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AIRCRAFT IN DETAIL
Military Boeing 707
Transport, Tanker and Specialist Variants



One of the first 707s to enter military service was this USAF VC-137A, a Model 707-153 bought for use as a VIP transport.



Probably the most famous Boeing 707s were the two VC-137Cs Presidential transports, commonly referred to as 'Air Force One' - 62-7000 was the second of these.

Seen on short finals at Mildenhall, this is one of three ex-airliners operated by the NATO AEW force as crew trainers. (Author)



This Chilean aircraft is typical of a number used by South American air forces in the transport role. (Adrian Balch)





AIRCRAFT IN DETAIL

Military Boeing 707s

Transport, Tanker and Specialist Variants described by Andy Sheppard

THE Boeing Model 367-80 first flew in July 1954, and heralded the dawn of modern mass transport by turbine-engined airliners, going on as the Model 707 to become one of the most familiar and widely-used airliners of the 1960s, 70s and 80s. It evolved from a series of designs based on the military Model 367/C-97 Stratofreighter and civilian Model 377 Stratocruiser - the Model 367-80 designation reflecting the 80th design concept originating from the Model 367 though it bore virtually no resemblance to its predecessor.

The design had the proven aerodynamic, structural and propulsion features of Boeing's B-47 Stratojet and B-52 Stratofortress bombers, with a wing incorporating 35-degrees of sweep and four turbojet engines located in pods below and ahead of its leading edges. Two features directly inherited from the Model

367 were the fuselage diameter and 'double-bubble' configuration. Boeing pressed ahead with the Model 367-80 as a private venture in May 1952, and after early trials the US Air Force placed contracts for transport and tanker derivatives which became the C-135 family.

Boeing then developed the Model 367-80 as a medium/long-range civil transport, receiving the first order for the production Model 707-100 in October 1955, and the type first flew in December 1957, and entered service from October 1958. The only examples of this pioneering airliner to enter military service were three Model 707-153s procured by the USAF as VC-137A Stratoliner presidential transports. They were redesignated VC-137B after being re-engined with Pratt & Whitney TF33-P-5 turbofans, but in the late 1970s were downgraded from presidential use and became 'plain' C-137Bs.

The first turbofan-powered Model 707, the -100B, first flew in June 1960 fitted with Pratt & Whitney JT3D-1s, and also introduced a tailplane of increased span and a new wing leading edge with four additional leading-edge flap segments for improved field performance. The next civil variant was the -200 that was built only in small numbers for operators needing a modern transport with improved hot-and-high capability; dimensionally identical to the -100, the -200 was powered by Pratt & Whitney JT4A-3 turbojets.

The intercontinental-range 707-300 had both an increased wingspan and stretched fuselage, and the basic type was soon developed into the -300B fitted with Pratt & Whitney JT3D-3 turbofans and an improved and slightly longer wing.

Last of the 707 family to enter US military service are the E-8C JSTARS aircraft, all conversions of former airliners.





Above top: The Luftwaffe has flown a handful of 707s on VIP and passenger duties for many years, and the Koln-based Flugbereitschaft's last remaining aircraft is due to be retired this year. (A Kurtz) **Above middle:** The Peruvian Air Force's single Boeing 707, photographed in South Africa in 1995. (Adrian Balch) **Above:** The Imperial Iranian Air Force was the sole customer for

the 707-3J9C tanker/transport, one of which is seen landing at RAF Brize Norton in 1978. (Adrian Balch) **Below top:** The Italian Air Force operates four tanker/transport 707s converted by Alenia. (Author) **Below middle:** The South African Air Force's tankers are believed to have been converted by Israel Aircraft Industries. (Author)



This in turn paved the way for the Advanced Model 707, which had extra leading-edge flaps, a further revision of the trailing-edge flaps, and lacked the earlier types' ventral fin. In its Advanced Model 707-320C form it had improved payload, operating weights, range and performance over the -300B.

The USAF bought two Advanced Model 707-353Bs for use as VC-137C Strato-liner 'Air Force One' presidential transports, and later two similar ex-airline aircraft for service as C-137C VIP transports. A number of -300 series aircraft and Advanced Model 707 variants serve with other military air arms in various roles, including general cargo, passenger and VIP transport, inflight-refuelling tankers and, in the case of Israel and South Africa, electronic reconnaissance and intelligence-gathering. Countries which have or had 707s in military service include Argentina, Australia, Brazil, Canada, Chile, Colombia, Germany, India, Indonesia, Iran, Israel, Italy, Morocco, Pakistan, Peru, Saudi Arabia, South Africa, Spain, Venezuela, and the former Yugoslavia; in addition, NATO operates three ex-airliners as crew trainers for its E-3A Sentry fleet.

Tankers/Transports

Delivered in the late-1970s, four of Iran's 14 new-build aircraft were 707-3J9C triple-point inflight-refuelling tankers, fitted with a Boeing Flying Boom under the rear fuselage and a Sargent-Fletcher Hose and Drogue Unit (HDU) at each wingtip. Of the five CC-137C (Model 707-347C) transports received by Canada in 1970, two were adapted as tankers with a Beech HDU at each wingtip and were the last of the type in service until retirement in 1997; three of the Royal Australian Air Force's 707-338s have a similar arrangement using Flight Refuelling Ltd Mk.32 pods.

Ex-airline Advanced Model 707-300C transports converted to inflight-refuelling tanker/freighter layout for the export market go under the generic designation KC-707; conversions undertaken by Boeing are designated KC-137. The aircraft can be completed in one, two or three-point configuration with a Boeing Flying Boom or Sargent-Fletcher HDU on the centreline and/or two Sargent-Fletcher or Beech HDUs under the wingtips.

In separate programmes, tanker versions of the 707 were developed by Israel and Italy. The first of the two Israeli versions was produced by Israel Aircraft Industries (IAI), and turned the transport version into a single-point tanker with a flying boom under the rear fuselage; the second variant developed by IAI's Bedek Aviation Division has two underwing HDUs in addition to the boom, allowing simultaneous refuelling of aircraft fitted with either a boom receptacle or drogue-compatible probe. It is believed that IAI was also involved in the conversion of four of South Africa's six Advanced Model 707-300s to tanker configuration with a standard fit of three HDUs.

The four Model 707T/Ts of the Italian Air Force were converted by Alenia to three-point layout with centreline and two underwing Sargent-Fletcher HDUs for refuelling probe-equipped aircraft. Other modifications include an APU for independent ground start capability, updated avionics, and a large cargo door to accommodate both passengers and freight in the main cabin.

KE-3A

This designation is applied to eight tanker/freighter aircraft adapted from ex-airline Advanced Model 707-300 transports for Saudi Arabia. The type is powered by four CFM International CFM56-2A2 turbofans, and initially had just a boom under the tail, later supplemented by underwing HDUs. As well as accommodating fuel cells, the cabin has interchangeable facilities for freight, passenger and VIP roles.

IAI Model 707 Phalcon

Developed by IAI, this is an Airborne Early Warning (AEW) conversion with the Elta EL/2075 Phalcon electronically steered phased-array radar, a modular system configured for optional antenna arrays, the standard being two on the forward fuselage sides and one in a large nose radome. The Phalcon is more than just an AEW type, however, as it includes an ESM system for Elint as well as tactical ESM, and a Comint system based on the highly capable EL/K-7031 receiver suite. The first Phalcon was delivered in 1993.

C-18A

In January 1982 the USAF bought eight Advanced Model 707-323Cs from American Airlines, which, stripped of their airline furnishings, entered service as crew trainers. One was later broken up for spares, and six of the others were revised for different duties, four being adapted for the ARIA (Advanced Range Instrumentation Aircraft) role with the designation EC-18B with special electronics and a large steerable nose antenna, used mainly for missile and spacecraft tracking; two were modified to EC-18D standard with APG-63 surveillance radar and a telemetry receiver as cruise missile mission control aircraft.

E-3A Sentry

Commonly known as the AWACS (Airborne Warning And Control System), the E-3 Sentry is a highly-capable platform used for airborne surveillance and control of air operations. In planning a successor to the Lockheed EC-121 Warning Star, the USAF decided that tur-

Right, top to bottom: A Royal Australian Air Force 707 of No.33 Squadron. (G Reid) A Brazilian Air Force KC-137 in original airline-style scheme, since replaced by an overall grey finish. (M Maia) This CC-137 of No.437 Squadron wears the Canadian Armed Forces markings style applied when the type entered service in 1970.(CAS) A Spanish Air Force tanker of 408 Escuadron. (P Krier) Under the Carter administration, this VC-137 was 'downgraded' to a C-137 and had the blue areas of its finish removed in the process. (B Monks)





bine engines were needed, along with a new generation of radar with an effective look-down capability, and in 1965 began the ORT (Overland Radar Technology) programme to solve the problem of detecting aircraft moving at high speed and low-level, found in pulse-Doppler radar operating with a powerful computer.

Two radar designs were put forward, by Westinghouse and Hughes, and the air force ordered two EC-137Cs for use in their evaluation. Taken from the Model 707-300B production line, the airframes had the upper fuselage strengthened for fitting of the pylon-mounted 30ft wide and 6ft high rotodome for the antennae. After trials the Westinghouse radar was selected for use in the production EC-137D, also based on the -300B airliner, with Pratt & Whitney JT3D (military designa-

tion TF33) turbofans. Between 1977 and 1984 34 examples of the E-3A entered service, including the two EC-137Ds revised to production standard.

The first 25 aircraft had only an overland capability and the designation Core E-3A Sentry, while the last nine were designated Standard E-3A Sentry with additional overwater sensor capability and Joint Tactical Information Distribution System (JTIDS) for secure up- and downloading of data. The Standard E-3A type was also ordered for the multi-national NATO early warning force, and 18 aircraft were delivered between 1982 and 1985. In the early 1990s, these NATO aircraft were upgraded electronically, with the main radar being improved and fitting of ESM system sensors in fairings on each side of the forward fuselage. Another five

Left: The Royal Saudi Air Force is unique in operating the KE-3A tanker variant, seen here at a recent RIAT. (Author) Below left: The sole remaining EC-18A, seen during a visit to RAF Mildenhall. (Author)

aircraft with a slightly less capable electronic fit and powered by four CFM International CFM56-A2-2 turbofans were delivered to Saudi Arabia under the semi-official designation E-3A/Saudi.

The 25 Core E-3As were upgraded from 1984 to E-3B standard with a CC-2 computer, increase in consoles from nine to 14, JTIDS, improved ECM capability, 'Have Quick' jam-resistant communications system, and limited overwater sensor capability. The nine Standard E-3As were upgraded between 1980 and 1983 to become E-3Cs with full overwater as well as overland capability, five extra consoles, additional UHF radios and the 'Have Quick-A' communications system - they can also be fitted with underwing pylons for AIM-9 Sidewinder air-to-air missiles as a self-defence measure.

In 1990, to replace the venerable Shackleton AEW.Mk2, the Royal Air Force took delivery of its first E-3D under the designation Sentry AEW.Mk 1. Basically similar in equipment fit to the NATO aircraft, the RAF aircraft also carry the MEL ARI.18240/1 'Orange Gate' ESM system in wingtip pods that increase the span to 147ft 7in, whilst the radar is modified for overwater use. In addition they have provision for inflight refuelling using the flying boom or HDU systems, the latter via a probe above the flightdeck, and are powered by CFM56-2A-2 turbofans.

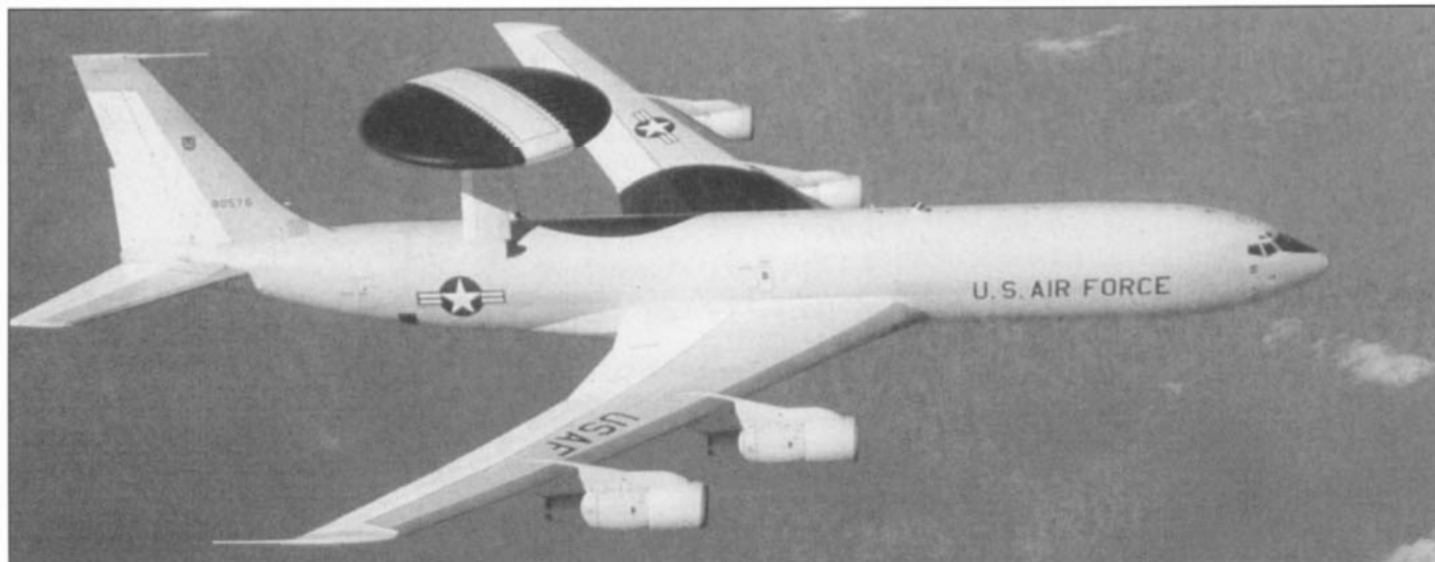
Between May 1991 and February 1992 the French Air Force took delivery of four aircraft designated E-3F Sentry, similar to the RAF E-3D but fitted with the Link 11 and 16 data-links employed by the French STRIDA defence network.



E-6A Mercury

First flown in February 1987, this US Navy version is based on the airframe of the Advanced Model 707-320 but pow-

Left: This E-3A was redesignated JE-3C after going back to Boeing for installation of ESM equipment in 'cheek' and under-nose fairings, as fitted to the NATO Sentry fleet. (USAF) Below: This E-3A, upgraded to E-3B standard, is seen here before the introduction of tailcodes. (USAF)



Right and middle right: This NATO E-3, seen on display at RIAT '98, has the 'cheek' and undernose fairings acquired during upgrade. (Author) Lower right: RAF Sentry AEW.Mk1 ZH103 also on display at RIAT '98. (Author)

ered by CFM International F108-CF-100 (CFM56-2A-2) turbofans, and incorporates special electronics to provide a communication relay facility between command post aircraft and submerged missile-armed nuclear submarines in the TACAMO (Take Charge And Move Out) role, replacing the Lockheed EC-130Q. The TACAMO system uses the ARC-182 radio transmitting through a dipole aerial system that employs trailing wire aeriels deployed from their stowed positions in an extended tailcone and under the rear fuselage; other electronic items include ESM equipment carried in wingtip pods. With a flight crew of four, mission crew of six, and an eight-man relief crew, multiple inflight refuelling allows operating periods of up to 72 hours before the point of crew exhaustion is reached.

E-8 JSTARS

First flown in December 1988, this version based on the Advanced Model 707-300 airframe was planned and developed as the E-18C for the battlefield surveillance and targeting role with JSTARS (Joint Surveillance and Target Attack Reconnaissance System, later Joint Surveillance and Target Acquisition Radar System) equipment in a combined USAF and US Army programme which also involved both Boeing and Grumman.

Redesignated E-8A, two aircraft were used to validate the JSTARS concept, the trials culminating in operational deployment during the 1991 Gulf War where the system's effectiveness was ably proven. The system is centred on a Norden phased-array multi-mode SLAR carried in a 'canoe' housing beneath the forward fuselage for surveillance of both stationary and slow-moving ground targets as it alternates between synthetic-aperture and pulse-Doppler modes. The radar has a range of 160 miles, and data is fed to 10 consoles and then transmitted via the JTIDS to aircraft and/or ground stations.

Right: US Navy E-6A 164410 of VQ-4 attended the 1998 RIAT. (Author) Below: This E-8A was deployed to RAF Mildenhall for 'Operation Earlylook', the first trials of the JSTARS concept in Europe. (Author)



The E-8A has a flight crew of four and a mission crew of 21 or 34 for standard or long-endurance missions.

It had been planned to produce a total of 21 JSTARS aircraft as E-8Bs using new-build airframes and CFM International F108 (CFM56) turbofans, but this was overtaken by closure of the 707 produc-

tion line. The JSTARS 'production' version thus comprises refurbished ex-airline Advanced Model 707-300s fitted with updated equipment and 18 consoles, including one tasked solely with defensive work, under the designation E-8C.

45 years after the prototype's first flight, military 707s soldier on.....



Military Boeing 707s Camouflage and Markings

Artwork by Iain Ogilvie

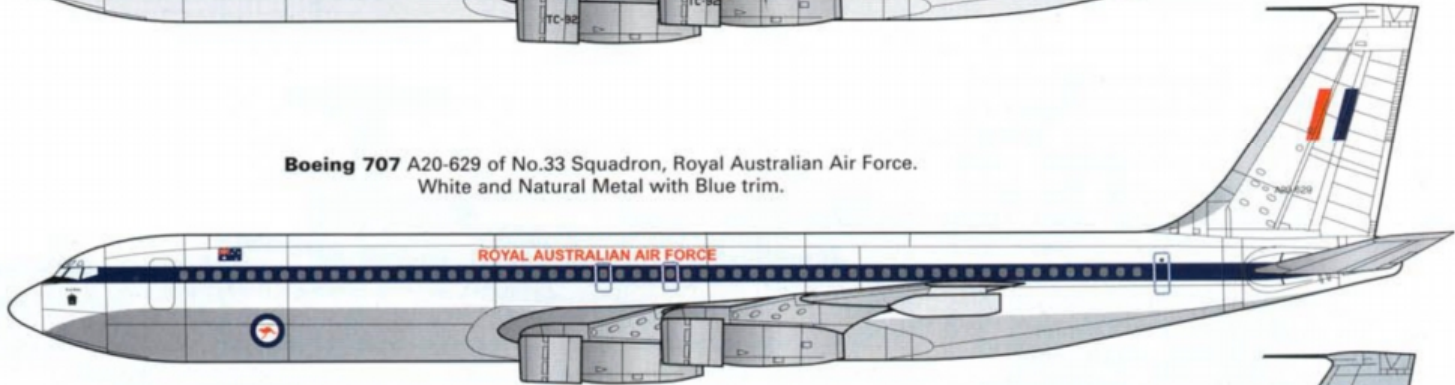
MILITARY 707s COLOUR KEY

											
Black FS37038	White FS37875	Natural Metal	Boeing Grey FS16515	Medium Grey	Boeing Blue BAC5071	Boeing Blue BAC5070	ADC Grey FS16473	Camouflage Grey BS381C:626	Grey FS36300	Insignia Red FS11136	Insignia Blue FS15044
											
Yellow FS13538	Blue FS15200	Blue FS15056	Green FS14187	Pale Roundel Red	Pale Roundel Blue	Grapefruit Yellow BS381C:315					

Boeing 707 TC-92 of Escuadron V/Grupo I de Transporte, Argentinian Air Force, 1990.
White, Boeing Grey and Natural Metal with Blue FS35200 trim edged in Yellow.



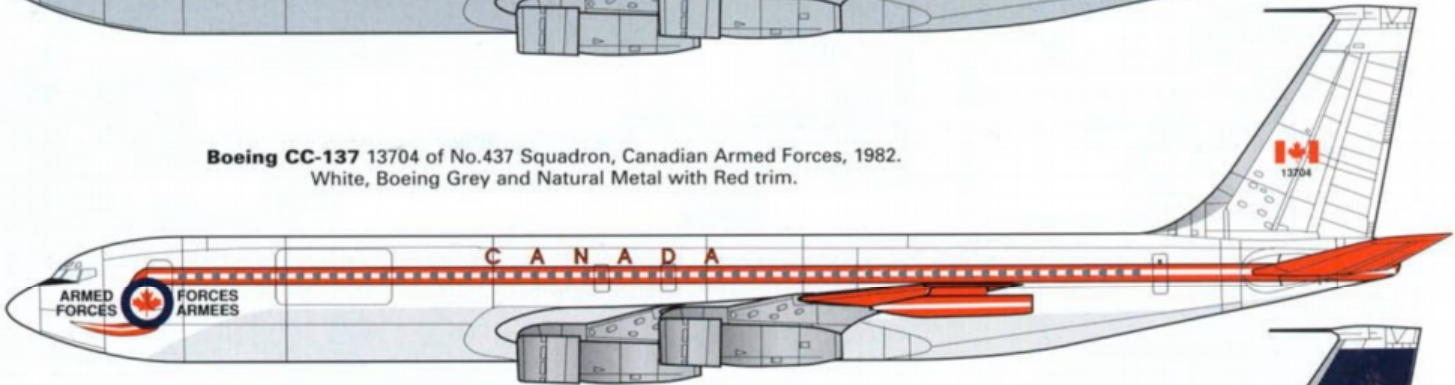
Boeing 707 A20-629 of No.33 Squadron, Royal Australian Air Force.
White and Natural Metal with Blue trim.



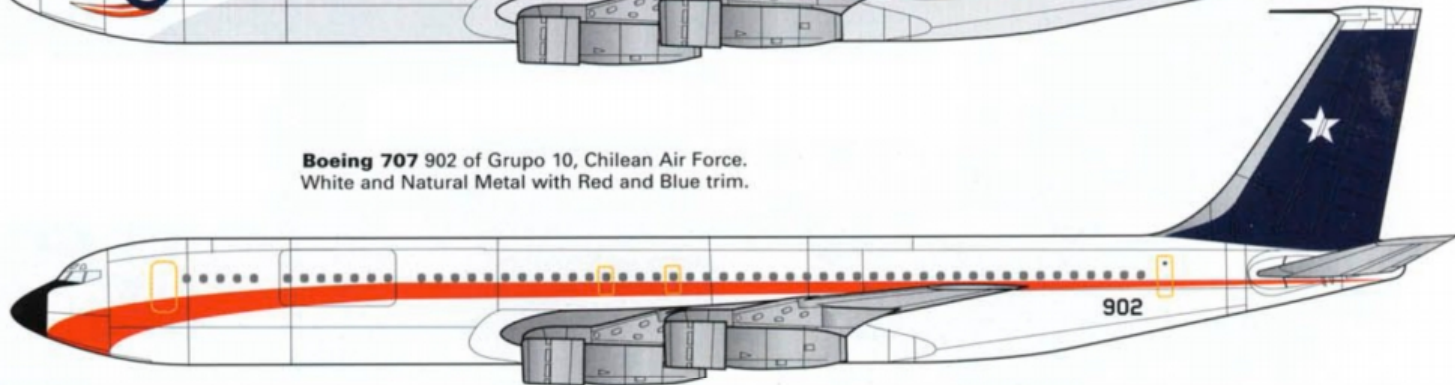
Boeing KC-137 2402 of 2/2 GT, Brazilian Air Force.
Overall Medium Grey.



Boeing CC-137 13704 of No.437 Squadron, Canadian Armed Forces, 1982.
White, Boeing Grey and Natural Metal with Red trim.



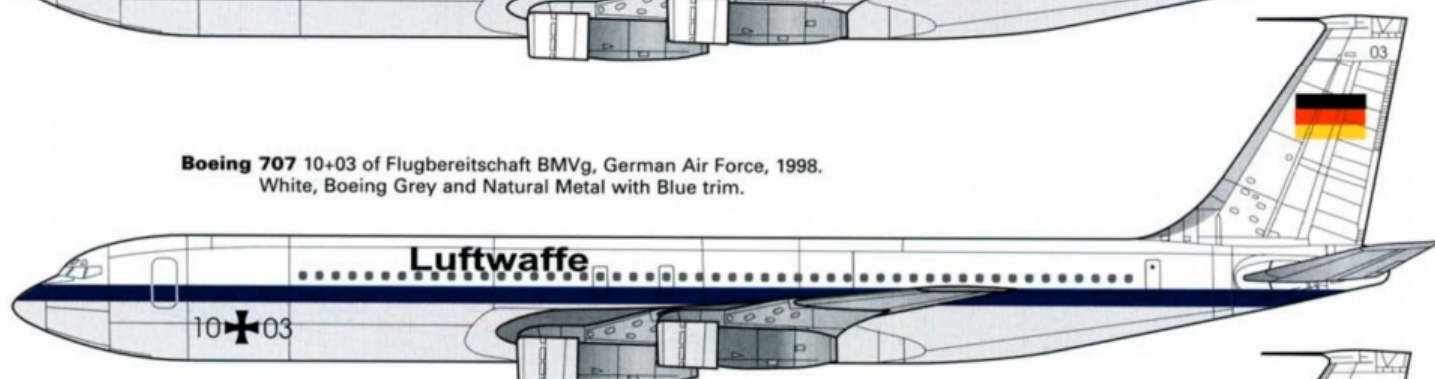
Boeing 707 902 of Grupo 10, Chilean Air Force.
White and Natural Metal with Red and Blue trim.



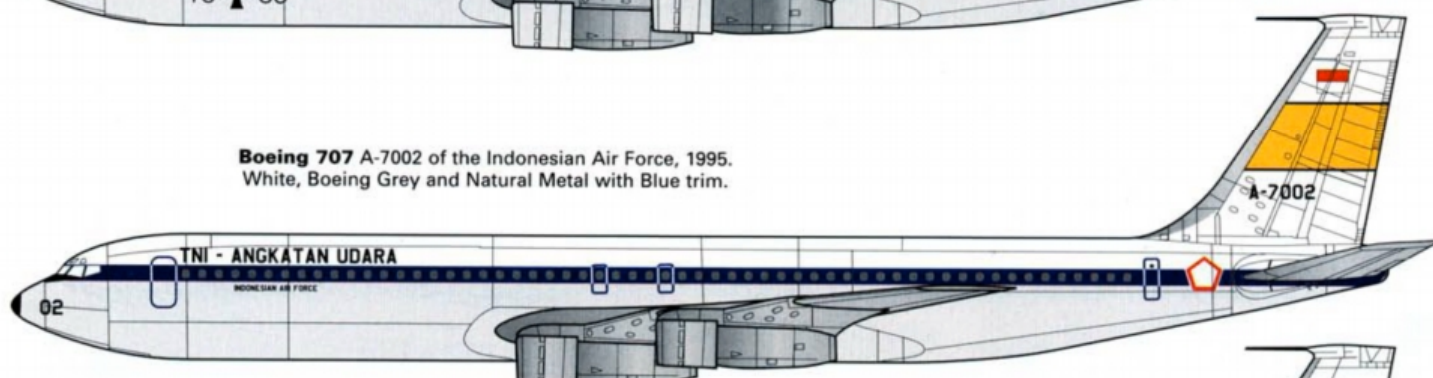
Boeing 707 1201 of Escuadron Presidencial, Colombian Air Force, 1997.
White, Boeing Grey and Natural Metal with Blue FS35200 trim.



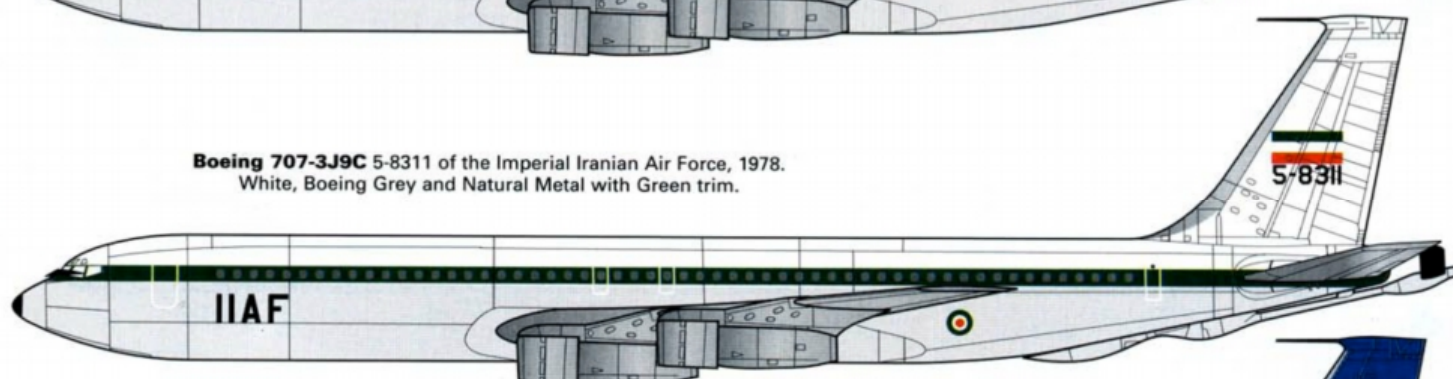
Boeing 707 10+03 of Flugbereitschaft BMVg, German Air Force, 1998.
White, Boeing Grey and Natural Metal with Blue trim.



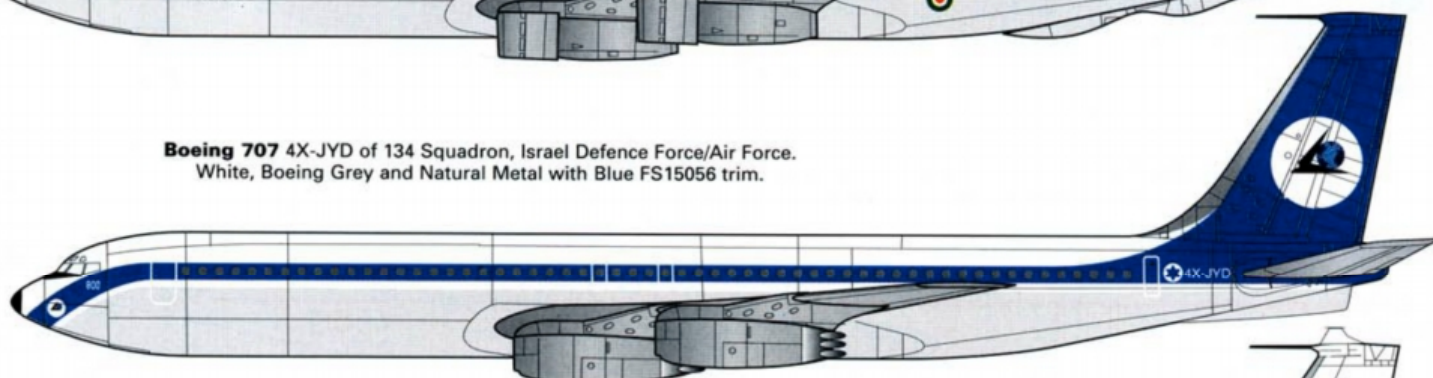
Boeing 707 A-7002 of the Indonesian Air Force, 1995.
White, Boeing Grey and Natural Metal with Blue trim.



Boeing 707-3J9C 5-8311 of the Imperial Iranian Air Force, 1978.
White, Boeing Grey and Natural Metal with Green trim.



Boeing 707 4X-JYD of 134 Squadron, Israel Defence Force/Air Force.
White, Boeing Grey and Natural Metal with Blue FS15056 trim.



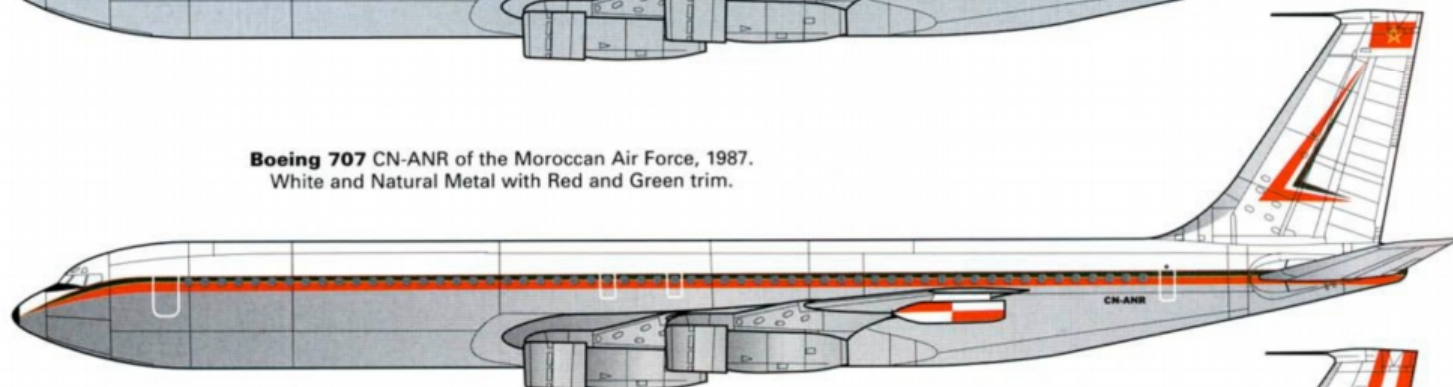
Boeing 707 128 of 134 Squadron, Israel Defence Force/ Air Force, 1996.
Matt White and Light Grey finish.



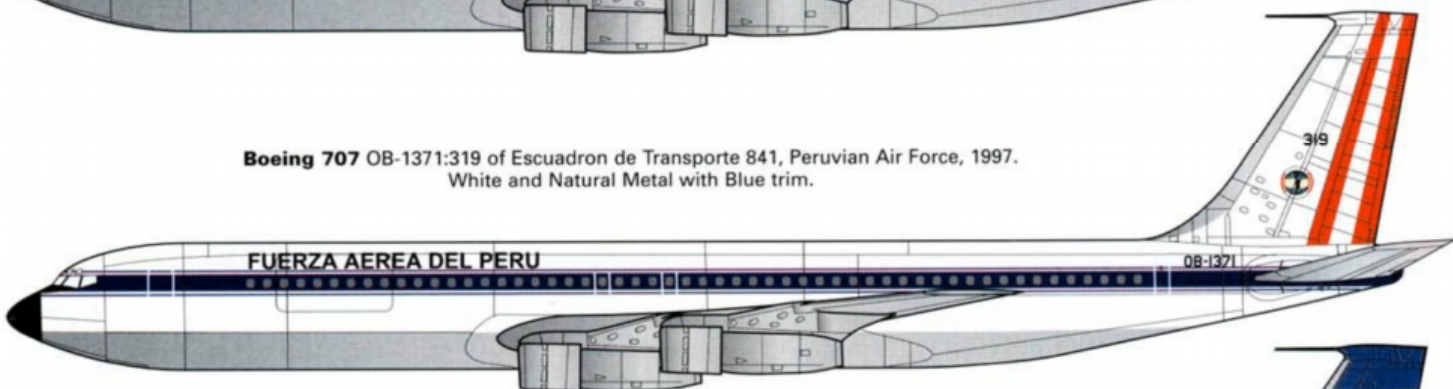
Boeing 707 MM62150:14-03 of 14 Stormo, Italian Air Force, 1997.
Overall Medium Grey finish.



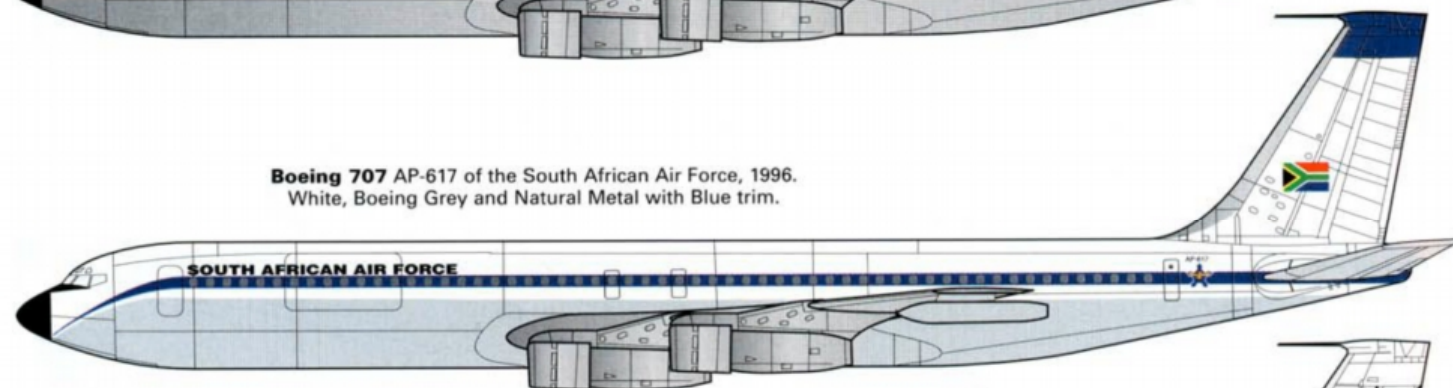
Boeing 707 CN-ANR of the Moroccan Air Force, 1987.
White and Natural Metal with Red and Green trim.



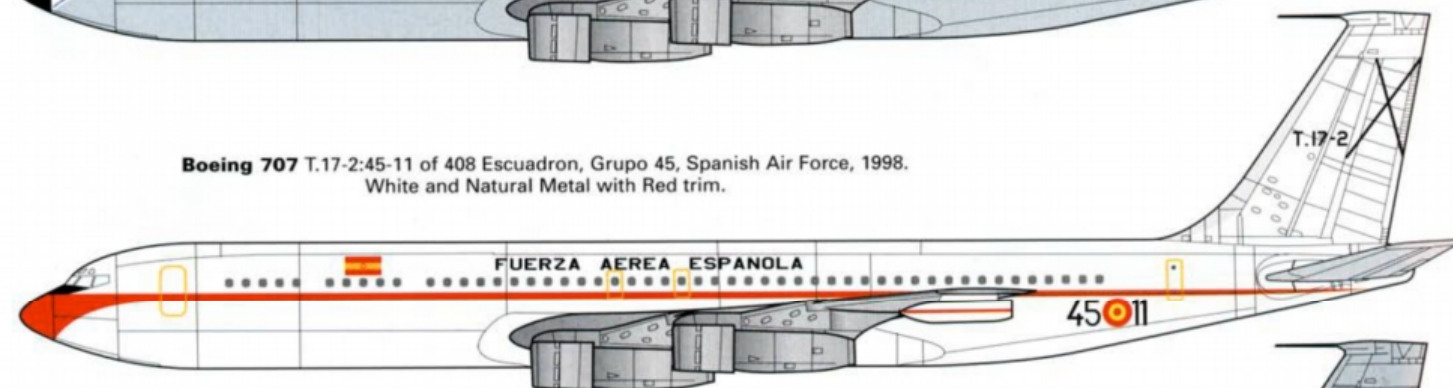
Boeing 707 OB-1371:319 of Escuadron de Transporte 841, Peruvian Air Force, 1997.
White and Natural Metal with Blue trim.



Boeing 707 AP-617 of the South African Air Force, 1996.
White, Boeing Grey and Natural Metal with Blue trim.



Boeing 707 T.17-2:45-11 of 408 Escuadron, Grupo 45, Spanish Air Force, 1998.
White and Natural Metal with Red trim.



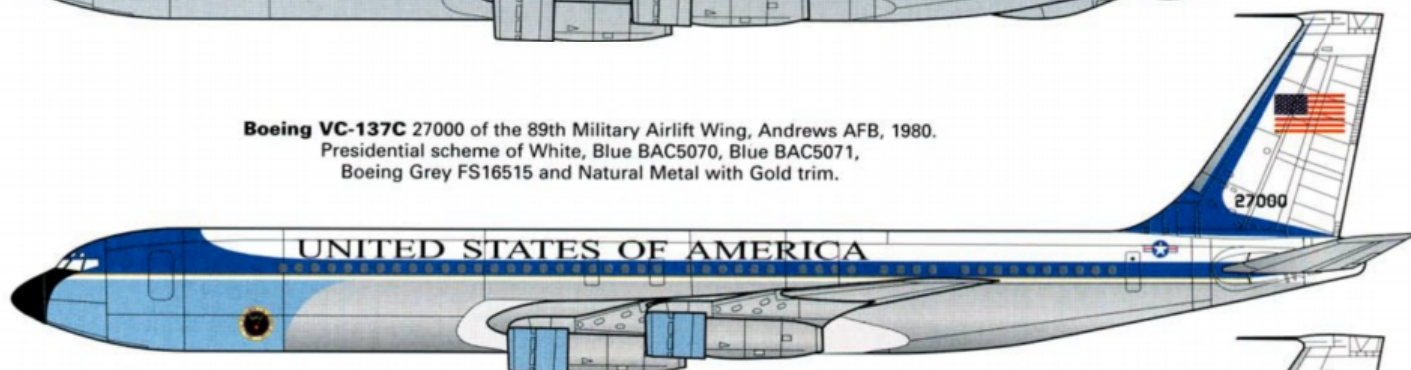
Boeing 707 TM.17-4:408-21 of 408 Escuadron, Spanish Air Force, 1996.
Overall Medium Grey finish.



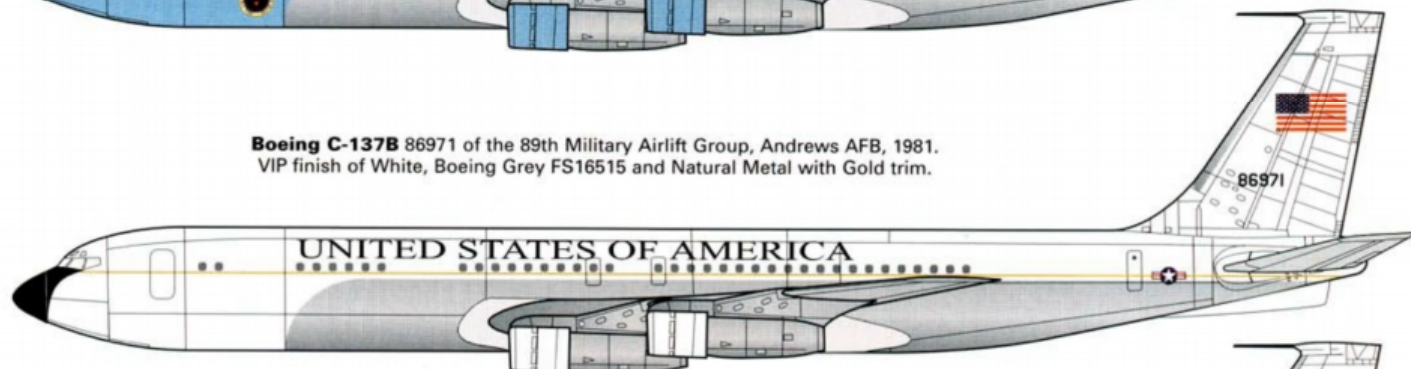
Boeing 707 8747 of Escuadron 21, Grupo Aereo de Transporte 6, Venezuelan Air Force, 1997.
Overall Medium Grey finish.



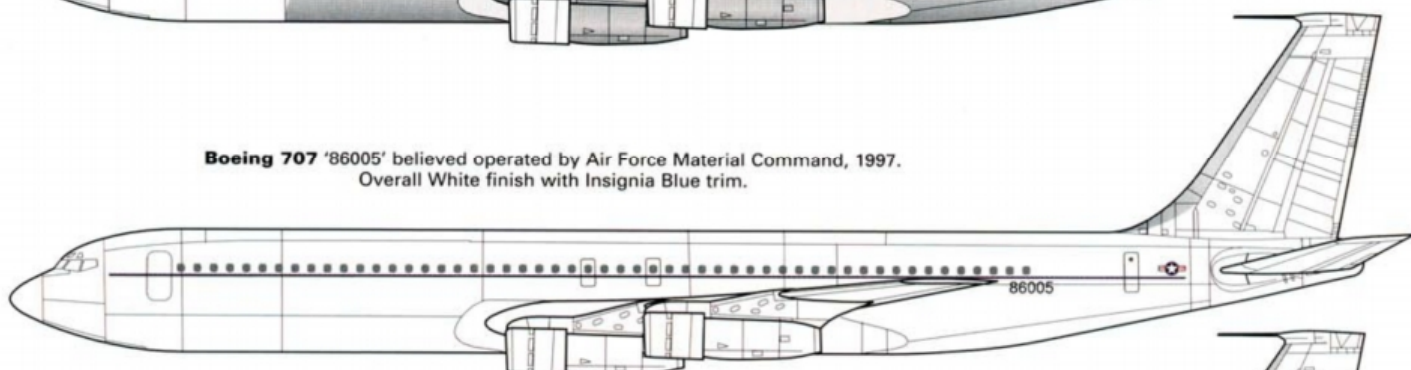
Boeing VC-137C 27000 of the 89th Military Airlift Wing, Andrews AFB, 1980.
Presidential scheme of White, Blue BAC5070, Blue BAC5071,
Boeing Grey FS16515 and Natural Metal with Gold trim.



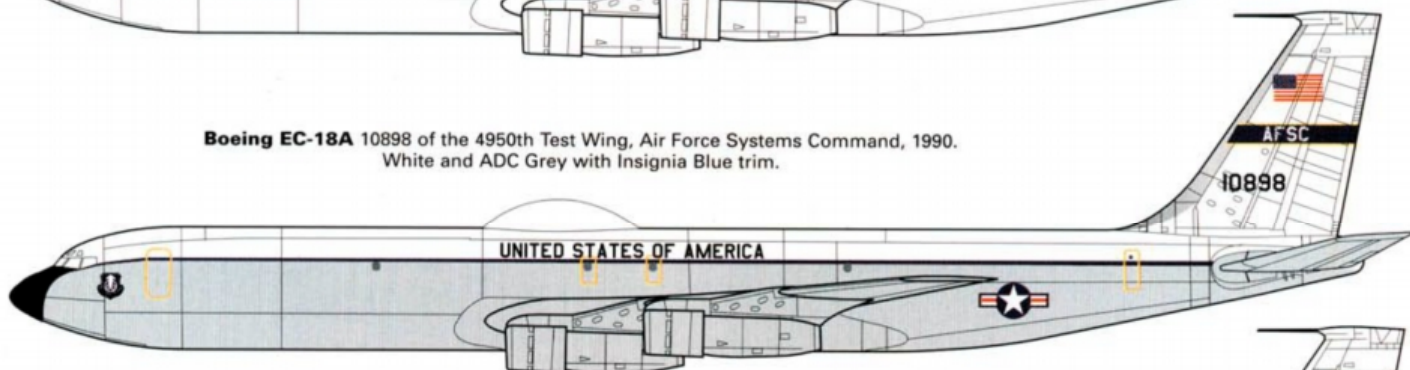
Boeing C-137B 86971 of the 89th Military Airlift Group, Andrews AFB, 1981.
VIP finish of White, Boeing Grey FS16515 and Natural Metal with Gold trim.



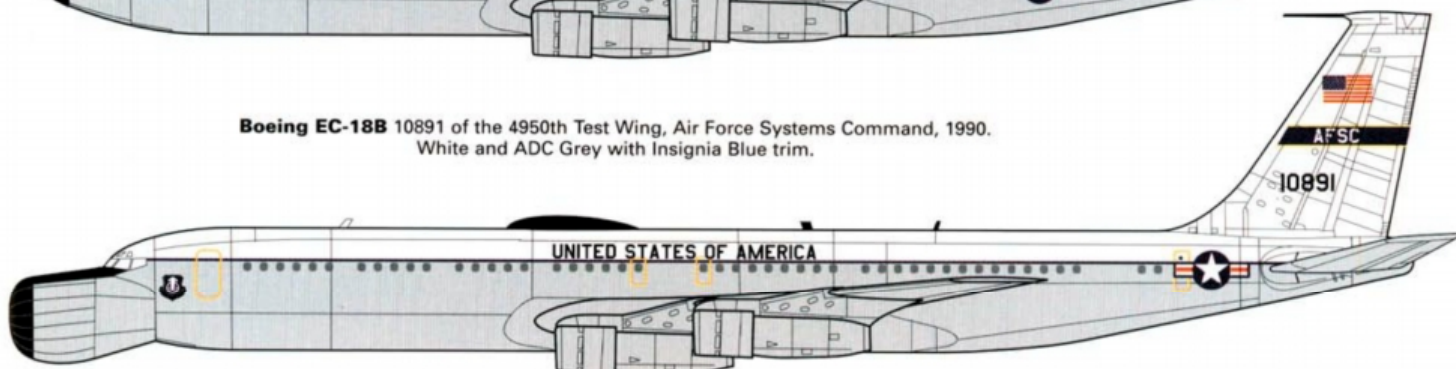
Boeing 707 '86005' believed operated by Air Force Material Command, 1997.
Overall White finish with Insignia Blue trim.



Boeing EC-18A 10898 of the 4950th Test Wing, Air Force Systems Command, 1990.
White and ADC Grey with Insignia Blue trim.



Boeing EC-18B 10891 of the 4950th Test Wing, Air Force Systems Command, 1990.
White and ADC Grey with Insignia Blue trim.



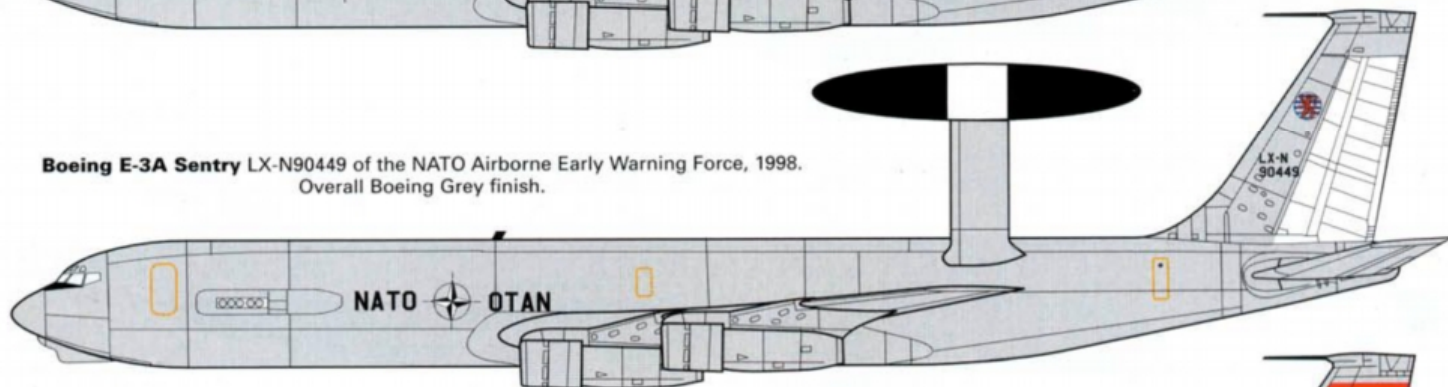
Boeing 707 LX-N19996 of the NATO Airborne Early Warning Force, 1990.
Overall Boeing Grey finish.



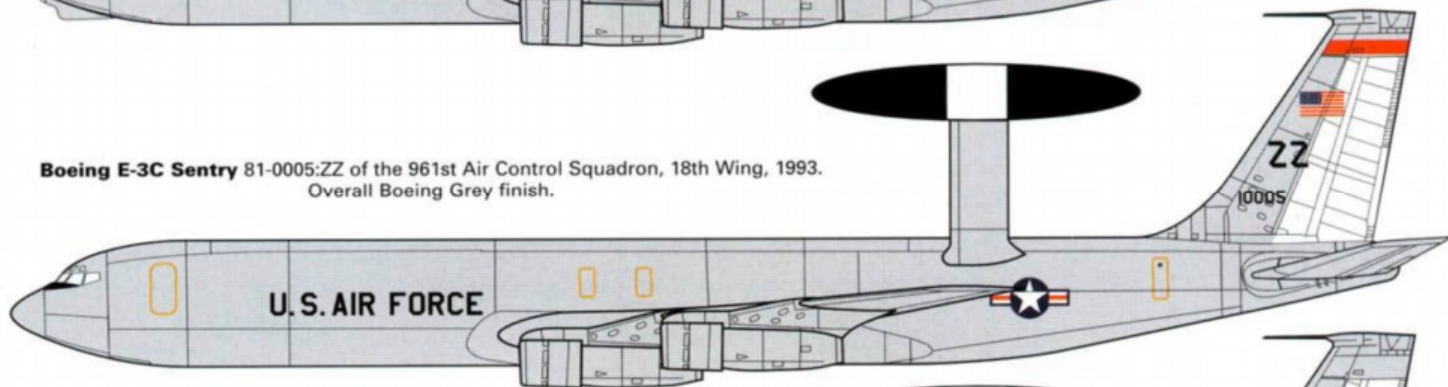
Boeing E-3A Sentry LX-N90451 of the NATO Airborne Early Warning Force, 1985.
Overall Boeing Grey finish.



Boeing E-3A Sentry LX-N90449 of the NATO Airborne Early Warning Force, 1998.
Overall Boeing Grey finish.



Boeing E-3C Sentry 81-0005:ZZ of the 961st Air Control Squadron, 18th Wing, 1993.
Overall Boeing Grey finish.



Boeing JE-3C Sentry 73-1674 bailed to Boeing, 1990.
Overall Boeing Grey finish.



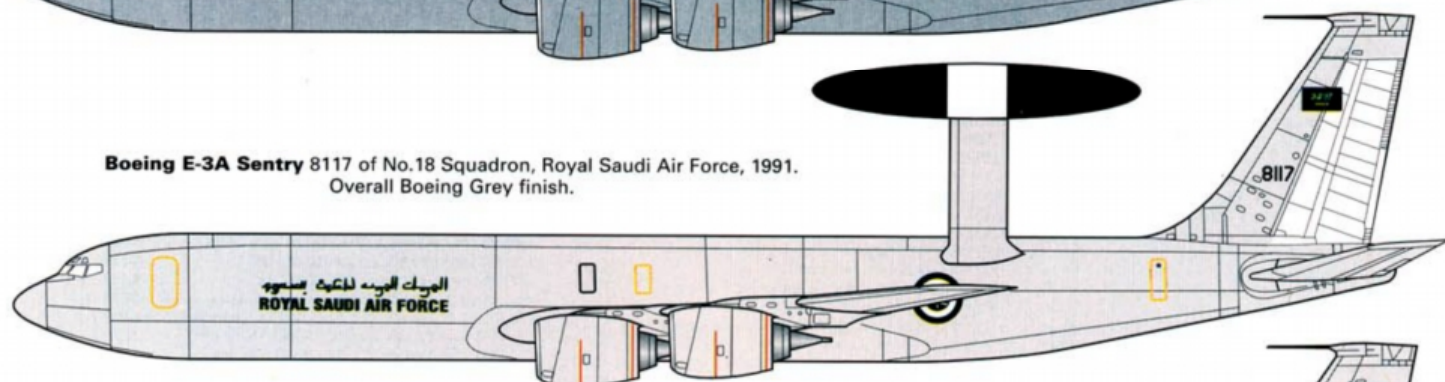
Boeing E-3D Sentry AEW.Mk1 ZH102 of No.8 Squadron, Royal Air Force, 1998.
Overall Camouflage Grey finish with Grapefruit Yellow markings.
No.8 Squadron insignia on port side, No.23 Squadron markings on starboard side.



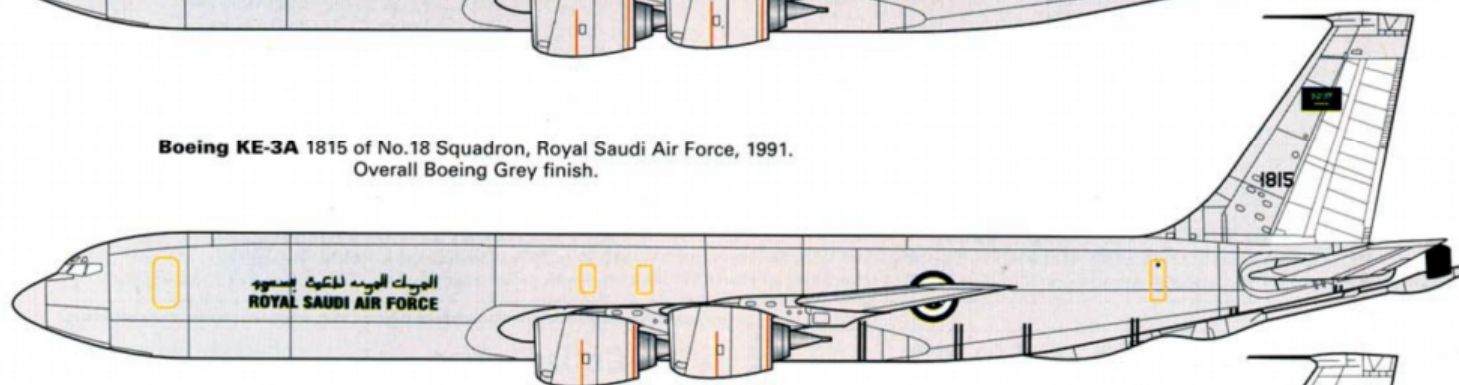
Boeing E-3F Sentry 201:36-CA of 36 Escadre de Detection Aeroportee,
French Air Force, 1991. Overall Grey FS36300.



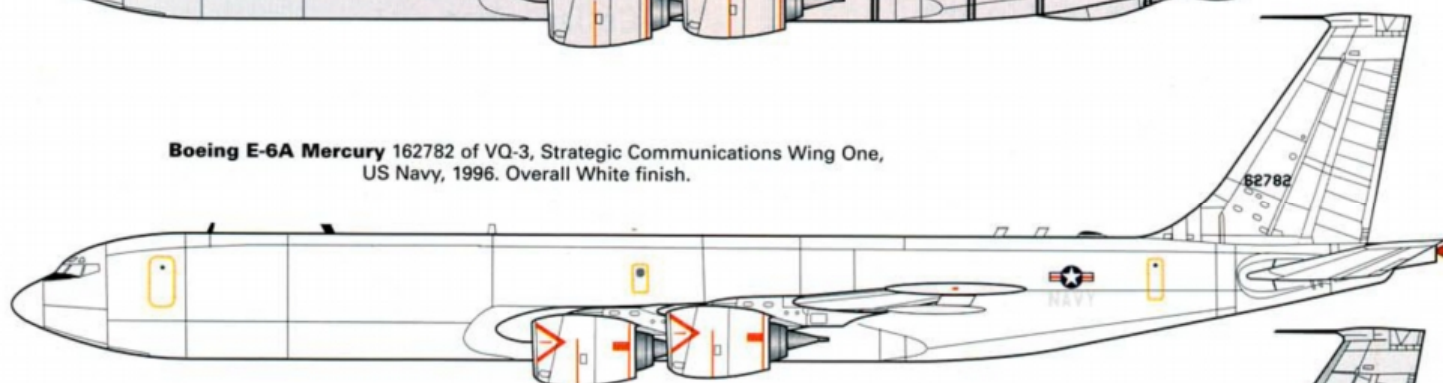
Boeing E-3A Sentry 8117 of No.18 Squadron, Royal Saudi Air Force, 1991.
Overall Boeing Grey finish.



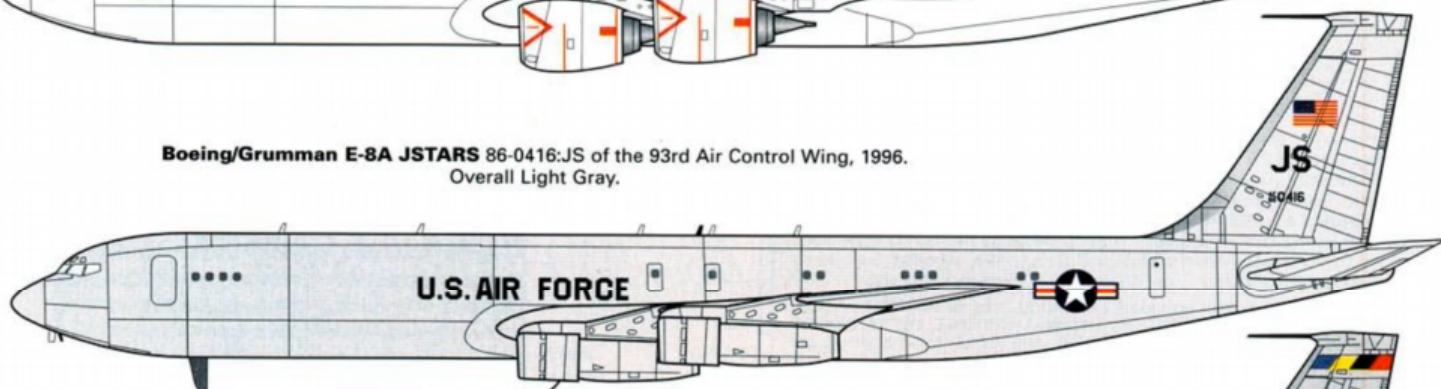
Boeing KE-3A 1815 of No.18 Squadron, Royal Saudi Air Force, 1991.
Overall Boeing Grey finish.



Boeing E-6A Mercury 162782 of VQ-3, Strategic Communications Wing One,
US Navy, 1996. Overall White finish.



Boeing/Grumman E-8A JSTARS 86-0416:JS of the 93rd Air Control Wing, 1996.
Overall Light Gray.



Boeing/Grumman E-8C JSTARS 92-3289:WR of the 93rd Air Control Wing, 1997.
Overall Boeing Gray FS16515.

