed by engine problems. The resulting fighter was a cousin to the Yak-7 and Yak-9 types through being derived from the Yak-1. The specific parent for the Yak-3 was the Yak-1M with a cut-down rear fuselage and a canopy providing the pilot with all-round vision.

Powerful combat performer

The Yak-3 first flew in 1943 and entered service in July 1944, but was then produced to the extent of 4,848 aircraft. The Yak-3 was perhaps the most agile single-seat fighter of the Second World War, and was notable for the ease and precision with which maneuvers could be executed. The Yak-3 was superior to all German fighters at low and medium altitudes, and once deployed in large numbers was instrumental in gaining air superiority for the Soviet tactical air forces. There were several experimental models that failed to enter service.

Principal versions

Yak-3 (production model with mixed metal and wood structure) and Yak-3U (improved model with the 1,650-hp/1,230-kW Klimov VK-107A engine and all- metal structure).

Principal users

France and USSR.

TECHNICAL DATA

Type: Yakovlev Yak-3 single-seat fighter.
Engine: one 1,300-hp (969-kW) Klimov VK-105PF-2 inline piston engine.
Performance: maximum speed 410 mph (660 km/h) at 10,500 ft (3,200 m; initial climb rate 3,806 ft (1,160 m); service ceiling 38,715 ft (11,800 m); range 440 miles (710 km).
Weights: empty 4,641 lb (2,105 kg); maximum take-off 5,864 lb (2,660 kg).
Dimensions: span 30 ft 2.25 in (9.20 m); length 27 ft 10.25 in (8.49 m); height 7 ft 11.15 in (2.42 m); wing area 159.85 sq ft (14.85 m^2).
Armament: one 20-mm cannon and two 12.7-mm (0.5-in) machine guns.

Particularly good use was made of the Yak-3 by the Normandie-Niemen Regiment, manned by French pilots but fighting beside Soviet units on the Eastern Front.

Photo S.H.A.A
D1 075 02.07
Printed in Italy

Attack and close support

USA

Northrop F-5 FREEDOM FIGHTER

Northrop F-5 FREEDOM FIGHTER

A low-cost fighter

In the mid-1950s Northrop started development of its N-156 as a light and easily maintained yet supersonic fighter suitable for supply to friendly nations under the USA's Military Assistance Program. The N-156F flew in July 1959, and was ordered into production as the Freedom Fighter in single- and two-seat variants. The first of these flew in October 1963, and though a few were bought for the US Air Force (for limited use in Vietnam) most went to American allies, who use the type mainly for attack and close support.

A favored mount for pilots

The performance of the Freedom Fighter is adequate, and the type's maintancne and airfield requirements are minimal. On the other side of the coin the Freedom Fighter lacks radar. Even so, the type's beautiful handling have made it a favorite with pilots, and most of the 1,108 aircraft are still in service.

Principal versions

F-5A (single-seat fighter), CF-5A (Canadian-built improved single-seater), NF-5A (Canadian-built single-seater for the Netherlands), RF-5A (single-seat reconnaissance variant), SF-5A (Spanish-built single-seater), F-5B (two-seat trainer), NF-5B (Canadian-built two-seater for the Netherlands), SF-5B (Spanish two-seater), and CF-5D (Canadian-built two-seater).

Principal users

Canada, Greece, Iran, Libya, Moroccco, Netherlands, Norway, Phlippines, South Korea, Spain, Taiwan, Thailand, Turkey, and Venezuela.

TECHNICAL DATA

Type: Northrop F-5A Freedom Fighter single-seat multi-role fighter.

Engines: two 4,080-lb (1,851-kg) reheated thrust General Electric J85-GE-13 turbojets.

Performance: maximum speed 924 mph (1,487 km/h) or Mach 1.4 at 36,000 ft (10,975 m); initial climb rate 28,700 ft (8,760 m); service ceiling 50,500 ft (15,390 m); radius 195 miles (314 km).

Weights: empty 8,085 lb (3,667 kg); maximum take-off 20,677 lb (9,379 kg).

Dimensions: span 25 ft 3 in (7.70 m); length 47 ft 2 in (14.38 m); height 13 ft 2 in (4.01 m); wing area 170.0 sq ft (15.79 m^2).

Armament: two 20-mm cannon and up to 6,200 lb (2,812 kg) of disposable stores.

An F-5A of the Moroccan air force being refueled. The F-5's ability to operate successfully with little background support made the type ideal for developing countries.

Photo M. Rostaing
D1 075 02.08
Printed in Italy

Attack and close support

Israel

Israel Aircraft Industries KFIR

Israel Aircraft Industries KFIR

An Israeli Mirage
Making its first appearance in April 1975, the Kfir-C1 was the airframe of the IAI Nesher (itself an unlicensed and simplified copy of the Dassault Mirage III) with an American J79 turbojet and Israeli electronics. The result was a modestly successful fighter with ground-attack capability, and 27 aircraft were built.

Domestic backborne for the Israeli air force
Further development was already in hand, and in July 1976 the Israelis revealed the Kfir-C2 with small canard surfaces just behind the engine inlets for better field performance and agility, especially in the primary ground- attack role. The Kfir-TC2 was produced as a two-seat trainer equivalent with combat capability, and total production of these two variants was 185. The definitive model, revealed in 1983, is the Kfir-C7 conversion of the -C2 with a more powerful engine, greater weapon load, flight refueling capability, improved electronics, and a revised cockpit with HOTAS (Hands On Throttle And Stick) controls. The comparable two-seat version is the Kfir-TC7 used for specialist tasks such as electronic warfare.

Principal versions
Kfir-C1 (initial single-seater), Kfir-C2 (canarded single-seater), Kfir-TC2 (two-seater), Kfir-C7 (upgraded single-seater), Kfir-TC7 (upgraded two- seater), and F-21A (leased type in two versions for US Navy and US Marine Corps).

Principal users
Colombia, Ecuador, Israel, and USA.

TECHNICAL DATA

Type: IAI Kfir-C7 single-seat attack plane and fighter.
Engine: one 18,750-lb (8,505-kg) reheated thrust General Electric J79-GE-J1E turbojet.
Performance: maximum speed 1,516+ mph (2,440+ km/h) or Mach 2.3+ at 36,000 ft (10,975 m); initial climb rate 45,930 ft (14,000 m); service ceiling 58,000 ft (17,680 m); radius 548 miles (882 km).
Weights: empty 16,060 lb (7,285 kg); maximum take-off 36,376 lb (16,500 kg).
Dimensions: span 26 ft 11.5 in (8.22 m); length 51 ft 4.25 in (15.65 m); height 14 ft 11.75 in (4.55 m); wing area 392.47 sq ft (36.46 m^2) including canards.
Armament: two 30-mm cannon and up to 13,415 lb (6,085 kg) of disposable stores.

This F-21A served with the US Marine Corps' VMFT-401 "aggressor" squadron based at Yuma, Arizona, for dissimilar air combat maneuver training.

Photo I.A.I.
D1 075 02.09
Printed in Italy

Attack and close support

USA

North American F-100 SUPER SABRE

North American F-100 SUPER SABRE

A Mach 1 fighter

Designed from 1949 as a supersonic successor to the F-86 Sabre, the Super Sabre first flew in prototype form during May 1953 and incorporated the tactical lessons learnt by the Americans early in the Korean War (1950-53). The initial production model was the first of the US Air Force's "century series" fighters and, with the almost exactly contemporary MiG-19, was the world's first supersonic warplane when it entered service in September 1954. However, this F-100A interceptor was grounded in November 1954 because of transonic control problems.

Successful revisions

Extensive revisions to the basic design, including a taller fin and longer wings, resulted in much improved models that were produced in comparatively large numbers for several roles. The Super Sabre was used in the Vietnam War for ground attack, electronic warfare, and forward air control. Total production was 2,294 aircraft when the line closed in October 1959.

Principal versions

F-100A (unsuccessful initial interceptor model), F-100C (revised fighter- bomber with flight-refueling capability), F-100D (nuclear strike and conventional attack model with the Low-Altitude Bombing System, flapped wings, and electronic countermeasures), and F-100F (two-seat trainer often converted for combat roles).

Principal users

Denmark, France, Taiwan, Turkey, and USA.

TECHNICAL DATA

Type: North American F-100D Super Sabre single-seat strike/attack fighter.
Engine: one 17,000-lb (7,711-kg) reheated thrust Pratt & Whitney J57-P-21A turbojet.
Performance: maximum speed 864 mph (1,390 km/h) or Mach 1.3 at 35,000 ft (10,670 m); initial climb rate 16,000 ft (4,877 m) per minute; service ceiling 46,000 ft (14,020 m); range 600 miles (966 km).
Weights: empty 21,000 lb (9,525 kg); maximum take-off 34,832 lb (15,800 kg).
Dimensions: span 38 ft 9.5 in (11.82 m); length 47 ft 1.25 in (14.36 m); height 16 ft 3 in (4.95 m); wing area 385.0 sq ft (35.77 m²).
Armament: four 20-mm cannon and up to 7,500 lb (3,402 kg) of disposable stores.

An F-100D Super Sabre strike/attack fighter of the Danish air force.

Photo P. Bigel
D1 075 02.10
Printed in Italy

Air superiority fighter

France

Dassault-Breguet MIRAGE 2000C

Air superiority fighter

Dassault-Breguet MIRAGE 2000C

Descended from a long tradition

After developing the Mirage F1 with its swept wings, Dassault-Breguet reverted to its traditional delta format, as in the Mirage III/5 series, for the Mirage 2000 high-performance fighter. The poor field, low-altitude, and maneuvering performance of the large delta wing in the earlier aircraft was overcome by the use of a design with relaxed stability, a variable-camber wing (produced by two-section leading-edge slats and trailing-edge elevons) and a "fly-by-wire" computerized control system in an airframe that makes extensive use of composite materials. The prototype flew in March 1978, and the type entered service in 1983.

A sophisticated weapon system

The Mirage 2000 has been developed in several variants, but the dedicated air-defense model is the Mirage 2000C with an advanced electronic countermeasures system, a "look-down/shoot-down" radar, and a mix of air-to- air missiles with infra-red or semi-active radar guidance, with an active radar-guided type to follow. The type can also be used in the attack role. Orders for this basic model total some 316 aircraft.

Principal versions

Mirage 2000B (combat-capable two-seat trainer), and Mirage 2000C (baseline air-defense model also produced in a number of differently suffixed subvariants for export).

Principal users

Abu Dhabi, Egypt, France, Greece, Jordan, India, and Peru.

TECHNICAL DATA

Type: Dassault-Breguet Mirage 2000C single-seat multi-role interceptor and air superiority warplane.
Engine: one 21,385-lb (9,700-kg) reheated thrust SNECMA M53-P2 turbofan.
Performance: maximum speed 1,453+ mph (2,338+ km/h) or Mach 2.2+ at 36,090 ft (11,000 m); initial climb rate 56,000 ft (17,060 m) per minute; service ceiling 59,055 ft (18,000 m); range 920 miles (1,480 km).
Weights: empty 16,534 lb (7,500 kg); maximum take-off 37,480 lb (17,000 kg).
Dimensions: span 29 ft 11.5 in (9.13 m); length 47 ft 1.25 in (14.36 m); height 17 ft 0.75 in (5.20 m); wing area 441.3 sq ft (41.00 m^2).
Armament: two 30-mm cannon and up to 13,890 lb (6,300 kg) of disposable stores.

A Mirage 2000C armed with Super 530 and Magic air-to-air missiles.

Photo SIRPA/air
D1 075 02.11
Printed in Italy

Land based helicopter

USA

McDonnell Douglas Helicopters OH-6 CAYUSE

Land based helicopter

McDonnell Douglas Helicopters OH-6 CAYUSE

Light observation helicopter contest

First flown in February 1963, the Hughes Model 369 prototype won the US Army's Light Observation Helicopter contest against Bell and Hiller helicopters, and was ordered into large-scale production. The OH-6 entered service in September 1966. Production was curtailed at 1,434 units out of a planned 4,000, however, when costs rose and production rate fell.

A long military career

The Cayuse proved well suited to the Vietnam War, where it flew armed missions with a multi-barrel machine gun or 40-mm grenade launcher. Some surviving helicopters have been upgraded to OH-6D standard with more advanced electronics and heavier armament. The OH-6 was exported as the Model 500, which can be configured in any of several armed forms. There is also the improved Model 530 now marketed by McDonnell Douglas Helicopters, as Hughes Helicopters became in January 1984.

Principal versions

OH-6A (initial production model), OH-6D (improved version), Model 500 Defender (export version of the OH-6A with better sensor and armament options), Model 530 Defender (variant with refined aerodynamics and more power), and AH-6 (Model 530 version for US Special Forces).

Principal users

Argentina, Bahrain, Bolivia, Brazil, Colombia, Costa Rica, Denmark, Dominican Republic, El Salvador, Finland, Greece, Haiti, Indonesia, Israel, Italy, Japan, Jordan, Kenya, Mauritania, Nicaragua, North Korea, Philippines, South Korea, Spain, Taiwan, and USA.

TECHNICAL DATA

Type: McDonnell Douglas Helicopters (Hughes) OH-6A Cayuse two-seat light observation helicopter.

Engine: one 317-shp (236-kW) Allison T63-A-5A turboshaft derated to 215 shp (160 kW).

Performance: maximum speed 150 mph (241 km/h) at sea level; initial climb rate 1,840 ft (561 m) per minute; service ceiling 15,800 ft (4,815 m); range 413 miles (665 km).

Weights: empty 1,156 lb (524 kg); maximum take-off 2,700 lb (1,225 kg).

Dimensions: main rotor diameter 26 ft 4 in (8.03 m); length overall, rotors turning 30 ft 9.5 in (9.39 m); height 8 ft 1.5 in (2.48 m); main rotor disc area 544.63 sq ft (50.60 m²).

Payload: four passengers or freight.

Clad in three-tone camouflage, this is an OH-6 in Japanese air force service.

Photo B. Thouanel
D1 075 02.12
Printed in Italy

Trainer

France

Aerospatiale EPSILON

Aerospatiale EPSILON

A forced decision
Faced with the problem of increased training costs, the French air force decided at the end of the 1970s to rethink its training program. The result was a decision that pilot candidates would have to prove their basic skills on a low-performance type before proceeding to full training on a more expensive military aircraft. The decision demanded the development of a new piston-engined trainer.

The first-step trainer
The resulting TB.30 Epsilon first flew in December 1979. The test program proceeded smoothly but revealed the need for a number of modifications to improve control and the crew's fields of vision, and these were incorporated in the second prototype. Production was authorized in 1982 and deliveries began in July 1983. Despite being piston engined, the Epsilon has a cockpit layout modelled on that of a fast jet to acclimatize the trainee pilot to the concept of military aircraft, and so ease conversion onto more advanced types. An armed version, with four underwing hardpoints, has been sold to Togo. Aerospatiale is now offering a turboprop-powered model for higher performance: this Omega model flew in prototype form during November 1985.

Principal versions
Epsilon (piston-engined trainer) and Omega (upgraded version under offer with the 450-shp/336-kW Turbomeca TP 319 turboprop derated to 350 shp/261 kW for higher performance).

Principal users
France, Portugal, and Togo.

TECHNICAL DATA

Type: Aerospatiale Epsilon two-seat primary/basic trainer.
Engine: one 300-hp (224-kW) Lycoming AEIO-540-L1B5D flat-six piston engine.
Performance: maximum speed 236 mph (378 km/h) at sea level; initial climb rate 1,850 ft (564 m) per minute; service ceiling 23,000 ft (7,010 m); range 792 miles (1,275 km).
Weights: empty 2.055 lb (932 kg); maximum take-off 2,755 lb (1,250 kg).
Dimensions: span 25 ft 11.75 in (7.92 m); length 24 ft 10.75 in (7.59 m); height 8 ft 8.85 in (2.66 m); wing area 96.9 sq ft (9.00 m²).
Armament: up to 661 lb (300 kg) of disposable stores.

The two-seat Epsilon has taken its place as the French air force's primary and basic trainer, and is expected to remain in service for many years.

Photo Aerospatiale
D1 075 02.13
Printed in Italy

Naval helicopter

France

Aerospatiale SA 321 SUPER FRELON

Naval helicopter

Aerospatiale SA 321 SUPER FRELON

A helicopter of great promise

Designed as an improved version of the SA 3200 Frelon (hornet) with the suport of Sikorsky, which was largely responsible for the rotor system, the SA 3210 Super Frelon first flew in December 1962. Prototypes were produced in land-based troop transport and naval anti-submarine forms, the latter forming the basis of the SA 321G initial production model, which entered service in 1966. Carrying weapons in addition to search radar and sonar, the SA 321Gs are used to patrol the seaward approaches to the French navy's nuclear submarine base at Brest.

Limited production

Only 24 SA 321Gs were built, but the production total was boosted by small-scale production of several other variants, notably the SA 321K assault transport for Israel (12 helicopters) and the SA 321J/L/M transport exported to China, South Africa, and Libya. Total production was 99 helicopters.

Principal versions

SA 321F (airline version for 37 passengers), SA 321G (French navy version able to carry 27 passengers or freight in its alternative transport role), SA 321J (improved civil model able to carry 27 passengers or 11,023 lb/5,000 kg of freight), SA 321K (Israeli assault transport, later re-engined with General Electric T58 turboshafts), SA 321L (development of the SA 321K for other export markets), SA 321M (Libyan version of the SA 321L), and Changhe Zhishengji-8 (Chinese development of the SA 321J with Chinese turboshafts).

Principal users

China, France, Iraq, Israel, Libya, South Africa, and Zaire.

TECHNICAL DATA

Type: Aerospatiale SA 321G Super Frelon five-seat anti-submarine and anti- ship helicopter.
Engines: three 1,570-shp (1,171-kW) Turbomeca Turmo IIIC6 turboshafts.
Performance: maximum speed 154 mph (248 km/h) at sea level; initial climb rate 984 ft (300 m) per minute; service ceiling 10,170 ft (3,100 m); range 506 miles (815 km).
Weights: empty 15,130 lb (6,863 kg); maximum take-off 28,660 lb (13,000 kg).
Dimensions: main rotor diameter 62 ft 0 in (18.90 m); length overall, rotors turning 75 ft 6.75 in (23.03 m); height 22 ft 2 in (6.76 m); main rotor disc area 3,019.94 sq ft (280.55 m^2).
Armament: four homing torpedoes or (in the anti-ship role) two AM.39 Exocet missiles.

This is one of nine SA 321L Super Frelons operated by the Libyan air force.

Photo M. Rostaing
D1 075 02.14
Printed in Italy

Land based helicopter

USA

Italy

Agusta-Bell AB.205

Agusta-Bell AB.205

American ancestry
Built by Agusta under license from Bell, the AB.205 is a direct counterpart of the UH-1H Iroquois (Model 205) military helicopter. This differs from the earlier Model 204 versions of the celebrated "Huey" in having a longer fuselage and larger cabin for the accommodation of a heavier payload carried with the aid of a more powerful engine. In its basic form, the AB.205 is similar to the US Army's UH-1D and UH-1H, but can be configured for specialist roles such as SAR with a door-mounted rescue hoist.

Civil and military service
The AB.205 is equipped for all-weather operation in its military utility role, and can be fitted with protective armor as well as any of several armament kits. In 1969 Agusta started licensed production of the Model 205A-1 civil version as the AB.205A-1 and, like its American counterpart, this is powered by the 1,400-shp (1,044-kW) T5313B civil version of the military turboshaft derated, in this application, to 1,250 shp (932 kW). Production of the AB.205A-1 totalled 290 helicopters.

Principal versions
AB.205 (military version) and AB.205A-1 (civil version).

Principal users
Greece, Iran, Israel, Italy, Morocco, Oman, Saudi Arabia, Singapore, Spain, Tanzania, Tunisia, Turkey, Uganda, United Arab Emirates, Yemen, Zambia, and Zimbabwe.

TECHNICAL DATA

Type: Agusta-Bell AB.205 one-crew utility transport helicopter.
Engine: one 1,400-shp (1,044-kW) Lycoming T53-L-13 turboshaft derated to 1,100 shp (820 kW).
Performance: maximum speed 138 mph (222 km/h) at sea level; initial climb rate 1,680 ft (512 m) per minute; service ceiling 15,010 ft (4,575 m); range 360 miles (580 km).
Weights: empty 4,800 lb (2,177 kg); maximum take-off 9,500 lb (4,309 kg).
Dimensions: main rotor diameter 48 ft 3.25 in (14.71 m); length overall, rotors turning 57 ft 0.75 in (17.39 m); height 14 ft 8.5 in (4.48 m); main rotor disc area 1,829.36 sq ft (169.95 m^2).
Payload: 14 troops, or six litters and one attendant, or freight.

An AB.205 utility helicopter of the Italian army.

Photo M. Rostaing
D1 075 02.15
Printed in Italy

Reconnaissance and observation

Great Britain

British Taylorcraft Auster Mk I to V

British Taylorcraft Auster Mk I to V

A touring plane in military service

In 1936 the Taylorcraft Aviation Company was established in the USA to design and built light planes for civil use. In 1938 the company established its Taylorcraft Aeroplanes (England) Ltd as its British subsidiary. British production was mainly of the Plus C and Plus D models, and in 1939 the Royal Air Force impressed 24 of the 32 aircraft for evaluation as observation and artillery spotter aircraft. The evaluation confirmed the soundness of the concept, and a derivative of the Plus D was ordered into production as the Auster Mk I. This entered service in August 1942.

Eyes for the army

Production during the Second World War covered variants up to the Auster Mk V and totalled 1,663 aircraft. These equipped 19 British as well as several Canadian and Dutch squadrons, and the type served mainly in the Italian and North-West European campaigns.

Principal versions

Auster Mk I (100 aircraft with the 90-hp/67-kW de Havilland Cirrus Minor I engine), Auster Mk II (two aircraft with a 130-hp/97-kW Lycoming engine), Auster Mk III (470 aircraft with the 130-hp/97-kW de Havilland Gipsy Major I engine), Auster Mk IV (254 aircraft based on the Mk II but with a larger cabin for one extra person), and Auster Mk V (804 aircraft, including three floatplanes, based on the Mk IV but with an improved instrument panel for blind and night flying capability).

Principal users

Canada, Great Britain, and the Netherlands.

TECHNICAL DATA

Type: British Taylorcraft Auster Mk IV three-seat air observation post plane.
Engine: one 130-hp (97-kW) Lycoming O-290-3 flat-four piston engine.
Performance: maximum speed 130 mph (209 km/h) at sea level; initial climb rate not revealed; service ceiling not revealed; range 250 miles (402 km).
Weights: empty 1,100 lb (499 kg); maximum take-off 1,850 lb (839 kg).
Dimensions: span 36 ft 0 in (10.97 m); length 22 ft 5 in (6.83 m); height 8 ft 0 in (2.44 m); wing area 167.0 sq ft (15.51 m²).
Armament: none.

A comparatively large number of Austers survive, this being an example of the Auster Mk IV photographed during a 1979 display at Biggin Hill.

Photo M. Hodeir
D1 075 02.16
Printed in Italy

Reconnaissance and observation

Italy

Aeritalia (Fiat) G91R

Aeritalia (Fiat) G91R

A NATO design competition

Aeritalia was created in 1969 by a merger of Fiat's aviation divisions with two smaller companies. One of the new company's inherited tasks was logistic support of the G91R, a light attack and reconnaissance fighter designed by Fiat to meet a 1954 NATO requirement. The first prototype had flown in August 1956, and the G91 light attack model began to enter limited squadron service in February 1959.

From attack to reconnaissance

Later in the year there appeared the definitive G91R version which added a tactical reconnaissance capability through the installation of three cameras in a shortened and revised nose. This model was adopted in differing subvariants by West Germany as well as Italy, and some aircraft were later passed on to Portugal, which left a few examples in Angola when it granted that country full independence.

Principal versions

G91 (initial light attack model), G91R/1 (attack and reconnaissance model), G91R/1A (verdsion with improved navigation system), G91R/1B (strengthened and updated version of the G91R/1A), G91R/3 (West German model with two 30-mm cannon, Doppler navigation and other improvements), G91R/4 (G91R/3 variant with the armament of the G91R/1), G91T/1 (Italian two-seat trainer with two 0.5-in/12.7-mm machine guns), and G91T/2 (West German version of the G91T/1).

Principal users

Angola, Italy, Portugal, and West Germany.

TECHNICAL DATA

Type: Aeritalia (Fiat) G91R/1 single-seat light attack and reconnaissance fighter.
Engine: one 5,000-lb (2,268-kg) thrust Fiat-built Rolls-Royce (Bristol Siddeley) Orpheus Mk 803 turbojet.
Performance: maximum speed 675 mph (1,086 km/h) at 4,920 ft (1,500 m); initial climb rate 6,005 ft (1,830 m) per minute; service ceiling 42,980 ft (13,100 m); radius 199 miles (320 km).
Weights: empty 6,834 lb (3,100 kg); maximum take-off 12,125 lb (5,500 kg).
Dimensions: span 28 ft 1 in (8.56 m); length 33 ft 9.5 in (10.30 m); height 13 ft 1.5 in (4.00 m); wing area 176.75 sq ft (16.42 m^2).
Armament: four 0.5-in (12.7-mm) machine guns and up to 1,500 lb (680 kg) of disposable stores.

A G91R in service with the West German air force, which has now replaced this trim little warplane with the altogether superior Panavia Tornado.

Photo M. Rostaing
D1 075 02.17
Printed in Italy

Interceptor

USSR

Mikoyan-Gurevich MiG-25 "FOXBAT"

Mikoyan-Gurevich MiG-25 "FOXBAT"

A direct response to the B-70

When the USSR learnt that the USA had started work on the North American B-70 Valkyrie as a Mach 3 strategic bomber, it undertook the design of a fighter intended specifically to counter the US high-altitude bomber. The B-70 was cancelled in 1961, but the Soviets pushed ahead with their new fighter, which first flew in April 1965 as the Ye-266 and later set several world records.

Service debut

The MiG-25 "Foxbat-A" entered service in 1970. The new inteceptor was made largely of steel and titanium to withstand the effect of kinetic heating, and sported an old-fashioned but very powerful radar as well as four examples of the largest air-to-air missile yet deployed. Total production was in the order of 600 aircraft in several variants, and the type has seen limited service in the Middle East.

Principal versions

MiG-25 "Foxbat-A" (high-altitude interceptor), MiG-25R "Foxbat-B" (reconnaissance version with cameras and a side-looking airborne radar), MiG- 25U "Foxbat-C" (two-seat trainer), MiG-25R "Foxbat-D" (reconnaissance version with a larger SLAR but no cameras), MiG-25M "Foxbat-E" (conversion of the "Foxbat-A" with a more modern radar/missile combination and more powerful R- 31F engines for better performance at lower altitude in the "look-down/shoot- down" role), and MiG-25 "Foxbat-F" (conversion of older aircraft with AS-11 "Kilter" missiles for the anti-radar role).

Principal users

Algeria, India, Iraq, Libya, Syria, and USSR.

TECHNICAL DATA

Type: Mikoyan-Gurevich MiG-25 "Foxbat-A" single-seat interceptor.
Engines: two 27,010-lb (12,250-kg) reheated thrust Tumanskii R-31 turbojets.
Performance: maximum speed 2,115 mph (3,404 km/h) or Mach 3.2 at 36,090 ft (11,000 m); initial climb rate 41,010 ft (12,500 m) per minute; service ceiling 80,050 ft (24,400 m); radius 702 miles (1,130 km).
Weights: empty 44,092 lb (20,000 kg); maximum take-off 37,425 lb (17,011 kg).
Dimensions: span 45 ft 9 in (13.95 m); length 78 ft 1.75 in (23.82 m); height 20 ft 0.25 in (6.10 m); wing area 611.7 sq ft (56.83 m^2).
Armament: up to four AAMs including AA-6 "Acrid" weapons.

Photographed from a US Navy plane, this Libyan MiG-25 is armed with AA-6 "Acrid" and far smaller AA-8 "Aphid" AAMs.

Photo B. Thouanel from USN
D1 075 02.18
Printed in Italy

Italy

Aeritalia G222

Aeritalia G222

An impractical NATO specification
In 1962 NATO issued a requirement for a tactical transport with STOVL (Short Take-Off and Vertical Landing) capability. This proved impossible for a number of technical reasons, but from Fiat's experience with the project Aeritalia produced the G222 tactical light transport to replace the Italian air force's fleet of aged Fairchild C-119 aircraft. The G222 prototype flew in July 1970, and entered service in 1976.

A capable utility transport
The G222 is a simple yet effective tactical airlifter. The plane is typical of its type, with a large-volume hold accessed by a rear ramp/door arrangement for the straight-in loading of bulky items. The manufacturer had plans for a family of special-purpose variants, but these came to nothing and production was completed in 1989 with the 90th plane. The type's major operator is the Italian air force, though smaller quantities were exported to several countries, of which the single largest operator is Libya with a special version produced to avoid export restrictions on American engines and equipment.

Principal versions
G222 (basic tactical transport), G222RM (navaid calibration model), G222SAA (firefighting model), G222T (version for Libya with European avionics and 4,860-shp/3,624-kW Rolls-Royce Tyne Mk 801 turboprops for improved hot-and-high performance), G222VS (electronic warfare model).

Principal users
Argentina, Italy, Libya, Nigeria, Somalia, United Arab Emirates, and Venezuela.

TECHNICAL DATA

Type: Aeritalia G222 three-crew tactical transport.
Engines: two 3,400-shp (2,535-kW) Fiat-built General Electric T64-GE-P4D turboprops.
Performance: maximum speed 336 mph (540 km/h) at 15,010 ft (4,575 m); initial climb rate 1,706 ft (520 m) per minute; service ceiling 25,000 ft (7,620 m); range 851 miles (1,370 km) with maximum payload.
Weights: empty 32,165 lb (14,590 kg); maximum take-off 61,729 lb (28,000 kg).
Dimensions: span 94 ft 2 in (28.70 m); length 74 ft 5.75 in (22.70 m); height 32 ft 2 in (9.80 m); wing area 882.67 sq ft (82.00 m^2).
Payload: 53 troops, or 40 paratroops, or 19,841 lb (9,000 kg) of freight.

A G222 tactical transport of the Italian air force.

Photo M. Rostaing
D1 075 02.19
Printed in Italy

Electronic warfare

Italy

Piaggio PD-808

Piaggio PD-808

American origins
This attractive type was designed by the Douglas Aircraft Company of Long Beach, California, as a business jet. No orders were received, and the complete project was bought by Piaggio, which flew the first prototype in August 1965. Piaggio also failed to secure any worthwhile commercial intrest, but a few examples were taken by the Italian air force.

An electronic warfare specialist
Only 27 examples of this type, with low-set wings and aft-mounted turbojet engines, were produced, and 25 of these went to the Italian air force. The first aircraft were configured for the utility role (navaid calibration, navigation training for three pupils, and light transport of up to eight passengers or an equivalent freight load), but the last six aircraft were completed as electronic warfare platforms with cabin accommodation for specialist Elint (electronic intelligence) equipment and its three operators.

Principal versions
PD-808TA (utility version) and PD-808ECM (electronic warfare version).

Principal user
Italy

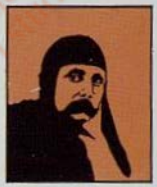
TECHNICAL DATA

Type: Piaggio PD-808ECM five-seat electronic warfare plane.
Engines: two 3,360-lb (1,524-kg) thrust Piaggio-built Rolls-Royce (Bristol Siddeley) Viper Mk 526 turbojets.
Performance: maximum speed 529 mph (851 km/h) at 19,685 ft (6,000 m); initial climb rate 5,415 ft (1,650 m) per minute; service ceiling 44,950 ft (13,700 m); range 1,322 miles (2,128 km).
Weights: empty 10,648 lb (4,830 kg); maximum take-off 18,001 lb (8,165 kg).
Dimensions: span 43 ft 3.75 in (13.20 m); length 42 ft 2 in (12.85 m); height 15 ft 9 in (4.80 m); wing area 224.97 sq ft (20.90 m^2).
Armament: none.

Except for its antennae and other special features, the PD-808ECM is very similar to the PD-808TA utility model.

Photo M. Rostaing
D1 075 02.20
Printed in Italy

Germany



Manfred von RICHTHOFEN

Manfred von RICHTHOFEN

A budding military career

Manfred, Freiherr von Richthofen was born on May 2, 1892 in the city of Breslau. After an education in several schools and military academies, he was commissioned in Uhlan Regiment Nr. 1. Posted to the Eastern Front with this lancer regiment at the First World War's start, the future ace led just a few patrols before being transferred to Alsace on the Western Front. Posted to the infantry, the young Richthofen requested transfer to the flying service, a request granted in May 1915. In the following month Richthofen began his flying career as an observer, and was soon posted to the Eastern Front before returning to the Western Front, this time in Belgium, during August 1915. Richthofen's desire to become a pilot was firmly kindled early in October, when he met the great ace and tactician, Oswald Boelcke.

The making of the "Red Baron"

After some 20 training flights, Richthofen flew solo at the beginning of 1916 and shifted seats to become the pilot of a C-class two-seater during the ghastly Battle of Verdun. Posted again to the Eastern Front, Richthofen was then selected by Boelcke as one of his pilots and returned to the Western Front. Here Richthofen scored his first official "kill" during September 1916, though he had already downed three aircraft whose fates could not be confirmed. Flying aircraft painted largely red, Richthofen went from strength to strength. By January 1917 he had chalked up 16 "kills", including a redoubtable British ace, Major Lanoe G.Hawker VC, and was awarded Germany's premier decoration, the Pour le Merite.

The Richthofen brothers

Two days earlier he had been apppointed commander of Jagdstaffel 11, in which he was soon joined by his younger brother, Lothar. During April 1917 the brothers scored prolifically: Manfred downed 21 aircraft and Lothar another 15. By June 1917 Manfred had achieved 56 "kills" and was the war's leading ace. Wounded in the head, Manfred refused to stop flying, and increased his score further during March and April 1918 at the controls of a Fokker Dr I triplane. With his score on 80, a total unexcelled by any other First World War ace, Manfred von Richthofen was killed on April 21, 1918, by a bullet through the heart while in combat against six British fighters.

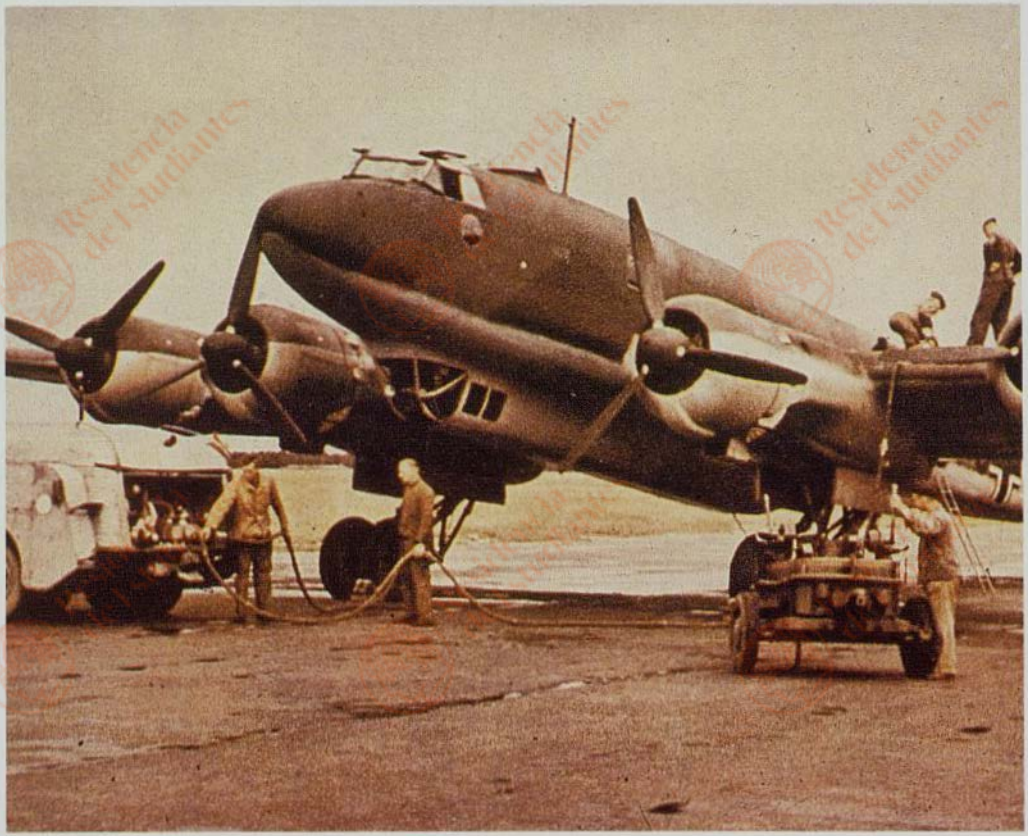
Posing in the cockpit of an Albatros fighter, Manfred von Richthofen is surrounded by other pilots of his greatest command, Jagdgeschwader Nr 1, known to the British and Americans as "The Flying Circus".

Photo: S.H.A.A.
D1 075 03.01
Printed in Italy

Reconnaissance and observation

Germany

Focke-Wulf Fw 200 CONDOR



Focke-Wulf Fw 200 CONDOR

Long range the primary requirement
The Fw 200 Condor flew in July 1937 in the form of the first prototype for a 26-passenger long-range airliner. In 1938 the type confirmed its potential by capturing several world records, and about 10 airliners had been delivered to Brazilian, Danish and German airlines before the outbreak of the Second World War. A few Nazi VIP transports had also been delivered.

Maritime predator
Thereafter, development was concentrated on the Fw 200C maritime version. In this role the Condor's long range was decisive, but there were constant problems with the integrity of the military version's fuselage, which had a tendency to break in heavy landings. Total production was 276 aircraft.

Principal versions
Fw 200A (pre-production airliner), Fw 200B (production airliner with 850- hp/634-kW BMW 132 radials), Fw 200C-0 (pre-production military model), Fw 200C-1 (production type with 3,757-lb/1,750-kg bombload), Fw 200C-2 (improved C-1 with revised nacelles and underwing bomb racks), Fw 200C-3 (first major version with BMW Bramo 323 Fafnir radials and different armament in several subvariants), Fw 200C-4 (definitive production model with search radar), Fw 200C-6 (model with two Henschel Hs 293 anti-ship missiles), and Fw 200C-8 (revised missile-carrier).

Principal users
Brazil, Denmark, and Germany.

TECHNICAL DATA

Type: Focke-Wulf Fw 200C-8 Condor six-seat long-range maritime reconnaissance bomber with missile capability.
Engines: four 1,200-hp (895-kW) BMW Bramo 323R-2 Fafnir radial piston engines.
Performance: maximum speed 224 mph (360 km/h) at 15,750 ft (4,800 m); initial climb rate not revealed; service ceiling 19,030 ft (5,800 m); range 2,175 miles (3,500 km).
Weights: empty 29,367 lb (12,950 kg); maximum take-off 50,044 lb (22,700 kg).
Dimensions: span 109 ft 1 in (33.25 m); length 78 ft 3 in (23.85 m); height 20 ft 4 in (6.20 m); wing area 1,270.2 sq ft (118.00 m²).
Armament: one 20-mm cannon, four 13.1-mm (0.52-in) machine guns, and one 7.92-mm (0.312-in) machine gun in nose, dorsal, beam and ventral positions, and two HS 293A missiles.

Rightly called the "scourge of the Atlantic", the Condor was at times countered by Allied fighters operating from aircraft carriers.

D1 075 03.02
Printed in Italy

Light bomber

France

Voisin TYPE LA (TYPE III)

Voisin TYPE LA (TYPE III)

Pre-war origins
The first Type LA (otherwise Type III) flew with a 120-hp (89.5-kW) Salmson radial engine in February 1914, several months before the start of the First World War. Despite its somewhat fragile appearance, this multi-role warplane was remarkably strong and was an important French asset in the first months of the war.

First aerial "kill" of history
When the First World War began in August 1914, the use of aircraft for military purposes was limited, and the potential of the warplane only dimly perceived. Initial employment was limited to observation, but soon the more enterprising crews took to arming their aircraft. The world's first air-to-air "kill" was scored on October 5, 1914, when one Quenault, the gunner of a Type LA flown by Sergeant Joseph Frantz, downed an Aviatik two-seater with an 8-mm (0.315-in) Hotchkiss machine gun. Production amounted to about 1,000 Type LAs in France, 12 in Italy, 50 in Great Britain, and many in Russia, and the machine was used for observation and bombing up to 1916.

Principal versions
Type LA (original version) and Type LAS (version with airframe modifications and greater power to create the Type V with the 150-hp/112-kW Salmson and the Type VI with the 155-hp/115.5-kW Salmson).

Principal users
France, Great Britain, Italy, and Russia.

TECHNICAL DATA

Type: Voisin Type LA two-seat light bomber and observation plane.
Engine: one 120-hp (89.5-kW) Salmson/Canton-Unne 9M radial piston engine.
Performance: maximum speed 75 mph (120 km/h) at sea level; initial climb rate not revealed; service ceiling 11,485 ft (3,500 m); range 311 miles (500 km).
Weights: empty not revealed; maximum take-off 2,965 lb (1,345 kg).
Dimensions: span 48 ft 4.75 in (14.75 m); length 31 ft 3.25 in (9.53 m); height 11 ft 11 in (3.63 m); wing area not revealed.
Armament: one machine gun and up to 265 lb (120 kg) of bombs.

First used for reconnaissance, observation and artillery spotting, the Type LA was promoted to bomber status because of its sturdy structure. However, from mid-1915 onward aircraft of this type were withdrawn from first-line daylight use as they lacked the performance and agility to deal with newly developed German fighters.

Photo: French Air Museum
D1 075 03.03
Printed in Italy

Fighter

Germany

Albatros D V

Albatros D V

Aerodynamic refinement

Early in 1917 the Allies began to field a new generation of high-performance fighters, and to meet this threat Albatros responded with a drag-reduced development of its current D III fighter featuring a deeper oval-section fuselage, a head rest (often removed as it interfered with the pilot's rearward view), reduction of the gap between the top of the fuselage and the upper wing, revision of the rudder, a different aileron-control system, and a larger spinner that provided a better entry line for the elegantly streamlined fuselage.

Large-scale production

The new D V entered service in May 1917 and was soon joined by the slightly different D Va. Total production figures no longer exist, but more than 1,000 examples of the two similar variants were in service during May 1918 over the Western, Italian and Palestinian fronts. Despite its aerodynamic refinement over the D III, the D V was no real match for the best of Allied fighters, and the major production program can only be construed as an effort to beat quality with quantity. Losses to Allied fighters were heavy, and the type also suffered a heavy accident rate as the lower wing had an alarming tendency to break away in highly stressed maneuvers.

Principal versions

D V (basic version) and D Va (derivative with the upper wing and aileron control system of the D III).

Principal users

Austria-Hungary, Germany, and Turkey.

TECHNICAL DATA

Type: Albatros D V single-seat fighter.
Engine: one 180/200-hp (134/149-kW) Mercedes D.IIa inline piston engine.
Performance: maximum speed 116 mph (186 km/h) at 3,280 ft (1,000 m); climb to 3,280 ft (1,000 m) in 4 minutes 0 seconds; service ceiling 18,700 ft (5,700 m); endurance 2 hours 0 minutes.
Weights: empty 1,515 lb (687 kg); maximum take-off 2,066 lb (937 kg).
Dimensions: span 29 ft 8.25 in (9.05 m); length 24 ft 0.5 in (7.33 m); height 8 ft 10.25 in (2.70 m); wing area 228.2 sq ft (21.20 m^2).
Armament: two 7.92-mm (0.312-in) machine guns.

This is a replica of a D Va in the personal colors of Leutnant (lieutenant) H.J. von Hippel of Jasta 5 (5th Squadron) in the spring of 1918.

Photo: D.R.
D1 075 03.04
Printed in Italy

Fighter

USSR

Polikarpov I-15 CHAIKA

Polikarpov I-15 CHAIKA

Obsolescent yet effective

Developed from the I-5 biplane fighter with more power, cantilever landing gear legs with faired wheels, and the upper wing gulled into the fuselage to provide the pilot with good forward and upward fields of vision, the TsKB-3 prototype flew in October 1933 with an imported 710-hp (529-kW) Wright SGR- 1820-F3 Cyclone radial. The resulting I-15 Chaika (gull) entered service in the following year with the 480-hp (358-kW) M-22 for a maximum speed of 199 mph (320 km/h). These 404 low-performance aircraft were followed by 59 with the SGR-1820, and by 270 with the 710-hp (529-kW) M-25, a Soviet development of the Cyclone.

A dramatic career

The I-15 was robust, maneuverable, and an excellent gun platform. The type performed well on the Republican side in the Spanish Civil War (1936-39), when 287 aircraft were built in Spain, and during border incidents with Japan (1938-39). Further development produced the I-15bis, of which 2,408 were built with a revised upper wing and greater fuel capacity. More than 1,000 aircraft were still in service at the time of the German invasion of the USSR in July 1941, and these obsolete aircraft fought on into early 1942.

Principal versions

I-15 (initial model with gulled upper wing) and I-15bis (revised model with straight upper wing and more powerful engine).

Principal users

China, Finland, Spain, and USSR.

TECHNICAL DATA

Type: Polikarpov I-15bis single-seat fighter.
Engine: one 775-hp (578-kW) M-25V radial piston engine.
Performance: maximum speed 230 mph (370 km/h) at optimum altitude; climb to 3,280 ft (1,000 m) in 1 minute 0 seconds; service ceiling 31,170 ft (9,500 m); range 329 miles (530 km).
Weights: empty 2,910 lb (1,320 kg); maximum take-off 4,189 lb (1,900 kg).
Dimensions: span 33 ft 5.5 in (10.20 m); length 20 ft 6.75 in (6.27 m); height 7 ft 2.25 in (2.19 m); wing area 242.52 sq ft (22.53 m^2).
Armament: four 7.62-mm (0.3-in) machine guns and up to 331 lb (150 kg) of bombs or six 82-mm (3.2-in) rockets.

Powered in its definitive forms by an imported American radial or its Soviet licensed equivalent, the I-15 was built in large numbers and used operationally in the turbulent years between 1936 and 1942.

Photo: D.R.
D1 075 03.05
Printed in Italy

Fighter

USA

Curtiss P-40E WARHAWK

Curtiss P-40E WARHAWK

A promising design
In April 1939 the US Army Air Corps awarded what was at that time the service's largest ever fighter contract, covering 524 examples of the P-40. This was in essence the P-36 revised with an inline engine, and the XP-40 prototype that flew in October 1938 was the first American fighter capable of exceeding 300 mph (483 km/h).

Proved in combat
High hopes were entertained for the P-40 series, which was produced in many forms for the American and export markets. It soon became clear, however, that with the Allison engine the series lacked the altitude performance required of a first-line interceptor, and the P-40 was rapidly relegated to the fighter-bomber role, where its ruggedness and stability made it a real asset to the Allies. The P-40 series was used in nearly every theater, and was later improved with the Merlin (and upgraded Allison) engine.

Principal versions
P-40 and, in British service, Tomahawk Mk I (339 aircraft with the 1,160- hp/865-kW V-1710-19 engine), P-40B and Tomahawk Mk IIA (241 aircraft with heavier armament), P-40C and Tomahawk Mk IIB (1,123 aircraft with a revised fuel system), P-40D and Kittyhawk Mk I (582 aircraft of a P-40C version with 1,150-hp/857-kW V-1710-39, shorter fuselage and shorter landing gear legs), and P-40E and Kittyhawk Mk IA (3,820 aircraft with two additional wing guns).

Principal users
Australia, Canada, China, Egypt, France, Great Britain, the Netherlands, South Africa, Turkey, USA, and USSR.

TECHNICAL DATA

Type: Curtiss P-40E Warhawk single-seat fighter-bomber.
Engine: one 1,150-hp (857-kW) Allison V-1710-39 inline piston engine.
Performance: maximum speed 335 mph (539 km/h) at 5,000 ft (1,525 m); climb to 10,000 ft (3,050 m) in 4 minutes 48 seconds; service ceiling 29,000 ft (8,840 m); range 850 miles (1,368 km).
Weights: empty 6,350 lb (2,880 kg); maximum take-off 9,200 lb (4,173 kg).
Dimensions: span 37 ft 4 in (11.38 m); length 31 ft 2 in (9.50 m); height 10 ft 7 in (3.22 m); wing area 236.0 sq ft (21.92 m^2).
Armament: six 0.5-in (12.7-mm) machine guns and up to 700 lb (318 kg) of bombs.

The shape of the P-40's nose and chin radiator lent itself readily to the shark's mouth insignia much favored by pilots in China and North Africa.

Photo: Robineau
D1 075 03.06
Printed in Italy

Fighter

USA

McDonnell Douglas F-4J PHANTOM II

McDonnell Douglas F-4J PHANTOM II

Replacement for the F-4B

In 1963 the US Navy began looking for a successor to the F-4B, its primary fleet defense and multi-role fighter of the period. The decision inevitably fell on an improved Phantom II variant, the F-4J that began to enter combat over Vietnam during 1967.

Limited but important modifications

The F-4J was based on the F-4B but used a more powerful variant of the J79 turbojet, and featured modifications such as drooping ailerons and a slotted tailplane to shorten the take-off distance and reduce the approach speed. The F-4J also replaced the F-4B's APQ-72 fire-control radar with the more advanced AWG-10 system, and introduced the AJB-7 bombing system for enhanced attack capability. Production of the variant up to 1972 was 522, and two comparable models for Great Britain were 52 F-4Ks and 118 F-4Ms for the Royal Navy and Royal Air Force respectively. These models had different equipment and were powered by Rolls-Royce Spey turbofans.

Principal versions

F-4J (US Navy multi-role fighter), F-4K (export naval interceptor known as the Phantom FG.Mk 1 in British service), and F-4M (export land-based ground- attack and reconnaissance fighter known as the Phantom FGR.Mk 2 in British service).

Principal users

Great Britain and USA.

TECHNICAL DATA

Type: McDonnell Douglas F-4J Phantom II two-seat carrierborne multi-role fighter.
Engines: two 17,900-lb (8,119-kg) reheated thrust General Electric J79-GE-10 turbojets.
Performance: maximum speed 1,485 mph (2,390 km/h) or Mach 2.25 at 40,000 ft (12,190 m); initial climb rate 61,400 ft (18,715 m) per minute; service ceiling 62,250 ft (18,975 m); radius 600 miles (966 km).
Weights: empty 28,000 lb (12,701 kg); maximum take-off 58,000 lb (26,309 kg).
Dimensions: span 38 ft 5 in (11.71 m); length 58 ft 2.5 in (17.74 m); height 16 ft 3 in (4.95 m); wing area 530.0 sq ft (49.239 m^2).
Armament: up to 16,000 lb (7,258 kg) of disposable stores.

After 20 years of service and many updates, the F-4 Phantom II is no longer a first-line warplane with the US regular forces, but is still going strong in many other countries.

Photo: M. Rostaing
D1 075 03.07
Printed in Italy

Fighter

USSR

Yakovlev Yak-23 "FLORA"

Yakovlev Yak-23 "FLORA"

Inspired by wartime experience

The design bureau headed by Aleksandr Yakovlev had begun to consider jet-powered aircraft before the end of the Second World War, but its first true jet fighter was the Yak-23 that flew in June 1947. This type resulted from an October 1946 requirement, and as one of the bureau's first all-metal stressed-skin designs was based on a "stepped" fuselage with the RD-500 engine (in essence a British unit, the Rolls-Royce Derwent V centrifugal-flow turbojet, built in the USSR) located in the forward fuselage and exhausting below the fuselage in line with the cockpit and trailing edges of the unswept wing. This kept the engine installation as short as possible, and so avoided the efficiency losses associated with a long jetpipe.

An early Soviet jet fighter

Production was authorized early in 1948, but was terminated at the 310th example because of the higher combat capability offered by the Mikoyam-Gurevich MiG-15 "Fagot", though it is worth noting that the Yak-23 possessed better climb performance than the MiG-15. After short service with the Soviet air force, the Yak-23 was passed on to Warsaw Pact air arms, where it proved popular.

Principal versions

Yak-23 (basic fighter model) and Yak-23UTI (two-seat conversion trainer whose production is unconfirmed).

Principal users

Czechoslovakia, Poland, Romania, USSR, and possibly other Warsaw Pact countries.

TECHNICAL DATA

Type: Yakovlev Yak-23 single-seat fighter.
Engine: one 3,505-lb (1,590-kg) thrust RD-500 turbojet.
Performance: maximum speed 606 mph (975 km/h) at optimum altitude; initial climb rate 9,252 ft (2,820 m) per minute; service ceiling 48,555 ft (14,800 m); range 746 miles (1,200 km).
Weights: empty 4,409 lb (2,000 kg); maximum take-off 7,460 lb (3,384 kg).
Dimensions: span 28 ft 7.75 in (8.37 m); length 26 ft 7.75 in (8.12 m); height not revealed; wing area 145.32 sq ft (13.50 m^2).
Armament: two 23-mm cannon and up to two 132-lb (60-kg) bombs.

This is one of the last series-built Yak-23s, now on display at the Polish Army Museum in Warsaw.

Photo: M. Hodeir
D1 075 03.08
Printed in Italy

Interceptor

USA

Lockheed F-104 STARFIGHTER

Lockheed F-104 STARFIGHTER

"Cold War" warrior

In 1952 Lockheed began work on a single-seat interceptor capable of besting any Soviet bloc warplane, priority being given to maneuverability and performance in terms of speed and climb rate. What emerged for a first flight in March 1954 was instantly dubbed a "manned missile": the long fuselage was tailored round the J79 engine, and the flying surfaces were small, unswept and very thin.

Dropped by the USAF

Development was difficult, and when the first F-104As entered service in 1958 the US Air Force had already lost interest in the type and took only 296 Starfighters. The type was then saved by the creation of the F-104G multi- role version for production by a multi-national European consortium as well as for Japan. Total Starfighter production was 2,282 units.

Principal versions

F-104A (interceptor), F-104B (two-seat trainer), F-104C (tactical strike), F- 104D (two-seat trainer), F-104G (definitive multi-role warplane with a strengthened structure, more power, and revised electronics), RF-104G (tactical reconnaissance), TF-104G (F-104G trainer), F-104J (F-104G version for Japan), F-104S (improved air defense version developed in Italy), CF-104 (Canadian-built F-104G), and CF-104D (CF-104 two-seat trainer).

Principal users

Belgium, Canada, Denmark, Italy, Japan, Jordan, the Netherlands, Norway, Pakistan, Taiwan, Turkey, USA, and West Germany.

TECHNICAL DATA

Type: Lockheed F-104G Starfighter single-seat multi-role fighter.
Engine: one 15,800-lb (7,167-kg) reheated thrust General Electric J79-GE-11A turbojet.
Performance: maximum speed 1,450 mph (2,333 km/h) or Mach 2.2 at 36,000 ft (10,975 m); initial climb rate 55,000 ft (15,765 m) per minute; service ceiling 58,000 ft (17,680 m); range 1,550 miles (2,495 km).
Weights: empty 14,900 lb (6,758 kg); maximum take-off 28,779 lb (13,054 kg).
Dimensions: span 21 ft 11 in (6.68 m); length 54 ft 9 in (16.69 m); height 13 ft 6 in (4.11 m); wing area 196.1 sq ft (18.22 m^2).
Armament: one 20-mm multi-barrel cannon and up to 4,310 lb (1,955 kg) of disposable stores.

Conceived in the early 1950s, the F-104 was controversial at times but proved its effectiveness during a long service life in several countries.

Photo: M. Rostaing
D1 075 03.09
Printed in Italy

Attack and close support

Great Britain

British Aerospace BUCCANEER

British Aerospace BUCCANEER

Saved at the last minute

In 1957 the British decided that the concept of manned warplanes was obsolete and cancelled most projects already under way. One type that avoided the cut was the Blackburn Buccaneer, which was almost ready for its first flight. This took place in April 1958, and the Buccaneer S.Mk 1 entered Royal Navy service as a carrierborne strike/attack warplane. From 1965 the Mk 1 with de Havilland Gyron Junior turbojets was replaced by the altogether more capable Buccaneer S.Mk 2 with turbofan engines.

A happy surprise

When the Royal Navy's large carriers were phased out of service from the late 1960s, the Buccaneer was passed to a reluctant Royal Air Force. Once the type was in service, however, the RAF found that the transonic Buccaneer was an excellent low-level attack type, and ordered additional aircraft. Total production was 183 aircraft, and the survivors were extensively upgraded in the late 1980s.

Principal versions

Buccaneer S.Mk 1 (turbojet-powered naval version), Buccaneer S.Mk 2 (turbofan-powered model suffixed A or B without or with capability for the Martel air-to-surface missile), and Buccaneer S.Mk 50 (S.Mk 2 derivative for South Africa with rocket boost pack).

Principal users

Great Britain and South Africa.

TECHNICAL DATA

Type: British Aerospace Buccaneer S.Mk 2B two-seat low-level strike and attack plane.
Engines: two 11,100-lb (5,035-kg) thrust Rolls-Royce Spey RB168-1A Mk 101 turbofans.
Performance: maximum speed 645 mph (1,038 km/h) at 200 ft (61 m); initial climb rate 7,000 ft (2,134 m) per minute; service ceiling 40,000+ ft (12,190+ m); radius 1,150 miles (1,851 km).
Weights: empty 30,000 lb (13,608 kg); maximum take-off 62,000 lb (28,123 kg). <C2>Dimensions: span 44 ft 0 in (13.41 m); length 63 ft 5 in (19.33 m); height 16 ft 3 in (4.95 m); wing area 514.7 sq ft (47.82 m²).
Armament: up to 16,000 lb (7,258 kg) of disposable stores carried internally and externally.

From its naval origins as a carrierborne type, the Buccaneer matured into a first-class low-level attack warplane for the RAF.

Photo: P. Buigel
D1 075 03.10
Printed in Italy

Fighter

Great Britain

de Havilland SEA MOSQUITO

de Havilland SEA MOSQUITO

A prestigious family
The Mosquito was developed as a private venture using de Havilland's unique wooden structure (stressed skins of plywood sandwiched round a balsa wood core), and first flew in November 1940. The type displayed excellent performance and versatility, and was developed in parallel light bomber, fighter-bomber, night-fighter, photo-reconnaissance, and trainer variants.

Navalized version
The Royal Navy operated a number of Mosquito FB.Mk VI and T.Mk 3 land-based aircraft in the anti-ship attack and trainer roles, but its most important type was the Sea Mosquito TR.Mk 33 carrierborne torpedo and reconnaissance fighter. This model first flew in November 1945 and entered service in August 1946. The variant was based on the FB.Mk VI with larger propellers, American radar, and naval features such as folding wings and an arrester hook. With the Second World War over, deliveries of this model totalled just 50, though there were also six examples of the related Sea Mosquito TR.Mk 37.

Principal versions
Sea Mosquito TR.Mk 33 (initial model with American ASH surface search radar), Sea Mosquito TR.Mk 37 (derived model with British ASV surface search radar), and Mosquito TT.Mk 39 (naval target-tug model based on the B.Mk XVI bomber).

Principal user
Great Britain.

TECHNICAL DATA

Type: de Havilland Sea Mosquito TR.Mk 33 two-seat carrierborne torpedo and reconnaissance fighter.
Engines: two 1,640-hp (1,223-kW) Rolls-Royce Merlin 25 inline piston engines.
Performance: maximum speed 385 mph (620 km/h) at 13,500 ft (4,115 m); initial climb rate 3,000 ft (914 m) per minute; service ceiling 30,000 ft (9,145 m); range 1,260 miles (2,028 km).
Weights: empty 17,165 lb (7,786 kg); normal take-off 22,500 lb (10,206 kg).
Dimensions: span 54 ft 2 in (16.51 m); length 42 ft 3 in (12.88 m); height 13 ft 6 in (4.11 m); wing area 454.0 sq ft (42.18 m^2).
Armament: four 20-mm cannon and up to 2,000 lb (907 kg) of bombs or one 18-in (457-mm) torpedo.

The Sea Mosquito TR.Mk 33 was distinguishable from its land-based brethren by its thimble radome, folding wings, and arrester hook.

Photo: RAF Museum
D1 075 03.11
Printed in Italy

Trainer

Sweden

Saab 105

Saab 105

A family of aircraft

The Saab 105 was conceived in 1958 as a multi-role type with civil and military applications, but did not fly until June 1963 because of problems in finding an appropriate engine type. The prototype used two 1,642-lb (745-kg) thrust Turbomeca Aubisque turbofans, and such engines were retained for the initial production aircraft for the Swedish air force, which took the type as the Sk 60 in three variants. The type entered service in 1965, and the light attack model can carry a 1,543-lb (700-kg) warload.

Successful development

The Saab 105 is an attractive high-wing monoplane with a T-tail, but failed to win civil orders. However, the 150 aircraft for the Swedish air force were complemented by 40 Saab 105Oe multi-role aircraft for Austria. This latter model was derived from the Saab 105XT prototype, which introduced higher- powered engines of the turbojet variety for better performance with a heavier warload, and first flew in April 1967. A new version has recently been proposed to meet a US Air Force trainer requirement.

Principal versions

Sk 60A (four-seat training and liason version), Sk 60B (two-seat light attack version), Sk 60C (two-seat light attack and reconnaissance version), and Saab 105Oe (upgraded attack version for Austria).

Principal users

Austria and Sweden.

TECHNICAL DATA

Type: Saab 105Oe two-seat light attack plane.
Engines: two 2,850-lb (1,293-kg) thrust General Electric J85-GE-17B turbojets.
Performance: maximum speed 603 mph (970 km/h) at sea level; climb to 32,810 ft (10,000 m) in 4 minutes 30 seconds; service ceiling 42,650 ft (13,000 m); range 513 miles (825 km) with a 3,000-lb (1,361-kg) warload.
Weights: empty 5,534 lb (2,550 kg); maximum take-off 14,330 lb (6,500 kg). <C2>Dimensions: span 31 ft 2 in (9.50 m); length 34 ft 5 in (10.50 m); height 8 ft 10 in (2.70 m); wing area 175.46 sq ft (16.30 m^2).
Armament: up to 4,409 lb (2,000 kg) of disposable stores.

A Saab 105Oe of the Austrian air force, which uses the type in the genuine multi-role fashion for air defense, light attack, reconnaissance, and operational conversion.

Photo: M. Rostaing
D1 075 03.12
Printed in Italy

Land based helicopter

USSR

Mil Mi-24 "HIND"

Land based helicopter

Mil Mi-24 "HIND"

A powerful warplane
Since it entered service in 1974, the Mi-24 has proved itself a formidable helicopter. The type was derived from the Mi-8 with the dynamic system of the Mi-14, but is considerably more agile and has stub wings for the carriage of varied ordnance whose capabilities have been demonstrated in wars as far apart as Cambodia and Angola.

Two development streams
The Mi-24 has been developed in parallel forms as an assault transport with a crew of three and accommodation for an eight-man infantry squad, and as a battlefield helicopter with tandem cockpits for the gunner and pilot, a revised cabin for an armorer and reload missiles, and improved sensors for the delivery of more specialized ordnance.

Principal versions
"Hind-A" (main troop-carrying model), "Hind-B" (pre-production model), "Hind-C" (unarmed "Hind-A" for training), "Hind-D" (gunship helicopter), "Hind-E" (upgraded "Hind-D"), "Hind-F" ("Hind-E" variant with the undernose machine gun replaced by a twin-barrel 30-mm cannon on the fuselage side), "Hind-G" (radiation-sampling version), Mi-25 (export "Hind-D" with inferior electronics), and Mi-35 (improved protective features).

Principal users
Afghanistan, Algeria, Angola, Bulgaria, Cambodia, Cuba, Czechoslovakia, East Germany, Ethiopia, Hungary, India, Iraq, Libya, Mozambique, Nicaragua, North Korea, Peru, Poland, Syria, USSR, Vietnam, and Yemen.

TECHNICAL DATA

Type: Mil Mi-24 "Hind-D" three-seat battlefield helicopter.
Engines: two 2,200-shp (1,640-kW) Isotov TV3-117 turboshafts.
Performance: maximum speed 193 mph (310 km/h) at optimum altitude; initial climb rate 2,460 ft (750 m) per minute; service ceiling 14,765 ft (4,500 m); radius 99 miles (160 km) with maximum warload.
Weights: empty 18,519 lb (8,400 kg); maximum take-off 27,557 lb (12,500 kg).
Dimensions: main rotor diameter 55 ft 9 in (17.00 m); length overall, rotors turning 70 ft 6.5 in (21.50 m); height 21 ft 4 in (6.50 m); main rotor disc area 2,443.3 sq ft (226.98 m^2).
Armament: one 12.7-mm (0.5-in) multi-barrel machine gun and up to 5,732 lb (2,600 kg) of disposable stores.

The "Hind-F" is distinguishable from the otherwise similar "Hind-D" by the twin-barrel cannon faired onto the starboard fuselage side.

Photo: Novosti
D1 075 03.13
Printed in Italy

Seaplane

USA

Grumman HU-16 ALBATROSS

Grumman HU-16 ALBATROSS

Fruit of great experience

Profiting from its wartime experience with the little Goose, Grumman decided in 1944 to begin work on a similarly configured but larger amphibian as the G-64. This first flew in prototype form during October 1947, and offered greater payload than the Goose, while performance was considerably improved by the more powerful engines in combination with an airframe of exemplary aerodynamic cleanliness.

Popular in military service

The type was ordered first by the US Navy, the initial UF-1 being joined later by the UF-2 with a longer-span wing of revised section, larger ailerons and tail surfaces, and a number of system improvements. Similar aircraft were ordered for the US Air Force as the SA-16A and SA-16B, and in 1962 these four models were redesignated HU-16A to HU-16D respectively. The UF-1F (HU-16E) was the US Coast Guard version. The type was used mainly for SAR, though some smaller nations employ the type for coastal patrol. Some ex-military aircraft have entered service as airliners.

Principal versions

UH-16A (short-span navy model), UH-16B (long-span navy model), UH-16C (short- span air force model), UH-16D (long-span air force model), and UH-16F (coast guard model).

Principal users

Argentina, Brazil, Canada, Chile, Indonesia, Italy, Japan, Philippines, Portugal, Spain, Taiwan, and USA.

TECHNICAL DATA

Type: Grumman HU-16D Albatross four/six-crew utility amphibian.
Engines: two 1,425-hp (1,063-kW) Wright R-1820-76 Cyclone radial piston engines.
Performance: maximum speed 236 mph (380 km/h) at optimum altitude; initial climb rate not revealed; service ceiling 21,500 ft (6,555 m); range 2,850 miles (4,587 km).
Weights: empty 22,883 lb (10,380 kg); maximum take-off 35,700 lb (16,193 kg).
Dimensions: span 96 ft 8 in (29.46 m); length 61 ft 3 in (18.67 m); height 25 ft 10 in (7.87 m); wing area 1,035.0 sq ft (96.15 m^2).
Armament: generally none, but the coastal anti-submarine model has provision for depth charges.

An HU-16 Albatross of the Italian air force, which operated the type in the SAR role.

Photo: M. Rostaing
D1 075 03.14
Printed in Italy

Reconnaissance and observation

Great Britain

Avro SHACKLETON

Avro SHACKLETON

Scouting the oceans
To succeed its Lancaster heavy bomber, Avro developed the Type 694 Lincoln, and from this was evolved the Type 696 that first flew in March 1949 as the prototype of a new long-range maritime reconnaissance plane. This entered service in 1951 as the Shackleton MR.Mk 1, which was soon complemented by the Shackleton MR.Mk 1A.

Steady improvements
The radar of the early Shackleton was inadequate, and the Shackleton MR.Mk 2 introduced a new forward fuselage which retained two 20-mm cannon but relegated the radar from a chin radome to a semi-retractable "dustbin" under the fuselage behind the bomb bay. The definitive Shackleton MR.Mk 3 introduced tricycle landing gear, a revised wing and, as a retrofit, extra power from two 2,500-lb (1,134-kg) thrust Rolls-Royce Viper Mk 203 turbojets in underwing nacelles. The last model was the Shackleton AEW.Mk 2 conversion of the MR.Mk 2 for airborne early warning with APS-20 radar in a large "guppy" radome under the forward fuselage. The last seven of these 12 aircraft should be retired in the early 1990s.

Principal versions Shackleton
MR.Mk 1 (two Griffon 57 and two Griffon 57A engines), Shackleton MR.Mk 1A (four Griffon 57A engines), Shackleton MR.Mk 2 (upgraded model), Shackleton MR.Mk 3 (definitive maritime reconnaissance model), and Shackleton AEW.Mk 2 (early warning conversion of MR.Mk 2).

Principal users
Great Britain and South Africa.

TECHNICAL DATA

Type: Avro Shackleton MR.Mk 3 10-seat long-range maritime reconnaissance plane.
Engines: four 2,455-hp (1,831-kW) Rolls-Royce Griffon 57A inline piston engines.
Performance: maximum speed 302 mph (408 km/h) at optimum altitude; initial climb rate not revealed; service ceiling 19,200 ft (5,850 m); range 3,660 miles (5,890 km).
Weights: empty 57,800 lb (26,218 kg); maximum take-off 98,000 lb (44,452 kg).
Dimensions: span 119 ft 10 in (36.52 m); length 92 ft 6 in (28.19 m); height 23 ft 4 in (7.11 m); wing area 1,421.0 sq ft (132.01 m^2).
Armament: two 20-mm cannons and up to 10,000 lb (4,536 kg) of bombs.

The surviving Shackleton AEW.Mk 2s are now operated by No.8 Squadron of the Royal Air Force, which is to replace these ancient machines with Boeing Sentry AEW.Mk 1s from 1991.

Photo: M. Rostaing
D1 075 03.15
Printed in Italy

France

Maurice Farman M.F.11 "SHORTHORN"

Maurice Farman M.F.11 "SHORTHORN"

Family history
The M.F.11 retained the same basic configuration as Maurice Farman's preceeding M.F.7, but introduced a number of refinements and one radical change: the forward elevator that had led the British to give the nickname "Longhorn" to the M.F.7 was abandoned, and the British inevitably dubbed the M.F.11 the "Shorthorn". Another visually notable change was an alteration in the position of the nacelle, which was raised from the upper surface of the lower wing to a point between the upper and lower wings.

A type much in demand
The M.F.11 first flew in 1914 and entered service in 1915 with an assortment of engine types delivering anything between 70 and 130 hp (52 and 97 kW), though the most common units were De Dion or Renault engines; aircraft licence-built in Italy by S.I.A. had Renault or Fiat A.10 engines. In the basic M.F.11 the pilot was seated in front of the observer, but in the M.F.11bis developed by Maurice's brother, Henry Farman, the observer was given a better field of fire for his gun by being seated in front of the pilot. The type was used mainly for observation, but was occasionally and successfully pressed into service as a bomber.

Principal versions
M.F.11 (basic model) and M.F.11bis (revised version with reversed seating).

Principal users
France, Great Britain, Italy, and Russia.

TECHNICAL DATA

Type: Maurice Farman M.F.11 "Shorthorn" two-seat observation plane and light bomber.
Engine: one 70-hp (52-kW) Renault inline piston engine. Performance: maximum speed 62 mph (100 km/h) at sea level; initial climb rate not revealed; service ceiling 12,470 ft (3,800 m); endurance 3 hours 45 minutes.
Weights: empty 1,213 lb (550 kg); maximum take-off 1,874 lb (840 kg).
Dimensions: span 53 ft 0 in (16.15 m); length 31 ft 2 in (9.50 m); height 12 ft 9.5 in (3.90 m); wing area 613.56 sq ft (57.00 m²).
Armament: one 8-mm (0.315-in) machine-gun and (bomber version) 288 lb (131 kg) of bombs.

In French service called the "barge" because of the shape of its central nacelle, the M.F.11 was withdrawn from first-line service during 1916 because of its low speed.

Photo: S.H.A.A.
D1 075 03.16
Printed in Italy

USA

Douglas C-47 SKYTRAIN

Douglas C-47 SKYTRAIN

Airliner turned warhorse

The C-47 was the military development of the epoch-making DC-3 airliner, and appeared after the US forces had gained experience with a number of transports based on the preceeding DC-2. By comparison with the airliner, the C-47 was fitted with more powerful engines, structural strengthening around the large cargo door, a sturdier floor, and strengthened landing gear, while the cabin was extensively revised. Vast production was undertaken in the USA, where the 10,000th of 10,349 aircraft was delivered in May 1945, and in addition to pre-war production in Japan the type was built under licence in the USSR.

An authentic warrior

The C-47 was used in every theater of the Second World War in its basic C-47, naval R4D and British Dakota forms. The type was used, and remained in service, for many years after that time. The type was used for trooping and freighting, and secured immortal fame as the transport and glider-tug used by the Allied airborne forces.

Principal versions

C-47, R4D-1 and Dakota Mk I (initial model), C-47A, R4D-5 and Dakota Mk III (revised electrical system), C-47B, R4D-6 and Dakota Mk IV (high-altitude blowers), Lisunov (2,000+ Soviet-built aircraft), and Nakajima/Showa L2D "Tabby" (485 Japanese aircraft).

Principal users

Australia, Canada, Great Britain, India, Japan, USA, and USSR.

TECHNICAL DATA

Type: Douglas C-47 Skytrain three-crew utility transport.

Engines: two 1,200-hp (895-kW) Pratt & Whitney R-1830-92 radial piston engines.

Performance: maximum speed 229 mph (368 km/h) at 7,500 ft (2,290 m); initial climb rate 1,130 ft (345 m) per minute; service ceiling 23,200 ft (7,075 m); range 1,500 miles (2,401 km).

Weights: empty 16,970 lb (7,705 kg); maximum take-off 26,000 lb (11,805 kg).

Dimensions: span 95 ft 0 in (28.90 m); length 64 ft 5.5 in (19.63 m); height 16 ft 11 in (5.20 m); wing area 987.0 sq ft (91.70 m2).

Payload: 28 troops, or 18 litters, or 10,000 lb (4,536 kg) of freight.

This C-47 sports the black and white wing bands that indicate its involvement in Operation "Overlord", the Allied landings in Normandy on June 6, 1944.

Photo: M. Rostaing
D1 075 03.17
Printed in Italy

France West Germany

Transall C-160

Transall C-160

Fruits of cooperation

In the late 1950s France and West Germany arrived at a joint requirement for a tactical airlifter to replace their Nord 2501 Noratlas and Douglas C-47 piston-engined transports. To meet this requirement a consortium was created by companies that now form parts of the Aerospatiale and MBB aerospace giants. The resulting C-160 (so named for its Cargo role and its wing area in square meters) is typical of its type, with a pressurized hold accessed by a rear ramp/door, and first flew in March 1963.

Production in two series

Production ended in 1972 after the delivery of 179 aircraft including four postal machines for Air France. Production was then relaunched in 1977 to meet a French requirement for additional airlift capability, and 35 new aircraft were delivered from 1981. Apart from six machines used for inter- island migration by Indonesia, these are 25 airlifters (all with flight refueling probes, 10 of them fitted out as refueling tankers and five more with capability for such a modification) and four communications relay aircraft. Proposals for other special-purpose variants have come to nothing.

Principal versions

C-160 (airlifter) and C-160 Astarte (communications relay aircraft)

Principal users

France, Indonesia, South Africa, Turkey, and West Germany.

TECHNICAL DATA

Type: Arbeitsgemeinschaft Transall C-160 three-crew tactical transport.
Engines: two 6,100-ehp (4,549-kW) Rolls-Royce Tyne RTy.20 Mk 22 turboprops.
Performance: maximum speed 319 mph (513 km/h) at 16,000 ft (4,875 m); initial climb rate 1,300 ft (396 m) per minute; service ceiling 27,000 ft (8,230 m); range 1,150 miles (1,853 km) with maximum payload.
Weights: empty 63,935 lb (29,000 kg); maximum take-off 112,435 lb (51,000 kg).
Dimensions: span 131 ft 3 in (40.00 m); length 106 ft 3.5 in (32.40 m); height 38 ft 2.75 in (11.65 m); wing area 1,722.3 sq ft (160.00 m2).
Payload: 93 troops, or 88 paratroops, or 62 litters and four attendants, or 35,273 lb (16,000 kg) of freight.

A C-160 of the second series disgorges paratroops. Palleted freight, weapons, and even light vehicles can be parachuted off the rear ramp.

Photo: SIRPA/air
D1 075 03.18
Printed in Italy

Seaplane

Great Britain

Short SHETLAND

Short SHETLAND

Successor for the Sunderland

When the Sunderland flying boat was well established in production in the spring of 1938, the British Air Ministry started the process of finding a successor. The prototype suggestions from Saunders-Roe and Short Brothers failed to find favor, but in 1941, with the Second World War well under way, the two companies agreed to the official suggestion for a collaborative venture, the S.45 Shetland. Construction of the first of two prototypes was started in 1943, and in December 1944 the plane had it's first flight. By this time the Shetland's role had been altered from maritime reconnaissance to transport, so the planned defensive gun turrets were never installed in the nose, dorsal and tail positions, and no provision was made for the planned 4,000-lb (1,814-kg) bombload.

Destroyed by fire

Trials proceeded only slowly, and the first machine was destroyed by fire during January 1946 while lying at its mooring. The second prototype was completed to Shetland Mk II standard as a civil transport able to accommodate between 30 and 70 passengers according to the level of comfort provided, and this machine flew in September 1947. British Overseas Airways Corporation was not interested in the type, which was then used as a test bed for the Napier Nomad compound engine.

Principal versions

Shetland Mk I (military prototype) and Shetland Mk II (civil propotype).

Principal user

Great Britain.

TECHNICAL DATA

Type: Short Shetland Mk I eight-crew transport flying boat.
Engines: four 2,500-hp (1,864-kW) Bristol Centaurus XI radial piston engines.
Performance: maximum speed 263 mph (423 km/h) at 6,500 ft (1,980 m); initial climb rate not revealed; service ceiling not revealed; range 4,000 miles (6,437 km).
Weights: empty 75,860 lb (34,410 kg); maximum take-off 125,000 lb (56,700 kg).
Dimensions: span 150 ft 4 in (45.82 m); length 110 ft 0 in (33.53 m); height not revealed; wing area 2,400.0 sq ft (222.96 m^2).
Payload: not revealed.

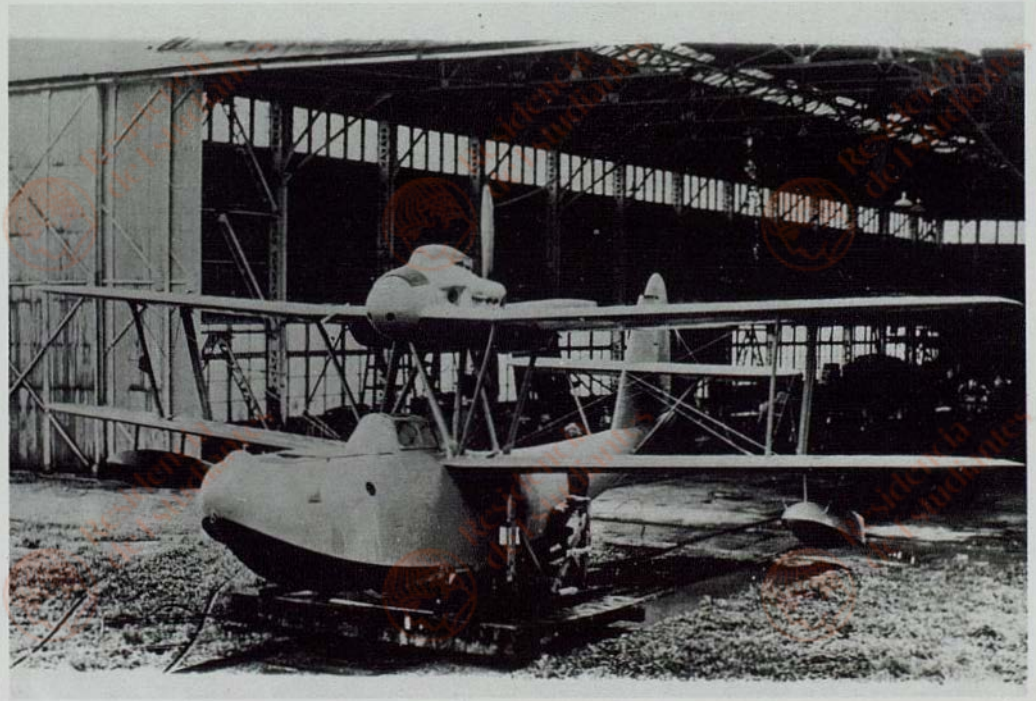
Intended as a replacement for the Sunderland, the Shetland Mk I appeared too late for its role and also suffered a number of development problems such as inadequate longitudinal stability and poor control harmonization.

Photo: RAF Museum
D1 075 03.19
Printed in Italy

Seaplane

Japan

Aichi E11A "LAURA"



Aichi E11A "LAURA"

Competitive selection
The E11A was planned to a 1936 requirement for a successor to the same company's E10A as the nocturnal spotter carried by Japanese battleships and cruisers, and first flew in June 1937. The Aichi prototype was evaluated competitively against the Kawanishi E11K, and ordered into production during April 1938 with the full designation Navy Type 98 Night Reconnaissance Seaplane, and the short designation E11A1 (reconnaissance seaplane, 11th in series, built by Aichi, 1st model).

A short operational career
The E11A1 production model was an attractive flying boat with biplane wings (featuring bracing wires as well as interplane and cabane struts) and a braced tailplane set comparatively high on the vertical tail to keep it clear of spray during take-off and landing. The lower wing was attached to the upper longerons of the two-step hull, which had an enclosed pilot's cockpit, and the engine was located in pusher layout on the center section of the upper wing; in the bow was an open position for the single defensive machine-gun. Including prototypes, production up to 1940 amounted to just 17 aircraft, and these saw limited operational service in the opening rounds of Japan's Pacific campaign in the Second World War.

Principal version
E11A1 (shipborne spotter flying boat).

Principal user
Japan.

TECHNICAL DATA

Type: Aichi E11A1 three-seat shipborne spotter flying boat.
Engine: one 620-hp (462-kW) Hiro Type 91 Model 11 inline piston engine.
Performance: maximum speed 135 mph (217 km/h) at 7,875 ft (2,400 m); climb to 9,845 ft (3,000 m) in 18 minutes 32 seconds; service ceiling 14,520 ft (4,425 m); range 1,209 miles (1,945 km).
Weights: empty 4,248 lb (1,927 kg); maximum take-off 7,275 lb (3,300 kg).
Dimensions: span 47 ft 6.5 in (14.49 m); length 35 ft 1.75 in (10.71 m); height 18 ft 0.5 in (5.50 m); wing area not revealed.
Armament: one 7.7-mm (0.303-in) machine-gun.

Known to the Allies as the "Laura", the E11A1 had only a very short operational career as a short-range night reconnaissance type before being pulled out of first-line service.

Photo: Musee Air
D1 075 03.20
Printed in Italy

CARD DECKS WP SIFTER

D1 075 401

Attack and close support

USA

General Dynamics F-111

General Dynamics F-111

Politically inspired joint program
In November 1962 General Dynamics was awarded a contract to develop the "swing-wing" TFX as a joint air force and navy fighter. Thus began one of the costliest and most controversial aircraft programs on record. The two requirements were too difficult to reconcile, and the overweight F-111B naval model was eventually cancelled.

Capable air force model
The F-111A first flew in December 1964, and entered service in October 1967. Early aircraft were deployed to the Vietnam War in March 1968, but the loss of two out of six machines in five days showed that development was still incomplete. Extensive refinement followed, and the F-111 has since developed into one of the US Air Force's most important tactical warplane series. A notable event was the types use in the 1987 American retaliatory attacks on Libya.

Principal versions
F-111 (159 early aircraft with TF30-P-3 engines), F-111C (24 Australian aircraft combining the F-111A with the wings of the FB-111A strategic bomber model), F-111D (96 aircraft with better electronics and TF30-P-9 engines), F- 111E (94 aircraft with improved engine inlets and an inertial navigation system), and F-111F (94 aircraft of the definitive tactical model with all- round improvement of the airframe and electronics, and considerably upgraded in service with advanced targeting equipment).

Principal users
Australia and USA.

TECHNICAL DATA

Type: General Dynamics F-111F two-seat all-weather strike and attack warplane.
Engines: two 25,100-lb (11,385-kg) reheated thrust Pratt & Whitney TF30-P-100 turbofans.
Performance: maximum speed 1,650 mph (2,655 km/h) or Mach 2.5 at 36,000 ft (10,975 m); initial climb rate not revealed; service ceiling 60,000 ft (18,290 m); range 2,925+ miles (4,707+ km).
Weights: empty 47,481 lb (21,537 kg); maximum take-off 100,000 lb (45,360 kg).
Dimensions: span 63 ft 0 in (19.20 m) spread and 31 ft 11.5 in (9.74 m) swept; length 73 ft 6 in (22.40 m); height 17 ft 1.5 in (5.22 m); wing area 525.0 sq ft (48.77 m^2) spread and 657.3 sq ft (61.07 m^2) swept.
Armament: one 20-mm multi-barrel cannon and up to 31,500 lb (14m288 kg) of disposable stores.

An F-111F is seen on final approach with its wings and flaps extended.

Photo: P. Bigel
D1 075 05-01
Printed in Italy

Attack and close support

Germany Great Britain Italy

Panavia TORNADO IDS

Panavia TORNADO IDS

Successful co-production
In 1969 three-nation airframe and engine consortiums were formed to develop and build the "swing-wing" Multi-Role Combat Aircraft required by the air arms of the countries involved. In 1976 the governments of the interested parties agreed that Panavia would build 809 of these Tornado aircraft, including 697 of the IDS interdictor/strike version with reconnaissance and other capabilities. Production totals have since increased.

A broad European program
The Tornado is a very advanced multi-role warplane using a fly-by-wire control system and an advanced nav/attack system (including terrain-following radar) for penetration and blind first-pass weapon delivery at very high speed at heights down to 200 ft (61 m). The combination of "swing wings" with extensive high-lift devices and thrust-reversible engines also provides the Tornado with STOL capability even on rough airfields. The type first flew in April 1974 and entered service in 1980. Current plans will result in the delivery of more than 725 IDS aircraft, and a mid-life update will soon maintain the type's capability into the next century.

Principal version
Tornado IDS (interdictor/strike and reconnaissance version operated by the RAF as the Tornado GR.Mk 1 combat type and the Tornado GR.Mk 1T combat- capable trainer).

Principal users
Great Britain, Italy, Saudi Arabia, and West Germany.

TECHNICAL DATA

Type: Panavia Tornado IDS two-seat multi-role warplane.
Engines: two 16,800-lb (7,620-kg) reheated thrust Turbo-Union RB199-34R turbofans.
Performance: maximum speed 1,453+ mph (2,337+ km/h) or Mach 2.2+ at 36,000 ft (10,975 m); climb to 30,000 ft (9,145 m) in less than 2 minutes 0 seconds from brake release; service ceiling 49,210+ ft (15,000+ m); radius 863 miles (1,390 km) with heavy warload.
Weights: empty 31,063 lb (14,090 kg); maximum take-off 60,000 lb (27,215 kg).
Dimensions: span 45 ft 7.5 in (13.91 m) spread and 28 ft 2.5 in (8.60 m) swept; length 54 ft 10.25 in (16.72 m); height 18 ft 8.5 in (5.70 m); wing area about 269.0 sq ft (25.0 m^2).
Armament: two 27-mm cannon and up to 19,840 lb (9,000 kg) of disposable stores.

A Panavia Tornado IDS of the Marineflieger, the air arm of the West German navy.

Photo: M. Rostaing
D1 075 05-02
Printed in Italy

Attack and close support

Italy

Aermacchi MB.326K

Aermacchi MB.326K

Trainer origins

First flown in December 1957, the MB.326 two-seat basic and advanced trainer enjoyed considerable success, more than 800 aircraft being sold to many countries. The trainer also revealed itself as an excellent weapon platform, so it is surprising that it was August 1970 before the company flew the first example of its dedicated single-seat attack derivative as the MB.326K with a strengthened airframe, a more powerful engine, and the volume of the erstwhile rear cockpit occupied by mission avionics, additional fuel and the inbuilt cannon armament. The external load can comprise a wide assortment of disposable stores including light air-to-surface and air-to-air missiles.

Slow sales

It was 1974 before Dubai became the MB.326K's first customer, and even then further sales were slow to materialize and small in size. The most important agreement was that with South Africa, which took 22 aircraft and bought a licence to manufacture the type as the Atlas Impala Mk 2 with the Viper Mk 540 engine. Some 53 MB.326Ks were built, and Atlas produced another 70 or more aircraft.

Principal versions

MB.326K (single-seat light attack warplane) and Impala Mk 2 (South African model).

Principal users

Dubai, Ghana, South Africa, Tunisia, and Zaire.

TECHNICAL DATA

Type: Aermacchi MB.326K single-seat light attack warplane.

Engine: one 4,000-lb (1,814-kg) thrust Rolls-Royce Viper Mk 632-43 turbojet.

Performance: maximum speed 553 mph (890 km/h) at 5,000 ft (1,525 m); initial climb rate 6,500 ft (1,980 m) per minute; service ceiling 47,000 ft (14,325 m); radius 167 miles (268 km) with maximum warload.

Weights: empty 6,885 lb (3,123 kg); maximum take-off 13,000 lb (5,895 kg).

Dimensions: span 35 ft 7.25 in (10.85 m); length 35 ft 0 in (10.67 m); height 12 ft 2.5 in (3.72 m); wing area 208.29 sq ft (19.35 m^2).

Armament: two 30-mm cannon and up to 4,000 lb (1,814 kg) of disposable stores.

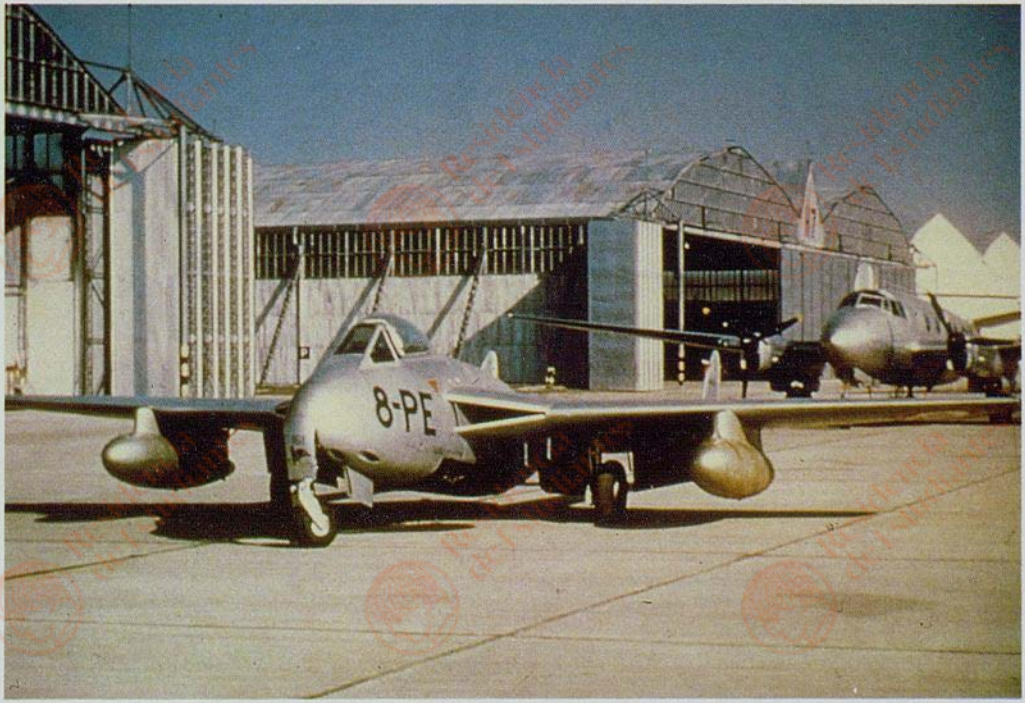
The Tunisian air force operates the MB.326 family in two- and single-seat variants, this formation comprising an MB.326L two-seater (in the foreground) and three MB.326Ks.

Photo: M. Rostaing
D1 075 05-03
Printed in Italy

Fighter

Great Britain France

SNCASE (de Havilland) MISTRAL



SNCASE (de Havilland) MISTRAL

Franco-British cooperation
In 1948 France reached an agreement with Great Britain for an arrangement that would speed the recreation of the French fighter arm after the problems of the Second World War. As part of this accord, France was to build the de Havilland Vampire FB.Mk 5 under licence, starting with assembly of British- supplied kits before moving forward to complete construction. The nationalized group entrusted with the task was the Societe Nationale de Constructions Aeronautiques du Sud-Est, which had been created in 1936 by the amalgamation of Liore et Olivier, Romano, and SPCA. The first French-built plane flew in January 1950.

Modified in France
SNCASE then modified the design to take the Rolls-Royce Nene, built under licence by Hispano-Suiza, in place of the original 3,100-lb (1,406-kg) thrust de Havilland Goblin III, and this produced the Vampire Mk 51. The inlets were inadequate for this engine, and further development produced the considerably more capable Vampire Mk 53, which first flew in April 1951. The type was then produced in France as the Mistral to the extent of 250 aircraft complementing 183 Vampires.

Principal versions
SE 532 Mistral (initial production later retrofitted with an ejector seat) and SE 535 Mistral (ejector seat from the beginning).

Principal user
France

TECHNICAL DATA

Type: SNCASE SE 535 Mistral single-seat fighter and fighter-bomber.
Engines: one 5,000-lb (2,268-kg) thrust Rolls-Royce Nene Mk 104B turbojet.
Performance: maximum speed 575 mph (925 km/h) at sea level; initial climb rate 7,087 ft (2,160 m) per minute; service ceiling 49,210 ft (15,000 m); range not revealed.
Weights: empty 7,672 lb (3,480 kg); maximum take-off 12,654 lb (5,740 kg).
Dimensions: span 38 ft 0 in (11.58 m); length 30 ft 9 in (9.37 m); height 8 ft 10 in (2.69 m); wing area 262.0 sq ft (24.34 m^2).
Armament: four 20-mm cannon and up to 2,000 lb (907 kg) of disposable stores.

Half-brother to the British Vampire, the Mistral was a transitional type in French service pending the arrival of more modern fighters of wholly French design and manufacture.

Photo: S.H.A.A.
D1 075 05-04
Printed in Italy

Fighter

Italy

Macchi MC.205V VELTRO

Macchi MC.205V VELTRO

An Italo-German marriage

From his MC.200 Saetta with an Italian radial engine, Macchi's very gifted chief designer, Mario Castoldi, developed the MC.202 Folgore with a licence built version of a German inline engine, the Daimler-Benz DB 601A. The MC.202 was a good fighter, but would clearly be better still with more power, and as a result the airframe of the MC.202 was married to an imported DB 605A engine to create the MC.205 that first flew in April 1942 and revealed outstanding qualities.

Engine delays

There was considerable delay in setting up Italian production of the DB 605A, and it was not until July 1943 that the great MC.205V Veltro (greyhound) entered service. Only 66 aircraft were operational at the time of Italy's armistice with the Allies in September 1943, and as the type was produced in northern Italy, all later MC.205Vs fought on the Axis side. Total production was 265 aircraft including single examples of the MC.205N-1 Orione high altitude interceptor and the MC.205N-2 with heavier armament. Future development envisaged a larger wing and, in a further improved model, four wing-mounted cannon as the primary armament.

Principal version

MC.205V Veltro (production fighter and fighter-bomber).

Principal users

Germany and Italy.

TECHNICAL DATA

Type: Macchi MC.205V Veltro single-seat fighter and fighter-bomber.

Engine: one 1,475-hp (1,100-hp) Fiat RA.1050 RC.58 Tifone inline piston engine.

Performance: maximum speed 399 mph (642 km/h) at 23,620 ft (7,200 m); climb to 9,845 ft (3,000 m) in 2 minutes 40 seconds; service ceiling 36,090 ft (11,000 m); range 646 miles (1,040 km).

Weights: empty 5,691 lb (2,581 kg); maximum take-off 7,154 lb (3,408 kg).

Dimensions: span 34 ft 8.5 in (10.58 m); length 29 ft 0.5 in (8.85 m); height 9 ft 11.5 in (3.04 m); wing area 180.84 sq ft (16.80 m^2).

Armament: two 12.7-mm (0.5-in) and two 7.7-mm (0.303-in) machine guns, the latter replaced by two 20-mm cannon in later aircraft, and up to 706 lb (320 kg) of bombs.

Seen at the Paris Air Show of 1985, this MC.205V Veltro had been lovingly restored to pristine condition by Aermacchi.

Photo: M. Rostaing
D1 075 05-05
Printed in Italy

Fighter

Great Britain

Hawker HURRICANE Mk I

Hawker HURRICANE Mk I

Vital in British rearmament

The Hurricane was Great Britain's first "modern" fighter of the 1930s, and introduced to British service features such as the low-wing monoplane layout, retractable landing gear, and an armament of eight machine guns in the wings to fire outside the disc swept by the propeller. A less advanced feature was the steel-tube primary structure covered in fabric, but this feature eased construction and facilitated repair. The Hurricane flew in prototype form during November 1935, and soon received large production orders for a service debut in December 1937.

Battle of Britain hero

By the outbreak of the Second World War in September 1939, 497 Hurricane Mk Is had been built as equipment of 18 British squadrons, and some exports had been made. Production continued to accelerate, and despite the more publicized role played by the Supermarine Spitfire in the Battle of Britain, it was the Hurricane that played the more decisive part, concentrating its efforts on the German bombers and downing more aircraft than the rest of the defenses combined. Production eventually totalled 14,232 including large numbers of later models used increasingly for the ground-attack role.

Principal versions

Hurricane Mk I (British production model) and Hurricane Mk X (Canadian production model).

Principal users

Australia, Belgium, Canada, Finland, Great Britain, the Netherlands, New Zealand, South Africa, Turkey, and Yugoslavia.

TECHNICAL DATA

Type: Hawker Hurricane Mk I single-seat fighter.
Engine: one 1,030-hp (768-kW) Rolls-Royce Merlin II inline piston engine.
Performance: maximum speed 308 mph (496 km/h) at 10,000 ft (3,050 m); climb to 10,000 ft (3,050 m) in 4 minutes 15 seconds; service ceiling 33,400 ft (10,180 m); range 525 miles (845 km).
Weights: empty 4,743 lb (2,151 kg); maximum take-off 6,218 lb (2,820 kg).
Dimensions: span 40 ft 0 in (12.19 m); length 31 ft 4.5 in (9.55 m); height 13 ft 4.5 in (4.07 m); wing area 258.0 sq ft (23.97 m^2).
Armament: eight 0.303-in (7.7-mm) machine guns.

The Hurricane is best remembered for its part in the Battle of Britain, but despite a very large production total only a few precious examples remain airworthy.

Photo: P. Guérin
D1 075 05-06
Printed in Italy

Fighter

France

Nieuport-Delage Ni-D.29

Nieuport-Delage Ni-D.29

Disappointing start

First flown in August 1918, during the closing stages of the First World War, the NiD.29 met all its performance requirements except that relating to ceiling. The second prototype introduced larger wings, and found no difficulty in reaching the required height. The Ni-D.29 was of conventional configuration for its period, with a curvaceous but well streamlined fuselage, and was visually notable for its use of two Lamblin water-cooling radiators under ther lower wings just outboard of the attachment points for the landing gear legs.

Quantity production

The Ni-D.29 was ordered into production during 1920 and entered service in 1922. Thereafter the type became the most important European fghter of the 1920s, and was extensively used by France and Spain in Morocco against the Riffian nationalist insurgents. Licence production was undertaken in four countries, and total production was in the order of 1,200 aircraft. There were several special record-breaking variants, and the type was also used as a racer in landplane and seaplane forms, sometimes with a Gnome or Le Rhone rotary engine in place of the fighter's stationary unit.

Principal versions

Ni-D.29 (initial fighter), Ni-D.29E.1 (fighter trainer with 180-hp/134-kW engine and only one machine gun), and Nakajima Ko-4 (Japanese model built to the extent of 608 aircraft).

Principal users

Argentina, Belgium, France, Italy, Japan, Spain, and Sweden.

TECHNICAL DATA

Type: Nieuport-Delage Ni-D.29 single-seat fighter.
Engine: one 300-hp (224-kW) Hispano-Suiza 8Fb inline piston engine.
Performance: maximum speed 146 mph (235 km/h) at sea level; initial climb rate not revealed; service ceiling 27,885 ft (8,500 m); range 360 miles (580 km).
Weights: empty 1,675 lb (760 kg); maximum take-off 2,535 lb (1,150 kg).
Dimensions: span 31 ft 10 in (9.70 m); length 21 ft 3.5 in (6.49 m); height 8 ft 4.75 in (2.56 m); wing area 287.41 sq ft (26.70 m^2).
Armament: two 0.303-in (7.7-mm) machine guns.

The Ni-D.29 was the primary French fighter of the 1920s, and was also operated by other countries including Japan, which used greater numbers than any other single country.

Photo: S.H.A.A.
D1 075 05-07
Printed in Italy

Fighter

Great Britain

Sopwith TRIPLANE

Sopwith TRIPLANE

A new formula

With the Pup biplane fighter established in production and successful service, the Sopwith design team turned its attention to a new fighter offering comparable agility but better performance. Enhanced performance in level flight could be provided simply by the installation of a more powerful engine. but improved climb rate demanded greater wing area. This in itself presented no problems, but the greater span and chord of such wings in a biplane layout would detract from agility. The solution was the use of three rather than two sets of wings, which would provide the necessary area and also improve the pilot's fields of vision because of their narrow chord.

Into dazzling service

The Triplane was based on the fuselage and tail of the Pup, and probably flew for the first time in May 1916, and was clearly a winner offering phenomenal climb rate. The type entered service in 1917, and of the production total of about 140 aircraft all went to the Royal Naval Air Service. The Triplane secured immediate air superiority along the most northern sector of the Western Front, and remained the best fighter in the area until replaced by Sopwith Camel from November 1917. The impact of the Triplane may best be gauged, however, from the rash of German triplane types that appeared in an effort to equal the British fighter.

Principal version

Triplane (production model, early examples being powered by a 110-hp/82 Clerget rotary).

Principal user

UK.

TECHNICAL DATA

Type: Sopwith Triplane single-seat fighter.
Engine: one 130-hp (97-kW) Clerget 9 rotary piston engine.
Performance: maximum speed 117 mph (188 km/h) at 5,000 ft (1,525 m); initial climb rate 1,200 ft (366 m) per minute; service ceiling 20,500 ft (6,250 m); endurance 2 hours 45 minutes.
Weights: empty 1,101 lb (499 kg); maximum take-off 1,541 lb (699 kg).
Dimensions: span 26 ft 6 in (8.08 m); length 18 ft 10 in (5.74 m); height 10 ft 6 in (3.20 m); wing area 231.0 sq ft (21.46 m²).
Armament: one or two 0.303-in (7.7-mm) machine guns.

Relatively few Triplanes were built, but their effect was considerable. A redoubtable exponent was the Canadian, Raymond Collishaw, who downed seven German aircraft and damaged another 17 in May and June 1917 while flying a Triplane.

Photo: D.R.
D1 075 05-08
Printed in Italy

Medium bomber

Germany

Dornier Do 17Z

Dornier Do 17Z

The "flying pencil"
Like other German warplanes of the larger type, the Do 17 was developed from the early 1930s in civil as well as military forms in an effort to deceive potential enemies about the type's true role as well as to provide greater marketing outlets. The Do 17 first flew in 1934, but its fuselage was too cramped for any real commercial potential, and subsequent development was concentrated on the bomber model.

Definitive bomber
After various models had been built and used operationally in the Spanish Civil War (1936-39), Dornier produced the Do 17S with the "beetle eye" glazed nose used on all later Do 17 bombers. The first of these was the Do 17Z, of which some 1,700 were built in 1939 and 1940. The type was the Luftwaffe's most important bomber up to 1941, but was then rapidly downgraded to secondary tasks after suffering heavy losses.

Principal versions
Do 17Z-1 (bomber with 1,102-lb/500-kg bombload), Do 17Z-2 (more powerful engines and greater bombload), Do 17Z-3 (reconnaissance bomber with reduced bombload but two cameras), Do 17Z-4 (dual-control trainer conversion), Do 17Z-5 (long-range maritime reconnaissance conversion), Do 17Z-6 Kauz I (night-fighter conversion of Z-3 with the nosecone of the Junkers Ju 88C-2 and additional gun armament), and Do 17Z-10 Kauz II (improved night-fighter conversion of Z-3 with a revised nose, heavier guns, and an infra-red sensor).

Principal users
Croatia, Finland, and Germany.

TECHNICAL DATA

Type: Dornier Do 17Z-2 four/five-seat medium bomber.
Engines: two 1,000-hp (746-kW) BMW Bramo 323P Fafnir radial piston engines.
Performance: maximum speed 255 mph (410 km/h) at 13,125 ft (4,000 m); initial climb rate not revealed; service ceiling 26,905 ft (8,200 m); range 932 miles (1,500 km).
Weights: empty 11,465 lb (5,200 kg); maximum take-off 18,940 lb (8,590 kg).
Dimensions: span 59 ft 0.5 in (18.00 m); length 51 ft 9.75 in (15.80 m); height 15 ft 1 in (4.60 m); wing area 592.01 sq ft (55.00 m^2).
Armament: between four and eight 7.92-mm (0.3-in) machine guns in windscreen, nose, dorsal, and ventral positions, and up to 2,205 lb (1,000 kg) of bombs.

The Do 17Z was used extensively in the Battle of Britain, but proved very vulnerable to fighter attack.

Photo: D.R.
D1 075 05-09
Printed in Italy

Medium bomber

Germany

Junkers Ju 88A

Medium bomber

Junkers Ju 88A

A classic warplane

The Ju 88 was the most versatile warplane of the Second World War, remaining in production in steadily improved variants for an increasing number of roles. The type was planned as a high-speed bomber and first flew in December 1936.

Large-scale production

The first variant was the Ju 88A bomber, and this was built to the extent of 7,000 or more aircraft (out of a total exceeding 15,000 Ju 88s). The type's Achilles heel remained the massing of the crew in the glazed nose, where they were a concentrated target for fighter attack but had only indifferent defensive firepower.

Principal versions

Ju 88A-1 (bomber with Jumo 211B-1 or G-1 engines and a 3,967-lb/1,800-kg bombload), Ju 88A-3 (trainer conversion), Ju 88A-4 (improved -1 with Jumo 211Fs in early aircraft), Ju 88A-5 (improved -1 with Jumo 211G-1s), Ju 88A-6 (-5 with balloon cable cutters and reduced bombload, later converted for maritime reconnaissance with radar), Ju 88A-7 (trainer conversion), Ju 88A-9, -10 and -11 (tropicalized -1, -5 and -4), Ju 88A-12 (trainer conversion), Ju 88A-13 (low-level ground-attack with 16 forward-firing 7.92-mm/0.312-in machine guns and 1,102-lb/500-kg bombload), Ju 88A-14 (anti-ship conversion), Ju 88A-15 (enlarged bomb bay for 6,614-lb/3,000-kg bombload), Ju 88A-16 (trainer conversion), and Ju 88A-17 (anti-ship with two torpedoes).

Principal users

Finland, France, Germany, Hungary, Italy, and Romania.

TECHNICAL DATA

Type: Junkers Ju 88A-4 four-seat medium bomber.
Engines: two 1,340-hp (999-kW) Junkers Jumo 211J-1/2 inline piston engines.
Performance: maximum speed 280 mph (450 km/h) at 19,685 ft (6,000 m); climb to 17,715 ft (5,400 m) in 23 minutes 0 seconds; service ceiling 26,905 ft (8,200 m); range 1,696 miles (2,730 km).
Weights: empty 21,737 lb (9,860 kg); maximum take-off 30,865 lb (14,000 kg).
Dimensions: span 65 ft 7.5 in (20.00 m); length 47 ft 2.75 in (14.40 m); height 15 ft 11 in (4.85 m); wing area 586.65 sq ft (54.50 m^2).
Armament: one 13-mm (0.51-in) machine gun and four 7.92-mm (0.312-in) machine gun in nose, dorsal and ventral positions, and up to 4,409 lb (2,000 kg) of bombs.

The Ju 88A was without doubt Germany's most important bomber in the Second World War.

Photo: D.R.
D1 075 05-10
Printed in Italy

Light bomber

USA

Douglas AD-4 SKYRAIDER

Light bomber

Douglas AD-4 SKYRAIDER

A long line of developments
The Skyraider was developed to meet a US Navy requirement of 1943 for a single-seat carrierborne warplane able to combine the dive- and torpedo-bombing roles. The resulting XBT2D-1 prototype flew in March 1945, opening the door to a massive and long-sustained development and production program for improved aircraft. The type was later reclassified in the attack category, and the AD-1 entered service in December 1946.

The Korean War and after
The Skyraider played a key part in allied air operations during the Korean War (1950-53), the AD-1 having been joined by the AD-2 (improved engine installion, larger fuel capacity, and greater structural strength) and AD-4 (more power, improved windscreen, and an autopilot). Built between 1951 and 1953, the AD-4 was produced in eight subvariants and in larger numbers than any other Skyraider variant. A large number was later passed on to France, which used the type in its North African war of the early 1960s.

Principal versions
AD-4 (372 aircraft), AD-4N (307 three-seat night attack aircraft), AD-4W (168 three-seat airborne early warning aircraft), AD-4Q (39 two-seat electronic countermeasures aircraft), AD-4L (63 AD-4s winterized for Korean operations), AD-4NA (100 AD-4Ns without night equipment to allow carriage of a heavier warload), AD-4NL (36 AD–4Ns with de-icing equipment and four 20-mm cannon), and AD-4B (165 aircraft and 28 AD-4 conversions for toss bombing).

Principal users
France, Great Britain, and USA.

TECHNICAL DATA

Type: Douglas AD-4B single-seat carrierborne and land-based attack warplane.
Engine: one 2,700-hp (2,013-kW) Wright R-3350-26WA Cyclone radial piston engine.
Performance: maximum speed 320 mph (515 km/h) at 15,000 ft (4,570 m); initial climb rate 2,980 ft (908 m) per minute; service ceiling 23,800 ft (7,255 m); range 900 miles (1,450 km).
Weights: empty 11,783 lb (5,345 kg); maximum take-off 18,669 lb (8,468 kg).
Dimensions: span 50 ft 0.25 in (15.25 m); length 39 ft 3 in (11.96 m); height 15 ft 8.25 in (4.78 m); wing area 400.33 sq ft (37.19 m^2).
Armament: four 20-mm cannon and up to 9,900 lb (4,491 kg) of disposable stores.

This AD-4N started life with the US Navy but ended its career with the French forces serving in Djibouti.

Photo: M. Rostaing
D1 075 05-11
Printed in Italy

Trainer

USA

North American T-6 TEXAN

North American T-6 TEXAN

Success in service and numbers
No other trainer of Western origins has ever come close to the record of the T-6 for longevity and production total: the type entered service in 1936 and is still encountered today, and 21,342 were built. The machine began life as the NA-16 prototype that flew in April 1935, and after a slow start production accelerated rapidly just before and during the Second World War.

War and post-war activities
The type was built in a host of forms and variants with fixed or retractable landing gear as well as two different engine types, and was known by separate designations in the hands of the major operators. A major slice of the construction program was handled in Canada, and after the Second World War many surviving aircraft were rebuilt to T-6G standard.

Principal versions
BT-9 (US Army version in four variants with fixed landing gear and 600- hp/447-kW R-1340 engine), BT-14 (development in two variants with 400-hp/298- kW R-985 engine), BC (army version in four variants with retractable landing gear and R-1340 engine), AT-6 Texan (army version in six variants with retractable landing gear and R-1340 engine), SNJ (US Navy version of AT-6 in six variants), Harvard (British version of AT-6 in four variants), Yale (Canadian version of BT-14 in one variant), and T-6G (post-war updated variant).

Principal users
Australia, Canada, China, France, Great Britain, New Zealand, USA, and later many friendly countries.

TECHNICAL DATA

Type: North American AT-6A Texan two-seat advanced trainer.
Engine: one 600-hp (447-kW) Pratt & Whitney R-1340-49 radial piston engine.
Performance: maximum speed 210 mph (338 km/h) at 5,000 ft (1,525 m); climb to 10,000 ft (3,050 m) in 7 minutes 24 seconds; service ceiling 24,200 ft (7,375 m); range 629 miles (1,012 km).
Weights: empty 3,900 lb (1,769 kg); maximum take-off 5,155 lb (2,338 kg).
Dimensions: span 42 ft 0.25 in (12.81 m); length 29 ft 0 in (8.84 m); height 11 ft 9 in (3.58 m); wing area 253.7 sq ft (23.57 m^2).
Armament: two 0.3-in (7.72-mm) machine guns (one fixed and one trainable).

This 1954 illustration reveals a T-6 used for navigational training by the French air force.

Photo: M. Rostaing
D1 075 05-12
Printed in Italy

Trainer

USA

Boeing (Stearman) Model 75 "KAYDET"

Boeing (Stearman) Model 75 "KAYDET"

Stearman origins
In 1933 the Stearman Aircraft Company began production of the PT-13 based on its earlier PT-9 primary trainer bought in small numbers by the US Army Air Corps. By 1936 substantial orders had been placed for the new trainer, which became universally known as the "Kaydet", and in 1939 Boeing bought Stearman as its Wichita Division.

Multiple variants
When production ended in February 1945, some 10,346 example of the type had been produced in a large number of forms. The type has proved so rugged, moreover, that many ex-military aircraft are still airworthy. These are generally known just as Stearmans, and are used mainly for cropdusting.

Principal versions
PT-13 (army trainer with 215-hp/160-kW Lycoming R-650-5 engine), PT-13A (220- hp/164-kW R-680-7 engine), PT-13B (R-680-11 engine), PT-17 (220-hp/164-kW Continental R-670-5 engine), PT-17A (blind-flying instrumentation), N2S-1 (naval trainer with R-670-14 engine), N2S-2 (R-680-2 engine), N2S-3 (R-670-4 engine), N2S-4 (naval equivalent of PT-17), PT-13D and N2S-5 (identical army and naval models based on the PT-17A with the R-680-17 engine), PT-18 (PT-13A with 225-hp/168-kW Jacobs R-755-7 engine), PT-18A (blind-flying instrumentation), and PT-27 (PT-18 model for Canada).

Principal users
Canada and USA.

TECHNICAL DATA

Type: Boeing N2S-5 two-seat primary trainer.
Engine: one 220-hp (164-kW) Lycoming R-680-17 radial piston engine.
Performance: maximum speed 124 mph (200 km/h) at sea level; climb to 10,000 ft (3,050 m) in 17 minutes 18 seconds; service ceiling 11,200 ft (3,415 m); range 505 miles (813 km).
Weights: empty 1,936 lb (878 kg); maximum take-off 2,717 lb (1,232 kg).
Dimensions: span 32 ft 2 in (9.80 m); length 25 ft 0.25 in (7.63 m); height 9 ft 2 in (2.79 m); wing area 297.0 sq ft (27.59 m^2).
Armament: none.

Produced in its thousands during the Second World War, the "Kaydet" served faithfully in the war and then passed in large numbers to civil life. This is just such a plane, much prized as a working type for its low operating cost, simplicity, and rugged power.

Photo: P. Guérin
D1 075 05-13
Printed in Italy

Land based helicopter

Great Britain

Westland WESSEX

Westland WESSEX

Turboshaft conversion

After its experience with the Whirlwind, in which the Sikorsky S-55 piston- engined helicopter had been revised to turboshaft power, Westland had few qualms in following the same path with the larger S-58, which was revised as the Wessex with a single and coupled twin turboshafts for naval and land based applications respectively. The first such machine flew in June 1958.

Naval and air force models

The first naval model was the Wessex HAS.Mk 1 that entered service in July 1961; the first air force model was the Wessex HC.Mk 2 that entered service in January 1962. The shipborne models were generally configured for anti- submarine warfare with a four-man crew and a central tactical system to convert sensor data into weapon-delivery information. The land based models were generally employed in the transport and medical evacuation roles, and a few examples remain in service to this day.

Principal versions

Wessex HAS.Mk 1 (anti-submarine type with 1,450-shp/1,081-kW Napier Gazelle Mk 161), Wessex HC.Mk 2 (transport with two 1,350-shp/1,007-kW Bristol Siddeley Gnome Mk 110/111), Wessex HAS.Mk 31,600-shp/1,193-kW Gazelle Mk 165), Wessex HC.Mk 4 (VIP transport), Wessex HU.Mk 5 (assault transport), Wessex HAS.Mk 31 (Australian anti-submarine model with 1,575-shp/1,174-kW) Gazelle Mk 162), Wessex Mk 50 series (twin-engined export models), Wessex Mk 60 (civil model).

Principal users

Australia, Bangladesh, Brunei, Ghana, Great Britain, and Iraq.

TECHNICAL DATA

Type: Westland Wessex HU.Mk 2 two-/three-crew tactical transport and assault helicopter.
Engines: two 1,350-shp (1,007-kW) Bristol Siddeley Gnome Mk 110/111 turboshafts.
Performance: maximum speed 132 mph (212 km/h) at sea level; initial climb rate 1,650 ft (503 m) per minute; service ceiling 14,100 ft (4,300 m); range 478 miles (769 km).
Weights: empty 8,657 lb (3,927 kg); maximum take-off 13,500 lb (6,123 kg).
Dimensions: main rotor diameter 56 ft 0 in (17.07 m); length overall, rotors turning 65 ft 9 in (20.04 m); height 16 ft 2 in (4.93 m); main rotor disc area 2,463.0 sq ft (228.81 m^2).
Payload: 16 troops, or seven litters, or 4,000 lb (1,814 kg) of freight.

A Wessex HC.Mk 2 helicopter of the Royal Air Force's No.72 Squadron.

Photo: M. Rostaing
D1 075 05-14
Printed in Italy

Great Britain

de Havilland MOSQUITO (PR)

de Havilland MOSQUITO (PR)

Eyes for the Allies

The Mosquito first flew in November 1940, and had the potential as well as the current performance for development into a number of models specialized for particular roles. One of the most important such roles, though it has still received comparatively inadequate attention, is photographic reconnaissance. The first such Mosquito model was the Mosquito PR.Mk I prototype. From this there was developed the Mosquito PR.Mk IV, of which 32 were produced as B.Mk IV conversions with 1,250-hp (932-kW) Merlin 21s and four cameras. Next came five similar Mosquito PR.Mk VIIIs with more fuel and Merlin 61 engines, whose two-stage superchargers provided better performance at high altitude.

Improved models

The B.Mk IX had Merlin 72 engines, and 90 equivalent aircraft were produced as Mosquito PR.Mk IXs. The definitive variant was the Mosquito PR.Mk XVI, which was based on the B.Mk XVI bomber with a pressurized cabin for optimum crew performance at high altitude; production totalled 432 aircraft. Later models were produced in small numbers.

Principal versions

Mosquito PR.Mk IV (initial model), Mosquito PR.Mk VIII (two-stage superchargers), Mosquito PR.Mk IX (high-altitude model), Mosquito PR.Mk XVI (definitive high-altitude model), Mosquito PR.Mk 32 (five lightened aircraft with extended-span wings and Merlin 113s), Mosquito PR.Mk 34 (50 very long range aircraft), Mosquito PR.Mks 35 and 40 (post-war conversions), and F-8 (US aircraft).

Principal users

Australia, Canada, UK, and USA.

TECHNICAL DATA

Type: de Havilland Mosquito PR.Mk IX two-seat photo-reconnaissance plane.
Engines: two 1,680-hp (1,253-kW) Rolls-Royce Merlin 72 inline piston engines.
Performance: maximum speed 408 mph (656 km/h) at high altitude; initial climb rate 2,850 ft (869 m) per minute; service ceiling 38,000 ft (11,580 m); range 2,450 miles (3,942 km).
Weights: empty 14,569 lb (6,608 kg); maximum take-off 22,000 lb (9,980 kg).
Dimensions: span 52 ft 4 in (16.51 m); length 44 ft 6 in (13.56 m); height 12 ft 6 in (3.81 m); wing area 454.0 sq ft (42.18 m^2).
Armament: none.

This is one of the few Mosquitoes still airworthy, and attracts considerable enthusiasm at air shows.

Photo: M. Hodeir
D1 075 05-15
Printed in Italy

Great Britain

de Havilland D.H.89 Dragon Rapide

de Havilland D.H.89 Dragon Rapide

Elegant transport

The design of the D.H.89 was based on that of the D.H.84 Dragon, and at the time of its first flight in April 1934 was called the Dragon Six as it was powered by two 200-hp (149-kW) de Havilland Gipsy Six engines. The type entered service as the Dragon Rapide light transport, a variant with small flaps on the lower wings being designated D.H.89A. Worldwide sales of nearly 200 aircraft had been completed before the outbreak of the Second World War.

Into uniform

The company produced the D.H.89M militarized version to meet a Brtish requirement for a general reconnaissance plane, but this secured only very small orders from Iran, Lithuania, and Spain. The Dragon Rapide was then chosen for the Royal Air Force in a model known to the manufacturer as the D.H.89B. In service these aircraft became Dominie Mk I radio trainers and Dominie Mk II communications aircraft. Production of the D.H.89 series ended in July 1946 with the delivery of the 728th machine.

Principal versions

D.H.89 (civil transport), D.H.89A (civil transport with flaps), D.H.89M (military model with light armament), and D.H.86B (military model produced in Dominie Mks I and II versions).

Principal users

Australia, Canada, Great Britain, Iran, Lithuania, New Zealand, Spain, and many British imperial possessions.

TECHNICAL DATA

Type: de Havilland D.H.89A Dragon Rapide one/two-crew light transport.
Engines: two 200-hp (149-kW) de Havilland Gipsy Queen 2 inline piston engines.
Performance: maximum speed 157 mph (257 km/h) at 1,000 ft (305 m); initial climb rate 867 ft (264 m) per minute; service ceiling 19,500 ft (5,940 m); range 578 miles (925 km).
Weights: empty 3,276 lb (1,486 kg); maximum take-off 5,500 lb (2,495 kg).
Dimensions: span 48 ft 0 in (14.63 m); length 34 ft 6 in (10.52 m); height 10 ft 3 in (3.12 m); wing area 336.0 sq ft (31.21 m^2).
Payload: nine passengers.

In the Second World War the D.H.89 was used for training and as a light transport, but after the war most of the survivors entered the civil aviation field.

Photo: P. Guérin
D1 075 05-16
Printed in Italy

USSR

Ilyushin Il-76 "CANDID"

Ilyushin Il-76 "CANDID"

Replacement for the An-12

The Il-76 was designed as successor to the turboprop-powered Antonov An-12 in the complementary roles of paratrooping and freighting for the military, and support of the Siberian resources-exploitation industry for the civil authorities. The Il-76 is in many respects comparable with the Lockheed C-141 StarLifter, and first flew in March 1971. Production began in 1975, the year in which the "Candid" set 25 world records.

Heavy duty operator

The Il-76 was designed for operation from short, semi-prepared airstrips with a heavy payload, and therefore features extensive high-lift devices as well as multi-wheel landing gear whose main units avoid intrusion into the cargo volume by retracting into fuselage side blisters. The Il-76 remains in series production, and is still under active development, especially for specialist military roles.

Principal versions

Il-76 "Candid-A" (initial model), Il-76T "Candid-A" (improved model with additional fuel tankage), Il-76TD "Candid-A" (civil transport with more powerful D-30KP-1 engines), Il-76M "Candid-B" (Il-76T version for military service with two 23-mm cannon in a tail turret), Il-76MD "Candid-B" (Il-76TD version for military service with tail turret), Il-76 "Mainstay" (development for airborne early warning with the antenna of the surveillance radar located in a large rotodome above the fuselage), and Il-78 "Midas" (inflight-refueling version of the Il-76 with three hose-and-drogue units).

Principal users

India, Iraq, Libya, Syria, and USSR.

TECHNICAL DATA

Type: Ilyushin Il-76T "Candid-A" seven-crew heavy logistic transport.
Engines: four 26,455-lb (12,000-kg) thrust Soloviev D-30KP turbofans.
Performance: maximum speed 528 mph (850 km/h) at optimum altitude; initial climb rate not revealed; service ceiling 50,850 ft (15,000 m); range 3,107 miles (5,000 km) with maximum payload.
Weights: empty not revealed; maximum take-off 374,785 lb (170,000 kg).
Dimensions: span 165 ft 8 in (50.50 m); length 152 ft 10.25 in (46.59 m); height 48 ft 5 in (14.76 m); wing area 3,229.2 sq ft (300.00 m2).
Payload: 88,183 lb (40,000 kg) of freight or 180 passengers.

The Il-76 is used by several of the USSR's client states including Libya. This is one of that country's five "Candids".

Photo: M. Rostaing
D1 075 05-17
Printed in Italy

USA

Douglas C-118 LIFTMASTER

Douglas C-118 LIFTMASTER

A pressurized transport

The origins of this type lie with a US Army requirement for a C-54 Skymaster successor providing the advantages of greater payload, higher performance and, very importantly, full pressurization so that the plane could climb above adverse weather. The new transport first flew in February 1946 as the XC-112A, but the US Army Air Forces had lost interest with the end of the Second World War. The type therefore became the civil DC-6 airliner, soon developed into improved DC-6A and DC-6B models. With the Lockheed Constellation series, these civil models were largely instrumental in developing long-range air transport.

Military service

In 1947 the USAAF bought a single DC-6 as the C-118 presidential transport, which was named The Independence after President Harry S Truman's home town in Missouri. This plane paved the way for larger military orders. The USAAF had become the USAF by this time, and ordered 101 examples of the DC-6A as a personnel and logistic transport under the designation C-118A. The US Navy had already ordered 65 similar aircraft for logistic transport with the designation R6D-1. When the current tri-service designation system was introduced in 1962, the designation C-118B was allocated to the remaining navy aircraft; the R6D-1Z VIP and staff transport subvariant became the VC- 118B.

Principal versions

C-118 (presidential transport), C-118A (USAF transport), and R6D-1 (US Navy transport).

Principal user

USA.

TECHNICAL DATA

Type: Douglas C-118A Liftmaster three/five-crew heavy transport.
Engines: four 2,500-hp (1,864-kW) Pratt & Whitney R-2800-52W radial piston engines.
Performance: maximum speed 315 mph (507 km/h) at optimum altituide; initial climb rate 1,010 ft (307 m) per minute; service ceiling not revealed; range 4,720 miles (7,595 km).
Weights: empty 49,767 lb (22,574 kg); maximum take-off 107,000 lb (48,534 kg).
Dimensions: span 117 ft 6 in (35.81 m); length 105 ft 7 in (32.18 m); height 28 ft 8 in (8.74 m); wing area 1,463.0 sq ft (135.92 m²).
Payload: 74 passengers, or 60 litters plus attendants, or 27,000 lb (12,247 kg) of freight.

The DC-6 was used by many air forces, and this is a Belgian machine.

Photo: M. Rostaing
D1 075 05-18
Printed in Italy

Canada

de Havilland Canada DHC-6 TWIN OTTER

de Havilland Canada DHC-6 TWIN OTTER

Another success for Canadian aviation

Design of the DHC-6 was begun in 1964, the company's intention being the creation of a 13/18-seat utility transport offering the same type of STOL take-off performance as the DHC-3 Otter but with considerably higher performance and safety through the use of two PT6A turboprop engines. Like its predecessor, the Twin Otter was intended for use on interchangeable wheel, ski, and float landing gear. The first Twin Otter flew in May 1965 with 579-ehp (432-kW) PT6A-6 engines.

Into production

The Twin Otter Series 100 was the first production variant, and introduced similarly rated PT6A-20 engines. The Twin Otter Series 200 differed in having a lengthened nose for additional baggage volume, and was certificated for operation at higher weights. The last version was the Twin Otter Series 300 with more powerful engines and still higher take-off weight. There was also the Twin Otter Series 30M military version available in maritime recoinnaissance, counter-insurgency, and transport variants, but only the last received an order. Production ended in 1988 with the delivery of the 844th plane.

Principal versions

Twin Otter Series 100 (115 aircraft), Twin Otter Series 200 (115 aircraft with greater take-off weight), Twin Otter Series 300 (definitive production model), Twin Otter Series 300M (military version of the Series 300), and Twin Otter Series 300S (six aircraft for city-to-city operations).

Principal users

More than 80 countries operate the Twin Otter, those with substantial fleets including Argentina, Canada, Chile, France Norway, Peru, and USA.

TECHNICAL DATA

Type: de Havilland Canada Twin Otter Series 300 one/two-crew STOL utility transport.
Engines: two 652-ehp (486-kW) Pratt & Whitney Canada Pt6A-27 turboprops.
Performance: maximum speed 210 mph (338 km/h) at 10,000 ft (3,050 m); initial climb rate 1,600 ft (488 m) per minute; service ceiling 26,700 ft (8,140 m); range 115 miles (185 km)with maximum payload.
Weights: empty 7,415 lb (3,363 kg); maximum take-off 12,500 lb (5,670 kg).
Dimensions: span 65 ft 0 in (19.81 m); length 51 ft 9 in (15.77 m); height 19 ft 6 in (5.94 m); wing area 420.0 sq ft (39.02 m2).
Payload: 20 passengers or 4,280 lb (1,941 kg) of freight.

This is a Twin Otter of the French air force at take-off.

Photo: M. Rostaing
D1 075 05-19
Printed in Italy

France

Pierre Le Gloan

Pierre Le Gloan

Straight shooting

Pierre Le Gloan was a major French ace of the Second World War, and at the time of his death in September 1943 had amassed a total of 21 "kills" in air-to-air combat. In June 1940 he achieved the rare feat of downing five enemy aircraft in the course of a single combat engagement. That exploit, at the time he was still an adjutant (warrant officer) pilot, brought him instant fame, a commission in the French air force, and a congratulatory visit from the French "ace of aces" of the first World War, Rene Fonck.

More effective fighter

In June 1940 Le Gloan's squadron, 5 Escadrille of Groupe de Chasse III/6 (based at Le Luc in the Zone d'Operations Aeriennes des Alpes, or Alps air operations zone), completed its conversion from the obsolescent Morane-Saulnier M.S.406 to the thoroughly modern Dewoitine D.520, a low-wing monoplane of considerable agility, useful firepower, and performance comparable with that of the Hawker Hurricane. Despite its obsolescence, Le Gloan has scored four confirmed "kills" in the M.S.406, together with one probable. And on June 13 he opened his acount on the D.520 by shooting down two Fiat BR.20 bombers.

Five-victory day

On June 15, Le Luc airfield received information that an Italian attack force was heading for St Tropez on the French Riviera coast. Le Gloan was one of three pilots sent up to intercept the raid, flown by a 12 Fiat CR.42 Falco fighters of the 18 and 23 Gruppi of the 3 Stormo. One of the French pilots was forced to turn back with mechanical problems, and the two left for the inteception were Le Gloan and Capitaine Assolant. Each destroyed a CR.42 in his first attack, and Le Gloan then swept back to down another two fighters. At this point the two Frenchmen were recalled to base, where another attack by CR.42s had already destroyed two D.520 fighters on the ground. Le Gloan intercepted this formation and shot down one more CR.42 before finding and shooting down a BR.20 that was photographing the effects of the raid from 11,480 ft (3,500 m). For this exceptional performance, Le Gloan was promoted to second lieutenant.

Seen second from the left, this is Pierre Le Gloan in front of his Dewoitine D.520 fighter.

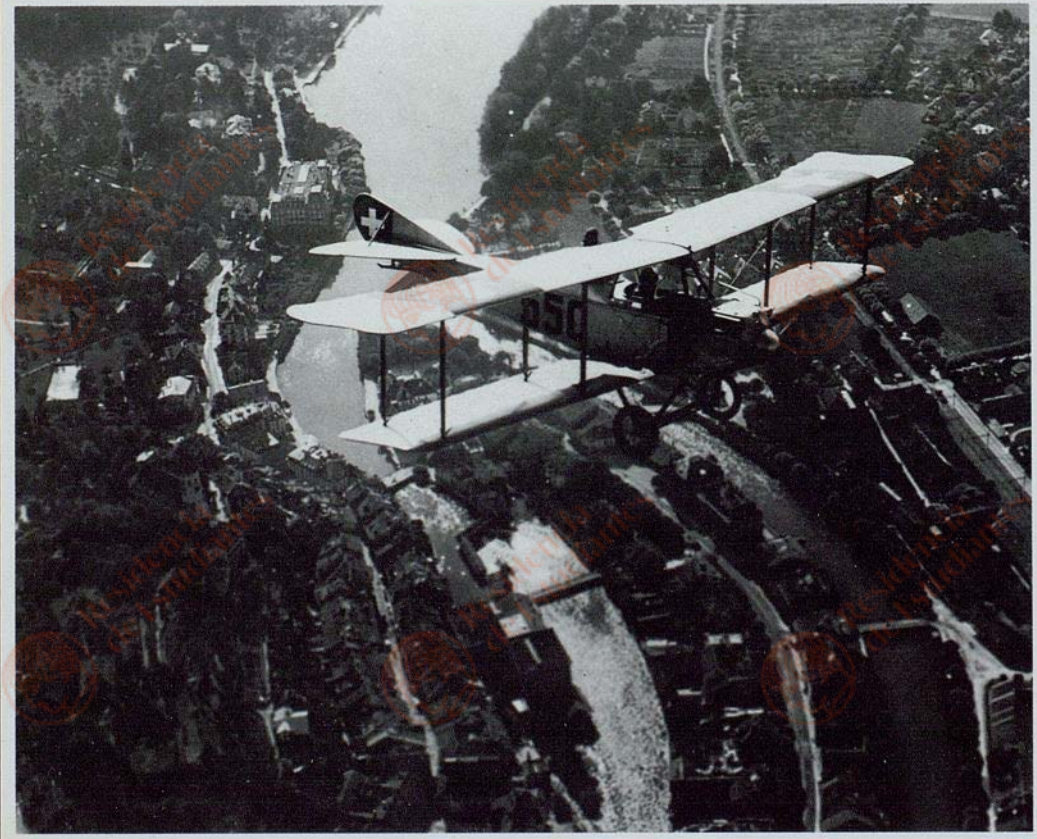
Photo: S.H.A.A.
D1 075 05-20
Printed in Italy

CARD DECKS WP

D1 075 05

Switzerland

Häfeli DH-3



Häfeli DH-3

Careful preparation
In 1915, the Swiss company Eidgenosisches Konstructions Werkstatte (K+W) established an aviation department at Thun. It was headed by August Häfeli, who had gained considerable experience in aeronautical design and construction in France and Germany. In 1916, Häfeli designed the DH-2 as a two-seat reconnaissance plane with the 120-hp (89-kW) Argus As.II inline engine. The type's performance was disappointing, no production order was placed, and the six development aircraft were used as pilot and observer trainers up to 1922.

Improved model
In 1917, the Swiss air arm ordered 30 examples of the DH-3, which was basically similar to the DH-2 apart from a large cut-out in the center section of the upper wing to improve the gunner's fields of fire. There were problems with the landing gear and engine cooling, and finally just 24 aircraft were built. These remained operational up to 1923, when they were withdrawn because of structural problems. The main production variant was the more powerful DH-3a, which was modestly updated to remain in service up to 1939.

Principal versions
DH-2 (initial model). DH-3 (improved model), DH-3a (89 aircraft produced in three distinct batches with greater power and, as a retrofit on 56 aircraft from 1930, Handley Page leading-edge slats and provision for the crew to wear parachutes). and DH-3b (three aircraft used for engine trials).

Principal user
Switzerland.

TECHNICAL DATA

Type: Häfeli DH-3a two-seat reconnaissance plane.
Engine: one 150-hp (112-kW) Hispano-Suiza HS 41 8Aa inline piston engine.
Performance: maximum speed 90 mph (145 km/h) at sea level; initial climb rate not revealed; service ceiling 14,765 ft (4,500 m); range 249 miles (400 km).
Weights: empty 1,587 lb (720 kg); maximum take-off 2,447 lb (1,110 kg).
Dimensions: span 41 ft 0 in (12.50 m); length 26 ft 1 in (7.95 m); height 10 ft 2 in (3.10 m); wing area 409.04 sq ft (38.00 m^2).
Armament: one machine gun.

Though of wholly Swiss design and manufacture, the DH-3 was reminiscent of the reconnaissance machines produced by Albatros, LVG, and Rumpler in Germany. The DH-3 was produced as a reconnaissance type, but its most important task was operational training.

Photo: S.H.A.A.
D1 075 13.09
Printed in Italy

Trainer

Great Britain

Hawker HUNTER T.Mk 7

Hawker HUNTER T.Mk 7

An illustrious reputation to maintain

In common with many other Royal Air Force fighters, the Hunter was adapted as a dual-control trainer but only after the single-seat model was in service. Design was started in 1953, and in the following year the P.1101 project was submitted to meet an official requirement. The Hunter T.Mk 7 first flew in July 1955 with side-by-side seating in a forward fuselage lengthened by 3 ft (0.91 m) and the Avon Mk 113 engine of the Hunter F.Mk 4. A second prototype was based on the Hunter F.Mk 6 with the more powerful Avon Mk 203, but the first machine formed the basis of the production variant.

A trainer worthy of confidence

The Hunter T.Mk 7 proved an admirable advanced trainer, and the RAF received 73 of the type (45 new and 28 conversions). The Royal Navy's Fleet Air Arm received an equivalent version as the Hunter T.Mk 8. Of 41 aircraft delivered 31 were new and 10 conversions. Some of the naval aircraft were later modified to T.Mk 8B and C standard with different avionics, and as T.Mk 8M trainers with Blue Fox radar for the instruction of BAe Sea Harrier pilots. The type was also built for export.

Principal versions

Hunter T.Mk 7 (RAF trainer), Hunter T.Mk 8 (Royal Navy trainer), Hunter T.Mk 66 (39 aircraft for India with the Avon Mk 203 engine), and various other marks in the T.Mk 50, T.Mk 60 and T.Mk 70 series for other customers.

Principal users

Abu Dhabi, Chile, Denmark, Great Britain, India, Jordan, Lebanon, Oman, Qatar, Singapore, Switzerland, UK, and Zimbabwe.

TECHNICAL DATA

Type: Hawker Hunter T.Mk 7 two-seat advanced flying trainer.
Engine: one 7,575-lb (3,436-kg) thrust Rolls-Royce Avon Mk 122 turbojet.
Performance: maximum speed 660 mph (1,062 km/h) at 20,000 ft (6,095 m); initial climb rate 10,500 ft (3,200 m) per minute; service ceiling 51,000 ft (15,545 m); range 572 miles (920 km).
Weights: empty 13,450 lb (6,101 kg); maximum take-off 17,500 lb (7,938 kg).
Dimensions: span 33 ft 8 in (10.26 m); length 48 ft 10.6 in (14.90 m); height 13 ft 2 in (4.01 m); wing area 349.0 sq ft (32.42 m^2).
Armament: one or two 30-mm cannon.

As a relatively simple adaptation of a classic fighter, the Hunter T.Mk 7 retains the performance and handling characteristics of its half-brother.

Photo: coll. Bigel
D1 075 13.10
Printed in Italy

Fighter

France

Dewoitine D.371

Dewoitine D.371

An improved parasol from Dewoitine

Developed at the same time as the D.500 low-wing monoplane fighter with fixed landing gear, the D.37 flew in August 1932 as the final development of Dewoitine's parasol-winged fighter series. The all-metal D.37 was powered by a 700-hp (522-kW) Gnome-Rhône 14Kds radial, and though not perfect showed sufficient promise for an improved D.371 to be evolved. This flew in September 1934 with an 800-hp (597-kW) version of the same engine.

Combat service

In the spring of 1935 the French air force ordered 28 D.371s with close-cowled engines. An order for 14 examples of the D.372 export model was placed by Lithuania, but that country finally took D.500 series fighters and the D.372s (as well as 10 D.371s) passed to Spain. Here they were used with some success by the Republican air force in the opening phases of the Spanish Civil War, and the survivors were then relegated to secondary air defense tasks. In November 1934, the French navy ordered 40 examples of the navalized D.373 variant with a flapped wing and arrester hook for use on the carrier ***Bearn.*** Some of these aircraft were delivered as D.376 fighters with folding wings, and few of the naval aircraft were still in service at the beginning of the Second World War.

Principal versions

D.371 (initial model), D.372 (export model), D.373 (fixed-wing naval model), and D.376 (folding-wing naval model).

Principal users

France and Spain.

TECHNICAL DATA

Type: Dewoitine D.371 single-seat fighter.
Engine: one 930-hp (694-kW) Gnome-Rhône 14Kfs radial piston engine.
Performance: maximum speed 252 mph (405 km/h) at 14,435 ft (4,400 m); climb to 14,765 ft (4,500 m) in 5 minutes 12 seconds; service ceiling 36,090 ft (11,000 m); range 559 miles (900 km).
Weights: empty 2,855 lb (1,295 kg); maximum take-off 4,100 lb (1,860 kg).
Dimensions: span 38 ft 8.5 in (11.80 m); length 24 ft 4.75 in (7.44 m); height 11 ft 1.75 in (3.40 m); wing area 191.6 sq ft (17.80 m^2).
Armament: two 0.303-in (7.7-mm) and two 0.295-in (7.5-mm) machine guns.

The D.371 was a transitional type between the eras of the biplane and low-wing monoplane fighters, and was notable for its complex arrangement of landing gear and wing bracing struts.

Photo: S.H.A.A.
D1 075 13.11
Printed in Italy

Trainer

USA

Ryan PT-22 RECRUIT

Ryan PT-22 RECRUIT

Rebirth of a company

Despite the fame brought to it by the NYP in which Charles Lindbergh achieved the first solo crossing of the Atlantic, in 1927 Claude Ryan decided to concentrate his efforts on flying training rather than aircraft manufacture. In 1933, however, Ryan decided that the time was ripe for a re-emergence into the field of aircraft production. The first product of the new Ryan Aeronautical Company was the Sport-Trainer, a braced low-wing monoplane with fixed landing gear. This was produced in a number of S-T and ST forms for the home and export markets.

US military interest

After evaluating an S-T-A as the XPT-16, the US Army Air Corps took comparatively small numbers of the YPT-16 and PT-20 before ordering 100 examples of the PT-21 with the 132-hp (98-kW) Kinner R-440-3 radial. This combination proved so successful that 14 out of 15 YPT-16s and 27 of the 30 PT-20s were re-engined to the same standard as PT-16As and PT-20As respectively. The definitive version was the PT-22 Recruit, of which 1,023 were ordered without the previously standard landing gear fairings and wheel spats. The US Navy also took 100 with the designation NR-1 Recruit, and 25 similar aircraft ordered as ST-3s by the Netherlands were taken into US service with the designation PT-22A.

Principal versions

YPT-16 (pre-production model), PT-20 (improved YPT-16), PT-20 (first production model), PT-22 Recruit (definitive model), PT-22A (ex-Dutch aircraft), and NR-1 Recruit (naval version).

Principal user

USA.

TECHNICAL DATA

Type: Ryan PT-22 Recruit two-seat primary trainer.
Engine: one 160-hp (119-kW) Kinner R-540-1 radial piston engine.
Performance: maximum speed 131 mph (211 km/h) at sea level; initial climb rate 850 ft (259 m) per minute; service ceiling 15,500 ft (4,725 m); range 352 miles (566 km).
Weights: empty 1,313 lb (596 kg); maximum take-off 1,860 lb (844 kg).
Dimensions: span 30 ft 1 in (9.17 m); length 22 ft 5 in (6.83 m); height 6 ft 10 in (2.08 m); wing area 134.25 sq ft (12.47 m^2).
Armament: none.

The PT-22 remained in US Army Air Force service as a primary trainer up to 1945, and large numbers of ex-military aircraft were then released onto the civil market.

Photo: P. Makanna
D1 075 13.12
Printed in Italy

Trainer

Belgium

Stampe et Vertongen SV.4

Stampe et Vertongen SV.4

A career interrupted by war
Established in 1922, this Belgian company's most celebrated product is the SV.4 of 1933, essentially an improved version of the RSV.3 designed by Alfred Renard shortly before his departure from the company. The type was developed as a trainer and light sport/touring plane, and bore more than a passing resemblance to the de Havilland Tiger Moth in the design of its forward fuselage, landing gear, and slightly swept-back wings. In prototype form the type was powered by the 120-hp (89-kW) de Havilland Gipsy III inline engine. Production before the Second World War totalled only some 35 aircraft, though as a result of a large Belgian air force requirement of 1939 orders exceeded 600, and in the war the company's Deurne factory was destroyed.

Post-war success
After the war Stampe merged with SA Avions et Moteurs Renard, and the revived company resumed production of the SV.4 to meet a Belgian order for 65 aircraft. Licenses were also signed for SCAN to built 700 examples, including 200 military trainers, in France and for the Atelier Industriel de l'Aeronautique d'Alger to produced some 240 machines in Algeria.

Principal versions
SV.4 (initial model), SV.4A (aerobatic model with the 140-hp/104-kW Renault 4-P05 engine), SV.4B (redesigned wings and different engine), and SV.4C (post-war model with the 140-hp/104-kW Renault 4-Pei engine).

Principal users
Belgium, France, and Germany.

TECHNICAL DATA

Type: Stampe et Vertongen SV.4B two-seat training and sport plane.
Engine: one 130-hp (97-kW) de Havilland Gipsy Major I inline piston engine.
Performance: maximum speed 124 mph (200 km/h) at sea level; climb to 3,280 ft (1,000 m) in 4 minutes 0 seconds; service ceiling 18,045 ft (5,500 m); range 249 miles (400 km).
Weights: empty 1,058 lb (480 kg); maximum take-off 1,720 lb (780 kg).
Dimensions: span 27 ft 6.75 in (8.40 m); length 21 ft 11.75 in (6.70 m); height 8 ft 0.5 in (2.45 m); wing area 193.75 sq ft (18.00 m^2).
Armament: none.

SV.4B trainers of the Belgian air force, which was a comparatively small-scale operator of the type by comparison with the French air force.

Photo: coll. Bigel
D1 075 13.13
Printed in Italy

USA

Fairchild C-119 FLYING BOXCAR

Fairchild C-119 FLYING BOXCAR

Simple yet effective improvement

With its C-82A Packet military transport well established in service by 1947, Fairchild began to consider ways of improving this important tactical machine and produced the XC-82B as a conversion of a standard C-82A with considerably more power and the flightdeck relocated from a position above the fuselage to a location in the nose.

Large-scale production

After trials, the type was ordered into production as the C-119B with still more power, structural strengthening, and its fuselage widened by 1 ft 2 in (0.36 m). Production of new aircraft was complemented by conversion of older aircraft to provide the US Air Force's Military Air Transport Service with steadily improved variants. Some aircraft were modified as electronic warfare and aerial gunship platforms.

Principal versions

C-119B (55 of the initial model with R-4360-20 engines), C-119C (303 aircraft with a revised tail unit), C-119F (424 aircraft with a further revised tail unit), C-119G (960 aircraft with propeller and equipment modifications), C-119J (62 C-119F/G conversions with a rear door openable in flight), C-119K (five C-119G conversions with two 3,700-hp/2,759-kW R-3350 radials and two 2,850-lb/1,293-kg thrust General Electric J85-GE-17 underwing booster turbojets), C-119L (22 C-119G with improved propellers), and R4Q (97 aircraft for the US Marine Corps).

Principal users

Belgium, Brazil, Ethiopia, France, India, Italy, South Vietnam, Taiwan, and USA.

TECHNICAL DATA

Type: Fairchild C-119C Flying Boxcar four-crew transport.
Engines: two 3,500-hp (2,610-kW) Wright R-3350-20 radial piston engines.
Performance: maximum speed 281 mph (452 km/h) at 18,000 ft (5,485 m); initial climb rate 1,010 ft (308 m) per minute; service ceiling 23,900 ft (7,285 m); range 1,770 miles (2,848 km).
Weights: empty 39,800 lb (18,053 kg); maximum take-off 74,000 lb (33,566 kg).
Dimensions: span 109 ft 3 in (33.30 m); length 86 ft 6 in (26.37 m); height 26 ft 6 in (8.08 m); wing area 1,447.0 sq ft (134.43 m^2).
Payload: 62 troops or freight.

A C-119G of the Belgian air force, which operated a maximum of 46 C-119F and G models of the Flying Boxcar.

Photo: coll. Bigel
D1 075 13.14
Printed in Italy

France

Guynemer's first victory

Guynemer's first victory

An unlikely hero

Who could have imagined that a young corporal, twice rejected for military service because of his puny appearance and apparent frailty, would go forward to become the most famous French military pilot of all time? The answer is virtually no one except Captain Antonin Brocard, the commander of Escadrille MS 3, who accepted Georges Marie Ludovic Jules Guynemer into his unit on June 8, 1915.

Early progress

Guynemer was accepted on his third attempt to join the French army on November 21, 1914, and was posted as a pupil mechanic to Pau aerodrome. The young man's driving ambition was to fly in combat against the Germans, and after much persuasion his commanding officer at Pau, Captain Bernard Thierry, allowed Guynemer to start the pilot training course. Guynemer made his first flight on March 10, 1915. As noted above, Guynemer joined MS 3 at Vauciennes in June of the same year, and did not have long to wait before scoring the first of his 54 victories.

A fateful day

On July 19, 1915, Guynemer boarded his Morane-Saulnier Type L parasol-wing monoplane in company with his mechanic and gunner, Corporal Guerder, and took off in search of German aircraft to attack. The squadron had already been informed of the presence of a German plane above the French lines, and Guynemer headed for the reported location. Finding nothing, Guynemer was thinking of a return to base when he spotted a lone Aviatik two-seater. Closing to a distance of about 50 feet from the German plane, Guynemer maneuvered to give his gunner a clear field of fire and, despite a bullet through one of his own hands, Gurder did not let Guynemer down. The German pilot was hit and crumpled into his cockpit, the German gunner then throwing his hands into the air in a gesture of despair. The Aviatik tumbled through the sky out of control, and crashed.

Citation

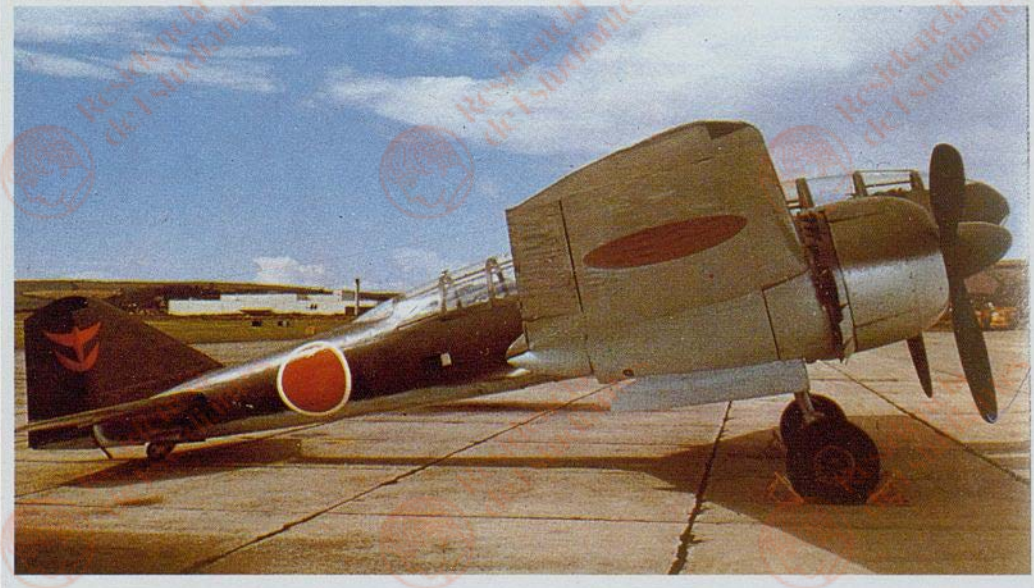
For this daring deed, Guynemer received the Medaille Militaire from General Dubois on August 4. The citation for this bravery decoration read: "A pilot of great spirit and daring, willing to carry out the most dangerous assignments. After a relentless chase, he brought a German plane to combat, a combat which ended in its crashing in flames."

Guynemer and Guerder in the Type L parasol used for their classic victory.

Photo: S.H.A.A.
D1 075 13.15
Printed in Italy

Japan

Mitsubishi Ki-46 "DINAH"



Mitsubishi Ki-46 "DINAH"

Imperial army requirement

Before the Second World War, Japan was one of the few countries prepared to consider specialized reconnaissance aircraft, and in 1937 the Imperial Japanese army air force issued the specification for a high-performance type to succeed the Mitsubishi Ki-15. In November 1939 the type flew as an exceptionally clean low-wing monoplane with retractable landing gear and two 900-hp (671-kW) Mitsubishi Ha-21-I radials.

A classy plane

Speed was some 10 per cent below expectation, but as the type had superior performance to all other army aircraft it was ordered into production as the Army Type 100 Command Reconnaissance Plane Model 1, with the company designation Ki-46-I and the later Allied reporting name "Dinah". Early operations showed that the Ki-46 was a superb reconnaissance machine virtually immune to interception. The type was steadily developed through the Second World War, and production totalled 1,742 aircraft of all variants.

Principal versions

Ki-46-I (initial model), Ki-46-II (major production model with 1,080-hp/805-kW Mitsubishi Ha-102 radials), Ki-46-I KAI (conversions for radio and navigation training), Ki-46-III (final production model for reconnaissance with an unstepped cockpit line), Ki-46-III KAI (interceptor conversions), Ki-46-IIIb (ground-attack conversions), and Ki-46-IV (high-altitude reconnaissance prototypes with 1,500-hp/1,119-kW Mitsubishi Ha-112-II Ru turbocharged radials).

Principal user

Japan.

TECHNICAL DATA

Type: Mitsubishi Ki-46-III "Dinah" two-seat reconnaissance plane.
Engines: two 1,500-hp (1,119-kW) Mitsubishi Ha-112-II radial piston engines.
Performance: maximum speed 391 mph (630 km/h) at 19,685 ft (6,000 m); climb to 26,250 ft (8,000 m) in 19 minutes 0 seconds; service ceiling 34,450 ft (10,500 m); range 2,485 miles (4,000 km).
Weights: empty 8,444 lb (3,830 kg); maximum take-off 14,330 lb (6,500 kg).
Dimensions: span 48 ft 2.75 in (14.70 m); length 36 ft 1 in (11.00 m); height 12 ft 8.75 in (3.88 m); wing area 344.46 sq ft (32.00 m^2).
Armament: none.

The last production version of the plane known to the Allies as the "Dinah" was the Ki-46-III with its extremely refined lines and low-drag cockpit faired into the upper contours of the fuselage.

Photo: DR
D1 075 13.16
Printed in Italy

Interceptor

USA

Convair F-102 DELTA DAGGER

Convair F-102 DELTA DAGGER

A revolutionary project

The Delta Dagger was a revolutionary delta-winged machine developed in an effort to meet a US Air Force requirement for a manned interceptor for the protection of North American airspace within the Semi-Automatic Ground Environment of radars and combat-control computers. The Model 8 design was selected in preference to contenders from five other companies, and was developed from the XF-92A experimental tailless delta evolved with the aid of Alexander Lippisch of Messerschmitt Me 163 fame. The Delta Dagger was the first USAF warplane planned as a complete weapon system (together with the associated Hughes fire-control system), and flew as the YF-102 prototype in October 1953.

Reviews and modifications

Performance was much below that specified, and extensive redesign produced the YF-102A with a more powerful engine, an area-ruled fuselage, and other drag-reducing features. This too failed to reach the performance specified, but was still a promising type and ordered into production as the F-102A for service from 1956. Some 889 of these single-seaters were complemented by 111 TF-102A combat-capable trainers with side-by-side seating. The Delta Dagger was later supplemented and then replaced by the definitive F-106 Delta Dart.

Principal versions

F-102A (single-seat model) and TF-102A (two-seat model).

Principal user

USA.

TECHNICAL DATA

Type: Convair F-102A Delta Dagger single-seat interceptor.

Engine: one 17,200-lb (7,802-kg) reheated thrust Pratt & Whitney J57-P-23/25 turbojet.

Performance: maximum speed 825 mph (1,328 km/h) or Mach 1.25 at 36,000 ft (10,975 m); initial climb rate 13,000 ft (3,960 m) per minute; service ceiling 54,000 ft (16,460 m); range 1,350 miles (2,173 km).

Weights: empty not revealed; maximum take-off 31,276 lb (14,187 kg).

Dimensions: span 38 ft 1.5 in (11.62 m); length 68 ft 4.5 in (20.84 m); height 21 ft 2.5 in (6.46 m); wing area 661.5 sq ft (61.45 m²).

Armament: up to six air-to-air missiles of various types (including nuclear-tipped weapons) carried in a lower-fuselage weapon bay.

The F-102A Delta Dagger was used by Air National Guard as well as US Air Force squadrons, this being such a plane of the North Dakota ANG.

Photo: DR
D1 075 13.17
Printed in Italy

Trainer

Switzerland

F+W C-3605

F+W C-3605

A lengthy background

In 1939/40, the Fabrique Federale produced two prototypes of its C-3602 design for a long-range reconnaissance and ground-attack plane. After extensive trials and the evaluation of 10 improved C-3603 aircraft, the type was ordered into production. These 142 aircraft remained operational between 1942 and 1952, but from 1946 21 were converted as target-tugs with another 40 following later for the nocturnal target-towing role. Following development of the C-3603 as an optimized target tug with the 1,250-hp (933-kW) Saurer YS-2 inline in place of the C-3602's 1,000-hp (746-kW) Hispano-Suiza inline, 12 aircraft were produced in 1947/48 and six more were assembled from C-3603 spares.

Turboprop power

The final development was the C-3605, produced by converting 23 C-3603s with turboprop engines in place of their worn out piston engines. The conversion involved a long extension of the nose to maintain the center of gravity with the lighter turboprop engine, and the aircraft were redelivered between 1971 and 1973. Another modification was the addition of a central fin in addition to the original endplate surfaces.

Principal versions

C-3603 (initial production model), C-3604 (upengined target-tug model), and C-3605 (turboprop conversions).

Principal user

Switzerland.

TECHNICAL DATA

Type: F+W C-3605 two-seat target tug.
Engine: one 1,100-shp (820-kW) Lycoming T53-L-7 turboprop.
Performance: maximum speed 269 mph (432 km/h) at 10,000 ft (3,050 m); initial climb rate 2,470 ft (753 m) per minute; service ceiling 32,810 ft (10,000 m); range 605 miles (980 km).
Weights: empty 5,806 lb (2,634 kg); maximum take-off 8,192 lb (3,716 kg).
Dimensions: span 45 ft 1 in (13.74 m); length 35 ft 9.75 in (12.03 m); height 13 ft 3.5 in (4.05 m); wing area 308.93 sq ft (28.70 m^2).
Armament: none.

The C-3605 is given its very distinctive appearance by the long nose required to maintain the plane's center of gravity position despite the installation of a turboprop engine much lighter than the original piston engine.

Photo: coll. Bigel
D1 075 13.18
Printed in Italy

Interceptor

Great Britain

Gloster METEOR NF.Mk 11

Gloster METEOR NF.Mk 11

Night fighting specialist

The Meteor was Great Britain's first jet warplane, and though designed as an interceptor proved amenable to development in several alternative forms. The Meteor entered service as a day interceptor in 1944, but a night fighter version was not developed until the late 1940s to succeed the de Havilland Mosquito variants that had served since the end of the Second World War. Development of the Meteor NF.Mk 11 was entrusted to Armstrong Whitworth. From 1949 the company combined the cockpit section of the Meteor T.Mk 7, the wings of the Meteor F.Mk 3 revised to accommodate the cannon displaced from the nose, the rear fuselage and tail unit of the Meteor F.Mk 8, and a new nose accommodating the American SCR-720 (AI.Mk 10) radar to produce a prototype that first flew in May 1950. The Meteor NF.Mk 11 entered service in January 1951, and production totalled 307.

Improved models

Superior variants were then produced as the Meteor NF.Mk 12 with APS-21 radar (100 aircraft), Meteor NF.Mk 13 tropicalised model (40 aircraft), and Meteor NF.Mk 14 with a clear-view canopy and aerodynamic refinements (100 aircraft). The type was also exported, and in British service was replaced by the Gloster Javelin from 1956.

Principal versions

Meteor NF.Mk 11 (initial model), Meteor NF.Mk 12 (improved radar), Meteor NF.Mk 13 (tropicalised model), Meteor NF.Mk 14 (definitive model with clear canopy), and Meteor NF(T).Mk 14 (training conversions).

Principal users

France and Great Britain.

TECHNICAL DATA

Type: Armstrong Whitworth (Gloster) Meteor NF.Mk 11 two-seat night fighter.
Engines: two 3,600-lb (1,633-kg) thrust Rolls-Royce Derwent 8 turbojets.
Performance: maximum speed 579 mph (932 km/h) at 9,845 ft (3,000 m); initial climb rate 5,800 ft (1,768 m) per minute; service ceiling 43,000 ft (13,105 m); range 920 miles (1,481 km).
Weights: empty not revealed; maximum take-off 22,000 lb (9,979 kg).
Dimensions: span 43 ft 0 in (13.11 m); length 48 ft 6 in (14.78 m); height 13 ft 10 in (4.62 m); wing area 374.0 sq ft (34.74 m²).
Armament: four 20-mm cannon.

A distinguishing feature of all but the last production model of the Meteor night fighters was the framed canopy. This is a Meteor NF.Mk 11.

Photo: coll. Bigel
D1 075 13.19
Printed in Italy

Trainer

Brazil

EMBRAER EMB-121 XINGU

EMBRAER EMB-121 XINGU

French antecedents
The Empresa Brasileira de Aeronautica is Brazil's major designer and manufacturer of aircraft, and one of its first major products was the EMB-110 Bandeirante light transport designed by a celebrated French engineer, Max Holste. The EMB-121 was designed as a smaller partner to the Bandeirante, and while retaining basically the same wing and powerplant, has a shorter but still fully pressurized fuselage combined with a new T-tail. The first prototype flew in October 1976, and as a result of flight trials several modifications, including the addition of a ventral fin, were made.

Military service
Six early aircraft were taken by the Brazilian air force with the designation VU-9 for the VIP transport role. However, the major operators of the type are the French air force and navy, with a total of 41 aircraft between them for multi-engine pilot training. The air force flies 25 aircraft from Bordeaux, Aix, and Avord, while the navy has 16 aircraft mainly at Lann-Bihoue for liaison as well as multi-engine training.

Principal versions
EMB-121A Xingu I (initial model) and EMB-121A1 Xingu II (version with more powerful PT6A-135 turboprops driving four-blade propellers).

Principal users
Brazil and France.

TECHNICAL DATA

Type: EMBRAER EMB-121A Xingu I one/two-crew light transport.
Engines: two 680-shp (507-kW) Pratt & Whitney Canada PT6A-28 turboprops.
Performance: maximum speed 280 mph (450 km/h) at 10,000 ft (3,350 m); initial climb rate 1.400 ft (427 m) per minute; service ceiling 26,000 ft (7,295 m); range 1,410 miles (2,270 km).
Weights: empty 7,981 lb (3,620 kg); maximum take-off 12,500 lb (5,670 kg).
Dimensions: span 46 ft 1.1 in (14.05 m); length 40 ft 2.3 in (12.25 m); height 15 ft 10.6 in (4.84 m); wing area 296.0 sq ft (27.50 m2).
Payload: 10 passengers or 1,896 lb (860 kg) of freight.

An EMB-121A Xingu I of the Aeronavale, the air arm of the French navy. This plane is based at Lann-Bihoue for training and liaison.

Photo: Embraer
D1 075 13.20
Printed in Italy

USA

Republic RF-86F THUNDERFLASH

Republic RF-86F THUNDERFLASH

Brother of a celebrity

In 1949 Republic began the design of a swept-wing version of its straight-winged F-84E Thunderjet, and this matured as the F-84F Thunderstreak. In 1952 Republic started work on a reconnaissance derivative of the F-84F, and soon concluded that the nose inlet of the fighter would have to be replaced by wing-root inlets to leave the nose clear for the installation of six cameras. The first prototype of the Thunderflash, as the reconnaissance model was called, was the YRF-84F that flew in February 1952 with the original Thunderjet type of rearward-sliding canopy.

Into service

In its definitive form, the RF-84F had the same type of canopy as the Thunderflash, with a central section that lifted upward between the windscreen and a fixed rear section. Production of the reconnaissance model totalled 715 aircraft including 386 delivered to the USA's NATO allies under the terms of the Military Assistance Program. Some 25 US Air Force RF-84Fs were later modified to RF-84K standard with an anhedralled tailplane and a retractable hook in the nose so that they could be released and recovered in mid-air by Convair GRB-36F reconnaissance bombers for additional range. The last American RF-84Fs were retired in 1971.

Principal versions

RF-84F (reconnaissance model) and RF-84K (version for air launch and recovery).

Principal users

Belgium, Denmark, France, Greece, Italy, the Netherlands, Norway, Taiwan, Turkey, USA, and West Germany.

TECHNICAL DATA

Type: Republic RF-84F Thunderflash single-seat reconnaissance plane.
Engine: one 7,800-lb (3,538-kg) thrust Wright J65-W-7 turbojet.
Performance: maximum speed 679 mph (1,093 km/h) at sea level; initial climb rate 8,000 ft (2,438 m) per minute; service ceiling 46,000 ft (14,020 m); range 2,200 miles (3,540 km).
Weights: empty not revealed; maximum take-off 28,000 lb (12,701 kg).
Dimensions: span 33 ft 7.25 in (10.24 m); length 47 ft 7.75 in (14.51 m); height 15 ft 0 in (4.57 m); wing area not revealed.
Armament: four 0.5-in (12.7-mm) machine guns.

This RF-84F Thunderflash of the French air force's 33e Escadre de Reconnaissance reveals the distinctive nose of this model. The double-headed axe was the unit marking of ER I/33 "Belfort".

Photo: coll. Bigel
D1/075 13.01
Printed in Italy

Interceptor

Great Britain

Hawker Siddeley (Gloster) JAVELIN

Hawker Siddeley (Gloster) JAVELIN

Massive tailed delta design

Designed to a 1948 requirement for a high-altitude interceptor, the Javelin was the first British warplane of delta layout, albeit with a tailplane above the vertical tail to ensure good field performance. The first prototype flew in November 1951, and the Javelin entered service in February 1956.

Short service career

The last Javelin was retired from service in June 1967 with the disappearance of the need for a high-altitude interceptor, but in its 11-year service life the Javelin went through a large number of variants with more power and fuel for the carriage of improved weapons.

Principal versions

Javelin F(AW).Mk 1 (40 aircraft with British AI.Mk 17 radar), Javelin F(AW).Mk 2 (30 aircraft with US APQ-43 radar), Javelin T.Mk 3 (23 dual-control trainers with the forward fuselage lengthened by 3 ft 8 in/1.12 m to maintain the centre of gravity position despite the removal of the radar equipment), Javelin F(AW).Mk 4 (50 aircraft with a powered slab tailplane), Javelin F(AW).Mk 5 (64 aircraft with greater fuel capacity and provision for four Firestreak AAMs), Javelin F(AW).Mk 6 (Mk 5 counterpart with APQ-43 radar), Javelin F(AW).Mk 7 (142 aircraft with 11,000-lb/4,880-kg thrust Sapphire ASSa.7 engines, modified control system, and an armament of two 30-mm cannon and four Firestreaks), Javelin F(AW).Mk 8 (47 aircraft with 12,300-lb/5,579-kg limited-reheat Sapphire ASSa.7R engines, APQ-43 radar, and an autopilot), and Javelin F(AW).Mk 9 (76 Mk 7s upgraded to Mk 8 standard, 22 of them with inflight refueling probes).

Principal user

Great Britain.

TECHNICAL DATA

Type: Gloster Javelin F(AW).Mk 1 two-seat all-weather interceptor.
Engines: two 8,000-lb (3,629-kg) thrust Armstrong Siddeley ASSa.6 turbojets
Performance: maximum speed 709 mph (1,141 km/h) at sea level; initial climb rate not revealed; service ceiling 52,500 ft (16,000 m); range 950 miles (1,530 km).
Weights: empty 24,000 lb (10,886 kg); maximum take-off 36,690 lb (16,642 kg).
Dimensions: span 52 ft 0 in (15.85 m); length 56 ft 3 in (17.15 m); height 16 ft 0 in (4.88 m); wing area 927.0 sq ft (86.12 m^2).
Armament: four 30-mm cannon.

A line-up of Javelin F(AW).Mk 7 all-weather fighters.

Photo: coll. Bigel
D1 075 13.02
Printed in Italy

Air superiority fighter

USSR

Mikoyan-Gurevich MiG-29 "FULCRUM"

Air superiority fighter

Mikoyan-Gurevich MiG-29 "FULCRUM"

Satellite revelation

From the beginning of the 1970s it was clear that the USSR must be developing a new fighter, yet it came as a surprise when, in 1979, American satellite reconnaissance revealed such a type at the Ramenskoye test airfield. The MiG-29 entered service in the mid-1980s, and is about the size of the McDonnell Douglas F/A-18 but similar in appearance to the same company's F-15.

Considerable development

The "Fulcrum-A" production model differs significantly from the pre-production standard, but all are agreed that the MiG-29 is an exceptional air superiority fighter with secondary attack capability. The fighter has superb handling qualities despite its retention of a conventional flight-control system. The sensors are advanced and include pulse-Doppler nose radar, a helmet-mounted sight for the optical designation of targets to missiles, and an infra-red search and track sensor that allows electronically silent attacks.

Principal versions

MiG-29 "Fulcrum-A" (initial production model), MiG-29U "Fulcrum-B" (combat-capable two-seat trainer based on the "Fulcrum-A" but with its fuselage lengthened to 57 ft 1.8 in/17.42 m), and MiG-29 "Fulcrum-C" (electronically upgraded version of the "Fulcrum-A" with extra equipment in a larger dorsal fairing).

Principal users

Czechoslovakia, East Germany, India, Iraq, North Korea, Syria, Poland, USSR, and Yugoslavia.

TECHNICAL DATA

Type: Mikoyan-Gurevich MiG-29 "Fulcrum-A" single-seat air superiority fighter with secondary attack capability.

Engines: two 18,298-lb (8,300-kg) reheated thrust Tumanskii R-33D turbofans.

Performance: maximum speed 1,519+ mph (2,445+ km/h) or Mach 2.3+ at high altitude; initial climb rate 64,960 ft (19,800 m) per minute; service ceiling 55,775 ft (17,000 m); radius 715 miles (1,150 km).

Weights: empty 17,251 lb (7,825 kg); maximum take-off 39,683 lb (18,000 kg).

Dimensions: span 37 ft 3.25 in (11.36 m); length 56 ft 9.85 in (17.32 m); height 15 ft 6.2 in (4.73 m); wing area 382.1 sq ft (35.50 m^2).

Armament: one 30-mm multi-barrel cannon, and a large weight of disposable stores including at least six AAMs.

The MiG-29 is a very capable warplane with advanced sensors and weapons.

Photo: DR
D1 075 13.03
Printed in Italy

Naval helicopter

Great Britain

Westland DRAGONFLY

Westland DRAGONFLY

First effective military helicopter

The world's first genuinely effective military helicopter was the Sikorsky R-5 (later H-5), which had been designed as the Model 327 and was later designated the S-51 in the company's system of nomenclature. In 1946, Westland negotiated a license for construction of the S-51 in Great Britain with an Alvis Leonides radial in place of the S-51's Pratt & Whitney R-985.

British derivative

The first Dragonfly Mk 1A flew in October 1948, and in its military form the helicopter began to enter service in 1950 as the equipment of the Royal Navy's first helicopter squadron, No.705 based at the Royal Naval Air Station Gosport; the Dragonfly was also adopted for the Royal Air Force's first helicopter squadron, No.194 created in 1953. There were also two civil models, one with the Leonides and the other with the R-985.

Principal versions

Dragonfly HR.Mk 1 (13 of the initial naval SAR model), Dragonfly HC.Mk 2 (three of the RAF casualty evacuation model with a single enclosed casualty pannier on each side of the fuselage), Dragonfly HR.Mk 3 (58 of the major production model similar to the HR.Mk 1 except for an all-metal main rotor), Dragonfly HC.Mk 4 (12 of the RAF's counterpart to the Mk 3), and Dragonfly HR.Mk 5 (nine of the final version basically similar to the Mk 3).

Principal users

Great Britain, Italy, Japan, and Thailand.

TECHNICAL DATA

Type: Westland Dragonfly HR.Mk 1 one-crew SAR and utility light helicopter.
Engine: one 540-hp (403-kW) Alvis Leonides 50 radial piston engine.
Performance: maximum speed 95 mph (153 km/h) at sea level; initial climb rate 800 ft (244 m) per minute; service ceiling 12,400 ft (3,780 m); range 300 miles (483 km).
Weights: empty 4,380 lb (1,987 kg); maximum take-off 5,870 lb (2,663 kg).
Dimensions: main rotor diameter 48 ft 0 in (14.63 m); length overall, rotors turning 57 ft 6.5 in (17.54 m); height 12 ft 11.5 in (3.95 m); main rotor disc area 1,809.56 sq ft (168.11 m^2).
Payload: three passengers or freight.

The Dragonfly was operated by only a single squadron of the Fleet Air Arm, but was invaluable in proving the utility of the helicopter as a multi-role type in naval affairs.

Photo: coll. Bigel
D1 075 13.04
Printed in Italy

Attack and close support

USA

Bell P-39Q AIRACOBRA

Bell P-39Q AIRACOBRA

A "nosey" plane

Despite a relatively conventional appearance in the air, the P-39 was a highly innovative design when it first flew in April 1938, for its engine was buried in the fuselage behind the pilot, who was provided with a car-type door on the starboardside of the cockpit. The engine's location kept its mass near the center of gravity with the object of improving maneuverability. Moreover, as the propeller was driven via a long transmission shaft, the nose was left clear for heavy armament and the forward unit of the pioneering tricycle landing gear.

Used only for ground attack

The P-39 did not gain success as a fighter when used by Great Britain and the USA in the early 1940s. Some 4,924 of the 9,558 aircraft were therefore allocated to the USSR under the Lend-Lease arrangement, though only 4,758 of these aircraft actually reached their destination. The Soviets flew the type in the ground-attack role. Here the definitive version was the P-39Q, which accounted for 4,905 of the overall total in three major subvariants with differing internal fuel capacities and weight of armour protection. The two underwing heavy machine guns were sometimes omitted in later aircraft, which also featured a four-rather than three-blade propeller.

Principal versions

P-39Q Airacobra (definitive ground-attack fighter).

Principal users

France, Italy and USSR.

TECHNICAL DATA

Type: Bell P-39Q Airacobra single-seat ground-attack fighter.
Engine: one 1,200-hp (895-kW) Allison V-1710-85 inline piston engine.
Performance: maximum speed 385 mph (620 km/h) at 11,000 ft (3,355 m); climb to 15,000 ft (4,570 m) in 4 minutes 30 seconds; service ceiling 35,000 ft (10,670 m); range 650 miles (1,046 km).
Weights: empty 5,645 lb (2,560 kg); maximum take-off 8,300 lb (3,765 kg).
Dimensions: span 34 ft 0 in (10.36 m); length 30 ft 2 in (9.19 m); height 12 ft 2 in (3.71 m); wing area 213.0 sq ft (19.79 m^2).
Armament: one 37-mm cannon and two or four 0.5-in (12.7-mm) machine guns, and one 500-lb (227-kg) bomb.

This restored P-39Q Airacobra of a collector sports the characteristic markings of the Red air force.

Photo: P. Makanna
D1 075 13.05
Printed in Italy

Air superiority fighter

USA

Grumman F-14A TOMCAT

Grumman F-14A TOMCAT

Successor to a failed design

After the cancellation of the naval version of the General Dynamics F-111 family, in which Grumman had been involved, the company used its experience for a new fighter using the same type of variable wing geometry as well as the F-111B's powerplant and Hughes weapon system (radar and AIM-54 long-range AAM). The resulting air superiority fighter flew in December 1970 and, despite the loss of the first prototype, soon proved itself a real winner.

The world's most powerful fighter

The F-14A entered service in 1972, and is still the world's most potent air superiority fighter. The core of the Tomcat's capability is its AWG-9 fire-control system, which can detect and track multiple targets at long range, and engage the six most threatening at ranges of well over 125 miles (201 km) with its maximum of six Phoenix missiles, though a more normal complement is four Phoenixes and two each of the AIM-7 Sparrow and AIM-9 Sidewinder medium-and short-range AAMs. The Tomcat also possesses a cannon for dogfighting, and the undernose Television Camera Set permits optical acquisition of targets at extended range.

Principal versions

F-14A Tomcat (main production model) and F-14A/TARPS Tomcat (reconnaissance version with a podded sensor package).

Principal users

Iran and USA.

TECHNICAL DATA

Type: Grumman F-14A Tomcat two-seat carrier-borne air superiority fighter.
Engines: two 20,900-lb (9,480-kg) reheated thrust Pratt & Whitney TF30-P-412A/414A turbofans.
Performance: maximum speed 1,564 mph (2,517 km/h) or Mach 2.34 at 36,999 ft (10,975 m); initial climb rate 30,000+ ft (9,145+ m) per minute; service ceiling 56,000+ ft (17,070+ m); range 2,000 miles (3,222 km).
Weights: empty 40,104 lb (18,191 kg); maximum take-off 74,349 lb (33,724 kg).
Dimensions: span 64 ft 1.5 in (19.55 m) spread and 38 ft 2.5 in (11.65 m) swept; length 62 ft 8 in (19.10 m); height 16 ft 0 in (4.88 m); wing area 565.0 sq ft (52.49 m^2).
Armament: one 20-mm multi-barrel cannon, and up to 14,500 lb (6,577 kg) of disposable stores.

An F-14A Tomcat of the Naval Air Test Centre takes on fuel. The Tomcat has powerful pulse-Doppler nose radar that can look down to targets flying at much lower altitudes.

Photo: Grumman
D1 075 13.06
Printed in Italy

Medium bomber

France

Bloch MB.200

Medium bomber

Bloch MB.200

Multi-sided competition

In 1932 the French air ministry issued a requirement for a five-seat medium bomber for night operations. Bloch responded with a four-seat design, but despite this the MB.200 was selected in preference to seven other designs. The first prototype flew in July 1933 with two 760-hp (567-kW) Gnome-Rhône 14Krsd radials, and despite the fact that maximum speed was well below that specified, in January 1935 the type was ordered into production.

Slow but reliable

Largely because of its fixed landing gear, angular wing, slab-sided fuselage, and three large and protruding gun positions, the MB.200 was extremely ungainly in appearance and very slow, yet it was completely reliable and easy to fly. In the circumstances, 208 aircraft were built by no fewer than six companies for France, while Aero and Avia produced 124 for Czechoslovakia. Seven French groupes de bombardement were still operational on the type in September 1939, but by the time of the German invasion in May 1940 the MB.200s had been relegated to training. Captured French and expropriated Czech aircraft were then used by the Germans and their allies as crew trainers.

Principal version

MB.200Bn.4 (sole production model).

Principal users

Bulgaria, Croatia, Czechoslovakia, France, Germany, and Romania.

TECHNICAL DATA

Type: Bloch MB.200Bn.4 four-seat night medium bomber.

Engines: two 870-hp (649-kW) Gnome-Rhône 14Kirs/Kjrs Mistral-Major radial piston engines.

Performance: maximum speed 177 mph (285 km/h) at 17,060 ft (5,200 m); climb to 19,685 ft (6,000 m) in 23 minutes 6 seconds; service ceiling 26,250 ft (8,000 m); range 621 miles (1,000 km).

Weights: empty 9,840 lb (4,463 kg); maximum take-off 16,049 lb (7,280 kg).

Dimensions: span 73 ft 8 in (22.45 m); length 52 ft 6 in (16.00 m); height 12 ft 9.5 in (3.90 m); wing area 721.18 sq ft (67.00 m²).

Armament: three 0.295-in (7.5-mm) machine guns, and up to 2,646 lb (1,200 kg) of bombs.

Fortunately for its crews the obsolete MB.200 had been relegated to secondary tasks before France was caught up in Germany's westward offensive of May 1940.

Photo: S.H.A.A.
D1 075 13.07
Printed in Italy

USA

Lockheed C-5 GALAXY

Lockheed C-5 GALAXY

Heavylift transport

In 1963 the US Air Force began to formulate a requirement for a very large logistic transport. This was intended to complement the Lockheed C-141 StarLifter, and while using the same length of runway be able to carry a load of 125,000 lb (56,700 kg) over a range of 8,000 miles (12,874 km) or twice that payload over a shorter range. From design proposals by three companies, the Lockheed design was declared winner. The first machine flew in June 1968, and though it had long been realized that the requirement had been too ambitious, the Galaxy was nonetheless a bold effort with considerable capabilities, especially with the aid of inflight refueling.

Production, service, and development

Some 81 C-5A transports were built with 41,000-lb (18,598-kg) thrust TF39-GE-1 turbofans, the provision of nose and ventral ramp/doors allowing the carriage of truly outsize loads. By July 1987 the surviving 77 aircraft had been revised with more durable wings and fitted with more powerful engines, increasing maximum take-off weight and payload. Another 50 aircraft were built to an improved version of the same standard as C-5B transports. Operating first as part of the Military Air Transport Service, the aircraft are now a component of Military Airlift Command.

Principal versions

C-5A (initial model) and C-5B (improved model delivered between 1986 and 1989).

Principal user

USA.

TECHNICAL DATA

Type: Lockheed C-5A Galaxy five-crew heavy logistic transport.
Engines: four 43,000-lb (19,504-kg) thrust General Electric TF39-GE-1C turbofans.
Performance: maximum speed 564 mph (908 km/h) at 25,000 ft (7,620 m); initial climb rate 1,725 ft (526 m) per minute; service ceiling 35,750 ft (10,895 m); range 3,434 miles (5,526 km) with maximum payload.
Weights: empty 374,000 lb (169,644 kg); maximum take-off 837,000 lb (379,663 kg).
Dimensions: span 222 ft 8.5 in (67.88 m); length 247 ft 10 in (75.54 m); height 65 ft 1.5 in (19.85 m); wing area 6,200.0 sq ft (575.98 m^2).
Payload: 345 troops or 275,000 lb (124,740 kg) of freight.

The first C-5A was dubbed "The Georgia Giant" by the press, after its birthplace of Marietta, Georgia, but the Galaxy is now more generally known to American military personnel as "Fat Albert".

Photo: Lockheed
D1 075 13.08
Printed in Italy

CARD DECKS WP

D1 075 13

Interceptor

USA

Vought F-8E(FN) CRUSADER

Vought F-8E(FN) CRUSADER

Much underestimated fighter

The Crusader was the US Navy's first truly supersonic warplane, and in overall terms a better combat type than the US Air Force's equivalent North American F-100 Super Sabre. The Crusader first flew in XF8U-1 prototype form during March 1955, and was then produced in a number of forms for service from 1957. In 1962 the F8U designation was changed to F-8.

French model

The last production model was the F-8E(FN), a variant of the definitive F-8E to meet the French navy's requirement for an interceptor able to operate from aircraft carriers smaller than the US Navy's vast ships. The F-8E(FN) thus has blown flaps and other high-lift features to reduce take-off and landing requirements. The French bought 42 of the type for delivery from January 1965, and the fire-control system of these aircraft is able to accommodate the R530 air-to-air missile. The 23 survivors were to have been upgraded considerably with the nav/attack system of the Dassault-Breguet Mirage F1, but in mid-1990 it was decided instead to provide some of the aircraft with a more modest upgrade for a limited operational viability until the advent of the Dassault-Breguet Rafale M in the later 1990s.

Principal version

F-8E(FN) Crusader (French carrierborne interceptor).

Principal user

France.

TECHNICAL DATA

Type: Vought F-8E(FN) Crusader single-seat carrierborne interceptor.
Engine: one 18,000-lb (8,165-kg) reheated thrust Pratt & Whitney J57-P-20A turbojet.
Performance: maximum speed 1,122 mph (1,806 km/h) or Mach 1.7 at 40,000 ft (12,190 m); initial climb rate 21,000 ft (6,400 m) per minute; service ceiling 58,000 ft (17,680 m); radius 600 miles (966 km) on a typical mission.
Weights: empty not revealed; maximum take-off 34,000 lb (15,420 kg).
Dimensions: span 35 ft 8 in (10.87 m); length 54 ft 6 in (16.61 m); height 15 ft 9 in (4.80 m); wing area 350.0 sq ft (32.52 m²).
Armament: four 20-mm cannon, and up to 5,000 lb (2,268 kg) of disposable stores.

The Crusader is an obsolescent type in the last years of its distinguished career, the only operational model being the F-8E(FN) used as an interceptor on France's two current aircraft carriers, the Clemenceau *and* Foch.

Photo: E.C.P.A
D1 075 12.01
Printed in Italy

Great Britain

British Aerospace (Percival/Hunting) PEMBROKE

British Aerospace (Percival/Hunting) PEMBROKE

Princely origins

After the Second World War, Percival began the design of a high-wing feederliner powered by de Havilland Gipsy six inline engines. This Merganser project was developed into the larger P.50 Prince that secured a modest commercial success as a civil transport, but was also developed further for Royal Air Force service. This P.66 Pembroke first flew in November 1952 with different (and more powerful) engines, greater wing span and area, beefed up landing gear and aft facing seats. Percival then became part of the Hunting group, and it was this parent that delivered 44 Pembroke C.Mk 1 transports between July 1953 and April 1958.

Diverse functions

Though most Pembrokes were used for liaison, light transport, and medevac, six additional aircraft were fitted with cameras and designated Pembroke C(PR).Mk 1. Most of the aircraft were withdrawn from service during the 1980s, but two remained operational in 1990. The Royal Navy also acquired 46 similar aircraft as Sea Prince C.Mk 1 transports and crew trainers, and other Pembrokes were produced for export.

Principal versions

Pembroke C.Mk 1 (RAF utility transport), Pembroke C(PR).Mk 1 (dual-role transport and photo-reconnaissance version), and Sea Prince C.Mk 1 (naval version of the Pembroke).

Principal users

Belgium, Denmark, Finland, Great Britain, Rhodesia, Sweden, and West Germany.

TECHNICAL DATA

Type: British Aerospace (Percival/Hunting) Pembroke C.Mk 1 two-crew utility transport.
Engines: two 560-hp (418-kW) Alvis Leonides 127 radial piston engines.
Performance: maximum speed 224 mph (360 km/h) at 2,000 ft (610 m); initial climb rate 1,070 ft (326m) per minute; service ceiling 22,000 ft (6,705 m); range 1,025 miles (1,650 km).
Weights: empty 9,589 lb (4,350 km); maximum take-off 13,500 lb (6,124 kg).
Dimensions: span 64 ft 6 in (19.66 m); length 46 ft 0 in (14.02 m); height 16 ft 1 in (4.90 m); wing area 400.0 sq ft (37.16 m^2)
Payload: 10 passengers, or six litters plus one attendant, or freight.

Its serial number identifies this plane as one of the Pembroke C.Mk 1s of the final production batch, and it is seen here in the markings of No. 60 Squadron RAF, based at Wildenrath, Germany.

Photo: coll. Bigel
D1.075 12.02
Printed in Italy

Attack and close support

Great Britain

de Havilland VAMPIRE F.Mk 6

de Havilland VAMPIRE F.Mk 6

From interception to ground attack
The Vampire was Great Britain's second turbojet-powered fighter to enter service, and first flew in prototype form during September 1943. The initial Vampire F.Mk 1 appeared too late for combat in the Second World War, but thereafter became one of the Royal Air Force's most important first-line interceptors before being developed into a fighter-bomber.

Definitive fighter-bomber
The RAF's most significant variant was the Vampire FB.Mk 5 with reduced-span wings and provision for underwing carriage of bombs and/or rockets. In July 1946 the Swiss, while ordering just four Vampire F.Mk 1s, also contracted for a version of the FB.Mk 5 as the Vampire F.Mk 6. Some 75 were delivered from Great Britain, and another 103 were license-built by a consortium comprising the Federal Aircraft Factory, Pilatus, and F+F. When phased out of first-line service, the aircraft were relegated to an important secondary career as advanced flying and weapon trainers, complementing the survivors of 39 Vampire T.Mk 55s.

Principal version
Vampire F.Mk 6 (Swiss version of the Vampire FB.Mk 5 with more powerful engine and detail modifications).

Principal user
Switzerland.

TECHNICAL DATA

Type: de Havilland Vampire F.Mk 6 single-seat fighter and fighter-bomber.
Engine: one 3,350-lb (1,518-kg) thrust de Havilland Goblin 3 turbojet.
Performance: maximum speed 548 mph (882 km/h) at 30,000 ft (9,145 m); initial climb rate 4,800 ft (1,463 m) per minute; service ceiling 42,800 ft (13,045 m); range 1,220 miles (1,963 km).
Weights: empty 7,283 lb (3,303 kg); maximum take-off 12,390 lb (5,620 kg).
Dimensions: span 38 ft 0 in (11.58 m); length 30 ft 9 in (9.36 m); height 8 ft 10 in (2.69 m); wing area 262.0 sq ft (24.33 m^2).
Armament: four 20-mm cannon, and up to two 500-lb (227-kg) bombs or eight 60-lb (27-kg) rockets.

The Vampire F.Mk 6's second career as a trainer was as important to the Swiss air force as its first career as a fighter-bomber. This is one of 19 aircraft that remain operational as trainers during the early 1990s.

Photo: DR
D1 075 12.03
Printed in Italy

Naval helicopter

Italy

Agusta A 106

Agusta A 106

A new departure

Agusta was founded in 1907 and embarked on the construction of helicopters during 1952, and is now best known as the Italian licensee of Bell and Sikorsky. The company has also produced a number of its own designs, and the first of these to be built in anything but prototype numbers was the A 106. This was designed as a small but powerful anti-submarine helicopter for carriage by the destroyers of the Italian navy, and first flew in prototype form during November 1965.

Submarine killer

The type was of classic configuration with a two-blade main rotor and anti-torque rotor connected by a fuselage of virtual pod-and-boom type, and was made as small and light as possible so that useful payload and performance would be possible on just one diminutive turboshaft engine. The A 106 had comprehensive avionics, including a Ferranti three-axis stability-augmentation system, and was produced in small numbers in the early 1970s. About five of the type were used for a short time by the Marinavia (Italian naval air arm) for trials on its "Impavido"' class destroyers.

Principal version

A 106 (sole model).

Principal user

Italy.

TECHNICAL DATA

Type: Agusta A 106 single-seat shipborne anti-submarine helicopter.

Engine: one 300-shp (224-kW) Agusta-built Turboméca TAA 230 turboshaft derate to 260 shp (194 kW).

Performance: maximum speed 109 mph (176 km/h) at sea level; initial climb rate 1,220 ft (372 m) per minute; hovering ceiling 9,845 ft (3,000 m) in ground effect; range 460 miles (740 km).

Weights: empty 1,300 lb (590 kg); maximum take-off 3,086 lb (1,400 kg).

Dimensions: main rotor diameter 31 ft 2 in (9.50 m); length overall, rotors turning 36 ft 0 in (9.50 m); height 8 ft 2 in (2.50 m); main rotor disc area 763.0 sq ft (70.88 m2).

Armament: two lightweight homing torpedoes, or depth charges; the type was also considered for the ground attack role with an armament of two 0.3-in (7.62-mm) machine guns and ten 3.2-in (82-mm) rockets.

The A 106 cannot be described as an elegant helicopter by any stretch of the imagination, but was a remarkable achievement in terms of payload and endurance on just one small turboshaft.

Photo: Agusta
D1.075 12.04
Printed in Italy

Fighter

Spain

Hispano HA-1112-M

Hispano HA-1112-M

The Bf 109 returns to life in Spain

In 1945 it was commonly assumed that the life of the Messerschmitt Bf 109 was over, but the type in fact enjoyed two more incarnations in Czechoslovakia and Spain. Spain had secured a license for the Bf 109G-2 in 1942, but received only incomplete drawings and 25 airframes lacking their tails and Daimler-Benz DB 605 engines. These were completed as HA-1109s with the 1,300-hp (969-kW) Hispano-Suiza 12Z-89 inline, the first flying in March 1945. Including German airframes, production of Hispano-engined aircraft totalled 69, most of them with more reliable French-built HS 12Z-17 engine. These aircraft had either no armament or a wide assortment of weapon installations before two 20-mm cannon were standardized on the HA-1112-K.

Enter the Merlin

Some of these aircraft were trialled with the Merlin 500-45 engine in 1954, and this powerplant became standard for the HA-1112-M, which was the first variant to reach full service. Despite its obsolescence in world terms, the HA-1112 entered service in 1956, 170 aircraft being built before production ended in 1958. The type remained operational up to 1957, and was often called the Buchon (pigeon).

Principal versions

HA-1109-J (initial model with Spanish-built Hispano-Suiza engine), HA-1109-K (version with French-built Hispano-Suiza engine), HA-1112-K (version with definitive armament), and HA-1112-M (definitive fighter with Rolls-Royce engine).

Principal user

Spain.

TECHNICAL DATA

Type: Hispano HA-1112-M1L single-seat fighter.
Engine: one 1,610-hp (1,200-kW) Rolls-Royce Merlin 500-45 inline piston engine.
Performance: maximum speed 419 mph (674 km/h) at 13,125 ft (4,000 m); initial climb rate 5,577 ft (1,700 m) per minute; service ceiling not revealed; range 476 miles (766 km).
Weights: empty 5,855 lb (2,656 kg); maximum take-off 7,011 lb (3,180 kg).
Dimensions: span 32 ft 6.5 in (9.92 m); length 29 ft 10 in (9.10 m); height 8 ft 6.5 in (2.60 m); wing area 173.3 sq ft (16.10 m²).
Armament: two 20-mm cannon, and eight 3.15-in (80-mm) rockets.

The HA-1112 was produced by combining a German airframe with a British engine. This example is painted in German markings to simulate a Bf 109 in the Battle of Britain film.

Photo: F. Robineau
D1 075 12.05
Printed in Italy

Attack and close support

Israel

Israel Aircraft Industries LAVI

Israel Aircraft Industries LAVI

Tailor-made for Israel

Toward the end of the 1970s, IAI began work on the Lavi (young lion) as an interdictor with an alternative air defense capability. The Israeli air force needed to replace its McDonnell Douglas A-4 Skyhawks with a type offering capabilities on a par with those of the General Dynamics F-16 Fighting Falcon but more precisely tailored to Israeli needs and less subject to foreign political interference than imported warplanes.

State of the art technologies

The Lavi was developed mainly in Israel with the aid of US companies such as Grumman, which designed the carbon epoxy flying surfaces. The Lavi was a close-coupled delta of relaxed stability with fly-by-wire controls to provide STOL performance and considerable combat agility. Of Israeli design and manufacture, the electronics were notably advanced and comprehensive in terms of offensive and defensive capability. In combination with the HOTAS (Hands On Throttle And Stick) cockpit, versatile mission computer, and high-quality weapon-delivery system, these promised very good combat capabilities. The first prototype flew in 1987 but, as a result largely of American financial pressure, the project was finally cancelled as being too expensive for Israel.

Principal version

Lavi (production model planned in single-and two-seat variants).

Principal user

Israel.

TECHNICAL DATA

Type: Israel Aircraft Industries Lavi single-seat multi-role warplane.
Engine: one 20,723-lb (9,400-kg) reheated thrust Beth Shemet-built Pratt & Whitney PW1120 turbofan.
Performance: maximum speed 1,222 mph (1,965 km/h) or Mach 1.85 at high altitude; initial climb rate not revealed; service ceiling not revealed; radius 280 miles (450 km) on a lo-lo-lo attack mission.
Weights: empty 15,498 lb (7,030 kg); maximum take-off 37,478+ lb (17,000+ kg).
Dimensions: span 28 ft 9.7 in (8.78 m); length 47 ft 9.6 in (14.57 m); height 15 ft 8.2 in (4.78 m); wing area 355.76 sq ft (33.05 m^2).
Armament: two 30-mm cannon, and up to 15,432 lb (7,000 kg) of disposable stores.

The Lavi two-seat prototype takes on fuel from a Skyhawk operating in the tanker role. The Lavi was a notably ambitious design whose practicality was overtaken by American commercial interests.

Photo: IAI
D1.075 12.06
Printed in Italy

France

Dorand AR.1 and AR.2

Dorand AR.1 and AR.2

Military designer for a military plane
In 1916 the head of the French army's Section Technique de l'Aeronautique, Colonel Dorand, designed a two-seat reconnaissance plane with the unusual feature of backward-staggered multi-bay biplane wings with the fuselage mounted in mid-gap between them. This AR.1 was of the standard wooden construction with fabric covering, and was ordered in sufficiently large quantities that the government factory at Chalais-Meudon had to subcontract to the Farman and Letord companies.

Reduced span
The AR.1 had the advantage of particularly robust landing gear, which allowed the type to operate from poor airfields close to the front line, but performance was generally on the low side. In an effort to boost speed, the AR.2 was produced with wings of reduced span, but the reduced power available from the type's 190-hp (142-kW) Renault 8Ge engine offset the drag reduction of the shorter wings and a measure of improved streamlining to keep performance identical with that of the AR.1. The two types were extensively employed as first-line aircraft by 18 French squadrons in France and Italy between April 1917 and the spring of 1918, but were thereafter steadily relegated to secondary tasks such as training. The American air arm in France used 22 AR.1s and 120 AR.2s as basic and advanced trainers respectively.

Principal versions
AR.1 (initial production model) and AR.2 (different engine and reduced span).

Principal users
France and USA.

TECHNICAL DATA

Type: Dorand AR.1 two-seat reconnaissance and artillery observation plane.
Engine: one 200-hp (149-kW) Renault 8Gdy inline piston engine.
Performance: maximum speed 92 mph (148 km/h) at 6,560 ft (2,000 m); initial climb rate not revealed; service ceiling not revealed; range not revealed.
Weights: empty not revealed; maximum take-off 2,900 lb (1,315 kg).
Dimensions: span 43 ft 7.5 in (13.30 m); length 30 ft 0 in (9.15 m); height not revealed; wing area 540.0 sq ft (50.17 m^2).
Armament: two or three 0.303-in (7.7-mm) machine-guns (one fixed and one or two trainable).

During the winter of 1917/18, an AR.2 of the French air force's AR 40 squadron runs up its engine before take-off on a mission.

Photo: S.H.A.A.
D1 075 12.07
Printed in Italy

Canada

Canadair CHALLENGER

Canadair CHALLENGER

American origins

In 1976 Bill Lear sold the rights to his Learstar 600 wide-body executive transport to Canadair, and the Canadian company developed the basic design considerably to produce the CL-600 Challenger that first flew in November 1978. The program was considerably slowed by a number of development problems, which caused the parent company financial problems that entailed further delays, and the CL-600 thus entered service considerably later than planned. The variant is powered by 7,500-lb (3,402-kg) thrust Lycoming ALF502L turbofans and can carry 19 passengers at a maximum take-off weight of 41,100 lb (18,642 kg) for a typical range of 3,222 miles (5,186 km). Most aircraft went to business operators, but Canada bought 12 aircraft as CC-144s (mostly for VIP transport and electronic warfare training), and two others went to Malaysia.

More power and greater range

The CL-601 variant of 1981 introduced a number of aerodynamic refinements (including winglets at the wing tips) and more power for much improved range. This model has also been bought by a number of air arms, notably those of Canada and West Germany.

Principal versions

CL-600 Challenger (initial medium-range model) and CL-601 Challenger (long-range variant).

Principal users

Canada, China, Malaysia, and West Germany.

TECHNICAL DATA

Type: Canadair CL-601 Challenger two-crew transport.
Engines: two 9,140-lb (4,146-kg) thrust General Electric CF34-1A turbofans.
Performance: maximum speed 529 mph (851 km/h) at high altitude; climb to 45,000 ft (13,715 m) in 25 minutes 0 seconds; service ceiling 45,000 ft (13,715 m); range 4,030 miles (5,925 km).
Weights: empty 25,585 lb (11,605 kg); maximum take-off 43,100 lb (19,550 kg).
Dimensions: span 64 ft 4 in (19.61 m); length 68 ft 5 in (20.85 m); height 20 ft 8 in (6.30 m); wing area 520.0 sq ft (48.31 m^2).
Payload: 19 passengers or freight.

The second of seven CL-601 Challengers for the Luftwaffe arriving in West Germany after its delivery flight from Canada. The West German air force operates the type for VIP transport.

Photo: Camadair
D1.075 12.08
Printed in Italy

Reconnaissance and observation

USA

Rockwell International OV-10 BRONCO

Rockwell International OV-10 BRONCO

Battlefield requirement
In 1964 North American (now part of Rockwell) secured a contract for its NA-300 design to meet the US Marine Corps' Light Armed Reconnaissance Airplane requirement. The first YOV-10A prototype flew in July 1965 with two 600-shp (447-kW) Garrett T76 turboprops. The type was ordered into production with 715-shp (533-kW) T76-G-416/417 engines and wings increased in span by 10 ft (3.05 m). The first of 114 OV-10As production aircraft flew in August 1967, and the type has built up a good reputation as a multi-role battlefield type.

Enhanced model
The basic model was also produced for export, and the USMC has revised a number of its OV-10As as OV-10D night surveillance and attack aircraft with a chin-mounted AAS-37 infra-red sensor and laser designator turret as well as a larger and more varied ordnance load. If no weapons are carried under the fuselage sponsons, a 20-mm cannon in a trainable installation can be included.

Principal versions
OV-10A (initial model), OV-10B (West German target-towing model with a 2,950-lb/1,330-kg thrust General Electric J85-GE-4 turbojet above the centre section), OV-10C (Thai version), OV-10D (improved model for the USMC), OV-10E (Venezuelan version), and OV-10F (Indonesian version).

Principal users
Indonesia, Morocco, Thailand, USA, Venezuela, and West Germany.

TECHNICAL DATA

Type: Rockwell International OV-10D Bronco two-seat night surveillance and attack plane.
Engines: two 1,040-shp (776-kW) Garrett T76-G-420/421 turboprops.
Performance: maximum speed 288 mph (463 km/h) at sea level; initial climb rate 3,020 ft (920 m) per minute; service ceiling 30,000 ft (9,145 m); radius 228 miles (367 km) with maximum warload.
Weights: empty 6,893 lb (3,127 kg); maximum take-off 14,444 lb (6,552 kg).
Dimensions: span 40 ft 0 in (12.19 m); length 44 ft 0 in (13.41 m); height 15 ft 2 in (4.62 m); wing area 291.0 sq ft (27.03 m^2).
Armament: four 0.3-in (7.62-mm) machine guns, and provision for up to 4,800 lb (2,177 kg) of disposable stores.

Despite its age, the OV-10A remains a valuable component of the US Marine Corps' tactical air strength, offering the capability of rapid response from forward airstrips.

Photo: coll. Bigel
D1 075 12.09
Printed in Italy

Attack and close support

China

Nanchang Q-5 "FANTAN"

Nanchang Q-5 "FANTAN"

MiG-19 derivative

First flown in June 1965, the Q-5 is a radical Chinese development of the Shenyang J-6 (Chinese version of the Mikoyan-Gurevich MiG-19) with larger overall size and a revised forward fuselage with lateral inlets in place of the original nose inlet to allow the incorporation of a small internal weapon bay. This was designed to allow carriage of a nuclear weapon in a strike version originally planned with nose radar and turbofan engines, but is now generally used for 70 per cent more fuel in the non-nuclear attack model.

Western avionics

China is currently evaluating two competing versions updated with Western electronics (head-up display, ranging radar, laser rangefinder, inertial navigation system, radar-warning receiver, and other features of an advanced nav/attack system). The Q-5K and Q-5M have update packages produced under the leadership of French and Italian companies, Thomson-CSF and Aeritalia respectively.

Principal versions

Q-5 I "Fantan-A" (initial production model), Q-5 II "Fantan-B" (revised model exported to North Korea as the A-5B), Q-5 III "Fantan-C" (current production model with detail improvements and two additional hardpoints for self-protection air-to-air missiles, and exported to Pakistan as the A-5C).

Principal users

China, North Korea, and Pakistan.

TECHNICAL DATA

Type: Nanchang Q-5 III "Fantan-C" single-seat attack and close support warplane.
Engines: two 7,165-lb (3,250-kg) reheated thrust Shenyang Wopen-6 turbojets.
Performance: maximum speed 739 mph (1,190 km/h) or Mach 1.12 at 36,090 ft (11,000 m); initial climb rate 19,685 ft (6,000 m) per minute; service ceiling 52,000 ft (15,850 m); radius 248 miles (400 km) on a lo-lo-lo mission with maximum warload.
Weights: empty 14,319 lb (6,495 kg); maximum take-off 26,455 lb (12,000 kg).
Dimensions: span 31 ft 10 in (9.70 m); length 53 ft 4 in (16.255 m); height 13 ft 9.75 in (4.516 m); wing area 300.85 sq ft (29.75 m^2).
Armament: two 23-mm cannon, and up to 4,409 lb (2,000 kg) of disposable stores.

Seen at the Paris Air Show of 1987, the Q-5 III (A-5C in its export form) is a radical but comparatively straightforward development of the J-6 fighter to produce a small but effective supersonic attack warplane.

Photo: coll. Bigel
D1.075 12.10
Printed in Italy

Seaplane

Germany

Hansa-Brandenburg W 12

Hansa-Brandenburg W 12

An illustrious designer

In the first part of the First World War, the seaplane bases along Germany's coast had relied for local defense on floatplane adaptations of landplane fighters. This process failed to produce a truly effective type, so the spring 1917 advent of the W 12, designed by Ernst Heinkel, was particularly welcome. The prototype of this biplane fighter was first flown in January 1917, and a notable feature was the slab-sided wooden fuselage with plywood covering. This was slightly upswept toward the tail and carried an underslung rudder arrangement which provided adequate water clearance at take-off as well as a good field of fire for the gunner. Production totalled 146 including 80 with the 150-hp (112-kW) Benz Bz.III engine.

Improved model

The W 12 remained operational until mid-1918. It was first complemented and then supplanted by the W 19, which first flew in November 1917 and was in essence a scaled-up W 12 with the 260-hp (194-kW) Maybach Mb.IV engine and greater fuel capacity for longer range. Production of this model reached 55 aircraft that remained operational to the end of the war. Prototype developments were the single W 27 with I-type interplane struts and the 195-hp (145-kW) Bz.IIIb engine, and two or three examples of the W 32 development of the W 27 with the 160-hp (119-kW) Mercedes D.III engine.

Principal versions

W 12 (initial model) and W 19 (longer-range model with greater power and size).

Principal user

Denmark and Germany.

TECHNICAL DATA

Type: Hansa-Brandenburg W 12 two-seat floatplane fighter.
Engine: one 160-hp (119-kW) Mercedes D.III in-line piston engine.
Performance: maximum speed 99 mph (160 km/h) at sea level; climb to 6,560 ft (2,000 m) in 18 minutes 54 seconds; service ceiling 16,405 ft (5,000 m); endurance 3 hours 30 minutes.
Weights: empty 2,198 lb (997 kg); maximum take-off 3,206 lb (1,454 kg).
Dimensions: span 36 ft 9 in (11.20 m); length 31 ft 6 in (9.60 m); height 10 ft 10 in (3.30 m); wing area 379.98 sq ft (35.30 m^2).
Armament: two or three 0.312-in (7.92-mm) machine guns (one or two fixed and one trainable).

This W 12 came down in Danish waters during a forced landing, and was taken into Danish service during the First World War.

Photo: S.H.A.A.
D1 075 12.11
Printed in Italy

Reconnaissance and observation

Germany

Fieseler Fi 156 STORCH

Fieseler Fi 156 STORCH

Remarkable STOL performance
Designed in 1935 and first flown in the spring of 1936, the Storch (stork) was a braced high-wing monoplane of mixed construction, and immediately revealed remarkable STOL performance thanks to its combination of leading-edge slats and trailing-edge slotted flaps. The cockpit's bulged side windows provided the crew with good sideways and downward fields of vision.

Large-scale production
The Storch was ordered into production during 1937 as a liaison and observation plane, and construction in Germany, France, and Czechoslovakia up to the end of the Second World War totalled about 2,900. After the war, production was continued in France as the Morane-Saulnier MS.500 series and in Czechoslovakia as the Mraz K-65 Cap.

Principal versions
Fi 156A (initial model in two subvariants), Fi 156C (improved model with a rear-firing 0.312-in/7.92-mm machine gun, produced in four subvariants optimised for liaison/staff transport, reconnaissance/ambulance, light transport, and long-range light transport use), Fi 156D (ambulance version in two subvariants with the As 10C/P engine), Fi 156E (experimental model with rubber-tracked landing gear), and Fi 156P (factory rather than official designation for an anti-partisan model with two underwing racks for 48 anti-personnel bomblets).

Principal users
Bulgaria, Croatia, Finland, Germany, Hungary, Italy, Romania, Slovakia, Spain, Sweden, and Switzerland.

TECHNICAL DATA

Type: Fieseler Fi 156C-2 two-seat army co-operation and reconnaissance plane.
Engine: one 240-hp (179-kW) Argus As 10C-3 inline piston engine.
Performance: maximum speed 109 mph (175 km/h) at sea level; climb to 3,280 ft (1,000 m) in 3 minutes 24 seconds; service ceiling 15,090 ft (4,600 m); range 239 miles (385 km).
Weights: empty 2,050 lb (930 kg); maximum take-off 2,921 lb (1,325 kg).
Dimensions: span 46 ft 9 in (14.25 m); length 32 ft 5.75 in (9.90 m); height 10 ft 0 in (3.05 m); wing area 279.87 sq ft (26.00 m²).
Armament: one 0.312-in (7.92-mm) machine gun.

This Storch of an American collector shows the type in typical low-altitude flight, in which the dorsal "stinger" gun in the rear of the cockpit provided a measure of defense against attacking fighters.

Photo: P. Makanna
D1.075 12.12
Printed in Italy

Light bomber

Poland

PZL P.23 KARAS

PZL P.23 KARAS

Polish reconnaissance mainstay

The Karas (crucian carp) was derived from a PZL project for a six-passenger transport for LOT, the Polish national airline, and design work began in 1931. The type was planned round the primary and secondary tasks of reconnaissance and light bombing, and the first prototype flew in August 1934. The Karas was conventional in design and construction, though fixed landing gear was retained, and a long ventral gondola provided good visual reconnaissance capability.

Near total losses

Total production was 307 aircraft delivered from 1936. Most of these were for the Polish air force which, at the beginning of World War 2, had 12 squadrons of the Karas B type. Of these five and seven operated in the bomber and reconnaissance roles respectively. Though obsolete, the aircraft fought desperately in the Polish effort to check the advance of the German forces, and in the process suffered about 95 per cent losses.

Principal versions

P.23A Karas A (40 aircraft with the 590-hp/440-kW Pegasus IIM2 and later converted as dual-control trainers), P.23B Karas B (210 aircraft of the definitive production model), P.43A Tchaika (12 aircraft for Bulgaria based on the P.23B but powered by the 930-hp/693-kW Gnome-Rhône 14Kfs radial), and P.43B Tchaika (42 aircraft based on the P.43A with the 970-hp/723-kW Gnome-Rhône 14N-01 radial).

Principal users

Bulgaria, Poland, and Romania.

TECHNICAL DATA

Type: PZL P.23B Karas B three-seat reconnaissance bomber.

Engine: one 680-hp (507-kW) PZL-built Bristol Pegasus VIII radial piston engine.

Performance: maximum speed 186 mph (299 km/h) at 6,560 ft (2,000 m); climb to 6,560 ft (2,000 m) in 4 minutes 45 seconds; service ceiling 23,950 ft (7,300 m); range 782 miles (1,260 km).

Weights: empty 4,250 lb (1,928 kg); maximum take-off 7,716 lb (3,500 kg).

Dimensions: span 45 ft 9.25 in (13.95 m); length 31 ft 9.25 in (9.68 m); height 10 ft 10 in (3.30 m); wing area 288.5 sq ft (26.80 m²).

Armament: three 0.303-in (7.7-mm) machine guns (one fixed and two trainable), and up to 1,543 lb (700 kg) of bombs.

The P.23 Karas was obsolete by the beginning of the Second World War, and Poland's fleet was almost totally destroyed in the heavy fighting of the German invasion.

Photo: S.H.A.A.
D1 075 12.13
Printed in Italy

Trainer

Switzerland

Pilatus P-3

Pilatus P-3

Swiss quality
The service success of its P-2 persuaded Pilatus in the early 1950s to plan a successor. The resulting P-3 first flew in September 1953 as a trim all-metal monoplane of low-wing configuration with tandem seating under a rearward sliding canopy, and retractable tricycle landing gear. The type was intended for the "all through" training of pilots from the primary stage to the point of conversion onto the de Havilland Vampire jet trainer, and was therefore fitted with a comparatively low-powered piston engine, though after evaluation with the first prototype a second machine was completed with a more powerful engine more typical of the eventual production model.

Limited production
Like its predecessor, the P-3 was completed with a high standard of instrumentation and other equipment (including an oxygen system and radio), and can be fitted with light armament for the weapon training role. Switzerland took 72 of the type, all modified at a later date with a long ventral fin to improve handling characteristics and remove the trainer's propensity to enter a flat spin. An additional six aircraft were built for the Brazilian navy, which passed the aircraft on to the air force's aerobatic display team.

Principal versions
P-3 (sole model).

Principal users
Brazil and Switzerland.

TECHNICAL DATA

Type: Pilatus P-3 two-seat primary and advanced flying and weapon trainer.
Engine: one 260-hp (194-kW) Lycoming GO-435-C2A flat-six piston engine.
Performance: maximum speed 193 mph (310 km/h) at 6,560 ft (2,000 m); initial climb rate 1,378 ft (420 m) per minute; service ceiling 18,045 ft (5,500 m); range 466 miles (750 km).
Weights: empty 2,447 lb (1,110 kg); maximum take-off 3,307 lb (1,500 kg).
Dimensions: span 34 ft 1.5 in (10.40 m); length 28 ft 8.5 in (8.75 m); height 10 ft 0 in (3.05 m); wing area 177.61 sq ft (16.50 m^2).
Armament: one 0.3-in (7.62-mm) machine gun, and up to two practise bombs or two rocket launchers.

Although replaced in the advanced flying training role by the same company's P-7, some 48 P-3s remain in Swiss service as primary trainers.

Photo: coll. Bigel
D1.075 12.14
Printed in Italy

France

Salmson-Moineau S-M.1

Salmson-Moineau S-M.1

Unique engine
In 1912 Emile Salmson created the Société des Moteurs Salmson to develop and build a unique series of water-cooled radial engines incorporating Canton-Unné design features. The outbreak of the First World War raised demand for this reliable powerplant very considerably, and once large-scale production had been inaugurated, Salmson turned his considerable talents from engines to aircraft.

An unsuccessful design
The first plane to result from this process was the S-M.1, which was designed by Lieutenant Rene Moineau of the French army's air arm and built by Salmson's new aircraft manufacturing facility. The type was ungainly but basically conventional in overall design, with a nosewheel unit to prevent damage if the machine nosed over on landing, and the fuselage was mounted in mid-gap between the biplane wings. Highly unusual, however, was the engine installation. Mounted transversely in the fuselage, this drove, via transmission shafts and gears, two tractor propellers located on X-shaped strut arrangements between the wings. It is believed that three or four of these aircraft were used by the SAL 58 squadron of the French air force at the beginning of 1917, but they were completely unsuccessful.

Principal version
S-M.1 (sole model).

Principal user
France.

TECHNICAL DATA

Type: Salmson-Moineau S-M.1 three-seat reconnaissance and observation plane.
Engine: one 160-hp (119-kW) Salmson Canton-Unné radial piston engine.
Performance: maximum speed 81 mph (130 km/h) at sea level; initial climb rate not revealed; service ceiling not revealed; range not revealed.
Weights: empty not revealed; maximum take-off not revealed.
Dimensions: span 57 ft 3.8 in (17.47 m); length 34 ft 5 in (10.49 m); height not revealed; wing area not revealed.
Armament: two 0.303-in (7.7-mm) machine-guns (on trainable mountings in front and rear positions.

Despite its original concept and features, the S-M.1 was not a success. It was heartily disliked by pilots, and its operational career was extremely brief.

Photo: S.H.A.A.
D1 075 12.15
Printed in Italy

Trainer

USSR

Yakovlev Yak-18 "MAX"

Yakovlev Yak-18 "MAX"

Astounding longevity

In 1943 Yakovlev revised its UT-2M trainer with an enclosed cockpit and a tailwheel as the UT-2MV, and further evolution resulted in the Yak-18 that first flew in 1945. Large-scale production started in 1947, and it is thought that some 9,000 aircraft have been built in a program that continues to the present.

Extended capabilities

The Yak-18's basic soundness resulted in a number of extensively different models, and between 1949 and 1954 the Yak-18 established a number of world records for its class.

Principal versions

Yak-18 (initial production model), Yak-18U (revised model with retractable tricycle landing gear, first flown in 1954 and placed in limited production during the following year), Yak-18A (revised version of the Yak-18 first flown in 1957 and then built to the extent of 6,760 aircraft with the 260-hp/194-kW AI-14R engine, greater fuel capacity, structural strengthening, span increased to 39 ft 9.25 in/9.40 m, and a revised tail unit), Yak-18P (1959 single-seat development in two subvariants for aerobatics with a fuel system designed to allow 5 minutes of inverted flight), Yak-18PM (1965 development of the Yak-18P with the 300-hp/224-kW AI-20RF radial and an improved cockpit), Yak-18PS (1969 variant of the Yak-18PM with retractable tailwheel landing gear), and Yak-18T (1964 development of the Yak-18 as a four-seat light plane with the 360-hp/268-kW M-14P radial).

Principal users

Afghanistan, Albania, Algeria, Bulgaria, China, Czechoslovakia, East Germany, Egypt, Guinea, Hungary Iraq, Mali, Mongolia, North Korea, Somalia, Syria, USSR, Vietnam, and Yemen.

TECHNICAL DATA

Type: Yakovlev Yak-18 "Max" two-seat primary trainer.

Engine: one 160-hp (119-kW) M-11FR radial piston engine.

Performance: maximum speed 154 mph (248 km/h) at sea level; initial climb rate 689 ft (210 m) per minute; service ceiling 13,125 ft (4,000 m); range 652 miles (1,050 km).

Weights: empty 1,799 lb (816 kg); maximum take-off 2,469 lb (1,120 kg).

Dimensions: span 33 ft 9.5 in (10.30 m); length 26 ft 5.75 in (8.07 m); height not revealed; wing area 182.99 sq ft (17.00m2).

Armament: none.

A French-registered Yak-18 in the markings of DOSAAF, the Soviet paramilitary flying training organization.

Photo: F. Robineau
D1.075 12.16
Printed in Italy

Attack and close support

USA

Republic F-84G THUNDERJET

Republic F-84G THUNDERJET

A classic warplane

Destined to replace the same company's P-47 Thunderbolt, the Thunderjet was one of the earliest jet fighters and first flew in XP-84 prototype form during August 1946. The type entered production and service as the P-84, a designation soon changed to F-84. In its original straight-winged Thunderjet form, the type found its niche in the fighter-bomber role, where it was an excellent weapon platform and able to absorb considerable battle damage.

Nuclear fighter-bomber

The definitive version of the Thunderjet was the F-84G, the first American fighter-bomber cleared for the carriage of tactical nuclear weapons. Development of this model began in 1950, and the type entered service in the following year. The F-84G could carry a sizeable load under its wings, with accurate delivery improved by the retrofit of the Low-Altitude Bombing System. To facilitate long-range deployment, the port wing was fitted with a receptacle for the Boeing "flying boom" inflight refueling system; this tactically limited system was later replaced by a probe for hose-and-drogue refueling. The range thus provided made it necessary to fit the F-84G with an autopilot. Production totalled 3,025 aircraft, and no fewer than 1,936 of these were allocated to NATO air forces under the terms of the Military Assistance Program.

Principal version

F-84G (nuclear fighter-bomber).

Principal users

Belgium, Denmark, France, Greece, Italy, the Netherlands, Norway, Portugal, Turkey, and USA.

TECHNICAL DATA

Type: Republic F-84G Thunderjet single-seat fighter-bomber.
Engine: one 5,600-lb (2,540-kg) thrust Allison J35-A-29 turbojet.
Performance: maximum speed 622 mph (1,001 km/h) at sea level; climb to 35,000 ft (10,670 ft) in 9 minutes 24 seconds; service ceiling 40,500 ft (12,345 m); range 2,000 miles (3,219 km).
Weights: empty 11,095 lb (5,033 kg); maximum take-off 23,525 lb (10,671 kg).
Dimensions: span 36 ft 5 in (11.10 m); length 38 ft 1 in (1.61 m); height 12 ft 7 in (3.84 m); wing area 260.0 sq ft (24.15 m^2).
Armament: six 0.5-in (12.7-mm) machine guns, and up to 4,000 lb (1,814 kg) of disposable stores.

The F-84G was a mainstay of the NATO air forces in the 1950s and 1960s, this being an example in Turkish markings.

Photo: coll. Bigel
D1 075 12.17
Printed in Italy

USSR

Antonov An-72 and An-74 "COALER"

Antonov An-72 and An-74 "COALER"

A remarkable STOL airlifter

Designed as a STOL counterpart to the An-24 and its derivatives, the An-72 first flew in 1977 and soon revealed remarkable STOL performance. This capability is provided by upper surface blowing, in which the two engines are located forward of the wing so that their efflux blows over the upper surface of the wing and double-slotted flaps to enhance lift and controlability. Other features are conventional for an airlifter, with externally mounted main landing gear units and a T-tail above an upswept rear fuselage incorporating a ventral ramp/door arrangement.

Civil and military applications

Development was protracted, and it was the mid-1980s before the An-74 production model entered service. The type is now used for civil as well as military purposes, and has been developed in a number of forms.

Principal versions

An-72 "Coaler-A" (pre-production version with wings spanning 84 ft 9 in/25.83 m), An-74 "Coaler-B" (initial production model with greater span and the fuselage stretched by 4 ft 11 in/1.50 m, as well as more comprehensive avionics and wheel/ski landing gear to allow arctic operation), An-74 "Coaler-C" (civil/military model with less advanced avionics), An-72A "Coaler-D" (upgraded version of the "Coaler-C" with engines each delivering 2,205 lb/1,000 kg more thrust), and An-74 "Madcap" (airborne early warning version with its radar antenna in a radome on top of a revised, forward-swept vertical tail).

Principal user

USSR.

TECHNICAL DATA

Type: Antonov An-74 "Coaler-B" four-crew STOL transport.
Engines: two 14,330-lb (6,500-kg) thrust Lotarev D-36 turbofans.
Performance: maximum speed 438 mph (705 km/h) at optimum altitude; initial climb rate not revealed; service ceiling 32,810 ft (10,000 m); range 715 miles (1,150 km) with maximum payload.
Weights: empty not revealed; maximum take-off 76,058 lb (34,500 kg).
Dimensions: span 104 ft 7.5 in (31.89 m); length 92 ft 1.25 in (28.07 m); height 28 ft 8.5 in (8.75 m); wing area not revealed.
Payload: 32 passengers, or 24 litters plus one attendant, or 22,046 lb (10,000 kg) of freight.

The "Coaler" series is seen here in the form of the An-72 with its remarkable powerplant/wing configuration for upper surface blowing.

Photo: DR
D1.075 12.18
Printed in Italy

Heavy bomber

USA

Boeing B-29 SUPERFORTRESS

Boeing B-29 SUPERFORTRESS

Very long range bomber
On the outbreak of the Second World War in 1939, the US Army Air Corps became increasingly concerned about its lack of a very long range heavy bomber, and in January 1940 issued a requirement for such a bomber. Four companies responded, and prototypes were ordered from Boeing and Consolidated. The XB-29 first flew in September 1942 as an exceptionally clean plane with turbocharged engines, pressurized crew accommodation, and eight of the 11 defensive machine guns located in remotely controlled barbettes.

Rapid production
Development proceeded swiftly despite the complexity of the plane and its systems, and the B-29 entered service in the fall of 1943. The type was soon in action, and large-scale production allowed the type to play a decisive part in the defeat of Japan, culminating in the A-bombings of Hiroshima and Nagasaki in August 1945.

Principal versions
B-29 (2,848 of the initial production model), B-29A (1,122 of a revised model with slightly increased span, greater fuel capacity, and modified armament), B-29B (311 of a lightweight model with the four barbettes removed and the tail turret converted to radar control), RB-29/RB-29A (photo-reconnaissance conversions of B-29/B-29A bombers, later redesignated F-13), and SB-29 (SAR conversions of B-29s with an air-dropped lifeboat).

Principal user
USA.

TECHNICAL DATA

Type: Boeing B-29 Superfortress 10-seat strategic heavy bomber.
Engines: four 2,200-hp (1,641-kW) Wright R-3350-23/23A/41 radial piston engines.
Performance: maximum speed 358 mph (576 km/h) at 25,000 ft (7,620 m); climb to 20,000 ft (6,095 m) in 38 minutes 0 seconds; service ceiling 31,850 ft (9,710 m); range 3,250 miles (5,230 km).
Weights: empty 70,140 lb (31,815 kg); maximum take-off 124,000 lb (56,245 kg).
Dimensions: span 141 ft 3 in (43.05 m); length 99 ft 0 in (30.18 m); height 29 ft 7 in (9.02 m); wing area 1,736.0 sq ft (161.27 m^2).
Armament: 11 0.5-in (12.7-mm) machine guns in four twin-gun barbettes and one three-gun tail turret, and up to 20,000 lb (9,072 kg) of bombs.

This B-29A is now on the strength of the Confederate Air Force, a superb collection of Second World War aircraft based at Harlingen, Texas.

Photo: P. Makenna
D1 075 12.19
Printed in Italy

Heavy bomber

Great Britain

Handley Page VICTOR

Handley Page VICTOR

Elegant bomber
Designed as a high-altitude bomber with free-fall nuclear weapons, the Victor flew in December 1952 with crescent-shaped flying surfaces for high subsonic cruise speed. Development was protracted, and the type entered service in 1956 as the last of the Royal Air Force's three "V-bombers".

Short service life as a bomber
The Victor B.Mk 1 was obsolescent even as it entered service, and as the aircraft could not readily be converted to the low-altitude role, they were adapted as tankers from the mid-1960s. The Victor B.Mk 2 was a more formidable machine, but was again of limited operational value.

Principal versions
Victor B.Mk 1 (50 of the initial model with 11,050-lb/5,012-kg thrust Armstrong Siddeley Sapphire Mk 202 turbojets), Victor B.Mk 1A (24 conversions with improved ECM), Victor B(K).Mk 1A (six two-point tanker conversions), Victor K.Mk 1 (11 three-point tanker conversions), Victor K.Mk 1A (14 three-point tanker conversions), Victor B.Mk 2 (34 improved bombers with turbofan power and the Blue Steel stand-off missile), Victor B.Mk 2R (21 B.Mk 2 conversions with improved ECM), Victor B(SR).Mk 2 (nine B.Mk 2 strategic reconnaissance conversions), and Victor K.Mk 2 (24 three-point tanker conversions).

Principal user
Great Britain.

TECHNICAL DATA

Type: Handley Page Victor B.Mk 2R five-seat strategic heavy bomber.
Engines: four 20,600-lb (9,344-kg) thrust Rolls-Royce Conway Mk 2301 turbofans.
Performance: maximum speed 645 mph (1,038 km/h) at 40,000 ft (12,190 m); initial climb rate not revealed; service ceiling 55,000 ft (16,765 m); radius 2,300 miles (3,701 km).
Weights: empty 91,000 lb (41,277 kg); maximum take-off 233,000 lb (105,687 kg).
Dimensions: span 120 ft 0 in (36.48 m); length 114 ft 11 in (35.03 m); height 28 ft 1.5 in (8.57 m); wing area 2,406.0 sq ft (223.52 m2).
Armament: up to 35,000 lb (15,876 kg) of disposable stores.

By the mid-1960s, the Victor was too vulnerable for continued service as a bomber, and was converted as an inflight refueling tanker. This is a Victor K.Mk 2 converted from B.Mk 2R standard.

Photo: coll. Bigel
D1.075 12.20
Printed in Italy

CARD DECKS WP

D1 075 12

Attack and close support

USA

Republic F-105 THUNDERCHIEF

Republic F-105 THUNDERCHIEF

Underpowered prototype
The F-105 was developed as a Mach 2 strike fighter capable of delivering a nuclear weapon. The first prototype flew in October 1955 with a 15,000-lb (6,804-kg) thrust Pratt & Whitney J57 turbojet, but the proposed F-105A production aircraft was not built so that the company could concentrate on the F-105B with the more powerful J75 engine.

Vietnam support missions
The F-105B entered service in August 1958, and comparatively few of this model were built. Next came the definitive F-105D with all-weather avionics and toss bombing capability, and finally the F-105F two-seat conversion and proficiency trainer. The F-105 was used very extensively in Vietnam, flying some 75% of all US Air Force support missions in the period between 1965 and 1968. The two-seater was also involved operationally in the Vietnam War after its conversion to the specialist combat role. Total production was 824 aircraft excluding prototypes.

Principal versions
F-105B (initial production model with 16,500-lb/7,484-kg thrust J75-P-3 engine), F-105D (definitive strike fighter with more power and other improvements), F-105F (two-seater trainer), and F-105G (F-105F conversion for the "Wild Weasel" defense suppression role with the equipment and weapons to detect and destroy enemy air defense radars).

Principal user
USA.

TECHNICAL DATA

Type: Republic F-105D Thunderchief single-seat strike and attack fighter.
Engines: one 26,500-lb (12,020-kg) reheated thrust Pratt & Whitney J75-P-19W turbojet.
Performance: maximum speed 1,390 mph (2,237 km/h) or Mach 2.1 at 36,000 ft (10,975 m); initial climb rate 34,500 ft (10,515 m) per minute; service ceiling 41,200 ft (12,560 m); radius 230 miles (370 km) with a 12,000-lb (5,443-kg) warload.
Weights: empty 27,500 lb (12,474 kg); maximum take-off 52,838 lb (23,967 kg).
Dimensions: span 34 ft 9 in (10.59 m); length 64 ft 4 in (19.61 m); height 19 ft 7 in (5.97 m); wing area 385.0 sq ft (35.77 m^2).
Armament: one 20-mm multi-barrel cannon and up to 14,000 lb (6,350 kg) of disposable stores.

For its time the Thunderchief was a truly massive and highly capable warplane able to deliver a tactical nuclear weapon with great accuracy. This is an F-105B.

Photo: P. Bigel
D1 075 06-01
Printed in Italy

Interceptor

France

Dassault-Breguet MIRAGE IIIC

Dassault-Breguet MIRAGE IIIC

First Mirage

Delta funded by the company and derived from the MD.550 Mirage development type that first flew in June 1955, the Mirage III prototype first flew in November 1956. With supersonic performance provided by successively more powerful engines and later an auxiliary rocket engine to boost climb rate and ceiling, the type attracted French air force interest as a fast-climbing interceptor. The 10 examples of the Mirage IIIA preproduction variant comfirmed the capability of the type, which was ordered into production as the Mirage IIIC all-weather interceptor.

Air defence workhorse

The Mirage IIIC entered service in 1961 with Cyrano air interception radar, and an armament of two internal cannon supplemented by one R530 medium-range air-to-air missile complemented by two Sidewinder short-range AAMs. The fighter could double in the light attack role, but in service was seldom required to carry the rocket booster package that meant sacrifice of cannon armament. Remaining in French service for more than two decades, the Mirage IIIC also proved the starting point for a remarkably successful series of multi-role fighters.

Principal versions

Mirage IIIB (two-seat conversion trainer), Mirage IIIC (French air force interceptor), Mirage IIICJ (version for Israel), and Mirage IIICZ (version for South Africa).

Principal users

France, Israel, and South Africa.

TECHNICAL DATA

Type: Dassault-Breguet Mirage IIIC single-seat all-weather interceptor.
Engine: one 13,228-lb (6,000-kg) reheated thrust SNECMA Atar 9B turbojet.
Performance: maximum speed 1,460 mph (2,350 km/h) or Mach 2.2 at 36,090 ft (11,000 m); initial climb rate 16,405+ ft (5,000+ m) per minute; service ceiling 55,775 ft (17,000 m); radius 745 miles (1,200 km).
Weights: empty 13,571 lb (6,156 kg); maximum take-off 19,700 lb (8,936 kg).
Dimensions: span 26 ft 11.75 in (8.22 m); length 50 ft 10.25 in (15.50 m); height 13 ft 11.5 in (4.25 m); wing area 376.75 sq ft (35.00 m^2).
Armament: two 30-mm cannon and up to 3,000 ln (1,361 kg) of disposable stores.

Photographed above Djibouti, this is an example of the Mirage IIIC in service with the last French air force squadron to operate the type.

Photo: SIRPA/Air
D1 075 06-02
Printed in Italy

Heavy bomber

Great Britain

Avro LANCASTER

Avro LANCASTER

From fair to excellent

Great things had been expected of the Manchester medium bomber, but continual problems with its two Rolls-Royce Vulture engines resulted in the termination of the program after just 200 aircraft. From an early point, however, Avro had planned a four-engined equivalent of the Manchester, and this matured as the Lancaster, Great Britain's finest bomber of the Second World War. The Lancaster first flew in May 1941.

Few variants

From the very beginning the Lancaster was a success. Few modifications to the basic machine were ever required, so the production of 7,378 aircraft in several marks reflects engine rather than airframe changes. Some of the few altered machines were those flown by No.617 Squadron, which was created for the celebrated "dams raid" and then continued on Lancasters with weapons such as the "Tall Boy" and "Grand Slam" earthquake bombs.

Principal versions

Lancaster Mk I (main production model with 1,280-hp/954-kW Merlin XX or XXIV inlines), Lancaster Mk II (1,735-hp/1,294-kW Bristol Hercules VI or XVI radials and reduced warload), Lancaster B.Mk III (Packard-built Merlins), Lancaster B.Mk VII (final production model with Martin dorsal turret accommodating two 0.5-in/12.7-mm machine guns), and Lancaster B.Mk X (Canadian-built Mk I with Packard Merlins).

Principal user

Australia, Canada, and Great Britain.

TECHNICAL DATA

Type: Avro Lancaster Mk I seven-seat heavy bomber.
Engines: four 1,640-hp (1,223-kW) Rolls-Royce Merlin XXIV inline piston engines.
Performance: maximum speed 287 mph (462 km/h) at 11,500 ft (3,505 m); climb to 20,000 ft (6,095 m) in 41 minutes 0 seconds; service ceiling 24,500 ft (7,470 m); range 2,530 miles (4,072 km) with a 7,000-lb (3,175-kg) bombload.
Weights: empty 36,900 lb (16,738 kg); maximum take-off 70,000 lb (31,751 kg).
Dimensions: span 102 ft 0 in (31.09 m); length 69 ft 6 in (21.18 m); height 20 ft 0 in (6.10 m); wing area 1,297.0 sq ft (120.49 m^2).
Armament: eight 0.303-in (7.7-mm) machine guns in nose, dorsal, and tail turrets and up to 14,000 lb (6,350 kg) of bombs.

The Lancaster was Great Britain's most important bomber of the Second World War and, in addition to its standard night bombing role, flew several specialized roles.

Photo: M. Rostaing
D1 075 06-03
Printed in Italy

Land based helicopter

France

Aerospatiale SA 330 PUMA

Land based helicopter

Aerospatiale SA 330 PUMA

An army requirement

The Puma resulted from a 1962 French army requirement for an all-weather medium helicopter offering a high level of maneuverability in the troop transport and logistic supply roles. The resulting SA 330 prototype flew in April 1965, and was then included in the 1967 Anglo-French agreement for collaborative production of three helicopters

Versatility wins a large market

In service the Puma rapidly proved itself both reliable and versatile, and thus secured orders in the civil and military markets. Improvements to the series have been centered on more powerful engine variants.

Principal versions

SA 330B (French army model with 1,328-shp/990-kW Turmo IIIC4 turboshafts), SA 330C (export military version with 1,400-shp/1,044-kW Turmo IVBs), SA 330E (British equivalent of SA 330B), SA 330F (civil version with 1,435-shp/1,070- kW Turmo IVAs), SA 330G (civil version with Turmo IVCs), SA 330H (export military model with Turmo IVCs), SA 330J (improved civil model), and SA 330L (improved military model).

Principal users

Abu Dhabi, Algeria, Argentina, Belgium, Brazil, Chile, Chad, Congo, Ecuador, Ethiopia, France, Gabon, Great Britain, Guinea, Indonesia, Iraq, Ivory Coast, Kenya, Kuwait, Lebanon, Malawi, Mexico, Morocco, Nepal, Nigeria, Pakistan, Portugal, Romania, Senegambia, South Africa, Spain, Sudan, Togo, and Zaire.

TECHNICAL DATA

Type: Aerospatiale SA 330L Puma two/three-crew medium transport helicopter.

Engines: two 1,575-shp (1,174-kW) Turbomeca Turmo IVC turboshafts.

Performance: maximum speed 160 mph (258 km/h) at optimum altitude; initial climb rate 1,201 ft (366 m) per minute; service ceiling 15,750 ft (4,800 m); range 342 miles (550 km).

Weights: empty 7,970 lb (3,615 kg); maximum take-off 16,535 lb (7,500 kg).

Dimensions: main rotor diameter 49 ft 2.5 in (15.00 m); length overall, rotors turning 59 ft 6.5 in (18.15 m); height 16 ft 10.5 in (5.14 m); main rotor disc area 1,902.21 sq ft (176.62 m^2).

Payload: 20 troops, or six litters and six seated casualties, or 7,055 lb (3,200 kg) of freight.

This SA 330B of the French air force is typical of the many hundreds in service with many air arms. The same basic type has also been built under licence in Indonesia and Romania.

Photo: SIRPA/Air
D1 075 06-04
Printed in Italy

USA

Beech UC-43 TRAVELLER

Beech UC-43 TRAVELLER

A civilian utility plane

The first major success for Beech, founded in its current form during 1932 after the original Travel Air Manufacturing Company had been bought by Curtiss-Wright, was the Model 17 developed in 1932 as a light transport. The type appealed partly because of the performance provided by its retractable landing gear, and partly because of the great aesthetic attraction of the deep fuselage with its enclosed cabin and biplane wing layout, whose backward stagger led to the nickname "Staggerwing".

In Allied service

Some 248 aircraft were produced for civil use before and after the Second World War, but another 492 were built to military orders. In 1939 the type was adopted for communications duties by the US Army Air Corps and US Navy as the UC-43 and GB respectively, and later in the war considerable numbers were supplied to Great Britain under Lend-Lease.

Principal versions

Model 17 (civil model in several subvariants, of which many were impressed with the designations UC-43A/H, J, and K), UC-43 (military version of the D17S), GB (naval version in two subvariants), Traveller (British Lend-Lease version).

Principal users

Australia, Great Britain, and USA.

TECHNICAL DATA

Type: Beech UC-43 single-crew light transport.
Engine: one 450-hp (336-kW) Pratt & Whitney R-985-AN-1/3 radial piston engine.
Performance: maximum speed 195 mph (312 km/h) at 5,000 ft (1,525 m); initial climb rate 1,500 ft (455 m) per minute; service ceiling 20,000 ft (6,095 m); range 500 miles (805 km).
Weights: empty 3,085 lb (1,400 kg); maximum take-off 4,700 lb (2,132 kg).
Dimensions: span 32 ft 0 in (9.75 m); length 26 ft 2 in (7.97 m); height 10 ft 3 in (3.12 m); wing area 296.0 sq ft (27.50 m^2).
Payload: four passengers.

Known to the British services as the Traveller, this is a Model 17 "Staggerwing" of the Royal Air Force. The type is now a collector's item, and there are several airworthy examples in truly immaculate condition.

Photo: P. Guérin
D1 075 06-05
Printed in Italy

Fighter

USA

Grumman F4F WILDCAT

Grumman F4F WILDCAT

Long in development

The Wildcat was planned as a biplane but then recast as a portly monoplane, and flew in XF4F-2 form during September 1937 with a 1,050-hp (783-kW) Pratt & Whitney R-1830-66 radial. Though fast, the type had a number of operational limitations, and was further refined as the XF4F-3 with greater power, a larger wing, and revised tail surfaces.

Pacific battles

The Wildcat was decisive in limiting the superiority of Japanese fighters in the Pacific theater, for despite is modest speed it was agile, heavily armed, well protected, and flown by good pilots. The type was also supplied to the British (initially as the Martlet), and production totalled 7,344.

Principal versions

F4F–3 (initial model), F4F-3A (greater power), F4F–4 (definitive fighter), F4F-7 (unarmed reconnaissance model), FM-1 (General Motors-built F4F–4), FM–2 (General Motors-built model with the 1,350-hp/1,007-hp Wright R-1820-56 engine), Wildcat Mk I (British version of F4F–3A), Wildcat Mk II (as Mk I with two more guns and folding wings), Wildcat Mk III (Mk II with catapult spools), Wildcat Mk IV (British version of F4F–4), Wildcat Mk V (British version of FM–1), and Wildcat Mk VI (British version of the FM–2).

Principal users

Canada, Great Britain, and USA.

TECHNICAL DATA

Type: Grumman F4F-4 Wildcat single-seat carrierborne fighter.

Engine: one 1,200-hp (895-kW) Pratt & Whitney R-1830-86 Wasp radial piston engine.

Performance: maximum speed 318 mph (512 km/h) at 19,400 ft (5,915 m); initial climb rate 1,950 ft (594 m) per minute; service ceiling 34,900 ft (10,640 m); range 770 miles (1,240 km).

Weights: empty 5,785 lb (2,624 kg); maximum take-off 7,952 lb (3,607 kg).

Dimensions: span 38 ft 0 in (11.58 m); length 28 ft 9 in (8.76 m); height 9 ft 2.5 in (2.81 m); wing area 260.0 sq ft (24.15 m^2).

Armament: six 0.5-in (12.7-mm) machine guns and up to 200 lb (91 kg) of bombs.

The F4F Wildcat was the US Navy's most important carrierborne fighter until replaced by the same company's F6F Hellcat during 1943.

Photo: P. Guérin
D1 075 06-06
Printed in Italy

Fighter

France

Nieuport 17

Nieuport 17

Fruit of wartime experience

Gustave Delage used the feedback from fighting squadrons about his Nieuport 11 "Bebe" sesquiplane fighter in developing the structurally strengthened Nieuport 17, whose improvements were centered on performance and agility. The type appeared in March 1916, and was soon in large-scale production and service. The Nieuport 17 was particularly important in the Battle of Verdun, where it proved more than a match for German fighters such as the Albatros D I, Fokker E-types, and Halberstadt D II.

Poor initial armament

The Nieuport entered service with a Lewis gun mounted above the upper wing to fire over the propeller, but it was very difficult to change the ammunition drum of this weapon. From the end of 1916, the advent of a gun synchronizer system allowed the incorporation of a belt-fed weapon in the fuselage. The type was widely made, and also flown by the air arms of several other countries.

Principal versions

Nieuport 17 (first model, initially with the 110-hp/92-kw Clerget rotary), Nieuport 17bis (130-hp/97-kW Clerget rotary), Nieuport 21 (80-hp/60-kW Le Rhone rotary and larger ailerons, and used after the First World War as an aerobatic type by several display pilots), and Nieuport 23 (heavier version of the Nieuport 21 with either the 80-hp/60-kW or 120-hp/89-kW Le Rhone rotary).

Principal users

Belgium, France, Great Britain, Italy, Russia, USA

TECHNICAL DATA

Type: Nieuport 17 single-seat fighter.
Engine: one 120-hp (89-kW) Le Rhone rotary piston engine.
Performance: maximum speed 106 mph (170 km/h) at 6,500 ft (1,980 m); climb to 13,125 ft (4,000 m) in 19 minutes 30 seconds; service ceiling 17,750 ft (5,350 m); range 155 miles (250 km).
Weights: empty 825 lb (374 kg); maximum take-off 1,235 lb (560 kg).
Dimensions: span 26 ft 10.75 in (8.20 m); length 19 ft 7 in (5.96 m); height 8 ft 0 in (2.44 m); wing area 158.77 sq ft (14.75 m^2).
Armament: one 0.303-in (7.7-mm) machine gun.

A Nieuport 17 of a French air force squadron. Despite the apparent fragility of the lower wing, the type was quite strong and could therefore be thrown about the sky without problem. This made the type a favored mount for several notable Allied aces of the First World War.

Photo: S.H.A.A.
D1 075 06-07
Printed in Italy

Germany

Dornier Do 28

Dornier Do 28

Logical successor

First flown in April 1959, the Do 28 was a logical follow-on from the Do 27 with the greater reliability of a twin-engined layout. This latter was unusual in comprising engines at the tips of stub wings projecting from the fuselage sides below the cockpit. Some 120 examples of the two Do 28 variants were produced.

Redesign for greater payload

To provide for bulkier as well as heavier payload, the basic airframe was then redesigned to produce the Do 28D Skyservant, which first flew in February 1966. Some export aircraft have underwing hardpoints for the carriage of light armament or, more usually, auxiliary fuel. Still further development resulted in the Do 128 model with capacity for 10 passengers.

Principal versions

Do 28A (initial eight-seat model in two subvariants with 250-hp/186-kW Lycoming O-540 engines), Do 28B (in two subvariants with IO-540 engines), Do 28D (revised airframe in two subvariants), Do 128-1 improved 11-seater with IGSO-540s), and Do 128-6 (version with two 400-shp/298-kW Pratt & Whitney Canada PT6A-110 turboprops).

Principal users

Cameroun, Ethiopia, Greece, Kenya, Lesotho, Malawi, Morocco, Niger, Nigeria, Somalia, Turkey, West Germany, Yugoslavia, and Zambia.

TECHNICAL DATA

Type: Dornier Do 28B-1 one-crew STOL utility transport.

Engines: two 290-hp (216-kW) Lycoming IO-540A flat-six piston engines.

Performance: maximum speed 180 mph (290 km/h) at sea level; initial climb rate 1,400 ft (427 m) per minute; service ceiling 20,700 ft (6,300 m); range 769 miles (1,235 km) with maximum payload.

Weights: empty 3,814 lb (1,730 kg); maximum take-off 6,000 lb (2,722 kg).

Dimensions: span 45 ft 3.5 in (13.80 m); length 29 ft 6 in (9.00 m); height 9 ft 2 in (2.80 m); wing area 241.1 sq ft (22.40 m^2).

Payload: seven passengers or an equivalent weight of freight.

The Do 28 series is used by both West German air arms, the Luftwaffe and the Marineflieger, for a variety of tasks.

Photo: M. Rostaing
D1 075 06-08
Printed in Italy

Attack and close support

USA

Republic F-84 THUNDERSTREAK

Republic F-84 THUNDERSTREAK

Swept-wing development

The first turbojet-powered fighter designed by Republic was the F-84 Thunderjet, which entered large-scale service as a tactical fighter (in fact the first such machine able to deliver a tactical nuclear weapon). However, the Thunderjet was limited in performance by its straight flying surfaces, and to overcome this restriction the company developed a considerably revised F-84F Thunderstreak model. This flew for the first time in April 1950 with an Allison J35 turbojet. The type was planned round the Wright J65, a licensed version of a British engine, the Armstrong Siddeley Sapphire, and this was introduced on the 2,713 production aircraft.

Reconnaissance version

To provide a reconnaissance capability, there was also the RF-84F Thunderflash. These 715 aircraft had the 7,800-lb (3,538-kg) thrust J65-W-7 turbojet aspirated via wing root inlets, the chance from the circular nose inlet of earlier models allowing complete revision of the nose for the camera installation.

Principal versions

F-84F Thunderstreak (swept-wing tactical fighter produced in large numbers with the J65-W-3 engine in all but 375 machines with the J65-W-1A), RF-84F Thunderflash (tactical photo-reconnaissance model with revised nose and wing root air inlets), and RF-84K (RF-84F version designed for air-launch and recovery by a Convair B-36 strategic heavy bomber).

Principal users

Belgium, Denmark, France, Greece, Norway, Turkey, USA, and West Germany.

TECHNICAL DATA

Type: Republic F-84F Thunderstreak single-seat tactical and attack fighter.
Engine: one 7,220-lb (5,384-kg) thrust Wright J65-W-3 turbojet.
Performance: maximum speed 695 mph (1,118 km/h) at sea level; initial climb rate 8,200 ft (2,499 m) per minute; service ceiling 46,000 ft (14,020 m); radius 810 miles (1,304 km).
Weights: empty 13,830 lb (6,273 kg); maximum take-off 28,000 lb (12,701 kg).
Dimensions: span 33 ft 7.25 in (10.24 m); length 43 ft 4.75 in (13.23 m); height 14 ft 4.75 in (4.39 m); wing area 325.0 sq ft (30.19 m^2).
Armament: six 0.5-in (12.7-mm) machine guns and up to 6,000 lb (2,722 kg) of disposable stores.

These are F-84F Thunderstreaks of a French air force squadron. The type was used by many NATO air arms.

Photo: S.H.A.A.
D1 075 06-09
Printed in Italy

France

Bloch MB.174

Bloch MB.174

Built too late

In 1936 the SNCASO, one of France's newly nationalized aircraft manufacturing groups, began work on a new reconnaissance plane that could also double in the light bomber role. An MB.170 prototype first flew in February 1938. The type clearly had operational potential, but considerable time was wasted in assessing various possible developments before the MB.174 prototype flew in January 1939 as the precursor of the reconnaissance model with more power than the MB.170.

Useful speed

Further time was squandered on armament trials and engine difficulties, and the MB.174 entered service only in March 1940. Germany invaded France two months later, and the 56 production aircraft then had a chance to prove their worth. Limited experience against the German air force confirmed that the MB.1784 would have been significant had it been available in larger numbers, for it had the speed and agility to undertake the reconnaissance role without unacceptably high levels of interception. Marcel Bloch was imprisoned by the Germans during the Second World War, and after his return to France changed his name to Marcel Dassault, founding the great aerospace manufacturing company that still bears his name.

Principal version

MB.174 (sole production model).

Principal user

France

TECHNICAL DATA

Type: Bloch MB.174A.3 three-seat reconnaissance and light bombing plane.
Engines: two 1,100-hp (820-kW) Gnome-Rhone 14N-48/49 radial piston engines.
Performance: maximum speed 329 mph (530 km/h) at 17,060 ft (5,200 m); climb to 26,250 ft (8,000 m) in 11 minutes 0 seconds; service ceiling 36,090 ft (11,000 m); range 1,025 miles (1,650 km).
Weights: empty 12,346 lb (5,600 kg); maximum take-off 15,784 lb (7,160 kg).
Dimensions: span 58 ft 8.75 in (17.90 m); length 40 ft 2.25 in (12.25 m); height 11 ft 7.75 in (3.55 m); wing area 409.03 sq ft (38.00 m^2).
Armament: seven 7.5-mm (0.295-in) machine guns (two fixed in nose and the other five in dorsal and ventral positions) and up to 1,102 lb (500 kg) of bombs.

The MB.174 appeared too late to aid France significantly in the disastrous 1940 campaign against Germany, but revealed considerable potential.

Photo: S.H.A.A.
D1 075 06-10
Printed in Italy

Air superiority fighter

USA

McDonnell Douglas F-15 EAGLE

Air superiority fighter

McDonnell Douglas F-15 EAGLE

A new air superiority mount

The F-15 was designed to succeed the same manufacturer's F-4 Phantom II, and first flew in July 1972 as a substantial twin-engined machine with advanced avionics, including a fly-by-wire control system and the very capable APG-63 radar. The type revealed phenomenal climb performance during trials, and began to enter service during January 1976.

Continued development

Work was already under way on an updated version with the improved APG-70 radar, a number of other electronic enhancements (including attachments for externally mounted sensor packages) and provision for FAST (Fuel And Sensor Tactical) packs. These can be attached snugly in the angle between the engine trunks and the under surfaces of the wing for considerably greater fuel capacity and additional weapon attachment points without any significant drag penalty. Production of more than 1,500 Eagles is expected.

Principal versions

F-15A (initial single-seat model), F-15B (initial two-seat model used for conversion and proficiency training but retaining full combat capability), F- 15C (improved single-seat model with features such as more capable electronic countermeasures and provision for the new AIM-120 AMRAAM air-to-air missiles), and F-15D (improved two-seat model).

Principal users

Israel, Japan, Saudi Arabia, and USA.

TECHNICAL DATA

Type: McDonnell Douglas F-15C Eagle single-seat air superiority fighter with attack capability.
Engines: two 23,950-lb (10,864-kg) reheated thrust Pratt & Whitney F100-P-100 turbofans.
Performance: maximum speed 1,650+ mph (2,655+ km/h) or Mach 2.5+ at 36,000 ft (10,975 m); climb to 40,000 ft (12,190 m) in 1 minute 0 seconds; service ceiling 60,000 ft (18,290 m); range 2,878 miles (4,631 km) without FAST packs.
Weights: empty 27,000 lb (12,247 kg); maximum take-off 68,000 lb (30,845 kg).
Dimensions: span 42 ft 9.75 in (13,05 m); length 63 ft 9 in (19.43 m); height 18 ft 5.5 in (5.63 m); wing area 608.0 sq ft (56.50 m^2).
Armament: one 20-mm multi-barrel cannon and up to 23,600 lb (10,705 kg) of disposable stores.

The world's finest air superiority fighter, the F-15 is illustrated in the form of an Eagle at the moment of touch down.

Photo: P. Bigel
D1 075 06-11
Printed in Italy

Land based helicopter

USA

Sikorsky H-34

Land based helicopter

Sikorsky H-34

Innovative design
The S-58 was one of the first true helicopter workhorses, and first flew in March 1954 as the XHSS-1 prototype in response to a naval requirement for a shipborne anti-submarine helicopter. The type featured a modern-looking fuselage with tailwheel landing gear, and an innovatory feature was the location of the engine low in the nose with a long shaft running obliquely through the forward fuselage. The type was built up to 1970, production amounting to 2,261 helicopters for civil, military, and naval use.

Distinguished service
The specifically land based variants were the CH-34 Choctaw for the US Army and, in small numbers, the S-58 civil models. The Choctaw entered service in September 1955 as a utility type generally used for the carriage of troops, and played an important part in France's North African war of the early 1960s. Some S-58s have been revitalized by the retrofit of a Pratt & Whitney Canada PT6A-3/6 coupled turboshaft.

Principal versions
CH-34A Choctaw (general purpose helicopter), CH-34C Choctaw (as CH-34A but with SAR equipment), S-58B (civil passenger/freight model), S-58C (civil airline version), S-58D (improved civil passenger/freight model), and S-58T (turboshaft-powered conversion).

Principal users
Belgium, Brazil, Canada, France, Israel, Italy, Japan, Kampuchea, Laos, the Netherlands, Philippines, South Vietnam, Taiwan, Thailand, Uruguay, USA, and West Germany.

TECHNICAL DATA

Type: Sikorsky CH-34A Choctaw two/three-crew general-purpose helicopter.
Engine: one 1,525-hp (1,137-kW) Wright R-1820-84B/D radial piston engine.
Performance: maximum speed 122 mph (196 km/h) at sea level; initial climb rate 1,100 ft (335 m) per minute; service ceiling 9,500 ft (2,895 m); range 247 miles (400 km).
Weights: empty 7,750 lb (3,515 kg); maximum take-off 13,000 lb (5,900 kg).
Dimensions: main rotor diameter 56 ft 0 in (17.07 m); length, fuselage 46 ft 9 in (14.25 m); height 15 ft 11 in (4.85 m); main rotor disc area 2,463.0 sq ft (228.81 m^2).
Payload: 18 troops, or eight litters, or freight.

The S-58 was a true multi-role helicopter, this being an example operated by the French army in Algeria for the assault transport role.

Photo: S.H.A.A.
D1 075 06-12
Printed in Italy

France

Dassault FLAMANT

Dassault FLAMANT

Successful Dassault contender

The Flamant (flamingo) first flew during February 1947 in the form of the MD.303 prototype to meet a requirement for a utility transport and aircrew trainer. The type featured retractable tricycle landing gear, and was based on a portly fuselage with a mid/low-set wing, and a substantial tail unit with endplate vertical surfaces. Evaluated successfully against the SNCASO SO.94 Corse, the Flamant entered production in 1948 for a service debut in January 1949. In service the type proved very durable, some examples remaining operational for 40 years before the type's final disappearance in the early 1980s.

Naval and overseas deployment

The Flamant was initially deployed to air force units in West Africa, and was also bought by the French navy. Ex-French aircraft were then supplied in small numbers for the fledgling air forces of several ex-French colonies. Total production of the three Flamant variants was 318 aircraft.

Principal versions

MD.311 Flamant (39 bombing, photography, and navigation trainers), MD.312 Flamant (liaison and communications model of which 142 were built), and MD.315 Flamant (light utility transport model, of which 137 were built with an interior adaptable for passenger, aeromedical evacuation, and freight use).

Principal users

Cambodia, France, Madagascar, Tunisia, and Vietnam.

TECHNICAL DATA

Type: Dassault MD.315 Flamant one/two-crew light utility transport.
Engines: two 580-hp (433-kW) SNECMA-Renault 12S 02-201 inline piston engines.
Performance: maximum speed 236 mph (380 km/h) at 3,280 ft (1,000 m); initial climb rate not revealed; service ceiling 26,245 ft (8,000 m); range 755 miles (1,215 km).
Weights: empty 9,370 lb (4,250 kg); maximum take-off 12,787 lb (5,800 kg).
Dimensions: span 67 ft 11 in (20.70 m); length 41 ft 0.25 in (12.50 m); height 14 ft 9.25 in (4.50 m); wing area 508.06 sq ft (47.20 m^2).
Payload: 10 passengers, or litters, or freight.

The Flamant was unexceptional but thoroughly workable and reliable, and therefore remained in service for many years.

Photo: F. Robineau/Aviaplans
D1 075 06-13
Printed in Italy

Heavy bomber

Italy

Caproni Ca.3

Caproni Ca.3

Caproni's initiative

Caproni was a far sighted aeronautical company, and realized even before Italy's entry to the First World War in 1915 that bombing could be a decisive weapon. In October 1914, therefore, it flew the Ca 30 prototype of a heavy bomber with a central nacelle ending in a 100-hp (75-kW) Gnome rotary driving a pusher propeller, and two 80-hp (60-kW) Gnomes with tractor propellers at the front of the twin booms supporting the tail unit with its triple rudders.

Into production

The type entered production (162 aircraft) as the Ca 31 with three 100-hp (75-kW) Fiat A.10 engines, and received the service designation Ca.1. Only nine Ca.12s were built before the appearance of the definitive Ca.3 with three Isotta-Fraschini inline engines: production of 299 in Italy was complemented by 83 aircraft from a French line. After the First World War, Caproni also produced 153 examples of the Ca 36, which was a more refined but structurally simplified version of the Ca.3. Built between 1923 and 1926, these aircraft served with the designation Ca 3M.

Principal versions

Ca.1 (initial bomber), Ca.2 (improved bomber with the central engine replaced by a 150-hp/112-kW Isotta-Fraschini V.4B inline engine), Ca.3 (definitive wartime bomber), Ca.3M (improved post-war bomber), Ca 56 (designation of Ca.1s modified as airliners for six passengers), and Ca 56a (similar conversion of Ca.3 bombers).

Principal users

France and Italy.

TECHNICAL DATA

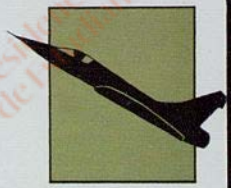
Type: Caproni Ca.3 three/four-seat heavy bomber.
Engines: three 150-hp (112-kW) Isotta-Fraschini V.4B inline piston engines.
Performance: maximum speed 87 mph (140 km/h) at sea level; initial climb rate not revealed; service ceiling 13,450 ft (4,100 m); range 280 miles (450 km).
Weights: empty 5,071 lb (2,300 kg); maximum take-off 7,302 lb (3,312 kg).
Dimensions: span 72 ft 10 in (22.20 m); length 35 ft 9.25 in (10.90 m); height 12 ft 1.5 in (3.70 m); wing area not revealed.
Armament: two or four 7.7-mm (0.303-in) machine guns and up to 992 lb (450 kg) of bombs.

Despite its somewhat unusual and ungainly appearance, the Ca 3 was amongst the best bombers of the First World War.

Photo: S.H.A.A.
D1 075 06-14
Printed in Italy

Fighter

USA



Republic P-47D THUNDERBOLT

Republic P-47D THUNDERBOLT

Heavy fighter project

Clearly an evolutionary development of the P-43 Lancer, the P-47 was the largest and heaviest single seat fighter of its time. The type's massive frame was the result of Alexander Kartveli's decision to use the largest possible radial engine with its turbocharger located, for center of gravity reasons, in the rear fuselage and connected to the engine by stainless steel ducts. The XP-47B prototype flew in May 1941, and P-47B fighters began to come off the production line in March 1942.

Fearsome and efficient

The P-47B lacked agility and performance at low and medium altitudes, but these shortcoming were remedied in later variants and the Thunderbolt became one of the truly decisive aircraft of the Second World War. The definitive model was the P-47D that introduced the bubble canopy to provide the pilot with all-round vision.

Principal versions

P-47B Thunderbolt (171 aircraft with the 2,000-hp/1,491-kW R-2800-21 radial), P-47C (602 aircraft based on the P-47B with a modified engine mounting for the 2,300-hp/1,715-kW R-2800-59, and provision for bombs or drop tanks), P- 47C (12,559 aircraft initially similar to the P-47C apart from detail improvements, but then delivered with a bubble canopy and other improvements including a more powerful engine).

Principal users

Brazil, France, Great Britain, USA, and USSR.

TECHNICAL DATA

Type: Republic P-47D Thunderbolt single-seat fighter and fighter-bomber.
Engine: one 2,535-hp (1,890-kW) Pratt & Whitney R-2800-59W radial piston engine.
Performance: maximum speed 433 mph (697 km/h) at 30,000 ft (9,145 m); climb to 20,000 ft (6,095 m) in 20 minutes 0 seconds; service ceiling 41,000 ft (12,495 m); range 1,900 miles (3,058 km) with drop tanks.
Weights: empty 9,950 lb (4,513 kg); maximum take-off 17,500 lb (7,938 kg).
Dimensions: span 40 ft 9.25 in (12.43 m); length 36 ft 1.65 in (11.02 m); height 14 ft 8 in (4.47 m); wing area 300.0 sq ft (27.87 m^2).
Armament: eight 0.5-in (12.7-mm) machine guns and up to 2,500 lb (1,134 kg) of disposable stores.

More P-47s were built than any other American fighter in history, and the type was a prodigious performer in its definitive form.

Photo: P. Guérin
D1 075 06-15
Printed in Italy

USA

Douglas C-54 SKYMASTER

Douglas C-54 SKYMASTER

Civil development

In June 1938 Douglas flew the prototype of an advanced four-engined airliner with tricycle landing gear and pressurized accommodation. This DC-4E was in reality too advanced for its period and, suffering many problems with several of its systems, was cancelled. The same basic concept was then used for the DC-4 of 1939, which was unpressurized and featured simplified systems.

Military requirement

The USA became embroiled in the Second World War before the new DC-4 could fly, and the type was then adapted with little difficulty as the C-54 Skymaster to meet a US Army Air Forces' requirement for a trans-oceanic transport. The type first flew in February 1942. Production for the military eventually totalled 1,122 aircraft that served with little glamor but great distinction.

Principal versions

C-54 (militarized DC-4A airliners), C-54A (C-54 variant with different engines and usable in the convertible passenger/freight role thanks to its reinforced floor and cargo doors), C-54B (heavier C-54A with provision for litters), C-54C (VIP transport), C-54D (re-engined C-54B), C-54E (long-range version), C-54G (high-density passenger transport), R4D-1/4 (US Navy equivalents of the C-54, A, D, and G), Skymaster Mk I (British equivalent of C-54B/D).

Principal users

Great Britain and USA.

TECHNICAL DATA

Type: Douglas C-54A Skymaster six-crew long-range transport.
Engines: four 1,290-hp (962-kW) Pratt & Whitney R-2000-7 radial piston engines.
Performance: maximum speed 275 mph (442 km/h) at optimum altitude; climb to10,000 ft (3,050 m) in 14 minutes 48 seconds; service ceiling 22,000 ft (6,705 m); range 3,900 miles (6,275 km).
Weights: empty 37,000 lb (16,783 kg); maximum take-off 62,000 lb (28,123 kg).
Dimensions: span 117 ft 6 in (35.81 m); length 93 ft 10 in (28.60 m); height 27 ft 6 in (8.38 m); wing area 1,460.0 sq ft (135.63 m^2).
Payload: 50 passengers or freight.

The C-54 Skymaster was the military counterpart to the DC-4, and was a workhorse transport of the Second World War.

Photo: P. Bigel
D1 075 06-16
Printed in Italy

Fighter

France

Dassault SUPER MYSTERE B-2

Dassault SUPER MYSTERE B-2

Successor to the Mystere IV

From the Mystere IV series Dassault developed a more capable warplane that first flew in March 1955 as the Super Mystere B-1. This achieved supersonic flight in its test program, and the resulting Super Mystere B-2 is reckoned to have been the first European warplane of the production type capable of besting Mach 1 in level flight. By comparison with the Mystere, the Super Mystere featured greater sweep on the flying surfaces, a thinner wing section, and an oval rather than circular inlet at the nose.

Production and service

Production began in 1956, and the Super Mystere B-2 entered service late in 1957. The availability of these 156 aircraft completely transformed the nature and capabilities of French air defense, but the type remained in front-line service for only a relatively short time before it was overtaken by the Dassault Mirage III series, when it was relegated to secondary roles such as weapon trials. Additional production was undertaken for Israel, which bought 24 aircraft for use mainly in the ground-attack role.

Principal version

Super Mystere B-2 (first and only production model).

Principal users

France, Honduras, and Israel.

TECHNICAL DATA

Type: Dassault Super Mystere B-2 single-seat fighter and fighter-bomber.

Engine: one 9,833-lb (4,460-kg) reheated thrust SNECMA Atar 101G-2/3 turbojet.

Performance: maximum speed 743 mph (1,195 km/h) or Mach 1.125 at 39,370 ft (12,000 m); initial climb rate 17,505 ft (5,335 m) per minute; service ceiling 55,775 ft (17,000 m); range 540 miles (870 km).

Weights: empty 15,282 lb (6,932 kg); maximum take-off 22,046 lb (10,000 kg).

Dimensions: span 34 ft 6 in (10.52 m); length 46 ft 4.25 in (14.13 m); height 14 ft 11 in (4.55 m); wing area 376.75 sq ft (35.00 m^2).

Armament: two 30-mm cannon and up to 2,205 lb (1,000 kg) of disposable stores.

This Super Mystere B-2 was one of the last in French service, and is seen during 1977.

Photo: SIRPA/Air
D1 075 06-17
Printed in Italy

France

Max Holste MH.1521 BROUSSARD

Max Holste MH.1521 BROUSSARD

Innovative design

In June 1951 Max Holste flew its MH.152 prototype designed as a high-wing braced monoplane to meet a French army requirement for a light liaison and observation plane. The type was powered by a 220-hp (164-kW) Salmson 8As inline engine (a French version of a German engine of the Second World War, the Argus), but failed to secure any production order as the army had abandoned its requirement for so low-powered a type.

Slight enlargement

The company then decided to produce a slightly larger but considerably more powerful version, and this flew in November 1952 as the MH.1521 with an R-985 radial piston engine. This development found immediate favour, and comparatively large scale production was undertaken to meet both civil and military orders. A single conversion, the MH.1522, with full-span leading edge slots and double-slotted trailing edge flaps, first flew in 1958 and revealed excellent STOL capability, but no production was undertaken.

Principal versions

MH.1521 Broussard (utility transport), and MH.1521A Broussard (version with equipment for agricultural use).

Principal users

Cameroun, Central African Republic, Chad, Congo, Dahomey, France, Gabon, Ivory Coast, Madagascar, Mauritania, Niger, Senegambia, and Upper Volta.

TECHNICAL DATA

Type: Max Holste MH.1521 Broussard one-crew utility transport.
Engine: one 450-hp (336-kW) Pratt & Whitney R-985-AN-1 radial piston engine.
Performance: maximum speed 168 mph (270 km/h) at 3,280 ft (1,000 m); initial climb rate 1,180 ft (360 m) per minute; service ceiling 18,045 ft (5,500 m); range 500 miles (805 km).
Weights: empty 3,373 lb (1,530 kg); maximum take-off 5,512 lb (2,500 kg).
Dimensions: span 45 ft 1.25 in (13.75 m); length 28 ft 4.5 in (8.65 m); height 12 ft 0 in (3.65 m); wing area 271.26 sq ft (25.20 m²).
Payload: four passengers or freight.

The MH.1521 Broussard proved a long lived type and, after sterling service with the French in the utility and observation roles, was distributed to the air arms of France's ex-colonies in Africa.

Photo: SIRPA/Air
D1 075 06-18
Printed in Italy

Trainer

USA

North American T-28 TROJAN

North American T-28 TROJAN

Post-war trainer

Immediately after the end of the Second World War, the US Army Air Forces started the quest for a new trainer to replace the AT-6 Texan. It is hardly surprising, however, that the contract for the Texan's replacement went to the same company, North American. The first XT-28 prototype flew in September 1949, and though superficially similar to the AT-6 in configuration, was a modern stressed skin plane with considerably more power.

USAF order

By this time the USAAF had become the US Air Force, and this ordered the new trainer into production as the T-28A Trojan, of which 1,194 were built with the 800-hp (597-kW) Wright R-1300 radial engine. In 1952 it was decided to standardize basic trainers within the US forces, and the US Navy adopted a version of the Trojan as the T-28B with considerably more power for much improved performance. These 489 aircraft were followed by 299 examples of the T-28C with an arrester hook to provide deck landing capability. In 1962 North American produced a weapon training and light attack model with six underwing hardpoints, and this T-28D model was produced to the extent of 399 conversions, of which many were used by France with the name Fennec; the AT- 28D was an attack trainer equivalent.

Principal versions

T-28A Trojan (air force trainer), T-28B (uprated naval trainer), T-28C (naval trainer with arrester hook), and T-28D (conversion for weapon training and light attack/counter-insurgency).

Principal users

Argentina, Bolivia, France, Kampuchea, Laos, Thailand, USA, and Zaire.

TECHNICAL DATA

Type: North American T-28B two-seat basic trainer.
Engine: one 1,425-hp (1.063-kW) Wright R-1820-86 Cyclone radial piston engine.
Performance: maximum speed 343 mph (552 km/h) at optimum altitude; initial climb rate 3,540 ft (1,079 m) per minute; service ceiling 35,500 ft (10,820 m); range 1,060 miles (1,706 km).
Weights: empty 6,424 lb (2,914 kg); maximum take-off 8,500 lb (3,856 kg).
Dimensions: span 40 ft 1 in (12.22 m); length 33 ft 0 in (10.06 m); height 12 ft 8 in (3.86 m); wing area 268.0 sq ft (24.90 m^2).
Armament: none.

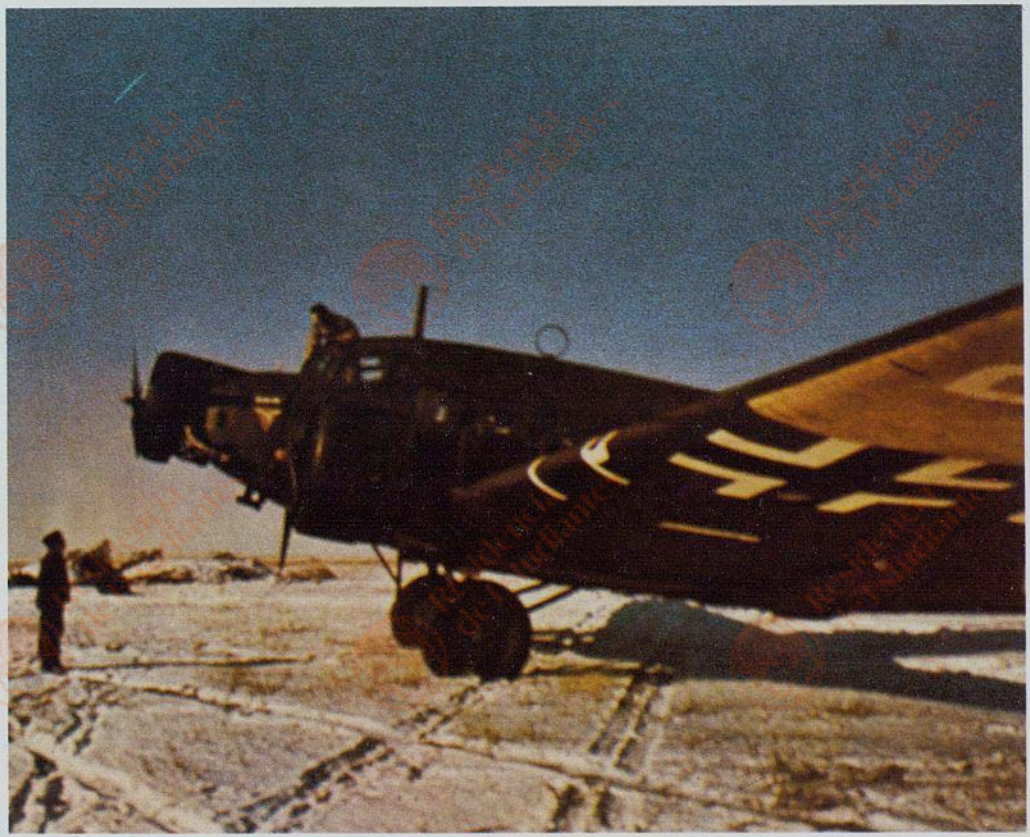
These are examples of the T-28D light attack conversion of earlier pure trainers.

Photo: S.H.A.A.
D1 075 06-19
Printed in Italy

Transport and utility

Germany

Junkers Ju 52/3m



Junkers Ju 52/3m

Early development

The Ju 52/3m was a simple yet highly effective development of the Ju 52 transport, the addition of two more engines turning an indifferent performer into a capable transport. The prototype first flew in April 1931, and by 1932 Lufthansa had a sizeable Ju 52/3m fleet. Useful sales were also made to other airlines.

Into uniform

It was when the German air force developed an interest in the type that the production rate soared. A few early examples were operated in the bomber role pending the delivery of purpose designed bombers, but it was as a military transport and paratrooping/glider-tug type for the airborne forces that the Ju 52/3m acquired immortality. Total production was about 4,850 aircraft, and some are still airworthy.

Principal versions

Ju 52/3mge (civil passenger transport), Ju 52/3m g3e (bomber-transport), Ju 52/3m g4e (improved bomber-transport), Ju 52/3m g5e (military transport), Ju 52/3m g6e (improved transport, some completed as floatplanes), Ju 52/3m g7e (transport with autopilot and larger hatch), Ju 52/3m g8e (convertible transport), Ju 52/3m g9e (glider tug), Ju 52/3m g12e (improved civil and military transport), and Ju 52/3m g14e (transport with armor protection and improved guns).

Principal users

Croatia, France, Germany, Hungary, Portugal, Romania, South Africa, Spain, Switzerland, and USSR.

TECHNICAL DATA

Type: Junkers Ju 52/3m g7e three-crew multi-role transport.

Engines: three 830-hp (619-kW) BMW 132T-2 radial piston engines.

Performance: maximum speed 178 mph (286 km/h) at 4,590 ft (1,400 m); climb to 9,845 ft (3,000 m) in 19 minutes 0 seconds; service ceiling 18,045 ft (5,500 m); range 930 miles (1,500 km).

Weights: empty 14,328 lb (6,500 kg); maximum take-off 24,320 lb (11,030 kg).

Dimensions: span 95 ft 10 in (29.20 m); length 62 ft 0 in (18.90 m); height 14 ft 10 in (4.52 m); wing area 1,189.41 sq ft (110.50 m^2).

Armament: four 7.92-mm (0.312-in) machine guns in dorsal and beam positions.

Payload: 18 troops, or 12 litters, or freight.

A legendary transport, the Ju 52/3m was born in peace, performed superbly in a violent war, and then returned to the humdrum existence of the civil transport world despite its technical obsolescence.

Photo: S.H.A.A.
D1 075 06-20
Printed in Italy

CARD DECKS WP

D1 075 06

Attack and close support

USA

Fairchild Republic A-10 THUNDERBOLT II

Fairchild Republic A-10 THUNDERBOLT II

Competitive fly-off
In 1967 the US Air Force launched a program for a subsonic tactical support warplane able to carry a large warload in the primary anti-tank role. Prototypes were ordered from Fairchild Republic and Northrop, the former's YA-10A first flying in May 1972. The YA-10A was evaluated competitively against the YA-9A, and declared winner of the competition in 1973.

Tank buster
The Thunderbolt II was designed as a low-cost type, and therefore lacks all-weather capability and relies on the pilot's head-up display for accurate weapon delivery. Total production was 723 aircraft designed specifically to survive against Soviet battlefield air defenses and knock out Soviet armor. Survivability was provided by widely separated engines, a titanium armor bath for the pilot and primary systems, and multiple redundancy of the structure and systems. Offensive capability was provided by the GAU-8/A Avenger seven-barrel cannon firing depleted uranium projectiles, and a large load of varied ordnance (including six Maverick air-to-surface missiles) carried under the fuselage and wings. Despite the type's protective features and low-level agility, there are now serious doubts about the A-10A's survivability because of its very low speed and comparatively large size.

Principal version
A-10A Thunderbolt II (sole production version).

Principal user
USA.

TECHNICAL DATA

Type: Fairchild Republic A-10A Thunderbolt II single-seat tactical support and anti-tank warplane.
Engines: two 9,065-lb (4,111-kg) thrust General Electric TF34-GE-100 turbofans.
Performance: maximum speed 439 mph (706 km/h) at sea level; initial climb rate 6,000 ft (1,830 m) per minute; service ceiling not revealed; radius 288 miles (463 km) with a loiter of 1 hour 42 minutes.
Weights: empty 24,960 lb (11,322 kg); maximum take-off 50,000 lb (22,680 kg).
Dimensions: span 57 ft 6 in (17.53 m); length 53 ft 4 in (16.26 m); height 14 ft 8 in (4.47 m); wing area 506.0 sq ft (47.01 m^2).
Armament: one 30-mm multi-barrel cannon and up to 16,000 lb (7,258 kg) of disposable stores.

The projectiles of the massive 30-mm multi-barrel cannon are the A-10A Thunderbolt II's main weapon against tanks at short range.

Photo: Salamander
D1 075 09.01
Printed in Italy

Attack and close support

USSR

Sukhoi Su-22 "FITTER"

Sukhoi Su-22 "FITTER"

"Swing-wing" version of the Su-7
Derived from the Su-7 attack fighter with "swing-wing" outer panels for improved field performance, greater range, and increased warload, the Su-17 is one of the most important tactical warplanes in the inventory of the USSR and its allies. The type was first flown in 1966, and has since been developed in several models.

Export version
The versions of the "Fitter" produced for export to non-Warsaw Pact nations are the Su-20 and Su-22. The Su-20 has a lower electronic standard than the Su-17, and the Su-22 is additionally distinguishable from the Su-17 by its bulged rear fuselage (dictated by use of a Tumanskii rather than Lyul'ka turbojet) and a short rear shroud. The model is generally configured for use with less advanced weapons.

Principal versions
Su-22 "Fitter-F" (equivalent of the Su-17M "Fitter-D" with limited-coverage radar warning receiver, few navaids, and obsolescent weapons), Su-22 "Fitter-G" (equivalent of the Su-17 "Fitter-G" two-seat conversion and continuation trainer with a drooped nose section), and Su-22 "Fitter-J" (equivalent of the Su-17 "Fitter-H" with increased fuel capacity and a more angular dorsal fin).

Principal users
Libya and Peru.

TECHNICAL DATA

Type: Sukhoi Su-22 "Fitter-F" single-seat ground attack fighter.
Engine: one 25,353-lb (11,500-kg) reheated thrust Tumanskii R-29BS-300 turbojet.
Performance: maximum speed 1,379 mph (2,220 km/h) or Mach 2.09 at 36,090 ft (11,000 m); initial climb rate 45,275 ft (13,800 m) per minute; service ceiling 59,055 ft (18,000 m); radius 425 miles (685 km) with a 4,409-lb (2,000-kg) warload.
Weights: empty 22,046 lb (10,000 kg); maximum take-off 39,021 lb (17,700 kg).
Dimensions: span 45 ft 3 in (13.80 m) spread and 32 ft 10 in (10.00 m) swept; length 61 ft 6.25 in (18.75 m); height 16 ft 5 in (5.00 m); wing area 430.0 sq ft (40.00 m^2) spread and 398.0 sq ft (37.00 m^2) swept.
Armament: two 30-mm cannon and up to 7,000+ lb (3,175+ kg) of disposable stores.

An Su-22 "Fitter-J" of the Libyan air force. In 1981 two such Libyan aircraft were destroyed by US Navy Grumman F-14A Tomcats over the Mediterranean after shaping up for an attack on the American fighters.

Photo: Salamander
D1 075 09.02
Printed in Italy

Medium bomber

Great Britain

Vickers WELLINGTON

Medium bomber

Vickers WELLINGTON

Vickers know-how
Vickers designed its Type 271 using the geodetic construction pioneered by the Wellesley bomber, and the prototype first flew in June 1936. The type was ordered into production as the Wellington Mk I with Vickers turrets including a retractable ventral "dustbin" type.

Disastrous baptism of fire
The Wellington appeared in steadily improved variants, and was initially flown as a day bomber in the Second World War. However, its losses in early battles were so high that the type was thereafter used only for night bombing, and here it was the mainstay of the British effort until the Avro Lancaster was in widespread service. From 1943 the type was successfully adapted for a number of alternative roles.

Principal versions
Wellington Mk I (initial 183 aircraft), Wellington Mk IA (187 with Nash & Thompson turrets), Wellington Mk IC (2,685 of the definitive early model with ventral turret replaced by beam guns), Wellington Mk II (401 with 1,145-hp/854-kW Rolls-Royce Merlin X inlines), Wellington Mk III (1,519 with 1,375- hp/1,025-kW Bristol Hercules III or 1,425-hp/1,062-kW Hercules XI radials and a four rather than two-gun tail turret), Wellington Mk IV (220 with 1,050-hp/789-kW Pratt & Whitney Twin Wasp radials), and Wellington B.Mk X (3,803 definitive aircraft with 1,675-hp/1,249-kW Hercules VI or XVI radials).

Principal users
Australia, Canada, and Great Britain.

TECHNICAL DATA

Type: Vickers Wellington Mk IC six-seat medium bomber.
Engines: two 1,000-hp (746-kW) Bristol Pegasus XVIII radial piston engines.
Performance: maximum speed 235 mph (378 km/h) at 15,500 ft (4,725 m); initial climb rate 1,120 ft (341 m) per minute; service ceiling 33,000 ft (10,060 m); range 2,550 miles (4,104 km).
Weights: empty 18,556 lb (8,417 kg); maximum take-off 28,500 lb (12,928 kg).
Dimensions: span 86 ft 2 in (22.73 m); length 64 ft 7 in (19.68 m); height 17 ft 5 in (5.31 m); wing area 840.0 sq ft (78.04 m^2).
Armament: six 0.303-in (7.7-mm) machine guns in nose and tail turrets and two beam positions, and up to 4,500 lb (2,041 kg) of bombs.

After sterling service as a bomber up to 1942, the Wellington was diverted increasingly to alternative roles such as gunnery training as seen in this 1943 photograph.

Photo: Salamander
D1 075 09.03
Printed in Italy

Medium bomber

USA

Martin B-26 MARAUDER

Medium bomber

Martin B-26 MARAUDER

Buy before fly

The B-26 was designed to a 1939 requirement for a fast medium bomber, and 1,131 aircraft had been ordered before the first example flew in November 1940. The type had good performance, but high take-off and landing speeds caused many accidents before pilots developed the right skills.

A devastating warplane

The Marauder was operated in nearly every theater involving the USAAF, and acquired a superb reputation as a multi-role attack warplane possessing high performance and great operational flexibility, the latter including torpedo bombing.

Principal versions

B-26 (201 with 1,850-hp/1,379-kW R-2800-5 radials, single 0.3-in/7.62-mm guns in the nose and tail positions, and two 0.5-in/12.7-mm guns in the dorsal turret), B-26A and, in British service, Marauder Mk I (139 with four heavy machine guns and provision for one 22-in/559-mm torpedo), B-26B and Marauder Mk IA (1,883 with different engines and, in the last 1,242 machines, span increased by 6 ft/1.83 m), B-26C and Marauder Mk II (1,235 as late-model B-26C from a different line), B-26F (300 based on B-26C with increased wing incidence), B-26G (893 with equipment changes), and Marauder Mk III (B-26F/Gs in British service).

Principal users

Australia, France, Great Britain, South Africa, and USA.

TECHNICAL DATA

Type: Martin B-26G Marauder seven-seat medium bomber.

Engines: two 2,000-hp (1,491-kW) Pratt & Whitney R-2800-43 radial piston engines.

Performance: maximum speed 283 mph (455 km/h) at 5,000 ft (1,525 m); initial climb rate 1,000 ft (305 m) per minute; service ceiling 19,800 ft (6,035 m); range 1,100 miles (1,770 km).

Weights: empty 25,300 lb (11,476 kg); maximum take-off 38,200 lb (17,327 kg).

Dimensions: span 71 ft 0 in (21.64 m); length 56 ft 1 in (17.09 m); height 20 ft 4 in (6.20 m); wing area 658.0 sq ft (63.13 m^2).

Armament: 11 0.5-in (12.7-mm) machine guns in fixed nose, trainable waist and turreted dorsal and tail positions, and up to 4,000 lb (1,814 kg) of bombs.

Elegant but unforgiving, the Marauder was better liked in operational squadrons than training units, where unrefined pilot skills caused large numbers of take-off and landing accidents. Combat losses were 911 aircraft in 129,943 sorties.

Photo: Salamander
D1 075 09.04
Printed in Italy

Medium bomber

France

Lioré et Olivier LeO 451

Lioré et Olivier LeO 451

Beautiful yet practical

The LeO 451 resulted from a 1934 requirement for a day bomber, and first flew as the LeO 45 prototype in January 1937 with 1,080-hp (805-kW) Hispano-Suiza 14Aa engines that proved very troublesome. Performance was good, but because another engine type had to be installed and the tail unit had to be revised to cure control problems at take-off, it was March 1939 before the first production LeO 451 was delivered by SNCASE, the nationalized group that had absorbed LeO in January 1937.

Bomber sacrifice

By this time 1,873 aircraft were on order, but only 452 had flown before the collapse of France in June 1940. Of the 220 aircraft delivered by May 10, 1940, only half were operational and these were wasted in day attacks on German armored formations. Another 225 aircraft were ordered by the Vichy regime in 1941, and the type remained in service to 1957, mostly in special-purpose conversions.

Principal versions

LeO 451B.4 (677 bombers), LeO 451C (12 conversions as 12-passenger transports), LeO 451E.2 (12 two-seat conversions for glider-towing), LeO 451T (15+ conversions as transports for fuel or 17 troops), LeO 453 (post-war conversions with 1,200-hp/895-kW Pratt & Whitney R-1830-67 radials for communications and SAR), and Leo 455Ph (five post-war conversions for photo- survey).

Principal users

France, Germany, and Italy.

TECHNICAL DATA

Type: Lioré et Olivier LeO 451B.4 four-seat medium bomber.

Engines: two 1,140-hp (850-kW) Gnome-Rhône 14N-48/49 radial piston engines.

Performance: maximum speed 308 mph (495 km/h) at 15,750 ft (4,800 m); climb to 16,405 ft (5,000 m) in 14 minutes 0 seconds; service ceiling 29,530 ft (9,000 m); range 1,429 miles (2,300 km).

Weights: empty 17,229 lb (7,815 kg); maximum take-off 25,133 lb (11,400 kg).

Dimensions: span 73 ft 9.75 in (22.50 m); length 56 ft 4 in (17.17 m); height 17 ft 2.25 in (5.24 m); wing area 731.97 sq ft (68.00 m^2).

Armament: one 20-mm cannon and, in later aircraft, two 7.5-mm (0.295-in) machine guns in retractable dorsal turret, two 7.5-mm (0.295-in) machine guns (one fixed forward firing and one in ventral position), and up to 4,409 lb (2,000 kg) of bombs.

A pair of LeO 451s on patrol over Tunisia during the Second World War.

Photo: S.H.A.A.
D1 075 09.05
Printed in Italy

Fighter

Germany

Dornier Do 335 PFEIL

Dornier Do 335 PFEIL

Originality at work

Following validation of the concept with the Göppingen Gö 9 research plane of 1939, the Pfeil (arrow) was a bold and original attempt to produce a high-performance warplane of twin-engined layout without the drag penalty and asymmetric thrust problems associated with wing-mounted engines. The original Do P.231 project was for a high-speed bomber, but the basic concept was then recast as an inteceptor and then multi-role fighter as the internal bomb bay allowed the carriage of a useful drop load. The first Do 335 prototype flew in September 1943 with tricycle landing gear and the engines arranged as nose-mounted tractor and tail-mounted pusher units.

Extensive development

The Do 335 offered considerable potential, and development was centered on variants capable of undertaking the single-seat fighter-bomber, single-seat long-range reconnaissance, two-seat night fighter, two-seat trainer, and single-seat heavy fighter roles. None of these progressed past the prototype or even pre-production stage, so of the 37 aircraft built none reached operational status. Planned developments were the Do 425 night fighter, the Do 535 with a Heinkel turbojet in place of the rear engine, and the Do 635 with two airframes joined by a new wing center section.

Principal version

Do 335A (fighter-bomber model).

Principal user

Germany.

TECHNICAL DATA

Type: Dornier Do 335A-1 Pfeil single-seat fighter and fighter-bomber.
Engines: two 1,750-hp (1,305-kW) Daimler-Benz DB 603A-2 inline piston engines.
Performance: maximum speed 478 mph (770 km/h) at 21,000 ft (6,400 m); climb to 26,250 ft (7,100 m) in 14 minutes 30 seconds; service ceiling 37,400 ft (11,400 m); range 857 miles (1,380 km).
Weights: empty 16,314 lb (7,400 kg); maximum take-off 21,164 lb (9,600 kg).
Dimensions: span 45 ft 3.75 in (13.80 m); length 45 ft 5.25 in (13.85 m); height 16 ft 4.75 in (5.00 m); wing area 414.42 sq ft (38.50 m^2).
Armament: one 30-mm and two 15-mm cannon and up to 2,205 lb (1,000 kg) of bombs.

The Do 335 was an original answer to the problems of using two engines in a single-seat fighter, but the nearest it got to operational status was Erprobungskommando 335, an operational evaluation unit, during the spring of 1945.

Photo: Salamander
D1 075 09.06
Printed in Italy

Fighter

USA

Northrop P-61 BLACK WIDOW

Northrop P-61 BLACK WIDOW

Purpose-designed night fighter
In January 1941 the US Army Air Corps contracted for its first radar-equipped warplane designed from the start specifically for the night fighter role. The XP-61 that first flew in May 1942 was a large machine with a central nacelle for the crew, radar, and armament, and its tail unit was supported on booms stretching rearward as extensions of the engine nacelles.

Black Widow at war
P-61As were delivered from the end of 1943, and the type entered combat in the Pacific theater in mid-1944. Thereafter the three P-61 models served as fighters and night intruders in the Pacific and European campaigns. Total production, including other variants, was 742 aircraft.

Principal versions
P-61A (200 aircraft, all but the first 37 delivered without the dorsal machine gun barbette that was found to cause tail buffeting), P-61B (450 aircraft, the last 250 with the dorsal barbette reinstated, similar to the P- 61A but with underwing attachments for four 1,600-lb/726-kg bombs), P-61C (41 aircraft with 2,800-hp/2,088-kW R-2800-73 engines), P-61G (16 P-61B conversions for unarmed weather reconnaissance), F-15A Reporter (36 post-war reconnaissance aircraft later redesignated RF-61C and produced from uncompleted P-61C airframes), and F2T-1N (12 P-61As used by the US Navy as night fighter training aircraft).

Principal user
USA.

TECHNICAL DATA

Type: Northrop P-61B Black Widow three-seat night fighter and intruder.
Engines: two 2,000-hp (1,491-kW) Pratt & Whitney R-2800-65 radial piston engines.
Performance: maximum speed 366 mph (589 km/h) at 20,000 ft (6,095 m); climb to 20,000 ft (6,095 m) in 12 minutes 0 seconds; service ceiling 33,100 ft (10,090 m); range 1,350 miles (2,173 km).
Weights: empty 23,450 lb (10,637 kg); maximum take-off 36,200 lb (16,420 kg).
Dimensions: span 66 ft 0 in (20.12 m); length 49 ft 7 in (15.11 m); height 14 ft 8 in (4.47 m); wing area 662.35 sq ft (61.53 m^2).
Armament: four 20-mm cannon and four 0.5-in (12.7-mm) machine guns, and up to 6,400 lb (2,903 kg) of bombs.

A P-61 Black Widow of the European-based 9th Air Force during the Second World War.

Photo: Salamander
D1 075 09.07
Printed in Italy

Fighter

Germany

Pfalz D XV

Pfalz D XV

The ultimate Pfalz

The last single-seat fighter developed by Pfalz in the First World War was its D XV. Earlier the company had produced the D XIV prototype, which was in essence an enlarged D XII with a Benz Bz.IVü high-compression engine. From this was evolved the D XIV with reduced-span wings, a plywood-covered fuselage of the semi-monocoque type strut-mounted between the wings, and all flying/landing wings eliminated from the wing cellule to reduce drag.

Overtaken by time

The D XV proved to be fast and maneuverable, and though some landing difficulties were caused by a slight tail-heaviness, this problem could have been eliminated without undue difficulty. The D XV was officially type tested on November 4, 1918, exactly one week before the end of the war, and plans were in hand for production aircraft to equip Bavarian flying units of the imperial German air service. The Inter-Allied Control Commission claimed after the war that 180 D XV fighters had been built, but this was probably the number to have been built in the first production batch. A few aircraft were built, however, with two different engine types.

Principal version

D XV (initial fighter model).

Principal user

Germany.

TECHNICAL DATA

Type: Pfalz D XV single-seat fighter.
Engines: one 180-hp (134-kW) Mercedes D.IIIa inline piston engine, or one 185-hp (138-kW) BMW IIIa inline piston engine.
Performance: maximum speed 124 mph (200 km/h) at optimum altitude; climb to 3,280 ft (1,000 m) in 2 minutes 0 seconds; service ceiling 19,685 ft (6,000 m); endurance about 2 hours 0 minutes.
Weights: empty 1,642 lb (745 kg) with Mercedes engine and 1,627 lb (738 kg) with BMW engine; maximum take-off 2,039 lb (925 kg) with Mercedes engine and 2,024 lb (918 kg) with BMW engine.
Dimensions: span 28 ft 2.5 in (8.60 m); length 21 ft 4 in (6.50 m); height 8 ft 10.25 in (2.70 m); wing area not revealed.
Armament: two 7.92-mm (0.312-in) machine guns.

The Pfalz D XV appeared so close to the end of the First World War that it was probably flown by more Allied pilots after the war than German pilots during it! This is an example in French hands during 1919.

Photo: S.H.A.A.
D1 075 09.08
Printed in Italy

Trainer

Great Britain

British Aerospace HAWK

British Aerospace HAWK

Viceless trainer

In 1971 the Royal Air Force selected the Hawker Siddeley P.1182 design to replace the Hawker Siddeley (Folland) Gnat in the basic/advanced training role, and in March 1972 an order for 176 Hawk T.Mk 1s was placed. The first Hawk flew in August 1974, and production aircraft were delivered from November 1976. In service the type has built an excellent reputation for viceless handling in the basic/advanced flying role.

Combat capability

The Hawk can also carry a useful warload, which suits the type to the weapon training and secondary light attack roles. In combination with the Hawk's relatively high performance, this persuaded the British that the type could be adapted as a second-line air defense fighter. Some 88 aircraft were therefore modified to Hawk T.Mk 1A standard with wiring for two AIM-9L Sidewinder air-to-air missiles, and also BL755 cluster bombs. There are also advanced attack and multi-role versions, and an American naval trainer model.

Principal versions

Hawk T.Mk 1 (trainer with secondary attack capability), Hawk T.Mk1A (T.Mk 1s revised with an air defense capability), Hawk Mk 50 (82 examples of the Hawk T.Mk 1's export version), and Hawk Mk 60 (90+ of the current export model with the 5,700-lb/2,586-kg thrust Adour Mk 861 turbofan).

Principal users

Abu Dhabi, Dubai, Finland, Great Britain, Indonesia, Kenya, Kuwait, Saudi Arabia, Switzerland, and Zimbabwe.

TECHNICAL DATA

Type: British Aerospace Hawk T.Mk 1 two-seat basic/advanced flying and weapon trainer.
Engine: one 5,200-lb (2,359-kg) thrust Rolls-Royce/Turboméca Adour Mk 151 turbofan.
Performance: maximum speed 645 mph (1,038 km/h) at 11,000 ft (3,355 m); initial climb rate 9,300 ft (2,835 m) per minute; service ceiling 50,000 ft (15,240 m); radius 345 miles (556 km) with a 5,600-lb (2,540-kg) warload.
Weights: empty 8,040 lb (3,647 kg); maximum take-off 18,890 lb (8,569 kg).
Dimensions: span 30 ft 9.75 in (9.39 m); length 36 ft 7.75 in (11.17 m); height 13 ft 1.25 in (3.99 m); wing area 179.6 sq ft (16.69 m^2).
Armament: up to 6,800 lb (3,084 kg) of disposable stores.

Seen here in combat configuration, this Hawk T.Mk 1A carries two Sidewinder air-to-air missiles as well as a 30-mm cannon in an underfuselage pack.

Photo: Salamander
D1 075 09.09
Printed in Italy

Seaplane

Japan

Shin Meiwa SS-2

Shin Meiwa SS-2

STOL flying boat

Resulting from a requirement of the early 1960s for an anti-submarine flying boat with comprehensive mission electronics and armament, the SS-2 first flew in October 1967 as an advanced type with STOL capability provided by wide-chord trailing edge flaps in the slipstream of the four large propellers. A boundary-layer control system, centered on T58-IHI-10 turboshaft, is used to eject compressed air over the flaps, elevators and rudder for full control at low speeds. The 23 production aircraft entered service with the designation PS-1, and soon displayed the ability to operate in waves up to 9.85 ft (3.0 m) high.

Amphibian version

An amphibious version was developed for the SAR role as the SS-2A, and first flew in October 1974 for service from March 1975 as the US-1 with facilities for 20 seated survivors or 12 litters. Production totalled 10 aircraft, of which the last three aircraft, designated US-1A, were delivered with 3,490-ehp (2,602-kW) T64-IHI-10J turboprops later retrofitted to the earlier aircraft.

Principal versions

PS-1 (anti-submarine flying boat), US-1 (SAR amphibian with retractable tricycle landing gear), US-1A (SAR amphibian with more powerful engine).

Principal user

Japan.

TECHNICAL DATA

Type: Shin Meiwa PS-1 10-seat anti-submarine flying boat.

Engines: four 3,060-ehp (2,282-kW) Ishikawajima Harima-built General Electric T64-IHI-10 turboprops.

Performance: maximum speed 340 mph (547 km/h) at 5,000 ft (1,525 m); initial climb rate 2,264 ft (690 m) per minute; service ceiling 29,530 ft (9,000 m); range 1,347 miles (2,168 km).

Weights: empty 57,982 lb (26,300 kg); maximum take-off 94,799 lb (43,000 kg).

Dimensions: span 108 ft 9 in (33.15 m); length 109 ft 9.25 in (33.46 m); height 32 ft 2.5 in (9.82 m) on beaching gear; wing area 1,461.79 sq ft (135.80 m^2).

Armament: four 331-lb (150-kg) anti-submarine bombs carried internally, four homing torpedoes in two wing pods, and other weapons carried externally.

The remarkable PS-1 STOL flying boat can operate in moderately severe sea states, and thanks to its STOL capability has take-off and landing distances of 820 and 605 ft (250 and 185 m) respectively.

Photo: Salamander
D1 075 09.10
Printed in Italy

Seaplane

Germany

Arado Ar 196

Arado Ar 196

Successful contender
The Ar 196 resulted from a 1936 requirement for a reconnaissance floatplane that could be catapulted from the larger German warships, and was selected in preference to the rival Focke-Wulf Fw 62 biplane after an evaluation in the summer of 1937. The Ar 196 was tested with different alighting gear (twin floats or a single main float and two small balancing floats), the twin-float arrangement being selected for the Ar 196A that entered service in 1939.

Shore-based service
Total production of the Ar 196 was 546, including comparatively small numbers built in France by SNCA and in the Netherlands by Fokker. These aircraft equipped 10 shore-based coastal squadrons as well as Germany's larger warships right up to the end of the Second World War. The type operated in areas as widely separated as the Black Sea and the Bay of Biscay for reconnaissance and convoy escort.

Principal versions
Ar 196A-0 (pre-production model with only one machine gun), Ar 196A-1 (shipborne model), Ar 196A-2 (coastal model introducing a forward-firing armament of two 20-mm cannon and one 7.92-mm/0.312-in machine gun), Ar 196A-3 (definitive model with structural strengthening and three-blade propeller), Ar 196A-4 (catapult version of A-3), and Ar 196A-5 (improved radio equipment and two defensive machine guns).

Principal users
Bulgaria, Germany, and Romania.

TECHNICAL DATA

Type: Arado Ar 196A-3 two-seat shipborne and shore-based reconnaissance floatplane.
Engine: one 960-hp (716-kW) BMW 132K radial piston engine.
Performance: maximum speed 193 mph (310 km/h) at 13,125 ft (4,000 m); initial climb rate 1,358 ft (414 m) per minute; service ceiling 23,025 ft (7,020 m); range 665 miles (1,070 km).
Weights: empty 6,593 lb (2,990 kg); maximum take-off 8,223 lb (3,730 kg).
Dimensions: span 40 ft 8.25 in (12.40 m); length 36 ft 1 in (11.00 m); height 14 ft 7.25 in (4.45 m); wing area 305.71 sq ft (28.40 m^2).
Armament: two 20-mm cannon and two 7.92-mm (0.312-in) machine guns (one fixed and one trainable) and up to two 110-lb (50-kg) bombs.

An Ar 196 taxiing slowly. The ability to alight on water was essential for recovery by a parent ship's crane, and also suited the type for operation from coastal bases.

D1 075 09.11
Printed in Italy

Seaplane

USA

Martin PBM MARINER

Martin PBM MARINER

Successful flying boat

Originating from a 1937 requirement for a patrol flying boat, the XPBM-1 first flew in February 1939 with 1,600-hp (1,193-kW) R-2600-6 radials, bomb bays in the two engine nacelles, and retractable stabilizing floats. The Mariner was overshadowed by the numerically superior Consolidated PBY, but was a superior machine offering better performance with less vulnerability.

Versatility

Production of the Mariner totalled 1,366 up to 1947, and the type served mainly in the Pacific, remaining in service past the Korean War (1950-53) in a number of first- and second-line roles.

Principal versions

PBM-1 (initial model), PBM-3B (British Mariner GR.Mk I with fixed stabilizing floats and greater power), PBM-3C (improved -3B with armor protection and revised armament including a 4,000-lb/1,1814-kg bombload), PBM-3D (greater power and provision for an 8,000-lb/3,629-kg warload including torpedoes), PBM-3R (unarmed transport for 20 passengers or freight), PBM-3S (anti-submarine model), PBM-5 (2,100-hp/1,566-kW Pratt & Whitney R-2800-34 Double Wasp radials), PBM-5A (amphibian version with retractable tricycle landing gear), PBM-5E (radar-carrying conversion), PBM-5G (SAR model), PBM-5S (anti-submarine model).

Principal users

Argentina, Australia, Great Britain, the Netherlands, Urugay, and USA.

TECHNICAL DATA

Type: Martin PBM-3C Mariner seven/eight-seat maritime reconnaissance flying boat.
Engines: two 1,700-hp (1,268-kW) Wright R-2600-12 Cyclone radial piston engines.
Performance: maximum speed 198 mph (319 km/h) at 13,000 ft (3,960 m); initial climb rate 410 ft (125 m) per minute; service ceiling 16,900 ft (5,150 m); range 2,137 miles (3,438 km).
Weights: empty 32,378 lb (14,687 kg); maximum take-off 58,000 lb (26,310 kg)
Dimensions: span 118 ft 0 in (35.97 m); length 80 ft 0 in (24.38 m); height 27 ft 6 in (8.38 m); wing area 1,408.0 sq ft (130.80 m^2).
Armament: seven 0.5-in (12.7-mm) machine guns in two-gun nose and dorsal turrets and in single-gun beam and tail positions, and up to 4,000 lb (1,814 kg) of bombs or depth charges.

An effective and versatile flying boat, the PBM Mariner remained in service up to 1956.

Photo: Salamander
D1 075 09.12
Printed in Italy

France

Potez 25

Potez 25

An inter-war celebrity

The Potez 25 was one of the best known aircraft between the world wars, and first flew in 1925 as a two-seat observation type. The design had unequal-span biplane wings and a powerplant mounting specially designed to accept most engine types in the range between 400 and 600 hp (298 and 447 kW).

Multiple variants

Some 87 variants were produced to the extent of some 4,100 aircraft in France and four other countries. A fair number of aircraft were still in French service in 1940, and despite its obsolescence the type remained operational in the Far East up to 1945. There were a number of special-purpose aircraft as well as some civil models, and the type was extensively used in combat by some export customers.

Principal versions

Potez 25A.2 (observation model), Potez 25B.2 (bomber model), Potez 25Et.2 (two-seat intermediate trainer model), Potez 25 Farman (otherwise known as the Potez 25/4 reconnaissance model with the 500-hp/373-kW Farman 12We inline engine), Potez 25 Jupiter (model with the 420-hp/313-kW Bristol Jupiter radial licence built as the Gnome-Rhône Jupiter 9Ac), and Potez 25TOE (general-purpose model for use in France's colonies and built to the extent of 2,270 aircraft of which 297 were exported).

Principal users

China, Estonia, Ethiopia, France, Greece, Paraguay, Poland, Portugal, Romania, Switzerland, Uruguay, and Yugoslavia.

TECHNICAL DATA

Type: Potez 25TOE two-seat general-purpose warplane.
Engine: one 450-hp (336-kW) Lorraine 12Eb inline piston engine.
Performance: maximum speed 129 mph (208 km/h) at sea level; climb to 3,280 ft (1,000 m) in 4 minutes 0 seconds; service ceiling 19,030 ft (5,800 m); range 783 miles (1,260 km).
Weights: empty 3,329 lb (1,510 kg); maximum take-off 5,511 lb (2,500 kg).
Dimensions: span 46 ft 4.75 in (14.14 m); length 29 ft 10.25 in (9.10 m); height 12 ft 0.25 in (3.67 m); wing area 505.92 sq ft (47.00 m^2).
Armament: three 0.303-in (7.7-mm) or 7.5-mm (0.295-in) machine guns (one fixed and two trainable) and up to 441 lb (200 kg) of bombs.

The Potez 25 was built in large numbers with a number of different engines of both the water-cooled inline and air-cooled radial types. This example, photographed over France in 1939, has a Renault inline engine.

Photo: S.H.A.A
D1 075 09.13
Printed in Italy

Land based helicopter

USSR

Mil Mi-6 "HOOK"

Mil Mi-6 "HOOK"

Great weightlifter

In 1954 the USSR issued a requirement for a new heavylift helicopter meeting a combined civil and military specification. The resulting Mi-6 was perhaps the single most important step in helicopter development and a truly extraordinary achievement in the field of heavy-lift helicopters, for when it first flew in September 1957, the type's payload was greater than the weight of the Sikorsky S-64 that was the West's largest helicopter when it flew some 10 years later! The Mi-6 used a massive two-engined turboshaft powerplant (the first seen in a helicopter), and distinctive features were the clamshell rear doors for straight-in access to the large hold, and detachable wings spanning 50 ft 2.5 in (15.30 m) to offload the main rotor by some 20% in forward flight.

Confirmed performance

In 1962 the Mi-6 set no fewer than 14 world records, including four long- lived ones. The type has important applications in the Siberian resources- exploitation industry, but its capabilities made it an obvious heavy-lift transport for the Soviet forces, which took the bulk of a production run exceeding 800 units.

Principal versions

Mi-6 (initial model) and Mi-6A (definitive production model with a number of detail improvements).

Principal users

Algeria, Egypt, Ethiopia, Iraq, Peru, Syria, USSR, and Vietnam.

TECHNICAL DATA

Type: Mil Mi-6A "Hook" five-crew heavy transport helicopter.

Engines: two 5,500-shp (4,101-kW) Soloviev D-25V (TV-2BM) turboshafts.

Performance: maximum speed 196 mph (300 km/h) at optimum altitude; initial climb rate not revealed; service ceiling 14,765 ft (4,500 m); range 385 miles (620 km) with a 17,637-lb (8,000-kg) payload.

Weights: empty 60,054 lb (27,240 kg); maximum take-off 93,696 lb (42,500 kg).

Dimensions: main rotor diameter 114 ft 10 in (35.00 m); length overall, rotors turning 136 ft 11.25 in (41.74 m); height 32 ft 4.25 in (9.86 m); wing area 10,356.5 sq ft (962.12 m^2).

Payload: 26,455 lb (12,000 kg) of freight or 70 troops, or 41 litters plus two attendants.

Despite its age, the Mi-6 remains an impressive helicopter as indicated by the apparent size of the five-blade main rotor.

Photo: Salamander
D1 075 09.14
Printed in Italy

Naval helicopter

USA

Sikorsky CH-53 SEA STALLION

Sikorsky CH-53 SEA STALLION

More than worthy successor

In the late 1950s Sikorsky began work on the basic design for a successor to the piston-engined S-56. The result was a pair of helicopters sharing many components: the S-64 became the CH-54 Tarhe flying crane, and the S-65 with a conventional but amphibious fuselage became the US Marine Corps' CH-53 Sea Stallion transport helicopter.

Classic capability

First flown in October 1964 for service from mid-1966, the CH-53 has retractable tricycle landing gear and a large hold with straight-in access provided by a rear ramp/door. The type went through several models in its basic version, and has paved the way for a much improved series with three rather than two engines.

Principal versions

CH-53A (139 of the initial model with 2,850-shp/2,125-kW T64-GE-6 turboshafts and a payload of 38 troops, or 24 litters, or 8,000 lb/3,629 kg of internal freight including a HAWK surface-to-air missile system or 105-mm/4.13-in howitzer, or a 13,000-lb/5,897-kg slung freight load), CH-53D (126 of the improved model with automatic folding of the main rotor blades, considerably more power, and a revised hold for much larger troop capacity), CH-53G (112 examples of the CH-53D version for West Germany, 110 of them built under licence by VFW-Fokker), and S-65Oe (version for Austria).

Principal users

Austria, Iran, Israel, USA, and West Germany.

TECHNICAL DATA

Type: Sikorsky CH-53D Sea Stallion three-crew assault transport helicopter.

Engines: two 3,925-shp (2,927-kW) General Electric T64-GE-413 turboshafts.

Performance: maximum speed 196 mph (315 km/h) at sea level; initial climb rate 2,180 ft (664 m) per minute; service ceiling 21,000 ft (6,400 m); range 257 miles (414 km).

Weights: empty 23,485 lb (10,653 kg); maximum take-off 42,000 lb (19,051 kg).

Dimensions: main rotor diameter 72 ft 3 in (22.02 m); length overall, rotors turning 88 ft 3 in (26.90 m); height 24 ft 11 in (7.59 m); main rotor disc area 4,099.8 sq ft (380.87 m^2).

Payload: between 55 and 64 troops, or 24 litters plus four attendants, or freight.

The CH-53A Sea Stallion proved very successful in service, though the basic design allowed the steady introduction of more power in later models for the carriage of greater payload.

Photo: Salamander
D1 075 09.15
Printed in Italy

Land based helicopter

USA

McDonnell Douglas Model 500 DEFENDER

McDonnell Douglas Model 500 DEFENDER

Illustrious lineage

The Hughes OH-6 Cayuse scout helicopter was also produced as the Model 500 utility civil helicopter, and this in turn spawned the Model 500 Defender export military version. In 1984 Hughes Helicopters became a McDonnell Douglas subsidiary, and the series is now known as the MD500.

Extraordinary versatility

The Defender series entered service in 1968 and, with more than 1,000 delivered, is still in development and production. The basic airframe has been refined and more powerful engines have been installed, while a diversity of sensor and armament fits provides maximum versatility.

Principal versions

Model 500M (initial version with 275-shp/207-kW Allison 250-C18A), Model 500MD (definitive early version with 420-shp/313-kW Allison 250-C20B in role-dedicated scout, anti-tank, anti-submarine, and upgraded Defender II forms), Model 500MG (more advanced electronics, a more streamlined nose, and the Model 500E's rotor system), Model 530MG (equivalent based on the MD530F Lifter with larger main rotor and Allison 250-C30), and AH-6F and MH-6A (upgraded versions for the US Special Forces).

Principal users

Argentina, Bolivia, Colombia, Costa Rica, Denmark, El Salvador, Finland, Greece, Haiti, Indonesia, Iraq, Israel, Italy, Japan, Jordan, Kenya, Mauritania, North Korea, South Korea, Spain, Taiwan, and USA.

TECHNICAL DATA

Type: McDonnell Douglas Model 500MD/TOW Defender two-seat light anti-tank helicopter.
Engine: one 420-shp (313-kW) Allison 250-C20B turboshaft.
Performance: maximum speed 137 mph (220 km/h) at sea level; initial climb rate 1,650 ft (503 m) per minute; service ceiling 13,800 ft (4,205 m); range 242 miles (389 km).
Weights: empty 1,976 lb (896 kg); maximum take-off 3,000 lb (1,361 kg).
Dimensions: main rotor diameter 26 ft 4 in (8.03 m); length overall, rotors turning 30 ft 10 in (9.40 m); height 8 ft 8 in (2.84 m); main rotor disc area 544.63 sq ft (50.60 m^2).
Armament: four BGM-71 TOW anti-tank missiles.

One of the latest developments in a long and successful line, this Model 530MG Defender is notable for its mast-mounted sight, which allows the helicopter to hover behind cover with the tactical situation relayed to a screen in the cockpit.

Photo: Salamander
D1 075 09.16
Printed in Italy

Land based helicopter

USA

Bell OH–58 KIOWA

Bell OH–58 KIOWA

Second time lucky

In response to the US Army's 1960 requirement for an observation helicopter, Bell responded with its Model 206. This was evaluated as the OH–4 against Hiller and Hughes prototypes in the LOH competitionwon by the Hughes machine that entered service as the OH–6. Some 4,000 units were planned, but as the Hughes production rate slipped and unit cost rose, only 1,434 were bought. The LOH contest was reopened in 1968, and this time was won by the improved model 206A.

Large-scale production

The type entered service in May 1969 as the OH–58A Kiowa, and production of 2,200 machines for the US Army was complemented by 74 Canadian and 12 Austrian helicopters. Some 275 of these have been upgraded to OH–58C standard and another 475 are in the process of more extensive improvement to OH–58D standard.

Principal versions

OH–58A (initial model with 317-shp/237-kW Allison T63-A-700), COH–58A (Canadian model), OH–58B (Austrian model), OH58C (upgraded model for "hot and high" conditions with a more powerful engine, infra-red suppression package, and flate plate canopy), OH-58D (improved model with four-blade main rotor, 650-shp/485-kW Allison 250-C30R, as mast-mounted sight, and a cockpit control and display system), and AH–58D Warrior (version of the OH–58D with air-to-air and air-to-surface armament).

Principal users

Austria, Canada, Israel, Spain, and USA

TECHNICAL DATA

Type: Bell OH–58C Kiowa two-seat light observation helicopter.

Engine: one 420-shp (313-kW) Allison T63-A-720 turboshaft.

Performance: maximum speed 138 mph (222 km/h) at sea level; initial climb rate 1,780 ft (543 m) per minute; service ceiling 18,900 ft (5,760 m); range 305 miles (491 km).

Weights: empty 1,585 lb (719 kg); maximum take-off 3,200 lb (1,451 kg).

Dimensions: main rotor diameter 35 ft 4 in (10.77 m); length overall, rotors turning 40 ft 11.75 in (12.49 m); height 9 ft 6.5 in (2.91 m); main rotor disc area 980.56 sq ft (91.09 m2).

Armament: provisio for one 7.62-mm (.3-in) multi-barrel machine gun

The most recent development of the Kiowa is the OH–58D produced to meet the requirements of the Army Helicopter Improvement Program with a new main rotor, a mast mounted sight, and enhanced electronics.

Photo: Salamander
D1 075 09.17
Printed in Italy

Reconnaissance and observation

Germany

Rumpler C I

Rumpler C I

A new category of warplane

The success of its B I two-seat unarmed reconnaissance plane persuaded Rumpler to produce a C-class armed machine in the spring of 1915. The C I entered production in the fall of 1915, and though no production records survive, it is estimated that several hundreds of the type were built by five manufacturers before production ended in June 1917; there were also 98 of the naval 6B version. A two-seat trainer version, developed by Bayerische Rumpler-Werke, was powered by a 150-hp (112-kW) Benz Bz.III inline engine.

Photo-reconnaissance

The C I was Germany's first photo-reconnaissance plane, and initially proved an elusive and difficult target for Allied fighters, especially when a fixed forward-firing pilot's gun was added to complement the observer's trainable weapon in the rear cockpit. However, as better British and French fighters entered service from late 1916, the C I was steadily relegated to secondary theaters such as Macedonia and Palestine, where it survived in first-line service until February 1918. After the First World War several C Is were adapted as passenger transports.

Principal versions

C I (initial model), C Ia (improved model with the 180-hp/134-kW Argus As.III engine), 6B 1 (version of the C I for the German navy with twin-float alighting gear), 6B 2 (6B 1 variant with the tail unit of the later C IV landplane).

Principal user

Germany.

TECHNICAL DATA

Type: Rumpler C I two-seat reconnaissance and general-purpose warplane.
Engine: one 160-hp (119-kW) Mercedes D.III inline piston engine.
Performance: maximum speed 95 mph (152 km/h) at optimum altitude; initial climb rate not revealed; service ceiling 16,405 ft (5,000 m); endurance 4 hours 0 minutes.
Weights: empty 1,748 lb (793 kg); maximum take-off 2,866 lb (1,300 kg).
Dimensions: span 39 ft 10.25 in (12.15 m); length 27 ft 9 in (7.85 m); height 10 ft 0 in (3.05 m); wing area 384.28 sq ft (35.70 m^2).
Armament: two 7.92-mm (0.312-in) machine guns (one fixed and one trainable) and up to 220 lb (100 kg) of bombs.

The Rumpler C I was an effective reconnaissance machine up to 1916, but from the beginning of 1917 proved inadequate in performance and agility to evade the latest generation of Allied fighters.

Photo: S.H.A.A.
D1 075 09.18
Printed in Italy

Trainer

USA

Boeing T-43

Boeing T-43

Civilian starting point

In 1967 the Boeing Company completed its initial family of jet airliners, which had begun with the long-range Model 707, by introducing the Model 737 as a short-range transport for 100 passengers. The initial Model 737-100 was soon replaced by more capacious variants with longer fuselages.

An off-the-shelf trainer

The US Air Force had previously used a militarized version of the Convair CV-240 piston-engined airliner as the T-29 trainer for navigators and bombardiers. Experience in the Vietnam War then showed that the USAF lacked adequate numbers of navigators, and in May 1971 the service announced that it was to buy a version of the Model 737-200 adapted for the navigator training role. Known to the manufacturer as the Model 737-253, this T-43A had a cabin revised with 19 navigator stations to accommodate three instructors, four advanced students, and 12 students. The first T-43A flew in April 1973, and all 19 aircraft had been delivered to Mather Air Force Base, California, byJuly 1974.

Principal version

T-43A (navigator trainer).

Principal user

USA.

TECHNICAL DATA

Type: Boeing T-43A two/three-crew navigator trainer.

Engines: two 14,500-lb (6,577-kg) thrust Pratt & Whitney JT8D-9 turbofans.

Performance: maximum speed 568 mph (914 km/h) at 21,000 ft (6,400 m); initial climb rate not revealed; service ceiling not revealed; range 2,400 miles (3,862 km).

Weights: empty not revealed; maximum take-off 114,500 lb (51,936 kg).

Dimensions: span 93 ft 0 in (28.35 m); length 100 ft 2 in (30.53 m); height 37 ft 0 in (11.28 m); wing area 980.0 sq ft (91.04 m^2).

Armament: none.

In military uniform the Model 737-200 airliner becomes the T-43A trainer, its cabin filled with navigation training equipment for 16 pupils supervised by three instructors. Within a course that includes Honeywell simulators, the aircraft are operated by the 455th Flying Training Squadron of the Air Training Command's 323rd Flying Training Wing.

Photo: Salamander
D1 075 09.19
Printed in Italy

USA

Lockheed S-3 VIKING

Lockheed S-3 VIKING

Submarine chaser

The underwater performance and quiet operation of modern nuclear-powered submarines offer challenging problems to navies that must protect their surface warships against the attacks of such vessels. Carrier battle groups are valuable assets and therefore high-priority targets, and to succeed the piston-engined Grumman S-2 Tracker as the maritime reconnaissance and anti- submarine plane of such groups the US Navy called for a carrier-borne type providing much the same capability as the land-based Lockheed P-3 Orion. The result was the S-3, which first flew in January 1973 and entered service in February 1974.

Small airframe but great capability

The S-3 is an amazing example of how much capability can be packed into a small carrierborne airframe. The folding wings are filled with fuel and support the two fuel-economical turbofans. The portly fuselage houses the advanced sensors and tactical system whose automation allows management by a two-man mission crew. The weapons are carried in a lower-fuselage bay and under the wings. Production totalled 187 aircraft.

Principal versions

S-3A (production model), KS-3A (one conversion as an inflight refueling tanker), US-3A (six conversions as carrier onboard delivery aircraft for six passengers and, in underwing pods, freight), and S-3B (upgraded model first flown in September 1984 and produced by converting S-3As with more advanced sensors and capability for the AGM-84 Harpoon anti-ship missile).

Principal user

USA.

TECHNICAL DATA

Type: Lockheed S-3A Viking four-seat carrierborne maritime reconnaissance and anti-submarine warplane.

Engines: two 9,275-lb (4,207-kg) General Electric TF34-GE-2 turbofans.

Performance: maximum speed 518 mph (834 km/h) at optimum altitude; initial climb rate 4,200+ ft (1,280+ m) per minute; service ceiling 35,000+ ft (10,670+ m); range 2,300+ miles (3,701+ km).

Weights: empty 26,650 lb (12,088 kg); maximum take-off 52,540 lb (23,832 kg).

Dimensions: span 68 ft 8 in (20.93 m); length 53 ft 4 in (16.26 m); height 22 ft 9 in (6.93 m); wing area 598.0 sq ft (55.56 m^2).

Armament: up to 7,000 lb (3,175 kg) of disposable stores.

A formation of five S-3A Vikings.

Photo: D.R.
D1 075 09.20
Printed in Italy

CARD DECKS WP

D1 075 09

Torpedo bomber

Great Britain

Fairey SWORDFISH

Torpedo bomber

Fairey SWORDFISH

A torpedo bomber for the Fleet Air Arm
In 1933 Fairey flew its T.S.R. I private-venture torpedo bomber, and from this evolved the T.S.R. II that first flew in April 1934 as the prototype of the Swordfish adopted for the Fleet Air Arm (then part of the Royal Air Force) in April 1935. The Swordfish entered service in February 1936 and, with its low performance and biplane configuration, was technically obsolete. However, the type outlived its successor, and the 2,393 aircraft built up to 1944 sank a greater tonnage of Axis shipping than any other Allied torpedo bomber of the Second World War. The Swordfish could operate on wheels or floats.

Obsolete yet capable
The Swordfish was obsolete yet reliable and versatile, and few Axis pilots or AA gunners could cope with an attacker flying so slowly. The type was devastating in the campaign against Axis shipping in the Mediterranean, and also played a major part in the Atlantic campaign against German surface raiders and, more importantly, U-boats. Its greatest success was perhaps the attack on the Italian fleet in Taranto harbor during November 1940.

Principal versions
Swordfish Mk I (initial model), Swordfish Mk II (lower wings strengthened for eight rockets), Swordfish Mk III (surface-search radar), and Swordfish Mk IV (Mk II conversion with an enclosed cockpit for Canadian operation).

Principal users
Canada and Great Britain.

TECHNICAL DATA

Type: Fairey Swordfish Mk I two/three-seat carrier-borne and land-based torpedo bomber.
Engine: one 690-hp (514-kW) Bristol Pegasus IIIM3 radial piston engine.
Performance: maximum speed 154 mph (248 km/h) at sea level; climb to 5,000 ft (1,525 m) in 10 minutes 0 seconds; service ceiling 10,700 ft (3,260 m); range 1,030 miles (1,657 km).
Weights: empty 4,195 lb (1,903 kg); maximum take-off 7,720 lb (3,502 kg).
Dimensions: span 45 ft 6 in (13.87 m); length 35 ft 8 in (10.87 m); height 12 ft 4 in (3.76 m); wing area 607.0 sq ft (56.39 m^2).
Armament: two 0.303-in (7.7-mm) machine gun (one fixed and one trainable) and one 18-in (457-mm) torpedo or up to 1,500 lb (680 kg) of mines or bombs.

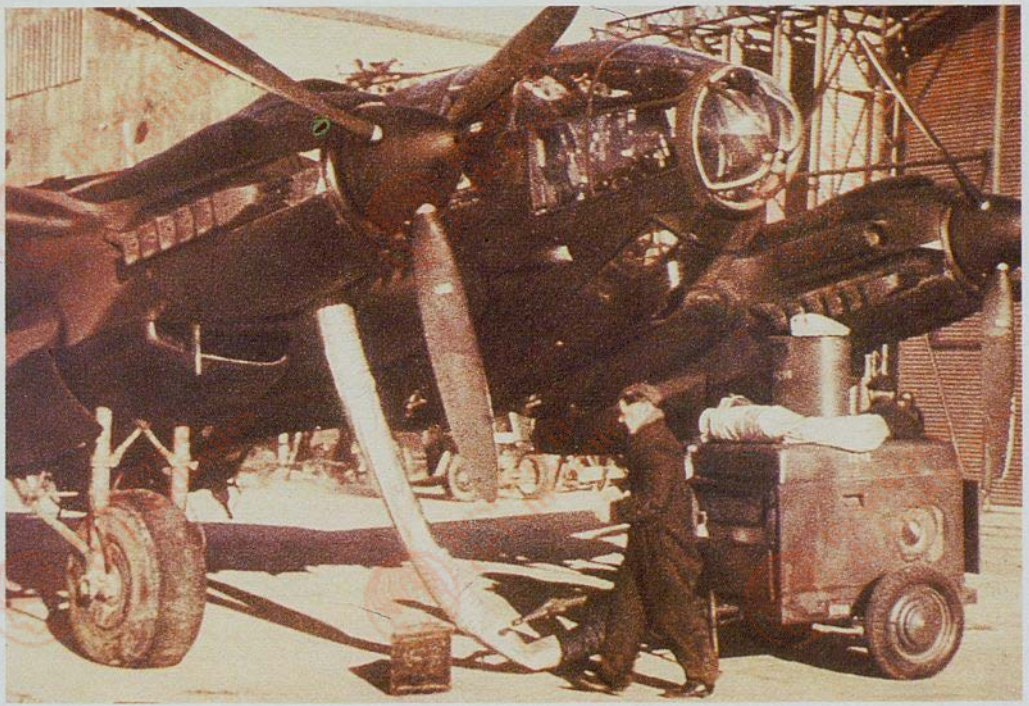
Despite its antiquated appearance, the Swordfish enjoyed notable operational success in the Second World War.

Photo: M. Hodeir
D1 075 04-01
Printed in Italy

Medium bomber

Germany

Heinkel He 111H



Heinkel He 111H

Workhorse of the German bomber arm
Flown in February 1935, the He 111 was produced in small numbers as a high- speed transport but was soon known only as a bomber. The He 111B was used operationally in the Spanish Civil War (1936-39) and paved the way for variants up to the He 111P with the glazed asymmetric nose characteristic of later models.

Obsolescent but unreplaceable
Some 400 He 111s were in service at the beginning of the Second World War, and the He 111H provided the vast majority of overall production, which totalled 7,300+ aircraft. The type was operated at first as a day bomber, but was soon so vulnerable that it was relegated to other tasks.

Principal versions
He 111H-1 (1,010-hp/753-kW Jumo 211A-1s), He 111H-2 (1,100-hp/820-kW Jumo 211A-3s), He 111H-3 (1,200-hp/820-kW Jumo 211D-1s), He 111H-4 (1,400- hp/1,044-kW Jumo 211F-1s), He 111H-5 (improved H-4), He 111H-6 (torpedo bomber), He 111H-7 (improved H-6), He 111H-8 (improved H-5), He 111H-10 (night bomber), He 111H-11 (upgraded H-10), He 111H-12 (one Hs 293A anti-ship missile), He 111H-14 (pathfinder), He 111H-5 (three Blohm und Voss glider bombs), He 111H-16 (definitive bomber), He 111H-18 (night bomber), He 111H-20 (airborne forces), He 111H-21 (1,750-hp/1,305-kW Jumo 213E-1s), He 111H-22 (one Fi 103 missile), and He 111H-23 (paratroop transport).

Principal users
Germany, Romania, and Slovakia.

TECHNICAL DATA

Type: Heinkel He 111H-16 five-seat medium bomber.
Engines: two 1,350-hp (1,007-kW) Junkers Jumo 211F-2 inline piston engines.
Performance: maximum speed 252 mph (405 km/h) at 19,685 ft (6,000 m); climb to 19,685 ft (6,000 m) in 42 minutes 0 seconds; service ceiling 27,890 ft (8,500 m); range 1,200 miles (1,930 km).
Weights: empty 19,136 lb (8,680 kg); maximum take-off 30,865 lb (14,000 kg).
Dimensions: span 74 ft 1.75 in (22.60 m); length 53 ft 9.5 in (16.40 m); height 13 ft 1.5 in (3.40 m); wing area 931.07 sq ft (86.50 m^2).
Armament: one 20-mm cannon, one 13-mm (0.51-in) machine gun, and five or six 7.92-mm (0.312-in) machine guns in nose, dorsal, ventral and beam positions, and up to 7,175 lb (3,250 kg) of bombs.

Despite its obsolescence from 1940, the He 111H remained operational to the end of the Second World War.

Photo: D.R.
D1 075 04-02
Printed in Italy

Medium bomber

USA

Douglas A-26 INVADER

Medium bomber

Douglas A-26 INVADER

Ancestry of fighting experience
In January 1941 Douglas started development of a new attack bomber to succeed the A-20/Boston series, but offering higher performance and offensive firepower. The first XA-26 flew in July 1942, and trials with prototypes in various attack and night-fighter configurations led to large-scale orders for the A-26B attack bomber that entered service in January 1944.

Cut-back in production
Some 6,000 aircraft were ordered, but production was curtailed in Sepotember 1945 at 2,450 aircraft. Examples saw very useful service in Europe and the Far East. In 1948 the type was redesignated B-26, and went on to effective combat use in the Korean War (1950-53) and in the early stages of the Vietnam War.

Principal versions
A-26B (initial production model, later redesignated B-26B, with a "solid" nose), A-26C (later production model, later redesignated B-26C and known in British service as the Invader Mk I, with a glazed bombardier nose and only two forward-firing fuselage guns, a wider fuselage, and dual controls), and B-26K (special counter-insurgency variant produced to the extent of some 70 conversions for use in the Vietnam War).

Principal users
Great Britain and USA.

TECHNICAL DATA

Type: Douglas A-26B Invader three-seat attack bomber.
Engines: two 2,000-hp (1,491-kW) Pratt & Whitney R-2800-27 or -97 radial piston engines.
Performance: maximum speed 355 mph (571 km/h) at 15,000 ft (4,570 m); climb to 10,000 ft (3,050 m) in 8 minutes 6 seconds; service ceiling 22,100 ft (6,735 m); range 1,400 miles (2,253 km).
Weights: empty 22,850 lb (10,365 kg); maximum take-off 35,000 lb (15,876 kg).
Dimensions: span 70 ft 0 in (21.34 m); length 50 ft 0 in (15.24 m); height 18 ft 6 in (5.64 m); wing area 540.0 sq ft (50.17 m^2).
Armament: between 10 and 18 0.5-in (12.7-mm) machine guns (six fixed in the nose, with provision for another eight in underwing and fuselage cheek packs, and two each in remotely controlled dorsal and ventral barbettes), and up to 4,000 lb (1,814 kg) of bombs.

The A-26 was the best attack bomber of the Second World War, offering a unique blend of speed, agility, and firepower. The type went on to play an important part in the Korean War as the B-26.

Photo: P. Guérin
D1 075 04-03
Printed in Italy

Fighter

France

SPAD S.13

SPAD S.13

Evolutionary development
Introduced so service in mid-1916, the S.VII was a revolutionary fighter using a thin aerofoil section and, in place of the air-cooled rotary type of engine that had featured in most earlier French fighters, a stationary V-8 engine of the water-cooled type. The manufacturer, more formally known as the Societe Pour l'Aviation et ses Derives, then introduced the S.XII with a 200- hp (149-kW) engine and a 37-mm cannon to complement the S.VII's single machine gun.

Serving the aces
First flown in April 1917 for a service debut in the following month, the S.XIII was a development of the S.XII with slightly greater span, improved ailerons and other refinements, and two synchronized machine-guns. The type proved to be an excellent fighter, and was flown by many French and Italian aces, as well as American pilots such as the 26-victory American "ace of aces", Captain Eddie Rickenbacker. Production totalled 8,472, and the type remained in widespread service after the First World War, in whose last year it was redesignated S.13.

Principal versions
S.13 (basic fighter), S.13Ca (37-mm cannon located between the cylinder banks to fire through the propeller shaft), S.14 (floatplane fighter), and S.18 (reconnaissance fighter with one machine gun, two cameras, and a 300-hp/224- kW Hispano-Suiza 8Fbc engine for higher performance).

Principal users
Belgium, Czechoslovakia, France, Great Britain, Italy, Japan, Poland, and USA.

TECHNICAL DATA

Type: SPAD S.13C.1 single-seat fighter.
Engine: one 220-hp (164-kW) Hispano-Suiza 8Be inline piston engine.
Performance: maximum speed 139 mph (224 km/h) at 6,560 ft (2,000 m); initial climb rate 1,509 ft (460 m) per minute; service ceiling 21,815 ft (6,650 m); endurance 2 hours 0 minutes.
Weights: empty 1,257 lb (570 kg); maximum take-off 1,863 lb (845 kg).
Dimensions: span 26 ft 6.75 in (8.10 m); length 20 ft 8 in (6.30 m); height 7 ft 8.5 in (2.35 m); wing area 227.13 sq ft (21.10 m^2).
Armament: two 0.303-in (7.7-mm) machine guns.

A prize exhibit in the collection of the Musee de l'Air in Paris is this S.13 wearing the markings of Capitaine Rene Fonck, the Allied "ace of aces" in the First World War.

Photo: Musee Air
D1 075 04-04
Printed in Italy

Fighter

USA

Vought F4U CORSAIR

Vought F4U CORSAIR

Biggest and fastest

The XF4U-1 prototype first flew in May 1940 and was the first US fighter capable of exceeding 400 mph (644 km/h). The type had been planned round the most powerful engine and largest propeller yet envisaged for a fighter, the wings' inverted-gull layout shortening the landing gear legs and reducing folded height to ease stowage in carrier hangars.

Shore and carrier operations

The US Navy decided that the Corsair had poor carrier landing performance, and first deliveries were made to the US Marine Corps for land-based combat from February 1943. Revisions allowed carrier operations from September of the same year, and the Corsair then became possibly the finest American fighter of the Second World War with a victory:loss ratio of 11:1 and superb ground-attack capability. Total production up to December 1952 was 12,571.

Principal versions

F4U-1 (initial fighter), F4U-1A and, in British service, Corsair Mk II (fixed wings and frameless, raised canopy), F4U-1B (British Corsair Mk I), F4U-1C (four 20-mm cannon), F4U-1D (fighter-bomber), F4U-1P (reconnaissance fighter), FG-1 (Goodyear-built model in same variants as F4U-1 and including Corsair Mk IV), F3A (Brewster-built model in the same variants as the F4U-1 and including Corsair Mk III), F4U-4 (2,450-hp/1,827-kW R-2800-18W or -42W), F4U-5 (post-war model with metal-skinned wings), F4U-7 (final fighter), and AU-1 (low-level attack model with improved protection and warload).

Principal users

Great Britain, New Zealand, France and USA.

TECHNICAL DATA

Type: Vought F4U-1 Corsair single-seat carrier-borne and land-based fighter.
Engine: one 2,000-hp (1,491-kW) Pratt & Whitney R-2800-8 Double Wasp radial piston engine.
Performance: maximum speed 415 mph (668 km/h) at 20,000 ft (6,095 m); initial climb rate 3,120 ft (951 m) per minute; service ceiling 37,000 ft (11,280 m); range 1,015 miles (1,633 km).
Weights: empty 8,695 lb (3,944 kg); maximum take-off 14,000 lb (6,350 kg).
Dimensions: span 40 ft 11.75 in (12.48 m); length 33 ft 4.5 in (10.17 m); height 15 ft 0.75 in (4.59 m); wing area 314.0 sq ft (29.17 m^2).
Armament: six 0.5-in (12.7-mm) machine guns.

A Vought F4U-7 belonging to a private collector is seen in French navy markings.

Photo: Robineau
D1 075 04-05
Printed in Italy

Fighter

Germany

Messerschmitt Bf 110

Messerschmitt Bf 110

A double mission
The Bf 110 was designed as a heavy twin-engined fighter that could also double as a high-speed bomber, and first flew in May 1936. The development program was delayed by problems with the fuel-injected DB 601A engines, and the type entered production as the interim Bf 110B with Jumo 210 engines.

Limited capabilities
The first definitive model was the Bf 110C with DB 601A engines, and this was produced in a number of improved fighter and specialized forms. The model did well in the campaign against Poland, slightly less well in the German werstern campaign launched in May 1940, and poorly in the Battle of Britain during the summer of 1940. Here the limitations of the big fighter were cruelly exposed in combat against single-seat fighters flown by skilled pilots. The type was then steadily relegated to less taxing roles.

Principal versions
Bf 110B (pre-production model in four subvariants with 700-hp/522-kW Jumo 210Da engines), Bf 110C-1 (DB 601A engines), Bf 110C-2 (improved C-1), Bf 110C-3 (improved cannon), Bf 110C-4 (improved protection), Bf 110C-4B (fighter-bomber), Bf 110C-5 (reconnaissance version without cannon), Bf 110C- 5/N (1,200-hp/895-kW DB 601Ns), Bf 110C-6 (heavy fighter with one 30-mm cannon replacing two 20-mm weapons), and Bf 110C-7 (fighter-bomber with 2,205 lb/1,000 kg of bombs).

Principal user
Germany.

TECHNICAL DATA

Type: Messerschmitt Bf 110C-1 two-seat heavy fighter.
Engines: two 1,100-hp (820-kW) Daimler-Benz DB 601A-1 inline piston engines.
Performance: maximum speed 326 mph (525 km/h) at 13,125 ft (4,000 m); initial climb rate 2,165 ft (660 m) per minute; service ceiling 32,810 ft (10,000 m); range 680 miles (1,100 km).
Weights: empty 9,755 lb (4,425 kg); maximum take-off 14,880 lb (6,750 kg).
Dimensions: span 53 ft 3.75 in (16.25 m); length 39 ft 7.25 in (12.70 m); height 13 ft 6.5 in (4.13 m); wing area 413.33 sq ft (38.40 m^2).
Armament: two 20-mm cannon and five 7.92-mm (0.312-in) machine guns (four fixed in the nose with the cannon and one trainable).

Like most other twin-engined fighters of the period, the Bf 110 was successful only when used under conditions of air superiority.

Photo: D.R.
D1 075 04-06
Printed in Italy

Fighter

USA

Bell P-63 KINGCOBRA

Bell P-63 KINGCOBRA

An Airacobra Plus

The P-63 was a logical development of the radical P-39 Airacobra with more power and aerodynamic refinements (including a laminar-flow wing) to improve performance, especially at high altitude. The same basic layout was retained, with the engine located in the fuselage behind the pilot and driving the propeller via a long transmission shaft to leave the nose clear for armament and the nosewheel unit of the tricycle landing gear.

Indifferent altitude performance

The XP-63 first flew in December 1942, and the type was ordered into production as the P-63A. Despite its adequate performance at high altitude, the Kingcobra was used almost exclusively as a ground-attack fighter. The majority of the aircraft were delivered to the USSR under Lend-Lease arrangements, and a smaller number went to the Free French air force. The US Air Force used the type only for training and for the unusual task of manned target with 1,500 lb (680 kg) of protection.

Principal versions

P-63A (initial ground-attack fighter in six subvariants with different armament provisions), P-63C (1,800-hp/1342-kW) V-1710-117 engine and a ventral fin), and RP-63A/C/G (manned target version).

Principal users

France, USA, and USSR.

TECHNICAL DATA

Type: Bell P-63A Kingcobra single-seat fighter and fighter-bomber.

Engine: one 1,325-hp (988-kW) Allison V-1710-93 inline piston engine.

Performance: maximum speed 410 mph (660 km/h) at 25,000 ft (7,620 m); climb to 25,000 ft (7,620 m) in 7 minutes 18 seconds; service ceiling 43,000 ft (13,110 m); range 450 miles (724 km) with maximum warload.

Weights: empty 6,375 lb (2,892 kg); maximum take-off 10,500 lb (4,763 kg).

Dimensions: span 38 ft 4 in (11.68 m); length 32 ft 8 in (9.96 m); height 12 ft 7 in (3.84 m); wing area 248.0 sq ft (23.04 m^2).

Armament: one 37-mm cannon and four 0.5-in (12.7-mm) machine guns, and up to 1,566 lb (710 kg) of bombs.

France received 330 examples of the P-63C model, and these entered service in 1943. The last were not retired until the early 1950s.

Photo: S.H.A.A.
D1 075 04-07
Printed in Italy

Interceptor

Great Britain

English Electric LIGHTNING

English Electric LIGHTNING

Super supersonic

In April 1950 English Electric was contracted to produce the P.1 research plane as Great Britain's first supersonic type, and between 1954 and 1957 six aircraft were actively involved in the flight test program. The RAF was then faced with the need for an interceptor, and the P.1 was adapted for the role as the Lightning, which first flew in October 1958. Pre-production aircraft were followed by the Lightning F.Mk 1 that entered service in June 1960.

Wringing out the design

Within the limitations imposed by the basic design, the Lightning was steadily upgraded in capability with better radar and improved weapons, and in its later versions received a welcome boost in range by the adoption of a ventral fuel tank. Total production was 338 aircraft including export models with provision for overwing armament.

Principal versions

Lightning F.Mk 1 (initial interceptor), Lightning F.Mk 1A (flight refueling), Lightning F.Mk 2 (variable reheat), Lightning F.Mk 3 (definitive fighter with more power and fuel, collision-course interception capability, but no cannon), Lightning F.Mk 3A (revised F.Mk 3), Lightning T.Mk 4 (trainer based on F.Mk 1A), Lightning T.Mk 5 (trainer based on F.Mk 3), Lightning F.Mk 6 (revised wing, increased fuel, and cannon restored), and Lightning F.Mk 53 (multi-role export model).

Principal users

Great Britain, Kuwait, and Saudi Arabia.

TECHNICAL DATA

Type: English Electric Lightning F.Mk 6 single-seat interceptor.
Engines: two 16,360-lb (7,420-kg) reheated thrust Rolls-Royce Avon Mk 301 turbojets.
Performance: maximum speed 1,320 mph (2,113 km/h) or Mach 2.0 at 36,000 ft (10,975 m); climb to 40,000 ft (12,190 m) in 2 minutes 30 seconds; service ceiling 55,000 ft (16,765 m); range 800 miles (1,287 km).
Weights: empty 28,041 lb (12,717 kg); maximum take-off 42,000 lb (19,057 kg).
Dimensions: span 34 ft 10 in (10.62 m); length 55 ft 3 in (16.84 m) including probe; height 19 ft 7 in (5.97 m); wing area 458.5 sq ft (42.97 m^2).
Armament: two 30-mm cannon and two air-to-air missiles.

Despite its short range, the Lightning served the Royal Air Force usefully until its retirement in 1989.

Photo: P. Bigel
D1 075 04-08
Printed in Italy

Interceptor

USSR

Mikoyan-Gurevich MiG-15 "FAGOT"

Mikoyan-Gurevich MiG-15 "FAGOT"

Urgent progam

From the end of the Second World War the USSR undertook a vast development program for modern jet-powered warplanes, and the first classic fighter to emerge was the swept-wing MiG-15, which flew in December 1947 as the I-310 with a Rolls-Royce Nene II turbojet. The Nene was copied in the USSR as the RD-45, and in its improved RD-45F version this was used in the MiG-15 production fighter, which entered service late in 1948.

Shock for the Western powers

The MiG-15 was extensively operated by the communist forces in the Korean War (1950-53), and its first-class performance and firepower came as a nasty surprise to the Western nations until ultimately the MiG-15 and improved MiG- 15bis were equalled by the North American F-86 Sabre. Soviet production continued up to 1951 and was complemented by Chinese, Czechoslovak, and Polish production to build 5,000+ single-seaters and 3,000+ two-seaters.

Principal versions

MiG-15 (fighter with 4,998-lb/2270-kg thrust RD-45F engine), MiG-15bis (improved fighter with more power and slab tailplane), and MiG-15UTI "Midget" (two-seat trainer).

Principal users

Afghanistan, Albania, Algeria, Angola, Bangladesh, Bulgaria, China, Congo, Cuba, Czechoslovakia, East Germany, Egypt, Guinea, Guinea-Bissau, Hungary, Iraq, Mali, Mongolia, Mozambique, Nigeria, North Korea, Pakistan, Poland, Romania, Somalia, Sri Lanka, Sudan, Syria, Tanzania, Uganda, USSR, Vietnam, Yemen, and Yugoslavia.

TECHNICAL DATA

Type: Mikoyan-Gurevich MiG-15bis "Fagot" single-seat fighter.

Engine: one 5,952-lb (2,700-kg) thrust Klimov VK-1 turbojet.

Performance: maximum speed 669 mph (1,076 km/h) at sea level; climb to 32,810 ft (10,000 m) in 5 minutes 30 seconds; service ceiling 50,855 ft (15,500 m); range 826 miles (1,330 km).

Weights: empty 8,115 lb (3,681 kg); maximum take-off 13,327 lb (6,045 kg).

Dimensions: span 33 ft 1 in (10.08 m); length 35 ft 7.5 in (10.86 m); height 12 ft 1.75 in (3.70 m); wing area 221.75 sq ft (20.60 m^2).

Armament: one 37-mm cannon and two 23-mm cannon, and up to 1,102 lb (500 kg) of disposable stores.

This North Korean MiG-15 was one of the first aircraft received by the Western countries after an American offer of substantial reward for any pilot who defected with his machine.

Photo: M. Rostaing
D1 075 04-09
Printed in Italy

Interceptor

Sweden

Saab JA 37 VIGGEN

Saab JA 37 VIGGEN

Ambitious project

Since the Second World War, Sweden has produced a remarkable series of locally designed warplanes to meet its primary combat requirements. The Saab 37 Viggen (Thunderbolt) was designed to succeed the Saab 35 with its remarkable double-delta wing, and emerged for its first flight in February 1967. The type is intended for dispersed operations in wartime, using short lengths of road, and the required STOL performance is provided by a thrust-reversible turbofan (a Swedish development of the Pratt & Whitney JT8D-22 civil engine), sturdy landing gear that allows to the Viggen to be flown onto the ground in a no-flare maneuver, and flying surfaces arranged as a rear- mounted delta wing and forward-mounted swept canards.

Air force jewel

After 180 early aircraft in the attack, reconnaissance, and training roles, Saab produced the JA 37 dedicated interceptor with a revised engine, advanced electronics including the world's first pulse-Doppler radar to reach production status, and provision for powerful armament including an Oerklikon-Buhrle KCA, the West's most potent air-to-air cannon. Production of 149 JA 37s was completed in 1990.

Principal version

JA 37 Viggen (interceptor with secondary attack capability)

Principal user

Sweden

TECHNICAL DATA

Type: Saab JA 37 Viggen single-seat interceptor.
Engine: one 28,109-lb (12,750-kg) reheated thrust Volvo Flygmotor RM8B turbofan.
Performance: maximum speed 1,320 mph (2,124 km/h) or Mach 2.0 at 36,090 ft (11,000 m); climb to 32,810 ft (10,000 m) in less than 1 minute 40 seconds from brake release; service ceiling 49,870+ ft (15,200+ m); radius 621 miles (1,000 km).
Weights: empty not revealed; maximum take-off 45,194 lb (20,500 kg).
Dimensions: span 34 ft 9.25 in (10.60 m); length 53 ft 9.75 in (16.40 m); height 19 ft 4.25 in (5.90 m); wing and canard area 561.89 sq ft (52.20 m^2).
Armament: one 30-mm cannon and up to 13,228 lb (6,000 kg) of disposable stores.

The Saab 37 is striking evidence of the Swedish aerospace industry's ability to build effective and thoroughly modern warplanes.

Photo: P.Bigel
D1 075 04-10
Printed in Italy

Fighter

Great Britain

Hawker SEA FURY

Hawker SEA FURY

Joint air force and navy program

Designed to meet air force and navy requirements for a high-performance fighter. the Fury was developed as a smaller and lighter version of the Tempest. Six prototypes were ordered with Rolls-Royce Griffin inline and Bristol Centaurus radial engines, and the first prototype flew in September 1944. The Royal Air Force ordered 200 Fury fighters, but the contract was cancelled at the end of the Second World War, leaving the Royal Navy to push ahead with its Sea Fury model, which first flew in February 1945 with the Centaurus radial.

From fighter to fighter-bomber

The first 50 aircraft were Sea Fury F.Mk X fighters. The next 615 British aircraft were Sea Fury FB.Mk 11 fighter-bombers, which performed with great distinction in the Korean War (1950-53). There were also 60 Sea Fury T.Mk 20 trainers (some converted later as target tugs), and production was boosted to 939 by export orders. Extensively modified Sea Furies are now classic air racers in the USA.

Principal versions

Sea Fury F.Mk 10 (initial carrierborne fighter), Sea Fury FB.Mk 11 (carrierborne fighter-bomber), Sea Fury T.Mk 20 (trainer), and export aircraft in the Sea Fury Mk 50 and 60 series.

Principal users

Australia, Burma, Canada, Cuba, Egypt, Great Britain, Iraq, the Netherlands, Pakistan, and West Germany.

TECHNICAL DATA

Type: Hawker Sea Fury FB.Mk 11 single-seat carrierborne fighter-bomber.

Engine: one 2,480-hp (1,849-kW) Bristol Centaurus 18 radial piston engine.

Performance: maximum speed 460 mph (740 km/h) at 18,000 ft (5,485 m); initial climb rate 4,320 ft (1,317 m) per minute; service ceiling 34,300 ft (10,455 m); range 680 miles (1,094 km).

Weights: empty 9,240 lb (4,191 kg); maximum take-off 12,500 lb (5,670 kg).

Dimensions: span 38 ft 4.75 in (11.70 m); length 34 ft 8 in (10.57 m); height 15 ft 10.5 in (4.84 m); wing area 280.0 sq ft (26.01 m^2).

Armament: four 20-mm cannon and up to 2,000 lb (907 kg) of disposable stores.

The Sea Fury FB.Mk 11 was too late for the Second World War, but this powerful fighter-bomber performed admirably during the Korean War.

Photo: M. Hodeir
D1 075 04-11
Printed in Italy

Trainer

France

Fouga CM.170 MAGISTER

Fouga CM.170 MAGISTER

Pioneering jet trainer

Though it was not the first type designed as such, the Magister was the world's first pure-jet basic trainer to enter large-scale production. Instantly recognizable by its "butterfly" tail, the CM.170 prototype first flew in July 1952 on the power of two Marbore II turbojets. The type was soon ordered for the French air force, and production of the CM.170-1 initial model totalled 761 aircraft for domestic and export orders, the latter leading to licensed production in Finland, Israel, and West Germany. Israel also used its aircraft for light attack in wars with its Arab neighbours.

An upgraded version

Improved capability was offered by use of 1,058-lb (480-kg) thrust Marbore VI turbojets, and this CM.170-2 Super Magister was built to the extent of 137 aircraft. A naval version equivalent to the CM.170-1 but fitted with an arrester hook is the CM.175 Zephyr, and 32 of this model were built for French service. Many examples remain in service, and Israel has converted its aircraft to Tzukit (thrush) standard under its AMIT (Advanced Multi-mission Improved Trainer) program.

Principal versions

CM.170-1 (initial model), CM.170-2 (more powerful engines), CM.175 (naval model), and Tzukit (upgraded Israeli version).

Principal users

Algeria, Bangladesh, Belgium, Cameroun, El Salvador, Finland, France, Gabon, Guatemala, Ireland, Israel, Lebanon, Libya, Morocco, Senegambia, Togo, and West Germany.

TECHNICAL DATA

Type: Fouga CM.170-1 Magister two-seat basic trainer with light attack capability.

Engines: two 882-lb (400-kg) thrust Turbomeca Marbore IIA turbojets.

Performance: maximum speed 414 mph (715 km/h) at 30,000 ft (9,145 m); initial climb rate 3,345 ft (1,020 m) per minute; service ceiling 36,090 ft (11,000 m); range 575 miles (925 km).

Weights: empty 4,740 lb (2,150 kg); maximum take-off 7,055 lb (3,200 kg).

Dimensions: span 39 ft 10 in (12.15 m); length 33 ft 0 in (10.06 m); height 9 ft 2 in (2.80 m); wing area 186.1 sq ft (17.30 m^2).

Armament: two7.5- or 7.62-mm (0.295- or 0.3-in) machine guns and up to 100 kg (221 lb) of disposable stores.

A CM.170-1 Magister of the French air force in flight.

Photo: SIRPA/Air
D1 075 04-12
Printed in Italy

Trainer

USSR

Polikarpov Po-2

Polikarpov Po-2

Tough start
The Po-2 remains very little known despite the fact that the type may have been built in larger numbers than any other plane in history: some 41,000 of the series may have been produced. The type began life as the U-2TPK trainer prototype that appeared in 1927 but was unsuccessful: the wings were four interchangeable panels with squared-off tips, while all seven control surfaces were likewise interchangeable.

Long career
The revised U-2 entered service in 1928, and more than 13,000 had been delivered by the time of the German invasion of the USSR in July 1941. Production continued at a high rate to meet Soviet requirement for trainers and a growing number of specialized models. The U-2 was redesignated Po-2 in 1944 shortly after Polikarpov's death, and production continued in North Korea and Poland up to 1953.

Principal versions
U-2 (trainer), U-2AO or AP (cropduster later redesignated Po-2A and fitted with improved 150-hp/112-kW M-11F engine), U-2S or Po-2S (air ambulance), U- 2LBN or Po-2LBN (nocturnal light bomber with 441 lb/200 kg of bombs), U-2UT (improved trainer with M-11D engine), U-2VS or Po-2VS (military liaison and utility), U-2VOM-1 or Po-2LSh (light attack with 265 lb/120 kg of bombs), U- 2NAK or Po-2NAK (nocturnal artillery spotter), Po-2SP (aerial photography), and Po-2GN (propaganda).

Principal users
North Korea, Poland, USSR, and many allied and client countries.

TECHNICAL DATA

Type: Polikarpov U-2VS two/three-seat trainer and multi-purpose plane.
Engine: one 100-hp (75-kW) M-11 radial piston engine.
Performance: maximum speed 97 mph (156 km/h) at sea level; climb to 3,280 ft (1,000 m) in 5 minutes 36 seconds; service ceiling 13,125 ft (4,000 m); range 249 miles (400 km).
Weights: empty 1,400 lb (635 kg); maximum take-off 1,962 lb (890 kg).
Dimensions: span 37 ft 4.75 in (11.40 m); length 26 ft 9.75 in (8.17 m); height 10 ft 2 in (3.10 m); wing area 356.86 sq ft (33.15 m^2).
Armament: one 7.62-mm (0.3-in) machine gun and up to 551 lb (250 kg) of bombs.

Despite its flimsy appearance, the U-2 was a remarkably sturdy and successful type that served the USSR with great distinction.

Photo: S.H.A.A
D1 075 04-13
Printed in Italy

Land based helicopter

France

Aerospatiale SA 341 GAZELLE

Aerospatiale SA 341 GAZELLE

Born of military needs

To meet a French army requirement for a light observation helicopter, Aerospatiale developed a helicopter using the dynamic system of the SA 318C Alouette II driving a rigid main rotor (developed in West Germany by Bolkow). The SA 340 prototype first flew in April 1967, just after the Gazelle had been included in an Anglo-French agreement for the joint development and production of three helicopters.

Technical success

The "fenestron" shrouded tail rotor was introduced in the second prototype, and the Gazelle revealed its capabilities with three speed records. Production of the SA 341 model was launched to meet large orders, and in a continuing program, including the upgraded SA 342 model as well as licensed Egyptian and Yugoslav production, the Gazelle has built up considerable commercial and operational success.

Principal versions

SA 341B (British army model in service as the Gazelle AH.Mk 1), SA 341C (British naval model in service as the Gazelle HT.Mk 2), SA 341D (British air force model in service as the Gazelle HT.Mk 3), SA 341E (British air force model in service as the Gazelle HCC.Mk 4), SA 341F (French army model), SA 341F/Canon (French army gunship model with a 20-mm cannon on the starboard side of the fuselage), and SA 341H (export model with the Astazou IIIB).

Principal users

Chad, France, Great Britain, Qatar, Senegambia, and Yugoslavia.

TECHNICAL DATA

Type: Aerospatiale SA 341F one/two-crew light utility helicopter.

Engine: one 590-shp (440-kW) Turbomeca Astazou IIIC turboshaft.

Performance: maximum speed 164 mph (264 km/h) at sea level; initial climb rate 1,770 ft (540 m) per minute; service ceiling 16,405 ft (5,000 m); range 223 miles (360 km) with a 1,102-lb (500-kg) payload.

Weights: empty 2,028 lb (920 kg); maximum take-off 3,968 lb (1,800 kg).

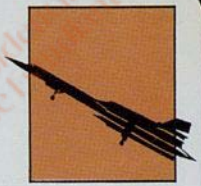
Dimensions: main rotor diasc area 34 ft 5.5 in (10.50 m); length overall, rotors turning 39 ft 3.25 in (11.97 m); height 10 ft 5.25 in (3.18 m); main rotor disc area 932.1 sq ft (86.60 m^2).

Payload: four passengers or 1,540 lb (700 kg) of freight.

An SA 341F Gazelle of the Aviation Legere de l'Armee de Terre, the French army's aviation arm.

Photo: Aérospatiale
D1 075 04-14
Printed in Italy

France



Breguet Bre.14

Breguet Bre.14

A remarkable warplane

Conceived in the summer of 1916, this remarkable First World War plane first flew in November 1916 and, to signify that its new Renault engine was installed as a tractor unit, was initially called the Breguet AV Type XIV, AV standing for Avant (in front).

Great success

The type was clearly a winner, and orders began to grow rapidly: by the end of 1917 these stood as 2,650 in A.2 reconnaissance and B.2 bomber variants. The Bre.XIVA.2 entered service in the summer of 1917, and production totalled 5,300 aircraft up to December 1918, by which time the designation Bre.14 had been adopted. Later aircraft had balanced ailerons that increased span. The type was exported after the war, and production to 1926 raised the overall total to 8,000 aircraft by nine manufacturers including Nakajima in Japan, which produced the type as the B6.

Principal versions

Bre.14A.2 (basic reconnaissance model), Bre.14B.2 (bomber with increased span and provision for 518 lb/235 kg of bombs), Bre.14S (air ambulance), Bre.14TOE (multi-role version for use in French colonies), Bre.14T Salon (civil transport for two passengers and/or mail) Bre.14T bis (improved civil version), Bre.14T bis Sanitaire (air ambulance), and Bre.14Et.2 (trainer).

Principal users

Belgium, Brazil, Czechoslovakia, Denmark, France, Greece, Poland, Portugal, Romania, Siam, Spain, USA, and Yugoslavia.

TECHNICAL DATA

Type: Breguet Bre.14A.2 two-seat reconnaissance plane.

Engine: one 310-hp (231-kW) Renault 12Fcy inline piston engine.

Performance: maximum speed 114 mph (184 km/h) at 6,560 ft (2,000 m); climb to 9,845 ft (3,000 m) in 12 minutes 10 seconds; service ceiling 19,685 ft (6,000 m); endurance 3 hours 0 minutes.

Weights: empty 2,227 lb (1,010 kg); maximum take-off 3,386 lb (1,535 kg).

Dimensions: span 48 ft 9 in (14.86 m); length 29 ft 1.25 in (8.87 m); height 10 ft 10 in (3.30 m); wing area 529.6 sq ft (49.20 m^2).

Armament: three 0.303-in (7.7-mm) machine guns (one fixed and two trainable) and provision for 88 lb (40 kg) of bombs.

The beautifully completed Bre.14 replica is closer in overall appearance to the Bre.14T than to the Bre.14A.2 and B.2 models, but is seen in the markings of a celebrated squadron, Escadrille BR 117.

Photo: Robineau
D1 075 04-15
Printed in Italy

USA

Beech C-45 EXPEDITER

Beech C-45 EXPEDITER

Civil origins
The C-45 was widely used by the military in the Second World War, and was a development of the Model 18 civil light transport which had first flown in January 1937. The first US Army order was placed in 1940 for 11 examples of the Model B18S, which were accepted with the designation C-45 for use as staff transports.

Flying station wagon
The C-45 proved so successful that considerably larger orders were placed for similar aircraft in a number of roles including multi-engined training of two basic types, photo-survey, and utility transport. Production of the Model 18 series lasted to 1969 and totalled some 9,100 aircraft including 7,521 used by the military.

Principal versions
C-45 (staff transport), C-45A (utility transport), C-45B and, in British service, Expediter Mk I (revised interior), C-45C to E (impressed civil aircraft), C-45F and Expediter Mk II (seven-passenger version with a lengthened nose), C-45G (post-war modernization of C-45s with an autopilot), C-45H (post-war modernization of C-45s without an autopilot), AT-7 Navigator (navigation trainer), AT-7A (revised landing gear and ventral fin), AT-7B (winterized model), AT-7C (different powerplant), AT-11 Kansan (bombing and gunnery trainer), AT-11A (AT-11 converted for navigation training), F-2 (civil aircraft modified for photo-survey), F-2A (similar conversion of C- 45A), F-2B (similar conversion of C-45F), JRB-1/4 (naval versions of C-45 series), and SNB-1/2 (naval versions of AT-7/11 series).

Principal users
Canada, China, France, Great Britain, and USA.

TECHNICAL DATA

Type: Beech C-45 two-crew light transport.
Engines: two 450-hp (336-kW) Pratt & Whitney R-985-AN-1 radial piston engines.
Performance: maximum speed 215 mph (346 km/h) at 10,000 ft (3,050 m); climb to 10,000 ft (3,050 m) in 8 minutes 36 seconds; service ceiling 20,000 ft (6,095 m); range 700 miles (1,126 km).
Weights: empty 5,890 lb (2,672 kg); maximum take-off 7,850 lb (3,560 kg).
Dimensions: span 47 ft 8 in (14.48 m); length 34 ft 3 in (10.44 m); height 9 ft 8 in (2.95 m); wing area 349.0 sq ft (32.42 m^2).
Payload: eight passengers.

Among the several operators of the C-45 was France, which used the type for liaison.

Photo: S.H.A.A.
D1 075 04-16
Printed in Italy

Great Britain

Shorts SC.7 SKYVAN

Shorts SC.7 SKYVAN

Light utility transport

Design of the S.C.7 began in 1959, Shorts' intention being the creation of a utility transport combining a boxy fuselage with the Hurel-Dubois type of high-aspect-ratio wing. The prototype flew in January 1963 with piston engines, though the pre-production Skyvan Series 1A introduced Turbomeca Astazou turboprops. These Astazou IIs were replaced by 830-ehp (544-kW) Astazou XIIs in the Skyvan Series 2 production variant of 1966.

Improved "hot and high" performance

The Astazou lacked the power for the "hot and high" requirements of most potential Skyvan operators, so the Skyvan Series 3 of 1968 introduced Garrett turboprops. The Skyvan Series 3A of 1970 was cleared for higher weights, and 1970 also saw the introduction of the Skyliner commuterliner for 19 passengers. Two military derivatives were the Skyvan Series 3M and the Skyvan Series 3M-200 cleared to higher weights. Total production was 150.

Principal versions

Skyvan Series 2 (initial Astazou-powered model), Skyvan Series 3 (Garrett-powered model), Skyvan Series 3M (military model with rear ramp/door), Skyvan Series 3M-200 (higher-weight military model), and Skyliner (all-passenger model).

Principal users

Argentina, Austrai, Botswana, Ghana, Great Britain, Guyana, Indonesia, Kuwait, Lesotho, Mauritania, Mexico, Nepal, Oman, Panama, Singapore, United Arab Emirates, USA, and Yemen.

TECHNICAL DATA

Type: Shorts SC.7 Skyvan Series 3 two-crew utility light transport.
Engines: two 715-shp (533-kW) Garrett TPE331-201 turboprops.
Performance: maximum speed 203 mph (327 km/h) at 10,000 ft (3,050 m); initial climb rate 1,640 ft (500 m) per minute; service ceiling 22,500 ft (6,860 m); range 694 miles (1,115 km) with a 4,000-lb (1,814-kg) payload.
Weights: empty 7,344 lb (3,331 kg); maximum take-off 12,500 lb (5,670 kg).
Dimensions: span 64 ft 11 in (19.79 m); length 40 ft 1 in (12.21 m); height 15 ft 1 in (4.60 m); wing area 373.0 sq ft (34.65 m²).
Payload: 22 passengers or 4,600 lb (2,086 kg) of freight.

With its braced wing, fixed landing gear, and rectangular-section fuselage, the Skyvan appears ungainly but has proved its utility value with several civil and military operators. This is a Skyvan of the United Arab Emirates.

Photo: M. Rostaing
D1 075 04-17
Printed in Italy

Spain

CASA C-207 AZOR

CASA C-207 AZOR

A totally Spanish design

Seeing a possible niche in the domestic airliner market, CASA decided in the early 1950s to produce the C-207 as a 30-passenger type scaled up from its 14-passenger Halcon. The first example flew in September 1955 as a conventional low-wing monoplane with tricycle landing gear. Because of the stiff competition from larger manufacturers offering better financial terms, the type found no takers as a commercial transport.

Saved at the last minute

The Azor was saved by the intervention of the Spanish government, which ordered 10 examples as 40-seat military transports with the service designation T.7A. These entered service in 1960, and could carry as an alternative load some 6,806 lb (3,087 kg) of freight. The aircraft were later complemented by 10 examples of the C-207C dedicated paratroop and freighter model. This had large double cargo loading doors at the rear of the fuselage, and entered service with the designation T.7B. The two prototypes were also delivered to the military, and all 22 aircraft were operated from Madrid- Getafe by the 35th Wing of the Transport Command. The last of these unexceptional aircraft were retired in the early 1980s.

Principal versions

C-207 (passenger model) and C-207C (convertible freight/paratroop model).

Principal user

Spain.

TECHNICAL DATA

Type: CASA C-207C Azor two/three-crew troop and freight transport.

Engines: two 2,040-hp (1,522-kW) Bristol Hercules 730 radial piston engines.

Performance: maximum speed 261 mph (420 km/h) at 4,920 ft (1,500 m); initial climb rate not revealed; service ceiling 26,250 ft (8,000 m); range 1,460 miles (2,350 km) with a 6,614-lb (3,000-kg) payload.

Weights: empty 23,370 lb (10,600 kg); maximum take-off 36,376 lb (16,500 kg).

Dimensions: span 91 ft 2.5 in (27.80 m); length 68 ft 5 in (20.85 m); height 25 ft 5 in (7.75 m); wing area 923.5 sq ft (85.80 m^2).

Payload: 37 paratroops or 8,818 lb (4,000 lb) of freight.

The Spanish air force's 22 C-207s were used for purposes such as trooping, parachuting, and freighting.

Photo: M. Rostaing
D1 075 04-18
Printed in Italy

Netherlands

Fokker F27 TROOPSHIP

Fokker F27 TROOPSHIP

Civil ancestry

In 1955 Fokker flew the first F27 Friendship airliner, a twin-turboprop type for 28 passengers. The type was then increased in capacity to 32 passengers, and embarked on a successful commercial career. After experience with a few F27 Mk 300M military versions of the Mk 300 Combiplane, in April 1965 the company flew the first F27 Mk 400M Troopship as the purely military version of the Mk 400 convertible passenger/freight transport. The Troopship has a large cargo door and, on each side, doors that can be opened in the air for the despatch of paratroops.

Maritime surveillance model

An offshore surveillance version is the F27 Maritime, which entered service in the late 1970s. This model carries search radar and a central plotting system, and with a crew of 12 can remain aloft for 12 hours. The armed equivalent is the F27 Maritime Enforcer, which adds submarine detection and electronic support measures equipment, and can carry 8,644 lb (3,930 kg) of weapons including torpedoes and anti-ship missiles.

Principal versions

F27 Mk 300M (military transport version of Mk 300), F27 Mk 400M (military transport version of Mk 400), F27 Maritime (economic-zone patroller), and F27 Maritime Enforcer (maritime reconnaissance and anti-ship/submarine plane).

Principal users

Algeria, Angola, Argentina, Bolivia, Burma, Finland, Ghana, Guatemala, India, Indonesia, Iran, Ivory Coast, Mexico, the Netherlands, New Zealand, Nigeria, Pakistan, Peru, Philippines, Spain, and Thailand.

TECHNICAL DATA

Type: Fokker F27 Mk 400M Troopship two/three-crew utility transport.
Engines: two 2,330-ehp (1,737-kW) Rolls-Royce Dart Mk 552 turboprops.
Performance: maximum speed 298 mph (480 km/h) at 20,000 ft (6,095 m); initial climb rate 1,620 ft (494 m) per minute; service ceiling 30,000 ft (9,145 m); range 1,375 miles (2,213 km).
Weights: empty 24,720 lb (11,213 kg); maximum take-off 45,900 lb (20,820 kg).
Dimensions: span 95 ft 1.75 in (29.00 m); length 77 ft 3.5 in (23.56 m); height 28 ft 2 in (8.59 m); wing area 753.5 sq ft (70.00 m²).
Payload: 46 paratroops, or 24 litters plus nine attendants, or 13,283 lb (6,025 kg) of freight.

This F27 Mk 300 of the Dutch air force is used for paratrooping and freighting.

Photo: M. Rostaing
D1 075 04-19
Printed in Italy

France

Nord 2501 NORATLAS

Nord 2501 NORATLAS

Twin-boom transport

Designed to meet a French air force requirement for a modern airlifter, the N2500 prototype flew in September 1949 with two 1,625-hp (1,212-kW) Gnome- Rhone 14R radials. The type was based on a large central nacelle with clamshell rear loading doors, and the engine nacelles were continued to the rear as booms supporting the wide tailplane and two sets of vertical tail surfaces. Greater power was needed for the N2501 production model, which switched to Bristol Hercules radials and entered service in 1951.

A long operational life

The Noratlas was also produced under licence in West Germany, where 161 of the Luftwaffe's 186 aircraft were built. Production was completed in 1961 with the 425th aircraft. Noratlas transports saw extensive use with the French forces in Indo-China and North Africa, and also saw active employment with Israel. The last Noratlas was retired in 1987.

Principal versions

N4501 (production model), N2501IS (Israeli version), N2501A (civil version with Hercules 758/759s), N2502 (N2501A version with two 882-lb/400-kg thrust Turbomeca Marbore IIE auxiliary turbojets), and N2504 (anti-submarine trainer for French navy with powerplant of N2502).

Principal users

Congo, Djibouti, France, Greece, Israel, Mozambique, Niger, Rwanda, and West Germany.

TECHNICAL DATA

Type: Nord 2501 four/five-crew tactical transport.
Engines: two 2,040-hp (1,521-kW) SNECMA-built Bristol Hercules 739 radial piston engines.
Performance: maximum speed 273 mph (440 km/h) at 9,845 ft (3,000 m); initial climb rate 1,230 ft (375 m) per minute; service ceiling 24,605 ft (7,500 m); range 1,553 miles (2,500 km) with a 10,031-lb (4,550-kg) payload.
Weights: empty 28,825 lb (13,075 kg); maximum take-off 46,297 lb (21,000 kg).
Dimensions: span 106 ft 7.5 in (32.50 m); length 70 ft 0.5 in (21.96 m); height 19 ft 8.25 in (6.00 m); wing area 1,089.34 sq ft (101.20 m^2).
Payload: 45 troops, or 36 paratroops, or 18 litters plus attendants, or 17,416 lb (7,900 kg) of freight.

After major service with the French, Israeli, and West German air forces, surviving Noratlases were passed to the air forces of several smaller countries.

Photo: SIRPA/Air
D1 075 04-20
Printed in Italy

WARPLANES

D1 075 04

Torpedo bomber

Great Britain

Bristol BEAUFORT

Bristol BEAUFORT

Blenheim derivative

In response to a 1935 requirement for torpedo bomber, Bristol proposed a derivative of its Blenheim Mk IV light bomber with more power and an enlarged fuselage for a more numerous crew and semi-internal carriage of the torpedo. The Type 152 prototype first flew in October 1938, and the Beaufort Mk I entered service in January 1040. The Beaufort Mk II was basically similar apart from its 1,200-hp (895-kW) Pratt & Whitney Twin Wasp radials for better take-off and low-level performance. British Beaufort production totalled 1,130 aircraft.

Australian production

In 1939 Australia decided to produce the Beaufort under license. Some 700 were built and all used the 1,200-hp (895-kW) Twin Wasp engines. Various versions were made and gave rise to the Beauforts Mks V-IX. The dorsal turret was also removed from the Mk IX. The Beaufort was the RAF's standard torpedo bomber up to 1943, and remained in Australian service up to the end of the Second World War.

Principal versions

Beaufort Mk I (initial British model, later examples with the improved Taurus XII or XVI engines), Beaufort Mk II (British model with Twin Wasp radials), and Beaufort Mks V to IX (Australian models with various versions of the Twin Wasp).

Principal users

Australia, Canada, Great Britain, and Turkey.

TECHNICAL DATA

Type: Bristol Beaufort Mk I four-seat torpedo bomber.

Engines: two 1,130-hp (834-kW) Bristol Taurus VI radial piston engines.

Performance: maximum speed 260 mph (418 km/h) at 6,000 ft (1,830 m); initial climb rate not revealed; service ceiling 16,500 ft (5,030 m); range 1,035 miles (1,666 km).

Weights: empty 13,107 lb (5,945 kg); maximum take-off 21,230 lb (9,630 kg).

Dimensions: span 57 ft 10 in (17.63 m); length 44 ft 7 in (13.59 m); height 12 ft 5 in (3.78 m); wing area 503.0 sq ft (46.73 m^2).

Armament: four 0.303-in (7.7-mm) machine guns in nose and dorsal positions plus three optional 0.303-in (7.7-mm) machine guns in undernose and two beam positions, and one 1,605-lb (728-kg) torpedo or up to 1,500 lb (680 kg) of bombs or mines.

A Beaufort Mk I of No. 217 Squadron, one of six Coastal Command units that operated the Beaufort in northern Europe. There were also three Middle Eastern squadrons with the type.

Photo: Salamander
D1 075 08.01
Printed in Italy

Attack and close support

USSR

Yakovlev Yak-38 "FORGER"

Yakovlev Yak-38 "FORGER"

Soviet STOVL capability

From its Yak-36 "Freehand" experimental VTOL type, Yakovlev developed the Yak-38 multi-role warplane as the warplane carried by its first generation of aircraft carriers. The Yak-36 first flew in the early 1970s and entered service in 1976. Western analysts thought the type capable only of VTOL operations because of its combination of an aft-mounted vectored-thrust turbojet and two forward-mounted lift turbojets, but in 1984 the "Forger" was revealed as having STOVL capability, so estimates of the warload that could be carried had to be revised upward.

Carrier deployment

The Yak-38 is carried by the four ships of the "Kiev" class, and provides these ships with a useful if limited offensive air capability. The importance of the Yak-38, however, lies in the experience it is providing to the Soviets in the operation of fixed-wing aircraft from carriers. The new generation of Soviet carrierborne aircraft, including the Yak-41 supersonic STOVL type, will offer far greater operational efficiency.

Principal versions

Yak-38 "Forger-A" (single-seat multi-role warplane) and Yak-38UV "Forger-B" (two-seat operational conversion and proficiency trainer with a lengthened fuselage).

Principal user

USSR.

TECHNICAL DATA

Type: Yakovlev Yak-38 "Forger-A" single-seat carrierborne multi-role STOVL warplane.

Engines: one 14,991-lb (6,800-kg) thrust Tumanskii R-27V-300 vectored-thrust turbojet and two 7,870-lb (3,750-kg) thrust Koliesov ZM lift turbojets.

Performance: maximum speed 627 mph (1,110 km/h) at 36,090 ft (11,000 m); initial climb rate 14,765 ft (4,500 m) per minute; service ceiling 39,370 ft (12,000 m); radius 229 miles (370 km) with maximum warload.

Weights: empty 16,281 lb (7,385 kg); maximum take-off 25,794 lb (11,700 kg) for VTO or 28,660 lb (13,000 kg) for STO.

Dimensions: span 24 ft 0.25 in (7.32 m); length 50 ft 10.25 in (15.50 m); height 14 ft 4 in (4.37 m); wing area 199.14 sq ft (18.50 m^2).

Armament: up to 7,937 lb (3,600 kg) of disposable stores.

Two Yak-38s parked on the flightdeck of the carrier Minsk, *one of the four "Kiev" class carriers in Soviet service.*

Photo: Salamander
D1 075 08.02
Printed in Italy

Attack and close support

USA

McDonnell Douglas A-4 SKYHAWK II

McDonnell Douglas A-4 SKYHAWK II

Upgraded capabilities

Despite the age of the basic design (the type first flew in June 1954) and its small overall size, the A-4 Skyhawk proved highly "developable" throughout its life. The key to the creation of the much enhanced Skyhawk II series was the adoption of the -408 version of the J52 offering 20% more thrust than earlier versions of the same engine. This allowed the addition of features such as an enlarged dorsal hump for more comprehensive electronics (including the Angle-Rate Bombing System), doubled cannon ammunition capacity, a larger windscreen, an inflight refueling probe, and a braking parachute.

Limited but important use

The first Skyhawk II was the A-4M for the US Marine Corps; some A-4Ms were later upgraded to A-4Y standard with a head-up display and an improved ARBS. Then came the similar A-4N version for Israel. Other Skyhawk II models were produced by conversion rather construction, and included the A-4PTM for Malaysia and the A-4S-1 for Singapore.

Principal versions

A-4M (162 aircraft for the US Marine Corps), A-4N (117 aircraft for Israel with 30-mm cannon, improved electronics and an extended jetpipe to defeat small heat-seeking SAMs), A-4PTM (34 conversions for Malaysia), and A-4S-1 (50+ conversions for Singapore with the General Electric F404 unreheated turbofan).

Principal users

Israel, Malaysia, Singapore, and USA.

TECHNICAL DATA

Type: McDonnell Douglas A-4M Skyhawk II single-seat carrierborne and land based attack warplane.
Engine: one 11,200-lb (5,080-kg) thrust Pratt & Whitney J52-P-408A turbojet.
Performance: maximum speed 645 mph (1,038 km/h) at 34,000 ft (10,635 m) with bombs; initial climb rate 8,440 ft (2,573 m) per minute; service ceiling not revealed; range 2,055 miles (3,307 km).
Weights: empty 10,465 lb (4,747 kg); maximum take-off 27,420 lb (12,438 kg).
Dimensions: span 27 ft 6 in (8.38 m); length 40 ft 3.75 in (12.29 m) excluding probe; height 15 ft 0 in (4.57 m); wing area 260.0 sq ft (24.15 m^2).
Armament: two 20-mm cannon and up to 9,155 lb (4,153 kg) of disposable stores.

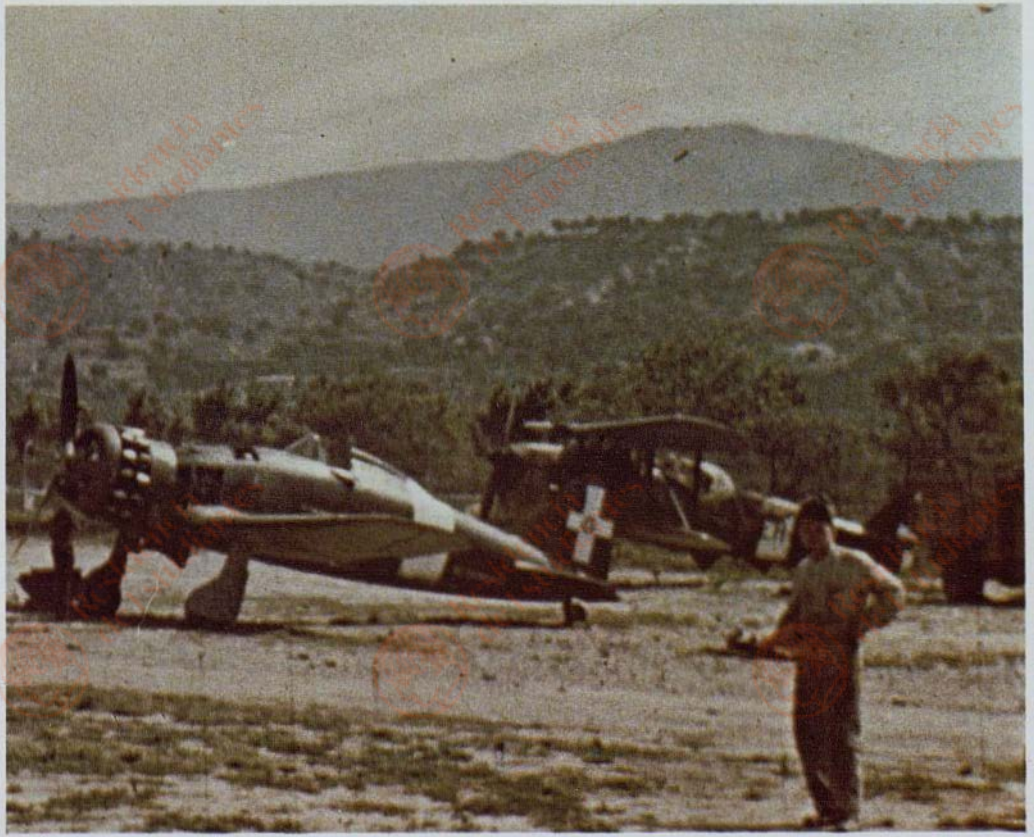
An A-4M Skyhawk II of the US Marine Corps is seen during a weapon training sortie near Yuma, Arizona.

Photo: Salamander
D1 075 08.03
Printed in Italy

Fighter

Italy

Macchi MC.200 SAETTA



Macchi MC.200 SAETTA

Italian air force requirement
Experience in its campaign to conquer Abyssinia (1935-36) persuaded the Italian air force that it needed a new fighter. To meet the resulting specification Mario Castoldi designed the Saetta (lightning) as a low-wing monoplane of all-metal construction with retractable tailwheel landing gear, an enclosed cockpit, and a Fiat A.74 RC 38 radial engine. The prototype first flew in December 1937 and proved to be extremely agile even if hindsight indicated lack of outright performance, firepower, and protection.

Italian fighter mainstay
Deliveries began in October 1939, and by the time Italy entered the Second World War in May 1940 there were about 150 MC.200s on strength. Total production was 1,153, and the type was used in every theater involving the Italian forces. From September 1943 some of the aircraft served with the Italian air units on the Allied side in the Italian campaign.

Principal versions
MC.200 (initial version delivered in early, intermediate, and late forms with enclosed, open, and semi-enclosed cockpits respectively), MC.200AS (tropicalized version with sand/dust filters for service in North Africa), MC.200CB (fighter-bomber version with provision for 705 lb/320 kg of bombs or two drop tanks carried under the wings).

Principal user
Italy.

TECHNICAL DATA

Type: Macchi MC.200 Saetta single-seat fighter.
Engine: one 870-hp (649-kW) Fiat A.74 RC 38 radial piston engine.
Performance: maximum speed 312 mph (502 km/h) at 14,765 ft (4,500 m); climb to 9,845 ft (3,000 m) in 3 minutes 24 seconds; service ceiling 29,200 ft (8,900 m); range 540 miles (870 km) with auxiliary fuel.
Weights: empty 4,178 lb (1,895 kg); maximum take-off 5,710 lb (2,590 kg).
Dimensions: span 34 ft 8.5 in (10.58 m); length 26 ft 10.25 in (8.19 m); height 11 ft 5.75 in (3.50 m); wing area 180.84 sq ft (16.80 m^2).
Armament: two 12.7-mm (0.5-in) machine guns and, in some later aircraft, two 7.7-mm (0.303-in) machine guns.

An MC.200 Saetta of the Italian air force is seen (probably) in the south of Italy. The Italians considered the type to be moderately advanced, but in combat with the best of British fighters the MC.200 was revealed as lacking in performance and firepower.

Photo: Salamander
D1 075 08.04
Printed in Italy

France

Caudron G.III

Caudron G.III

Military observation development
Developed by the brothers René and Gaston Caudron, the G.III (sometimes rendered as G.3) was an observation development of the G.II that had been built before the First World War largely for display flying. Flown early in 1914, the G.III already equipped one squadron on the outbreak of war in August 1914.

Service throughout the war
The G.III was built to the extent of 2,450 aircraft in France, 233 in Great Britain, and 166 in Italy. The crew was accommodated in tandem cockpits immediately behind the tractor engine located in the nose of the short central nacelle, and the tail unit was supported by four braced booms projecting to the rear of the sesquiplane wings. In early aircraft, roll control was effected by wing-warping, though ailerons became standard on later machnes. The type was produced in various forms based on the Cau 3 military designation, and was steadily relegated to training from mid-1916 onward. After the war, some of the surviving aircraft passed into civil hands.

Principal versions
Cau 3A.2 (two-seat artillery observation model), Cau 3D.2 (dual-control trainer), Cau 3E.2 (rotary-engined trainer), Cau 3R.1 (single-seat *rouleur* or taxiing trainer without fabric on the wings), and Cau 3.12 (100-hp/75-kW Anzani radial engine).

Principal users
Belgium, France, Great Britain, Italy, Russia, and USA.

TECHNICAL DATA

Type: Caudron G.III two-seat artillery spotting and reconnaissance plane.
Engine: one 80-hp (60-kW) Le Rhône rotary piston erngine.
Performance: maximum speed 67 mph (108 km/h) at sea level; climb to 6,500 ft (1,980 m) in 20 minutes 0 seconds; service ceiling 13,125 ft (4,000 m); endurance 4 hours 0 seconds.
Weights: empty 926 lb (420 kg); maximum take-off 1,565 lb (710 kg).
Dimensions: span 43 ft 11.5 in (13.40 m); length 21 ft 0 in (6.40 m); height 8 ft 2.5 in (2.50 m); wing area 290.64 sq ft (27.00 m2).
Armament: usually none, though some aircraft carried an 8-mm (0.315-in) or 0.303-in (7.7-mm) machine gun and when flown as a single-seater some machines carried bombs.

Some G.IIIs remain airworthy, including this example seen at a display of vintage aircraft.

Photo: Salamander
D1 075 08.05
Printed in Italy

Trainer

Yugoslavia

SOKO G-2 GALEB

SOKO G-2 GALEB

A Yugoslav first

Established in 1951, SOKO began its career with licensed production, and moved to aircraft design only in 1957. With a configuration very similar to that of the Aermacchi MB.326 in its unswept flying surfaces and unstepped seating, the Galeb (seagull) first flew in May 1961, and entered production during 1963 for the Yugoslav air force with the designation G-2A. The Galeb was not the first jet-powered Yugoslav plane to be flown, but was the first to enter full-scale production. Though designed as a basic flying trainer, the G-2A was given greater operational flexibility by the installation of armament (nose-mounted guns and underwing hardpoints) for the weapon training role, a camera beneath the rear cockpit floor, and target-towing capability.

Export sales

In 1974 there flew the G-2A-E export model differing only slightly from the Yugoslav standard in having more advanced navigation equipment, and this remained in limited production up to 1983. The G-2 was also the basis for the J-1 Jastreb single-seat light attack warplane.

Principal versions

G-2A (Yugoslav model) and G-2A-E (export model with more advanced navigation aids).

Principal users

Libya, Yugoslavia, and Zambia.

TECHNICAL DATA

Type: SOKO G-2A Galeb two-seat basic flying and weapon trainer.
Engine: one 2,500-lb (1,134-kg) thrust Rolls-Royce Viper 11 Mk 22-6 turbojet.
Performance: maximum speed 505 mph (812 km/h) at 20,340 ft (6,200 m); initial climb rate 4,495 ft (1,370 m) per minute; service ceiling 39,370 ft (12,000 m); range 771 miles (1,240 km).
Weights: empty 5,776 lb (2,620 kg); maximum take-off 9,840 lb (4,300 kg).
Dimensions: span 31 ft 11 in (9.73 m); length 33 ft 11 in (10.34 m); height 10 ft 9 in (3.28 m); wing area 209.15 sq ft (19.43 m^2).
Armament: two 0.5-in (12.7-mm) machine guns an up to 441 lb (200 kg) of disposable stores.

This G-2A Galeb of the Yugoslav air force has two nose-mounted machine guns and underwing hardpoints for the carriage of light weapons. The rear seat is fitted with green curtains for instrument flight training.

Photo: Salamander
D1 075 08.06
Printed in Italy

USA

Boeing E-3 SENTRY

Boeing E-3 SENTRY

Based on a civil airframe

The E-3 is a costly machine, yet as an airborne warning and control system it is a very cost effective "force multiplier". First flown in the EC-137D prototype, the Westinghouse APY-1 surveillance radar is mounted with its antenna in the large rotodome above the rear fuselage to search to a radius of 250 miles (402 km). The airframe is based on that of the Model 707-320B civil transport, and the first of 24 Core E-3A Sentries entered service in March 1977.

Steady improvement

The next 10 aircraft were completed as Standard E-3A Sentries, as were NATO's 18 aircraft. Older aircraft have been upgraded, and the operators can monitor all air activities within radar range and control the efforts of friendly air units. Inflight refueling capability boosts endurance most usefully.

Principal versions

Core E-3A (initial model with nine display consoles), Standard E-3A (10 US and 18 NATO aircraft with greater computing power, improved communications, and overwater capability), E-3A/Saudi (five Saudi Arabian aircraft with CFM56 turbofans but inferior communications), E-3B (Core E-3As upgraded to Standard E-3A configuration), E-3C (updated Standard E-3As with five more consoles and improved communications), E-3D (seven British aircraft with CFM56 engines and improved electronic support measures due to enter service from 1991 as Sentry AEW.Mk 1s), and E-3F (four French aircraft similar to the E-3D).

Principal users

France, Great Britain, NATO, Saudi Arabia, and USA.

TECHNICAL DATA

Type: Boeing E-3A Sentry 20-seat airborne warning and control system plane.
Engines: four 21,000-lb (9,526-kg) thrust Pratt & Whitney TF33-P-100/100A turbofans.
Performance: maximum speed 530 mph (853 km/h) at 29,000 ft (8,840 m); initial climb rate not revealed; operating ceiling 29,000 ft (8,840 m); range 1,000 miles (1,609 km) for a 6-hour patrol.
Weights: empty not revealed; maximum take-off 325,000 lb (147,418 kg).
Dimensions: span 145 ft 9 in (44.42 m); length 152 ft 11 in (46.61 m); height 41 ft 9 in (12.73 m); wing area 3,050.0 sq ft (283.35 m^2).
Armament: none.

US Air Force E-3As operate on a worldwide basis, while NATO's 18 aircraft are registered in Luxembourg but operate from a base in West Germany.

Photo: Salamander
D1 075 08.07
Printed in Italy

Naval helicopter

USA

Sikorsky SH-3 SEA KING

Sikorsky SH-3 SEA KING

A new-generation hunter/killer

Experience with the HSS-1 Seabat persuaded the US Navy that an effective submarine hunter/killer helicopter for shipborne use needed turboshaft power, and in 1957 the service contracted for the S-61 design with an amphibious boat hull. This first flew in March 1959 as the XHSS-2 for a service debut in September 1961 as the HSS-2 with 1,250-shp (932-kW) T58-GE-8B engines and dunking sonar as its main sensor. In 1962 the type was redesignated SH-3A, and total production of 324 for the US Navy was complemented by Canadian and Japanese production.

Improved models

The only other production model for the US Navy was the SH-3D, of which 72 were built with more power, greater fuel capacity, and improved sonar. The two later US Navy models were produced as conversions, and the type is now being replaced by the same company's SH-60 series. Somewhat different models have been built in Great Britain and Italy.

Principal versions

SH-3A (initial American model), VH-3A (VIP transport), HSS-2 (Japanese version), CH-124 (Canadian version), SH-3D (improved American model), VH-3D (VIP transport), HSS-2A (Japanese model), HH-3F Pelican (SAR version for the US Coast Guard), SH-3G (105 conversions for the utility role), SH-3H (112 conversions with improved sensors including high-definition radar for the anti-submarine, anti-ship and missile-detection roles), and S-61D-4 (Argentine version).

Principal users

Argentina, Brazil, Canada, Denmark, Japan, Spain, and USA.

TECHNICAL DATA

Type: Sikorsky SH-3D four-seat shipborne anti-submarine helicopter.
Engines: two 1,400-shp (1,044-kW) General Electric T58-GE-10 turboshafts.
Performance: maximum speed 166 mph (267 km/h) at optimum altitude; initial climb rate 2,200 ft (667 m) per minute; service ceiling 14,700 ft (4,480 m); range 625 miles (1,006 km).
Weights: empty 11,865 lb (5,382 kg); maximum take-off 21,500 lb (9,752 kg).
Dimensions: main rotor diameter 62 ft 0 in (18.90 m); length overall, rotors turning 72 ft 8 in (22.15 m); height 15 ft 6 in (4.72 m); main rotor disc area 3,019.08 sq ft (280.47 m^2).
Armament: up to 840 lb (381 kg) of torpedoes or depth charges.

An SH-3D Sea King from the US Navy's carrier Kitty Hawk.

Photo: Salamander
D1 075 08.08
Printed in Italy

Naval helicopter

USSR

Kamov Ka-25 "HORMONE"

Kamov Ka-25 "HORMONE"

Unusual configuration

The Ka-25 was developed from the late 1950s primarily as an anti-submarine type for deployment aboard warships, a role facilitated by the Kamov design speciality of superimposed contra-rotating rotors with a twin-turboshaft powerplant. This arrangement removed the need for an anti-torque tail rotor at the end of a long fuselage, and so permitted compact overall dimensions.

Watchdog of the Soviet navy

The concept was probably validated in the Ka-20 "Harp" prototype of 1959, but the Ka-25 entered service only in 1965, initially with 900-shp (671-kW) GTD-3 turboshafts and, as a result, modest performance. More power was provided later in the production run, which is thought to have totalled about 500 helicopters in three operational models.

Principal versions

Ka-25 "Hormone-A" (anti-submarine model with radar, either dunking sonar or magnetic anomaly detection gear, and optional sonobuoys), Ka-25 "Hormone-B" (midcourse guidance-update model for ship-launched missiles), and Ka-25 "Hormone-C" ("Hormone-A" stripped of mission equipment and fitted with a hoist for the SAR and utility roles with a maximum of 12 passengers).

Principal users

India, Syria, USSR, and Yugoslavia.

TECHNICAL DATA

Type: Kamov Ka-25 "Hormone-A" five-seat ship-borne anti-submarine helicopter.

Engines: two 990-shp (738-kW) Glushenkov GTD-3BM turboshafts.

Performance: maximum speed 130 mph (210 km/h) at low altitude; initial climb rate not revealed; service ceiling 11,480 ft (3,500 m); range 298 miles (400 km) on internal fuel.

Weights: empty 10,505 lb (4,765 kg); maximum take-off 16,534 lb (7,500 kg).

Dimensions: rotor disc diameter, each 51 ft 8 in (15.74 m); length, fuselage 32 ft 0 in (9.75 m); height 17 ft 7.5 in (5.37 m); rotor disc area, total 4,189.0 sq ft (389.20 m^2).

Armament: torpedoes and/or depth charges carried in a lower-fuselage bay.

Known to NATO as the "Hormone", the Ka-25 is remarkable for its contra-rotating twin rotors above the short but comparatively capacious fuselage with its quadricycle landing gear, endplate vertical surfaces on the tailplane and, under the nose of this "Hormone-A", the radome over the search radar's antenna.

Photo: Salamander
D1 075 08.09
Printed in Italy

Seaplane

France

Latécoère 298

Latécoère 298

Modernization for the French navy

In 1933 the French navy issued a specification for a two/three-seat torpedo bombing floatplane. The resulting Latécoère 298 prototype flew in May 1936 with semi-internal accomodation for a torpedo that could be dropped between the twin floats. Orders were placed for 177 production aircraft delivered from October 1938.

Seaplanes versus tanks

In the crucial days after Germany's invasion of France in May 1940, the Latécoère 298s were even pressed into service as dive-bombers against German armor, and suffered heavy losses. The aircraft left in Vichy French service were augmented by 30 new machines, and after the Second World War the type was used as a trainer until retirement in 1951.

Principal versions

Latécoère 298A (29 aircraft for shore-based use with fixed wings), Latécoère 298B (42 four-seat aircraft for shipborne use with dual controls and folding wings), Latécoère 298D (106 aircraft derived from the Latécoère 298B with dual controls but fixed wings), and Latécoère 298F (modified version of the Latécoère 298D for Vichy France).

Principal user

France.

TECHNICAL DATA

Type: Latécoère 298D three-seat torpedo bomber and reconnaissance floatplane.
Engine: one 880-hp (656-kW) Hispano-Suiza 12Ycrs-1 inline piston engine.
Performance: maximum speed 178 mph (287 km/h) at 6,560 ft (2,000 m); climb to 4,920 ft (1,500 m) in 5 minutes 39 seconds; service ceiling 21,325 ft (6,500 m); range 1,367 miles (2,200 km).
Weights: empty 6,768 lb (3,070 kg); maximum take-off 10,141 lb (4,600 kg).
Dimensions: span 50 ft 10.25 in (15.50 m); length 41 ft 2.5 in (12.56 m); height 17 ft 2.75 in (5.25 m); wing area 340.15 sq ft (31.60 m^2).
Armament: three 7.5-mm (0.295-in) machine-guns (two fixed and one trainable) and one 1,477-lb (670-kg) torpedo or 1,102 lb (500 kg) of bombs or depth charges.

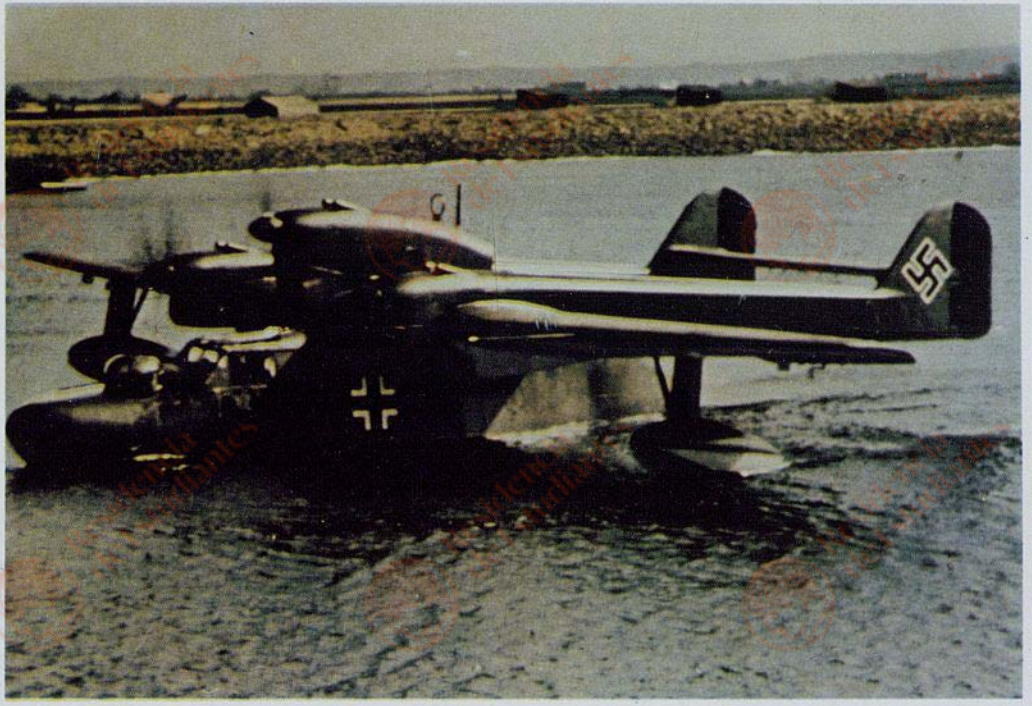
Two Latécoère 298s of Escadrille T1 on patrol. The comparative size of the pilot and observer give some indication of the type's considerable bulk. The French navy had four squadrons with the Latécoère 298, two of them (Escadrilles HB1 and HB2) on the seaplane carrier Commandant Teste, *and the other two shore-based at Berre (Escadrille T1) and Cherbourg (Escadrille T2).*

Photo: S.H.A.A.
D1 075 08.10
Printed in Italy

Seaplane

Germany

Blohm und Voss Bv 138



Blohm und Voss Bv 138

Changing designation

The first seaplane designed by the Hamburger Flugzeugbau was a reconnaissance flying boat that flew as the Ha 138 in July 1937. Three twin-engined prototypes were to have been built, each with different engines, but delays meant that the sole type was recast with three 650-hp (485-kW) Jumo 205C diesels. Considerable revision was needed to improve water and airborne handling before production was authorized under the designation Bv 138A, the changed suffix indicating Hamburger Flugzeugbau's parent company.

Widespread service

The Bv 138 entered service just before the German invasion of Norway in April 1940 and was used in that campaign as a transport with up to 10 passengers. Thereafter the type was used to the end of the Second World War in its designed role, and production up to 1943 totalled 279 aircraft.

Principal versions

Bv 138A (production model in two subvariants), Bv 138B (improved model with three 880-hp/656-kW Jumo 205Ds and heavier defensive/offensive armament), Bv 138C (definitive production model with strengthened structure and much improved defensive armament), and Bv 138MS (conversions of the Bv 138B for sweeping of magnetic mines with an electrified dural hoop).

Principal user

Germany.

TECHNICAL DATA

Type: Blohm und Voss Bv 138A-1 six-seat maritime reconnaissance flying boat

Engines: three 600-hp (447-kW) Junkers Jumo 205C-4 inline piston engines.

Performance: maximum speed 165 mph (265 km/h) at sea level; climb to 6,560 ft (2,000 m) in 8 minutes 30 seconds; service ceiling 11,810 ft (3,600 m); range 2,442 miles (3,930 km).

Weights: empty 23,810 lb (10,800 kg); maximum take-off 30,313 lb (13,750 kg).

Dimensions: span 88 ft 4 in (26.94 m); length 65 ft 1.5 in (19.85 m); height 19 ft 4.25 in (5.90 m); wing area 1,205.56 sq ft (112.00 m^2).

Armament: one 20-mm cannon in nose turret and two 7.92-mm (0.312-in) machine guns in central nacelle and hull rear positions, and up to 331 lb (150 kg) of bombs.

The Bv 138 was of unusual configuration with its central nacelle, twin booms, and three engines, but proved an effective long-range reconnaissance machine with anti-ship/submarine capability.

D1 075 08.11
Printed in Italy

USA

Lockheed P-3 ORION

Lockheed P-3 ORION

Submarine hunter

At the end of the 1950s the US Navy needed a replacement for its Lockheed P2V Neptune anti-submarine plane, and Lockheed won the contract with a derivative of its L-188 Electra airliner. The Orion prototype flew in November 1959 with a fuselage revised for advanced electronics and a long weapon bay.

New systems and job satisfaction

During a long production life due to end only in the early 1990s, the P-3 went through three major versions totalling more than 750 aircraft, and is to be supplemented by the P-7, which is in essence a completely updated P-3 with new engines.

Principal versions

P-3A (165 of the initial version with water/alcohol-injected T56-A-10W turboprops each delivering 4,500 shp/3,356 kW), P-3B (152 of an improved version with T56-A-14 engines and the Deltic tactical processing system), P- 3C (definitive model with the A-NEW electronic system, later aircraft being delivered in steadily improved Update I, Update II, and Update III forms), CP-140 Aurora (aircraft for Canada with the electronic suite of the Lockheed S-3 Viking).

Principal users

Australia, Canada, Iran, Japan, The Netherlands, New Zealand, Norway, Pakistan, Portugal, Spain, and USA.

TECHNICAL DATA

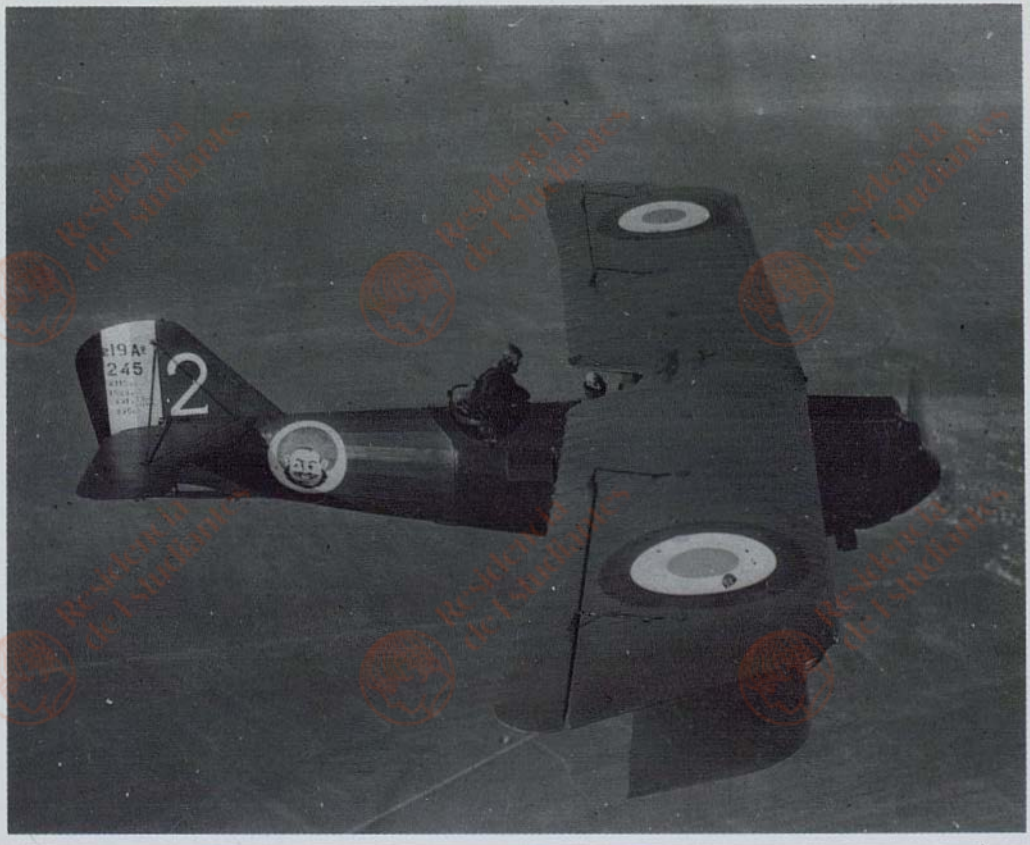
Type: Lockheed P-3C Orion 10-seat maritime patrol and anti-submarine plane.
Engines: four 4,910-shp (3,661-kW) Allison T56-A-14 turboprops.
Performance: maximum speed 473 mph (761 km/h) at 15,000 ft (4,570 m); initial climb rate 1,950 ft (594 m) per minute; service ceiling 28,300 ft (8,625 m); radius 1,550 miles (2,494 km) for a 3-hour patrol.
Weights: empty 61,490 lb (27,892 kg); maximum take-off 142,000 lb (64,410 kg).
Dimensions: span 99 ft 8 in (30.37 m); length 116 ft 10 in (35.61 m); height 33 ft 8.5 in (10.29 m); wing area 1,300.0 sq ft (120.77 m^2).
Armament: up to 20,000 lb (9,072 kg) of disposable stores.

The P-3 Orion is the West's most important long-range ocean surveillance and anti-submarine plane. This is a P-3C Update II, the long "sting" at the tail housing the sensor of the magnetic anomaly detection system that complements radar, forward-looking infra-red, acoustic sonobuoys, and electronic support measures systems for the detection of surface and underwater targets.

Photo: Salamander
D1 075 08.12
Printed in Italy

France

Breguet Bre.19



Breguet Bre.19

Wearing two hats

The Bre.19 was designed as successor to the Bre.14 in the reconnaissance and light bomber roles, and first flew in March 1922. The new machine was laid out in much the same way as its predecessor, but was a better streamlined machine with finer nose entry lines and using a more modern structure of metal for its circular-section fuselage, simplified wing cellule, and semi-cantilever main landing gear legs.

Inter-war mainstay

The Bre.19 was the light utility mainstay of several air forces in the period between the world wars, and total French and licenced production exceeded 3,000 aircraft with a large number of engine types. The French relegated the type to secondary tasks from the early 1930s, but many survived into the Second World War with smaller European and overseas air arms. The celebrated Grand Raid, Bidon, and Super Bidon versions of the Bre.19 were special long- range record breakers.

Principal versions

Bre.19A.2 (two-seat reconnaissaance and observation model with differing armament combinations and engine types rated at between 400 and 860 hp/298 and 641 kW), Bre.19B.2 (two-seat light bomber model with provision for 970 lb/440 kg of bombs carried externally), and Bre.19Cn.2 (two-seat night fighter development).

Principal users

Argentina, Belgium, Bolivia, Brazil, China, Croatia, France, Greece, Poland, Romania, Spain, Turkey, Venezuela, and Yugoslavia.

TECHNICAL DATA

Type: Breguet Bre.19A.2 two-seat reconnaissance and observation plane.
Engine: one 450-hp (336-kW) Lorraine 12Ed inline piston engine.
Performance: maximum speed 133 mph (214 km/h) at sea level; initial climb rate not revealed; service ceiling 23,620 ft (7,200 m); range 497 miles (800 km).
Weights: empty 3,058 lb (1,387 kg); maximum take-off 5,511 lb (2,500 kg)
Dimensions: span 48 ft 7.75 in (14.83 m); length 31 ft 6.25 in (9.61 m); height 12 ft 1.25 in (3.69 m); wing area 538.21 sq ft (50.00 m^2).
Armament: three 0.303-in (7.7-mm) machine guns (one fixed and two trainable) and provision for light bombs.

This Bre.19A.2 sports the "tete de bougnat" (coal man's head) insignia inherited from SAL 19, a celebrated squadron of the First World War.

Photo: S.H.A.A.
D1 075 08.13
Printed in Italy

USA

Lockheed C-141 STARLIFTER

Lockheed C-141 STARLIFTER

Global reach

The StarLifter was designed to meet a US Air Force requirement for a logistic freighter providing its Military Airlift Command with global reach. The design is of typical airlifter concept, with a high-set wing carrying four pylon-mounted engines, main landing gear units blistered onto the outside of the fuselage, and a T-tail above the combination of a rear ramp/door and clamshell doors that provides straight-in access to the hold. The type first flew in December 1965, and C-141As entered service from April 1965.

Stretched fuselage

Production totalled 284 aircraft, and service experience soon showed that the StarLifter's hold was generally volume rather than weight limited (becoming full before reaching its weight limit). Between 1976 and 1983, therefore, Lockheed rebuilt the 270 surviving aircraft to C-141B standard with their fuselages stretched by 23 ft 4 in (7.11 m): this provided the volume for 13 rather than 10 standard pallets, thereby creating the equivalent of 87 more aircraft at far lower overall cost. At the same time an inflight refueling capability was added.

Principal versions

C-141A (initial model) and C-141B (initial model given additional payload volume and weight by a fuselage stretch).

Principal user

USA.

TECHNICAL DATA

Type: Lockheed C-141B StarLifter four-crew logistic heavy transport.

Engines: four 21,000-lb (9,526-kg) thrust Pratt & Whitney TF33-P-7 turbofans.

Performance: maximum speed 566 mph (910 km/h) at optimum altitude; initial climb rate 2,920 ft (890 m) per minute; service ceiling 41,600 ft (12,680 m); range 2,935 miles (4,723 km) with maximum payload.

Weights: empty 148,120 lb (67,186 kg); maximum take-off 343,000 lb (155,582 kg).

Dimensions: span 159 ft 11 in (48.74 m); length 168 ft 3.5 in (51.29 m); height 39 ft 3 in (11.96 m); wing area 3,228.0 sq ft (299.88 m^2).

Payload: 94,525 lb (42,877 kg) of freight, or 154 troops, or 123 paratroops, or 80 litters plus 16 attendants.

The C-141B is the C-141A with its fuselage lengthened by 13 ft 4 in (4.06 m) forward of the wing and 10 ft 0 in (3.05 m) behind it for greater payload volume. The additional volume also increases the maximum payload weight from the the C-141A's figure of 70,847 lb (32,136 kg).

Photo: Salamander
D1 075 08.14
Printed in Italy

Attack and close support

USA

Vought A-7 CORSAIR II

Vought A-7 CORSAIR II

Skyhawk replacement

In the early 1960s the US Navy required a replacement for the McDonnell Douglas A-4 Skyhawk as a carrierborne type with about twice the A-4's payload/range performance. The VAL contest was won by the subsonic Corsair II modelled aerodynamically on the supersonic F-8 Crusader fighter to save on design time. The prototype flew in September 1965 and the A-7A entered service in February 1967 with the 11,350-lb (5,148-kg) thrust Pratt & Whitney TF30-P-6 turbofan. These 199 aircraft were followed by 196 examples of the A-7B with slightly more power, and then by 67 examples of the A-7C with more power and the avionics of the A-7E.

Definitive attack platform

For its A-7D version the US Air Force selected a licence-made version of the Rolls-Royce Spey, different gun armament, and a more advanced nav/attack system, and these features were also adopted for the navy's definitive A-7E, of which 551 were built for service right up to the present.

Principal versions

A-7A (initial model with two 20-mm cannon), A-7B (improved model with the 12,200-lb/5,534-kg thrust TF30-P-8), A-7C (upgraded model with 13,400- lb/6,078-kg thrust TF30-P-408 and new nav/attack system), TA-7C (A-7B and A- 7C conversions as two-seat trainers), A-7E (new engine and revised armament), A-7H (60 similar aircraft for Greece), TA-7H (five two-seaters equivalent to the A-7H), and A-7P (50 A-7As refurbished to A-7C standard for Portugal).

Principal users:

Greece, Portugal, and USA.

TECHNICAL DATA

Type: Vought A-7E Corsair II single seat carrierborne and land based light/medium attack warplane.
Engine: one 14,500-lb (6,577-kg) thrust Allison TF41-A-2 turbofan.
Performance: maximum speed 698 mph (1,123 km/h) at sea level; initial climb rate not revealed; service ceiling not revealed; radius 700 miles (1,127 km km) with typical warload.
Weights: empty 19,490 lb (8,841 kg); maximum take-off 42,000 lb (19,051 kg)
Dimensions: span 38 ft 9 in (11.81 m); length 46 ft 1.5 in (14.06 m); height 16 ft 0.75 in (4.90 m); wing area 375.0 sq ft (34.84 m^2).
Armament: one 20-mm multi-barrel cannon and up to 15,000 lb (6,804 kg) of disposable stores.

An A-7H of the Greek air force, which became the Corsair II's first export customer in 1977.

Photo: Vought
D1 075 08.15
Printed in Italy

Naval helicopter

USA

Bell AH-1 SEACOBRA

Bell AH-1 SEACOBRA

A Marine Corps variant

When the US Army introduced the AH-1 Huey-Cobra gunship helicopter in June 1967, the US Marine Corps was soon interested in an adaptation of the type for the close support role with twin engines providing improved performance and flight safety. The resulting AH-1J SeaCobra first flew in October 1969, and orders for 69 helicopters for the marines were boosted by an Iranian requirement for 202 similar helicopters with capability for TOW anti-tank missiles.

Improved models

The marines then ordered 57 AH-1T helicopters with greater power, a number of airframe and dynamic system improvements and, in 51 of the type, TOW missiles. The definitive model is the AH-1W, which first flew in 1986 with much greater power and a number of system improvements to make the type a more capable multi-role type. The marines wish to procure 121 of the type and upgrade all surviving AH-1Ts to this standard.

Principal versions

AH-1J SeaCobra (initial model with the 1,800-shp/1,342-kW Pratt & Whitney Canada T400-CP-400 coupled turboshaft flat-rated to 1,100 shp/820 kW), AH-1T Improved SeaCobra (upgraded model with the T400-WV-402 coupled turboshaft), and AH-1W SuperCobra (definitive model with two General Electric T700-GE-701 turboshafts delivering 3,250 shp/2,424 kW through a combining gearbox).

Principal users

Iran and USA.

TECHNICAL DATA

Type: Bell AH-1T Improved SeaCobra two-seat shipborne and land based close support and anti-tank helicopter.
Engine: one 1,970-shp (1,469-kW) Pratt & Whitney Canada T400-WV-402 coupled turboshaft flat-rated to 1,673 shp (1,248 kW).
Performance: maximum speed 172 mph (277 km/h) at sea level; initial climb rate 1,785 ft (544 m) per minute; service ceiling 7,400 ft (2,255 m); range 261 miles (420 km).
Weights: empty 8,030 lb (3,642 kg); maximum take-off 14,000 lb (6,350 kg).
Dimensions: main rotor diameter 48 ft 0 in (14.63 m); length overall, rotors turning 58 ft 0 in (17.68 m); height 14 ft 2 in (4.32 m); wing area 1,809.55 sq ft (168.11 m^2).
Armament: one 20-mm multi-barrel cannon and a significant weight of disposable stores.

An AH-1J SeaCobra of the US Marine Corps, which adopted the type for close support of its beach-head forces from amphibious warfare vessels lying offshore.

Photo: Bell
D1 075 08.16
Printed in Italy

USA

William "Billy" MITCHELL

William "Billy" MITCHELL

Destined for aviation

Born on December 29, 1879, William "Billy" Mitchell left George Washington University in 1898 to join the US Army Signal Corps during the Spanish- American War (1898). Mitchell remained in the army after that war, and received his commission in 1901. The Signal Corps was reponsible for army aviation at the time, and in February 1908 ordered its first heavier-than-air craft in the form of a Wright Model A pusher biplane with skid landing gear. During 1914 the US Army's air interests were grouped into the Aviation Section of the Signal Corps, and it was in this branch of the service that Mitchell was soon to rise to prominence. In 1917 Michell was certificated as a civil and military pilot, and after the USA's entry into the First World War in April 1917, Mitchell rose to command the air component of the American Expeditionary Forces in France with the rank of brigadier general.

Air targets

Mitchell rapidly became convinced that air power offered the possibility of winning wars without the ghastly casualties of the type of trench warfare that came to the fore in the First World War. Sure in his belief in the efficiency of air bombardment, Mitchell actively pursued the concept of a large independent air force. In this campaign Mitchell soon ran foul of the US Navy's high command, for he stated that the battleship had been made obsolete by the bomber. His views raised considerable controversy, but Mitchell refused not to expound his beliefs, and loudly proclaimed that the US Navy's fleet of 16 new battleships was wholly vulnerable to air attack, and that the cost of each battleship would be better spent on building 1,000 bombers. Mitchell's beliefs were finally tested in 1921, when Martin MB-2 bombers sent the former German battleship *Ostfriesland* to the bottom with three 2,000-lb (907-kg) bombs, together with a destroyer and cruiser, and then sank three old American battleships. Admittedly, the ships were neither maneuvering nor firing back. Even so, the aircraft were of limited capability, so their successes should at least have been food for further thought.

Court martial

The navy remained unconvinced, and indeed affirmed that the battleship was the backbone of the US Navy. Disarmament treaties and Congressional action did halt the construction of some new battleships and ensured that another two were converted into aircraft carriers. However, little money was made available for the development of a bomber force and Mitchell therefore kept up his attacks. An exasperated President Coolidge then demoted Mitchell to colonel, to try and silence the out spoken commander. But without success and finally, in 1925, Mitchell openly accused the administration of criminal negligence after the crash of the airship USS *Shenandoah*. Mitchell was court martialled for insubordination and resigned his commission on February 1, 1926. Mitchell died on February 19, 1936, but was rehabilitated posthumously in 1948.

Mitchell demonstrated that battleships were vulnerable to air attack and, forced from the service, died before events in the Second World War confirmed his predictions.

Photo: D.R.
D1 075 08.17
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USSR

Tupolev Tu-126 "MOSS"

Tupolev Tu-126 "MOSS"

From airliner to early warning

The Tu-126 is the Soviet counterpart to the Boeing E-3 Sentry and, like the American plane, has its airframe origins in a civil airliner. In the case of the Tu-126, the core of the plane is the airframe and massive turboprop powerplant of the Tu-114 airliner, itself a derivative of the Tu-95 bomber with a larger fuselage. Production of the Tu-114 totalled only some 30 aircraft, and these were taken out of Aeroflot service from 1971.

Over-fuselage rotodome

Development of the Tu-126 began in the mid-1960s, and the "Moss" began to enter service in 1971 with the antenna of its "Flat Jack" surveillance radar in a large rotodome added above the rear fuselage. Some 12 conversions were completed with inflight refueling capability, and these have served the USSR well despite the limitations imposed on radar performance by factors such as interference from the four sets of contra-rotating propellers. The 10 surviving examples of the type are now being replaced by the considerably more effective Ilyushin Il-76 "Mainstay".

Principal version

Tu-126 "Moss" (Soviet airborne early warning plane).

Principal user

USSR.

TECHNICAL DATA

Type: Tupolev Tu-126 "Moss" 12-seat airborne early warning and command system plane.
Engines: four 14,795-ehp (11,033-kW) Kuznetsov NK-12MV turboprops.
Performance: maximum speed 528 mph (850 km/h) at high altitude; initial climb rate not revealed; service ceiling 36,090 ft (11,000 m); range 7,800 miles (12,550 km).
Weights: empty 231,481 lb (105,000 kg); maximum take-off 385,802 lb (175,000 kg).
Dimensions: span 167 ft 7.75 in (51.10 m); length 188 ft 0 in (57.30 m); height 52 ft 8 in (16.05 m); wing area 3,348.8 sq ft (311.10 m^2).
Armament: none.

The range and payload of the Tu-114 airliners were exploited in the Tu-126 conversion, which added a large rotodome containing the surveillance radar antenna feeding data to the tactical center in the fuselage. From this, information is data-linked to ground stations and interceptor fighters.

Photo: Salamander
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Fighter

Germany

Messerschmitt Me 163 KOMET

Messerschmitt Me 163 KOMET

Deadly rocket plane

In the 1930s, Alexander Lippisch produced a number of tailless sailplanes. In 1939 the Lippisch team joined Messerschmitt and began adapting its DFS 194 to accept an 882-lb (400-kg) thrust liquid-propellant rocket motor designed by Helmuth Walter. This conversion achieved a speed of 342 mph (550 km/h), and the team was instructed to design the Me 163 interceptor. The first of six prototypes were tested as gliders, but powered flights began in the summer of 1941 with the 1,653-kg (750-kg) thrust Walter HWK RII-203b.

Dangerous duty

The type took off from a jettisonable trolley, and landed on a central skid. Despite a short powered endurance and the propensity of any residual fuel to explode in a hard landing, the redesigned Me 163B was ordered into production. The type's first combat mission was flown in July 1944, but shortages of fuel and skilled pilots kept missions to a minimum, and the Me 163s destroyed only nine bombers for the loss of 14 of their own number. Total production was about 390.

Principal versions

Me 163A (10 examples of the pre-production glider used for training), Me 163Ba-1 (70 examples of the pre-production powered model with redesigned lower fuselage, wings, and vertical tail plus an armament of two 20-mm cannon), Me 163B-1a (production model with alterations to the cockpit and vertical tail as well as heavier armament), and Me 163S (two-seater training glider version of the Me 163B).

Principal user

Germany.

TECHNICAL DATA

Type: Messerschmitt Me 163B-1a Komet single-seat interceptor fighter.
Engine: one 3,750-lb (1,700-kg) thrust Walter HWK 509A-2 rocket.
Performance: maximum speed 596 mph (960 km/h) at 32,810 ft (10,000 m); climb to 29,855 ft (9,100 m) in 2 minutes 36 seconds; service ceiling 39,700 ft (12,100 m); powered endurance 7 minutes 30 seconds.
Weights: empty 4,189 lb (1,900 kg); maximum take-off 9,498 lb (4,300 kg).
Dimensions: span 30 ft 7 in (9.32 m); length 19 ft 2 in (5.84 m); height 9 ft 1 in (2.77 m); wing area 199.14 sq ft (18.50 m^2).
Armament: two 30-mm cannon.

Though an interceptor of remarkable performance in terms of speed and climb rate, the Me 163B-1a was of limited operational value.

Photo: D.R.
D1 075 08.19
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Attack and close support

Germany

Henschel Hs 123

Henschel Hs 123

An unpromising start

The Hs 123 was designed to meet an official requirement for a single-seat dive bomber, and first flew in 1935 with a 650-hp (485-kW) BMW 132A-1 radial engine. Two of the first three prototypes crashed as a result of wing failures during the type's official trials. A fourth prototype confirmed that structural strengthening had obviated this problem, and the type was ordered into production as the Hs 123A.

Close support mission

The Hs 123A entered service in 1936, and the operations of five early aircraft in the Spanish Civil War (1936-39) showed that while the Ju 87 was a superior dive bomber, the Hs 123A had excellent close support capability. Total production was 604 Hs 123A aircraft up to 1938, and these received much approval for their performance in the Polish and Western campaigns of 1939 and 1940. Thereafter the type was used mainly on the Eastern Front, its capabilities prompting some suggestions that production be resumed. The type's lack of performance meant its steady relegation to the nocturnal role, and the Hs 123 was finally withdrawn in 1944. Nothing came of plans to produce the Hs 123B with greater power and the Hs 123C with greater power, two additional machine guns, and an enclosed cockpit.

Principal version

Hs 123A-1 (sole production model).

Principal users

Germany and Spain.

TECHNICAL DATA

Type: Henschel Hs 123A-1 single-seat close support warplane.
Engine: one 880-hp (656-kW) BMW 132Dc radial piston engine.
Performance: maximum speed 211 mph (340 km/h) at 3,935 ft (1,200 m); initial climb rate 2,950 ft (900 m) per minute; service ceiling 29,530 ft (9,000 m); range 531 miles (855 km).
Weights: empty 3,307 lb (1,500 kg); maximum take-off 4,884 lb (2,215 kg).
Dimensions: span 34 ft 5.5 in (10.50 m); length 27 ft 4 in (8.33 m); height 10 ft 6 in (3.20 m); wing area 267.49 sq ft (24.85 m^2).
Armament: two 7.92-mm (0.312-in) machine guns and up to 992 lb (450 kg) of bombs.

After being supplanted by the Ju 87 Stuka as a dive bomber, the Hs 123A found its niche as a close support type. The type lacked the performance to "mix it" with even indifferent fighters, but for accurate ground attack at very low level had few equals amongst the warplanes of the Second World War.

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