

ATP 3.3.4.2(C)

NATIONAL SRD – SPAIN (Formerly National Annex V)

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1. Introduction. Spanish Air Force (SAF) has 2 tanker types: the KC130H “Hercules” – internal SAF designation: TK-10 – and the Boeing 707 T/T– internal SAF designation: TK-17 –. SAF has six types of receivers: EF-18A/B “Hornet” – internal SAF designation: C-15A and C/CE-15M –, EF-2000 “Typhoon” – internal SAF designation: C/CE-16 –, Mirage F-1 – internal SAF designation: C-14M –, CASA-295 – internal SAF designation: T-21 – and AV-8B Harrier II, operated by Spanish Navy.

2. Tanker Aircraft Types.

- a. KC130H.** The KC130H is cleared as a tanker by day and night



Spanish KC-130 refueling two Spanish F/A-18 A/B Hornets

(1) AAR Equipment. The KC130H has 2 high speed drogue equipped refuelling stations, one mounted on each wing outboard of the engines. Each refuelling station consists of a refuelling pod, 26 m (85 ft) of hose, MA-2 coupling and 1 m (27 in) diameter paradrogue. Fuel flows when the hose is pushed in 1.5 m (5 ft); fuel keeps flowing as long as the hose is maintained in the refuelling position, between 6 - 24 m (20 - 80 ft) of hose extension.

Hydraulic pressure provides 90% of the force required to rewind the hose during refuelling to reduce hose slack and whip. The hoses are marked each 3 m (10 ft). The MA-2 coupling requires 140 ft lb of pressure to make contact (2 - 5 knot closure) and 420 ft lb to disconnect. The hose and drogue envelope is at [Appendix 1](#) and drogue dimension is at [Appendix 9](#).

(2) Refuelling Altitudes and Speeds. AAR altitude window spans from 1500 ft to 23,000 ft; speed range encompass from 195 to 230 KIAS. Refuelling with the tanker heavy weights and high speeds will require detailed planning and may require the use of the toboggan maneuver.

(3) Maximum Transferable Fuel. With a fuselage auxiliary tank, total fuel loads are typically up to 32,662 kg (72,000 lb), with an overload weight of 38,500 kg (84,900 lb). Without the fuselage tank, total fuel is 26,817 kg (59,000 lb). Transferable fuel depends on sortie duration; around 18,182 kg (40,000 lb) is available for transfer during a 4 hr flight with the fuselage tank. Without the fuselage tank, 12,272kg (27,000 lb) of fuel is transferable. Fuel figures assume a fuel burn rate of 2272 kg/hr (5000 lb/hr).

(4) Fuel Transfer Rate. With fuselage fuel tank fitted, the maximum transfer rate is about 885 kg/min (1950 lb/min) per drogue. Without the fuselage tank, the maximum transfer rate is about 442 kg/min (975 lb/min) per drogue. Both rates of transfer depend on the receiver system capability.

(5) Regulated Fuel Pressure. Fuel pressure at the drogue is calibrated at 45 ± 5 psi with the fuselage tank and 10 psi without it.

(6) Fuel Types Available for AAR. JP-8 (NATO F-34), Jet A1.

(7) Receiver Types Certified. See [Appendix 10](#).

(8) Lighting. Red, green and amber lights are located on the trailing edge of each pod. These are AAR pod status lights and mean:

Steady Red (before contact) Do not make contact

Steady Amber Pod system ready for contact

Steady Green Fuel flows

Flashing Green Receiver full or pod fuel malfunction

Steady Red (whilst in contact) Disconnect, pod malfunction

The light signal commanding a breakaway is the tanker's lower rotating beacon being switched on. Before a receiver is cleared for contact, the beacon is turned off to indicate tanker AAR checklist has been completed. AAR during EMCON constraint requires additional light signals from the tanker; these are provided by hand held ALDIS lamps. These lights will be seen in the paratroop door windows located at the rear of the fuselage on both sides of the aircraft. Drogue illumination is provided by refuelling lights located in the outboard leading edge of the horizontal stabilizer. The AAR pod status lights and aircraft exterior lighting is at [Appendices 2 and 3](#).

(9) Mark Facilities. Nil.

(10) Dimensions. See aircraft drawing at [Appendix 4](#).

(11) RV Aids. The KC130H has the following radio, navigation and RV aids:

(a) UHF radios with Have Quick II and Crypto system.

(b) VHF,

- (c) HF radios with crypto system.
- (d) VOR, ADF, TACAN and 2 INS/GPS.
- (e) A/A TACAN (ranges).
- (f) MILACAS (TCAS with military capabilities) with rendezvous function.

(12) Defensive Measures: Spanish KC-130H has an Electronic Warfare Defensive system, consisting in a Missile Alert Warning System – MAWS – and chaff and flare dispenser. Cockpit and oxygen converter have been armoured as well.

- b. **Boeing 707 T/T.** The B707 T/T is cleared as a tanker by day and night.



Spanish Tanker Boeing 707 refuelling two Spanish F/A-18 A/B Hornets

(1) AAR Equipment. The B707 T/T has 2 drogue equipped refuelling stations, one mounted on each wing outboard of the engines. Each refuelling station consists of a refuelling pod, 15 m (50 ft) of hose and a MA-4 coupling. Fuel flows when the hose is pushed in 1.5 m (5 ft); fuel keeps flowing as long as the hose is maintained in the refuelling position, between 9.1 - 13.7 m (30 - 45 ft) of hose extension. The hoses are marked with light reflecting white bands spaced 3 m (10 ft). The MA-4 coupling requires 140 ft lb of pressure to make contact (2 - 5 knot closure) and 420 ft lb to disconnect. The hose and drogue envelope is at [Appendix 5](#) and drogue dimension is at [Appendix 9](#).

(2) Refuelling Altitudes and Speeds. AAR altitude window spans from 1500 ft to 35,000 ft; speed range encompass from 200 to 350 KIAS (standard 250 to 310 KIAS). Standard altitude is 20,000 ft. Optimum speed is 275 KIAS or 0.78 IMN, whichever is lower.

(3) Maximum Transferable Fuel. Maximum fuel load is 72,300 kg (159,800 lb). Transferable fuel depends on sortie duration; around 33,000 kg (73,000 lb) of fuel is available for transfer during a 4 hr flight, assuming an average fuel consumption of 7400 kg/hr (16,300 lb/hr) including diversion reserves.

- (4) Fuel Transfer Rate.** Transfer rate is about 1500 kg/min (3330 lb/min) per drogue, depending on the receivers.
- (5) Regulated Fuel Pressure.** Fuel pressure at the drogue is regulated to maintain a maximum pressure of 55 psi.
- (6) Fuel Types** Available for AAR. Primary/usual fuel is JP-8 (NATO F-34). JP-1, JP-4 (NATO F-40), JP-5 (NATO F-44), Jet A-1 (NATO F-35) and AVCAT (NATO F-43) are also usable.
- (7) Receiver Types Certified.** See [Appendix 10](#).
- (8) Lighting.** Red, amber and green lights are located on the trailing edge of each pod. These are AAR pod advisory/status lights and mean:

Steady Red	(before contact): Do not make contact.
Steady Amber:	Pod system ready for contact.
Flashing Amber:	Hose pushed in beyond minimum refuelling range. No fuel flow.
Steady Green:	Fuel flows.
Steady Red:	(whilst in contact) Disconnect, pod malfunction.
Flashing Red:	(whilst in contact) Breakaway.

The AAR pod status lights and aircraft exterior lighting is at [Appendices 6](#) and [7](#).

The light signal commanding a breakaway is the flashing red light located on the trailing edge of each pod, and/or the tanker's lower rotating beacon being switched on. Before a receiver is cleared for contact, the beacon is turned off to indicate tanker's AAR checklist has been completed.

Drogue illumination is provided by store illumination lights located on the outboard side of the outboard engines nacelle strut. In addition, there are 6 equally spaced lights installed on drogue struts to assist during night operations.

The aircraft underwing outboard engine nacelles and wing-tip AAR stores are illuminated. See aircraft exterior lighting drawing for additional information on the Spanish Air Force Boeing 707 T/T exterior lighting system, [Appendix 5](#).

- (9) Mark Facilities.** Nil.
- (10) Dimensions.** See aircraft drawing, [Appendix 8](#). See drogue dimensions drawing, [Appendix 9](#).
- (11) RV Aids.** The B707 T/T has the following radio, navigation and RV aids:
- (a)** VHF, UHF and HF radios.

(b) VOR, ADF, TACAN and INS/GPS.

(c) A/A TACAN Beacon (bearing facility available with suitably equipped receivers).

(d) ACAS / TCAS II (standard Traffic Collision Avoidance System).

(12) **Defensive Measures.** Nil

(13) **Remarks.** One of the Boeing 707 is capable to transport personnel while performing AAR operations.

The other one is a true Multirole Transport Tanker (MRTT) airplane. It may fly in a passenger, cargo or a combination configuration in the main cabin while refuelling in flight. Also could be used as a CASEVAC airplane.

3. Receiver Aircraft Types.

a. **EF-2000 “Typhoon”.** The EF-2000 could refuel by day or night.



Spanish Typhoon refueling from SPAF KC-130H

(1) **AAR Equipment.** The Aircraft is equipped for Air Refuelling (AR) through an extendable probe, located in the right side of the front fuselage. The probe is stored in a sealed compartment and incorporates a nozzle and weak link, designed to fracture on application of excessive radial load. The status of the entire fuel system may be monitored during the refuelling procedure. The extension / retraction sequence takes between 5 and 20 seconds, and in both cases, is completed when the forward probe door closes. If probe extension / retraction exceeds 20 seconds, an IFR warning is generated which clears if the door subsequently closes.

(2) **Refuelling Altitudes and Speeds.**

Operating Fuel Probe Speeds:

Cycling:	200 to 300 KIAS
Extended:	200 to 325 KIAS
Air refuelling speeds:	210 to 325 KIAS, below 35.000 ft

The Eurofighter has not any optimum FL or Speed for refuelling. Altitudes below FL350 (FL250 in some cases) and speeds between 210KDAS to 325KDAS are recommended.

(3) Observations.

If asymmetry problems develop, an abnormal CG situation could occur. This causes a CG warning caption. If a CG warning caption is displayed, refuelling must be stopped and the problem diagnosed.

The Typhoon has not any kind of device to light the drogue; an auto-lighted drogue is needed.

Typhoon is cleared for refuelling in all types of turbulence, but in some software package is only cleared for light turbulence. If turbulence is encountered in an AAR zone, Typhoon pilots must advice tanker pilots about the capability to refuel in turbulence medium or higher.

Only in Fuel Emergency the EF-2000 is authorized to refuel with any kind of failure of Flight Control System, Hydraulic System or Fuel System. Typhoon pilot must acknowledge and advice tanker pilot about the feasibility to refuel with any of these technical issues.

Air to air refuelling with BDA (Boom Drogue Adapter) is not cleared, at present day.

(4) Fuel Types.

JP-8 (NATO F-34) and Jet A-1 (NATO F-35) are also usable.

Jet A is prohibited

(5) AAR Clearances and restrictions.

NETMA is the agency that orders to test the different tankers – receivers compatibilities; later, it will pass the clearances to Eurofighter in order to include them in the approved list. Up to now only the published aircrafts are cleared to refuel the EF-2000.

Wet air refuelling with a Tornado Buddy-Buddy pod is prohibited. Dry contacts with a Tornado Buddy-Buddy pod are permitted only with Tornado Buddy-Buddy pod Flow Switch selected OFF.

The Spanish Typhoon has refuelled from these tankers:

- VC-10 (GBR)
- B-707 T/T (ESP)
- KC130H (ESP)
- KC-767 (ITA)

b. **EF-18 A/B “Hornet”**. Spanish F/18 could make day/night refuelling.

(1) AAR Equipment. EF/A-18 refuelling system is hydraulically operated. It is situated on the right side of the fuselage forward of the windshield. It uses MA-2 flexible tip nozzle, standard NATO probe system.

(2) Refuelling Altitudes and Speeds. The system is limited to maximum 300 KCAS for extending and retracting the probe. The maximum speed with the probe extended is 400 KCAS. There is no specified minimum speed, or maximum altitude to refuel in the Technical Order. Nevertheless, speeds below 200 KCAS or altitudes above FL300 are not recommended.



Spanish EF-18 refuelling from SPAF Boeing 707

(3) Observations. The probe, during night operations, has one light which can illuminate toward the astern once the probe is extended. AAR NVG'S operations are not allowed for Spanish EF/A-18. Standard navigation lights are required in the tanker.

(4) Fuel Types.

JP-8 (NATO F-34) and Jet A-1 (F-35) are also usable.

If EF-18 is refuelled with Jet A-1, there is a limitation of 10 hours of continuous operation with that kind of fuel

(5) AAR Clearances and restrictions.

Spanish F-18 has refuelled from:

- VC-10 (GBR)
- Tristar (GBR)
- KC-130H (ESP)
- C-135 (FRA)
- C-160NG (FRA)
- KCC-130 (CAN)
- B707 T/T (ESP)
- KC-135 MPIRS (USA)
- KC-767 (ITA)

And it has refueled from Boom Drogue Adaptor (BDA) equipped tankers like KC-135 (USA) and C-135FR (FRA).

c. Mirage F-1. SPAF Mirage F-1 is day/night aerial refuelling capable.

(1) AAR Equipment. The refuelling of the Mirage F-1 is done with a non-retractable probe fixed on top of the right front part, very close to the radome. The system allows the plane to be totally refuelled (including the external tanks). The base of the probe is fixed to the fuselage by screws. This link has been intentionally designed to be the weakest part of the probe so that it will break in case of any problem during disconnection of the hose.

The F-1 maximum fuel capacity is 6.400 litres with external tanks and 4.100 without them.



SPAF Mirage F-1 refuelling from US KC-135 BDA

(2) Refuelling Altitudes and Speeds. Mirage F-1M altitude refuelling envelope spans from 5000 ft. to 30.000 ft. Best suitable altitude is 25.000 ft.

Airspeed could vary from 200KCAS to 320KCAS. Best suitable speed is 305KCAS or M0.80 to refuel.

(3) Observations. Spanish F-1 can perform refuelling with some downgrade flight controls issues: with “tang”, “roul” and “emp” lights on, AAR is only allowed in case of emergency. With any other minor problem, AAR is allowed.

Mirage F-1 has a 6 hours maximum time of non-stop operation. All Mirage F-1 operations must accomplish this limitation.

Mirage F-1 has got a light in the left part of the fuselage which is used in night air to air refuelling. The light is switched on and off and regulated in intensity by a rheostat in the cockpit. There is a limitation for light using: for each 15 minutes of light on, it must switched off for 45 minutes.

(4) Fuel Types.

JP-8 (NATO F-34) and Jet A-1 (F-35).

(5) AAR Clearances and restrictions.

Mirage F-1 has refuelled from:

- KC-130H (ESP)
- C-135 (FRA)
- C-160NG (FRA)
- KCC-130 (CAN)
- B707 T/T (ESP)
- KC-135 (USA)

d. AV-8B Harrier II. SP Navy Harrier II is capable to refuel by day or night.

(1) AAR Equipment. SP Navy Harrier has a hydraulic operated extendable probe over the left air-intake.



SP Navy Harrier II Plus refuelling from VC-10

(2) Refuelling Altitudes and Speeds. SP Navy Harrier II could refuel from Sea Level to 35.000 ft.

AAR Speed range spans from 190 KIAS to 300 KIAS. 300 KIAS is the probe limitation. Airspeed from 250 KIAS to 300 KIAS are recommended above 30.000 ft.

(3) Observations. SP Navy accomplish with US NAVY Flight Manual NATOPS, but it has reserved the right to deviate whether necessary.

SP Navy harrier can refuel at night operations, so it's equipped with a probe light which illuminates the drogue.

The refuelling can be conducted with downgraded flight commands, particularly referred to the downgraded automatic stabilization system. In such an event, aerial refuelling can be performed although it requires greater pilot ability.

(4) Fuel Types.

JP-8 (NATO F-34).

(5) AAR Clearances and restrictions.

SP Harrier has refuelled from:

- VC-10 (GBR)
- KC-130H (ESP)
- B707 T/T (ESP)

e. CASA-295. Spanish CASA 295 is capable to perform day and night aerial refueling.

(1) AAR Equipment. C-295 is equipped with a standard NATO probe. It's on the right side of the airframe, just over the right main window.



SP C-295 refuelling from SP KC-130

(2) Refuelling Altitudes and Speeds. Optimum altitudes and speeds could change due to airplane weight.

Next figures are to be familiar with C-295 performances. They must be briefed before AAR activity.

C-295 could refuel from Sea Level to 18.000 ft. MSL. Best suitable altitude is 15.000 ft. MSL.

AAR speed range is from 170 KIAS to 195 KIAS. Best suitable speed is 180 KIAS.

(3) Observations. When C-295 is slower than tanker, tanker must maintain a steady 20° turn in order to facilitate C-295's assembly. Tanker must maintain the slowest airspeed compatible with refuelling operation.

Once briefed, C-295 will request to join from altitudes above the tanker. After the refuelling, it will request to leave the tanker by the right and below.

Maximum non-stop flight trip for C-295 is 15 hours.

(4) Fuel Types.

JP-8 (NATO F-34).

(5) AAR Clearances and restrictions.

C-295 has refuelled from:

- C-160 (FRA)
- KC-130H (ESP)

4. Source Documents.

Spanish Air Force AAR equipment technical and operational manuals.

5. POC for National SRD-Spain.

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6. POC for Tanker/Receiver Clearances.

As for National SRD-Spain.

7. POC for STANEVAL.

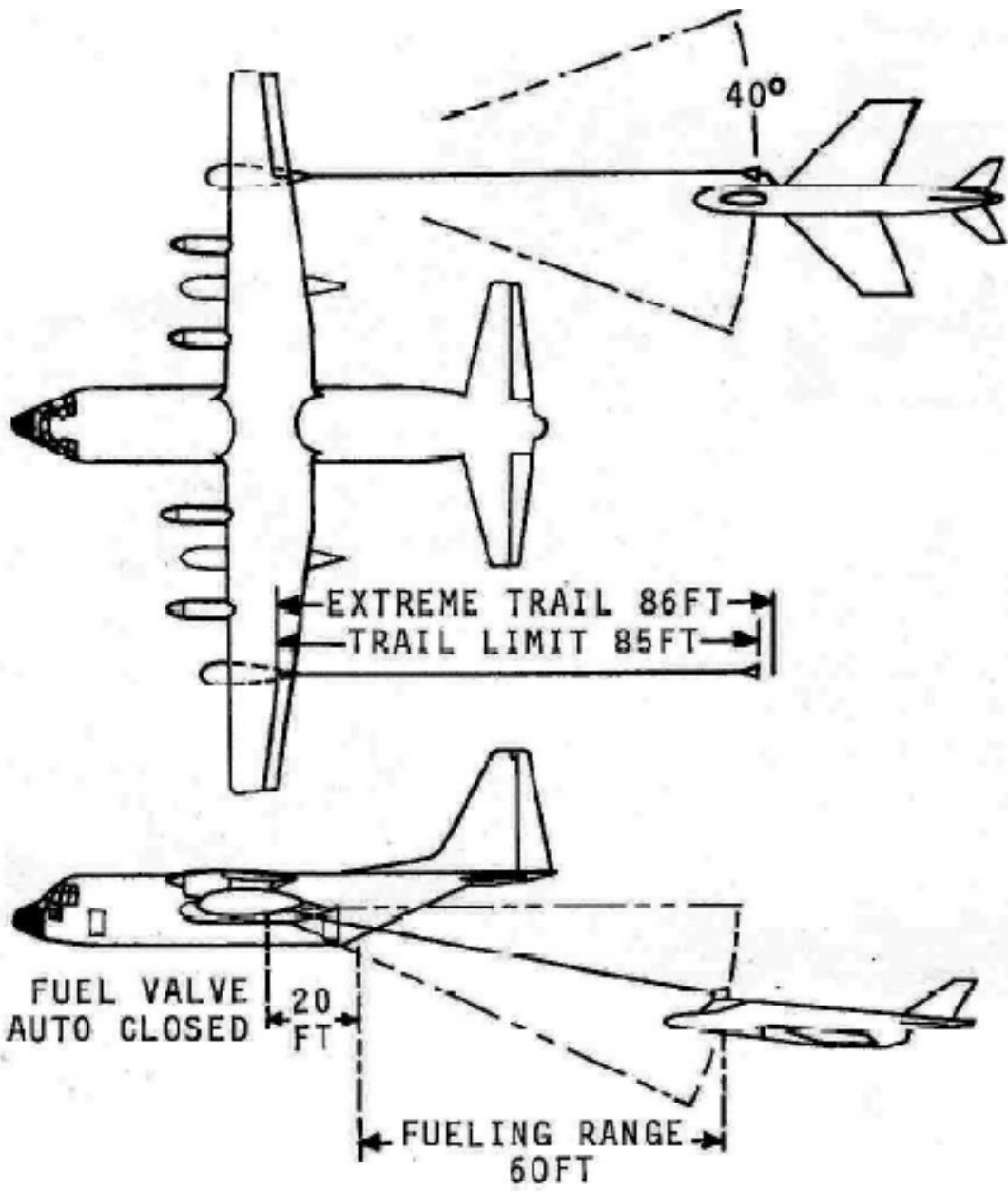
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8. National SRD Last Updated.

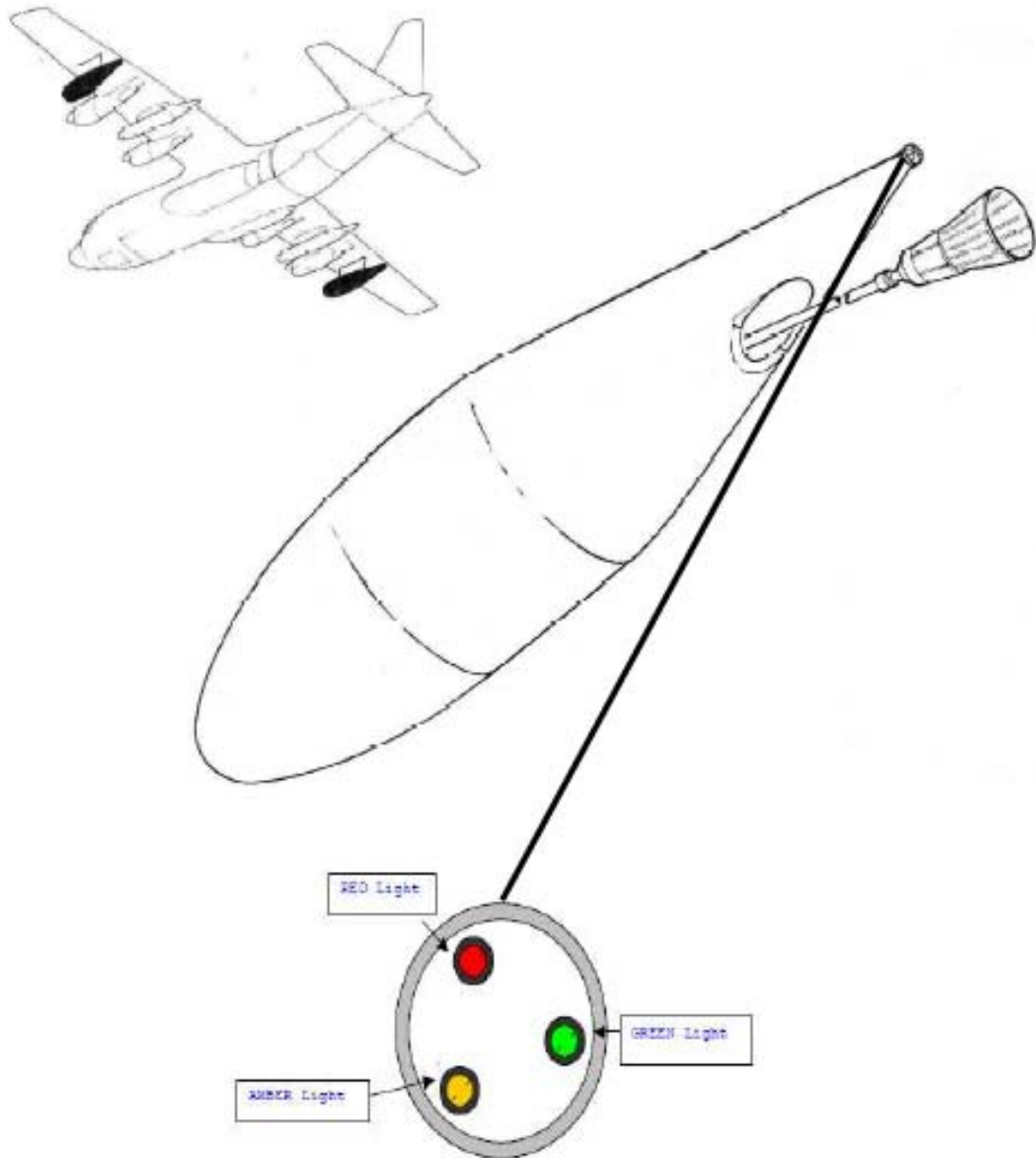
February 19th 2014.

9. National Reservation. NIL.

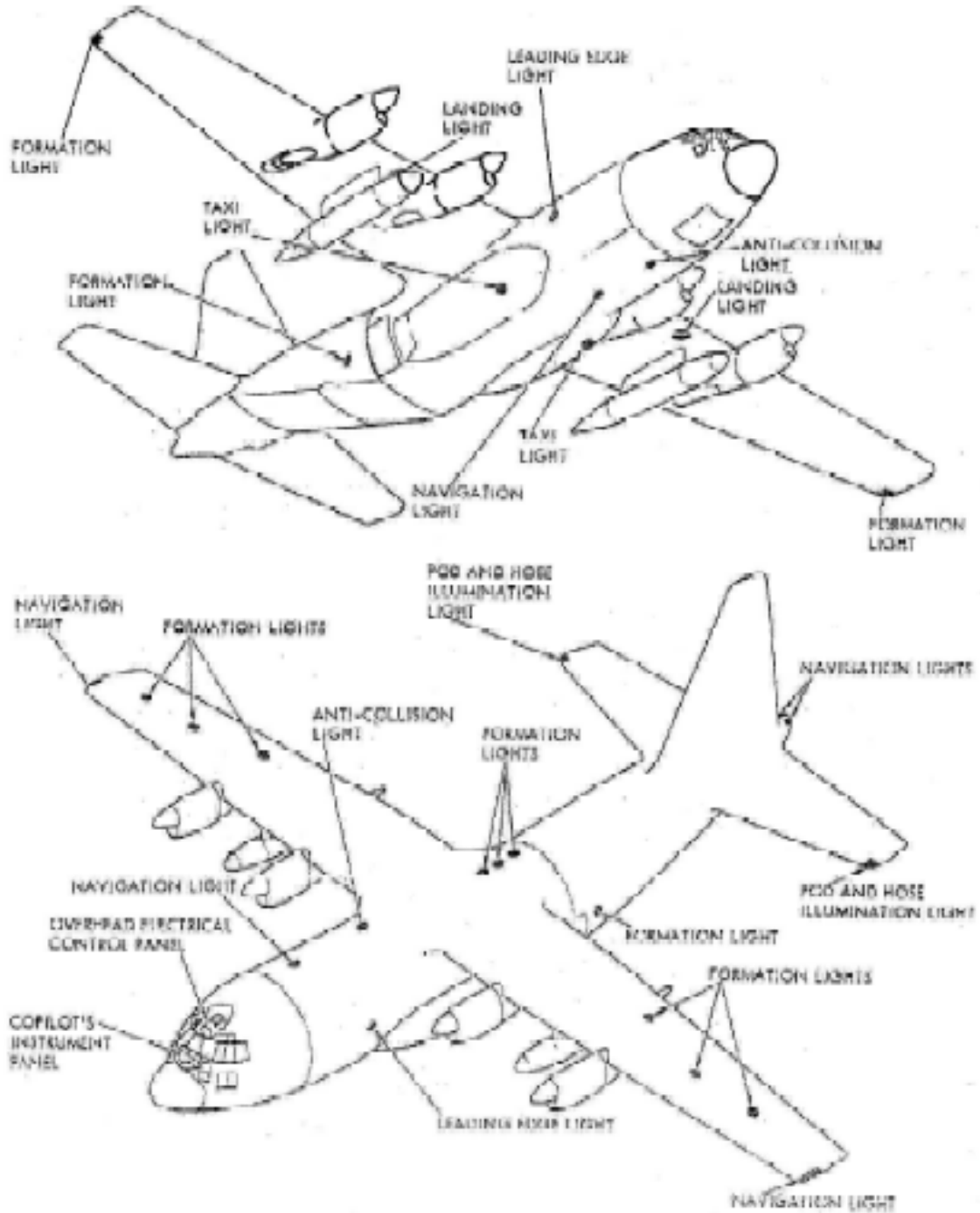
APPENDIX 1 TO NATIONAL SRD-SPAIN
KC130H – HOSE AND DROGUE ENVELOPE



APPENDIX 2 TO NATIONAL SRD-SPAIN
KC130H – AAR POD ADVISORY/STATUS LIGHTS

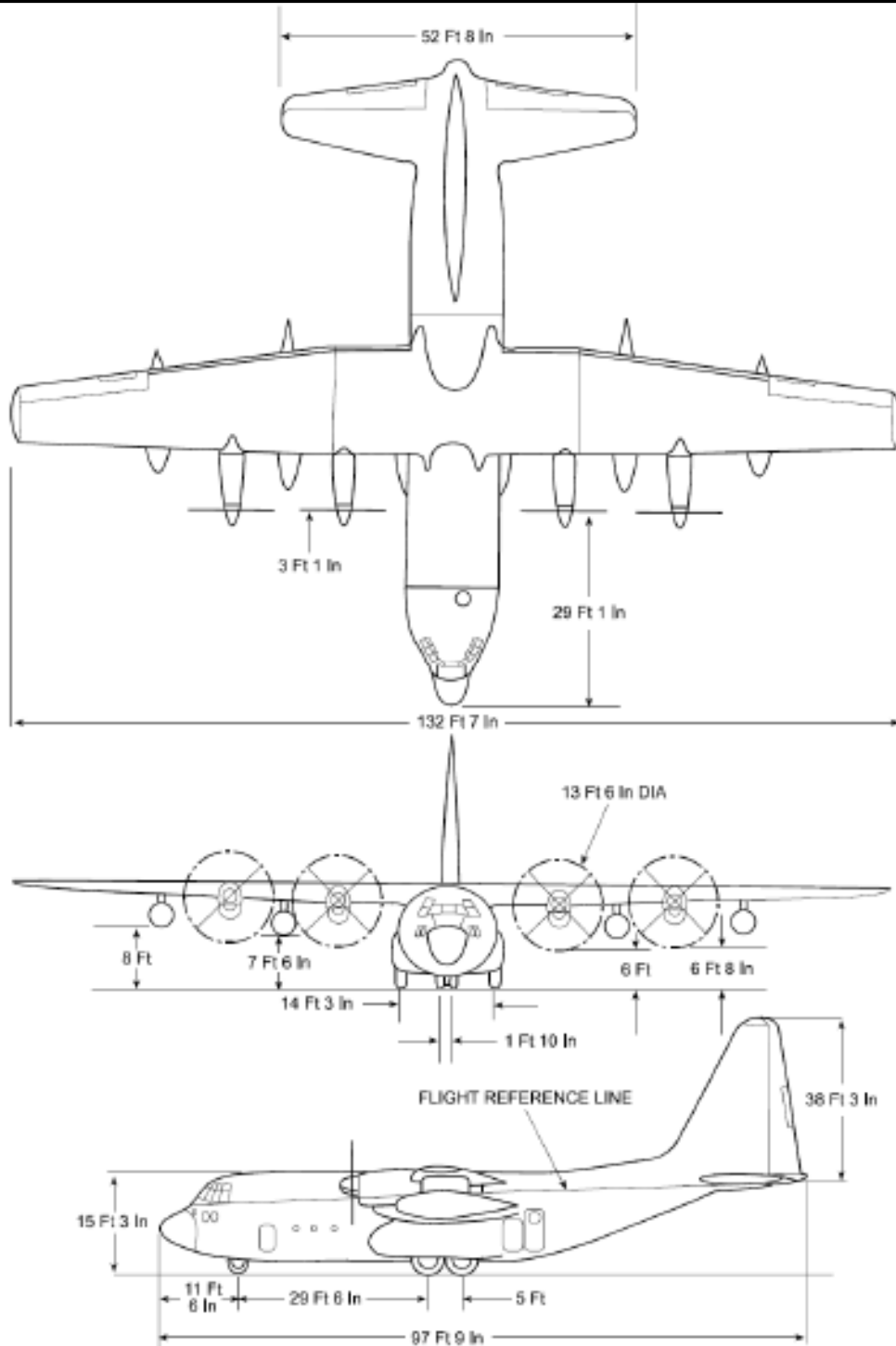


APPENDIX 3 TO NATIONAL SRD-SPAIN
KC130H – AIRCRAFT EXTERIOR LIGHTING

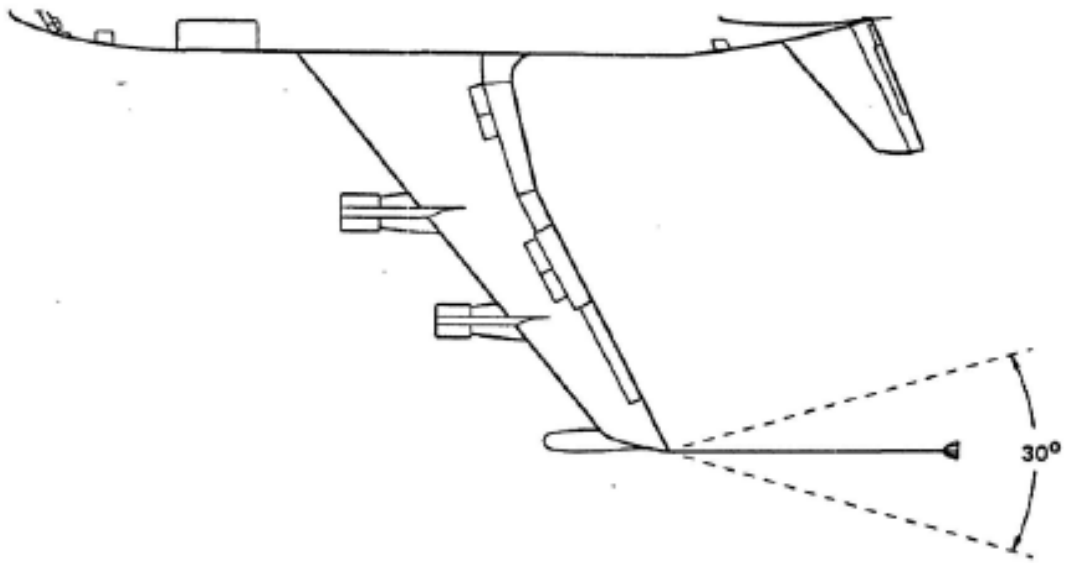
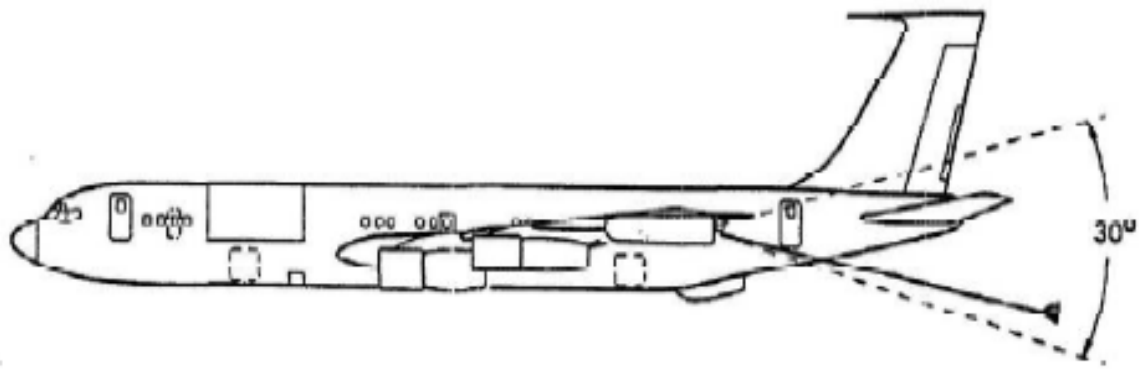


APPENDIX 4 TO NATIONAL SRD-SPAIN

KC130H – DIMENSIONS

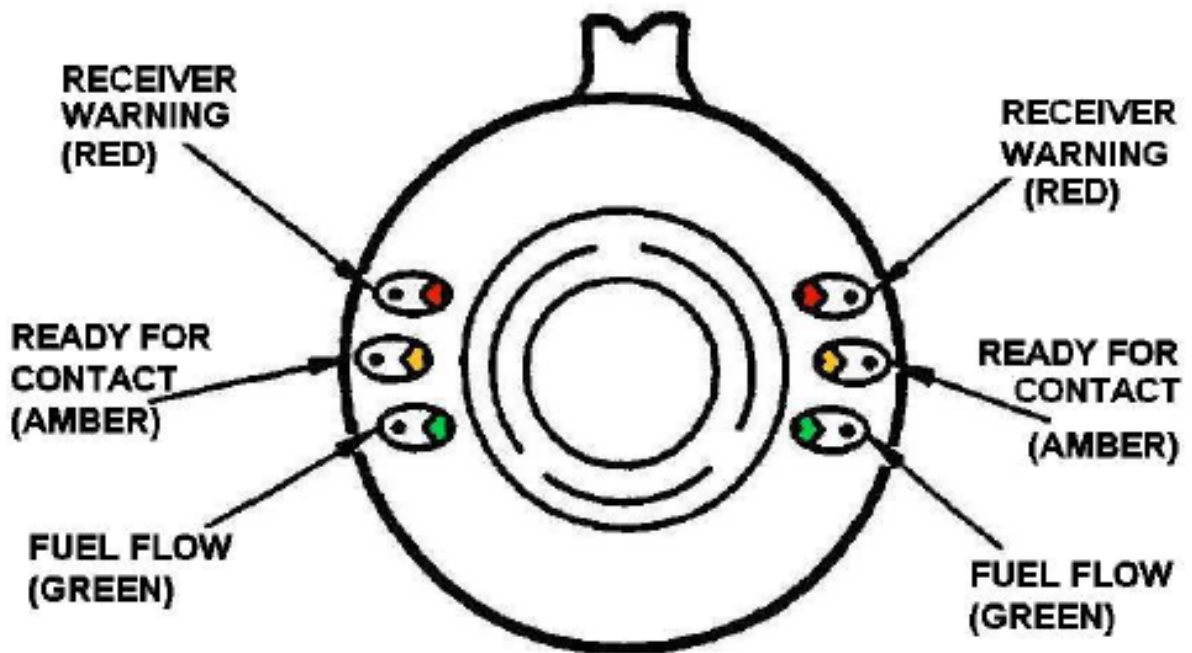


APPENDIX 5 TO NATIONAL SRD-SPAIN
BOEING 707 T/T – HOSE AND DROGUE ENVELOPE



APPENDIX 6 TONATIONAL SRD-SPAIN

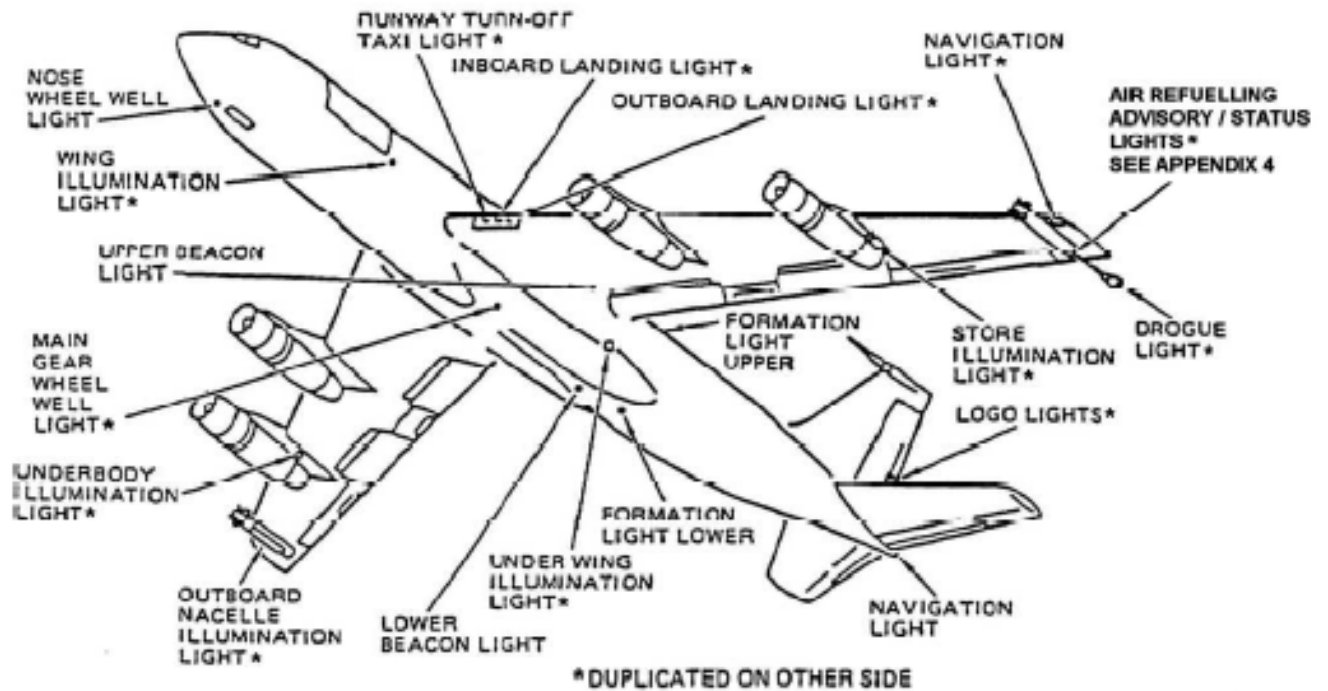
BOEING 707 T/T – AAR POD ADVISORY/STATUS LIGHTS



Rear view of the SP Boeing 707 AAR pod

APPENDIX 7 TO NATIONAL SRD-SPAIN

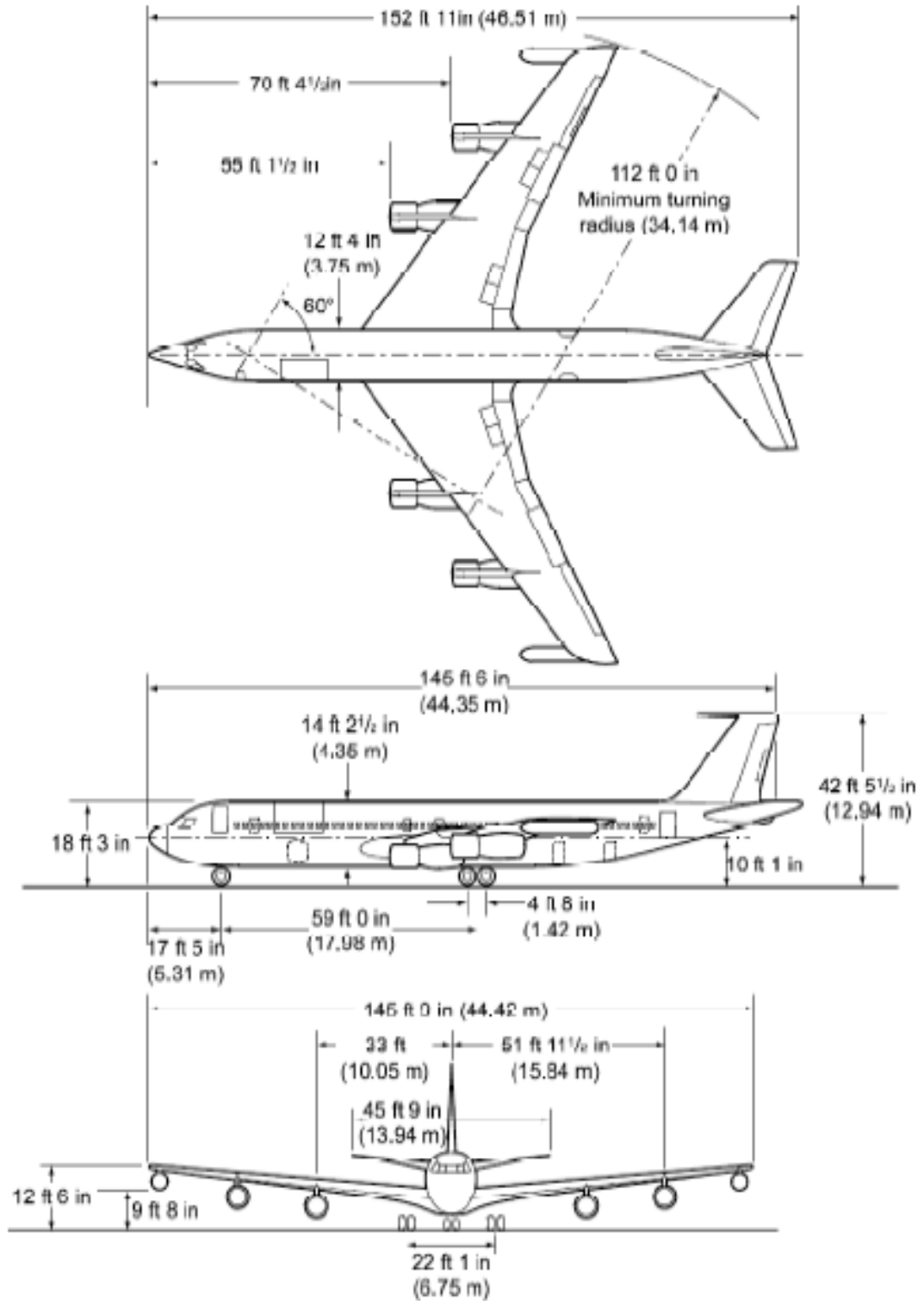
BOEING 707 T/T – AIRCRAFT EXTERIOR LIGHTING

**Note:**

1. In addition to the lights listed above, two white lights illuminate the inside of the tail section. These lights illuminate simultaneously with the Droogie lights and they are not dimmable. The lights extinguish when hose retraction is initiated.
2. Out of the lights listed above, only the following lights are dimmable: Air Refuelling Advisory/Status lights, Formation lights, Navigation lights, Store Illumination lights, Under Wing Illumination lights, Under Body Illumination lights, and Outboard Nacelle Illumination lights.

APPENDIX 8 TO NATIONAL SRD-SPAIN

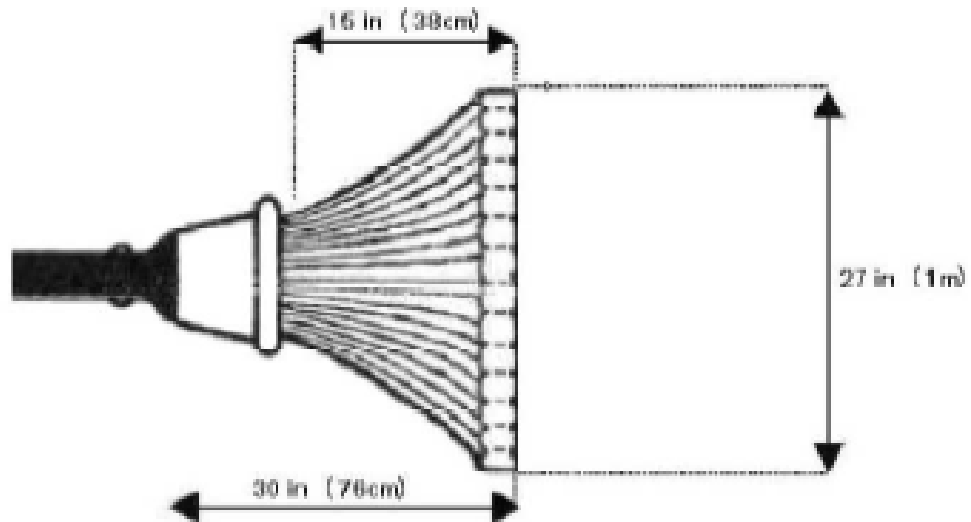
BOEING 707 T/T – DIMENSIONS



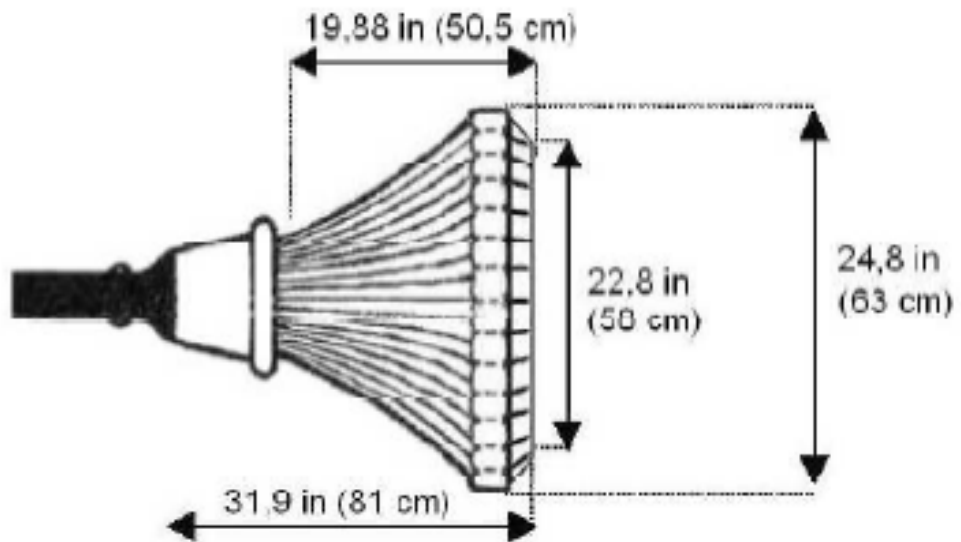
APPENDIX 9 TO NATIONAL SRD-SPAIN

TYPES OF DROGUES

1. SP KC130H Drogue



2. SP BOEING 707 Drogue



APPENDIX 10 TO NATIONAL SRD-SPAIN

SPANISH AAR RECEIVER CLEARANCES

Receivers	SP Tankers		Notes
	KC-130	Boeing 707	
AMX	X	X	Italian Air Force and for daylight operations
C-295	X		Spanish Air Force
C-160 NG	X		Daylight only and limited to 50 ft. of drogue visible
CF-18	X	X	Canadian Air Force
EA-6B	X	X	US Navy & US Marines
EF-18 A/B/M	X	X	
EF-2000	X	X	Spanish, Italians, Germans and British Typhoons
F/A-18 A/B/C/D	X	X	US Navy & US Marines
AV-8 B Harrier II	X	X	Spanish Navy & US Marines
Mirage 2000	X	X	French Air Force
Mirage F-1 CR	X	X	French Air Force
Mirage F-1M	X	X	Spanish Air Force
S-3 Viking	X	X	US Navy
Tornado	X (1)	X	IDS, ECR, GR4/4A (ITA, DEU, GBR) (1)Tornado ECR cannot refuel from KC-130 due to airspeed differences.
Super Etendar Modernisé	X	X	Authorized to provide up to 700 lbs less than maximum fuel load (top off is prohibited)
Rafale	X(1)	X	(1) Unable to refuel from KC-130 with any SCL which force an AAR speed greater than 250 KIAS.