1. **Introduction.** The Japan has 2 tanker types in service with the Japan Air Self-Defence Force (JASDF).

2. **Tanker Aircraft Types.**
   a. **KC-767.** See Annex A for full details of the KC-767.
   b. **KC-130H.** See Annex B for full details of the KC-130H.

3. **Receiver Qualification and Currency for Non JASDF Receivers**
   a. For non-Japanese receiver aircrafts, the publishing of information in this National SRD does not constitute an automatic authority to undertake AAR, it merely shows that the platform is compatible with the Japanese tanker; such authority will require special agreements between the receiver's nation and the JASDF.
   b. Receiver aircraft must be certified for AAR operations and the aircraft must receive an assessment of technical and operational compatibility with the applicable tanker.
   c. All receiver aircraft pilots must be current and qualified for AAR operations. The receiver currency requirements for foreign national aircrew receiving from JASDF tankers will be prescribed in the appropriate agreement.
   d. The receiver aircrew must have been briefed by a JASDF tanker qualified instructor on Boom operations as applicable. As a minimum, this briefing will include: closure limitations, lighting schemes, procedures, possible difficulties and emergency actions.

4. **POC for National SRD**
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5. **National SRD Last Updated.** 20 APR 2017

**List of Annexes:**

- **Annex A**  KC-767 Tanker
- **Annex B**  KC-130H Tanker
### ANNEX A TO NATIONAL SRD-JAPAN

#### KC-767 – TANKER

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1A. Introduction. The Japan Air Self Defense Force (JASDF) has 4 KC-767s in service which are equipped with an Air to Air Refueling (AAR) boom. These aircraft are modified B767 aircraft with the necessary military equipment integrated into the aircraft to support a wide range of boom AAR activities. They retain the general appearance of a commercial B767-200 except for the boom, camera system modifications, and AAR lighting.

2A. AAR Equipment.

a. AAR Boom System Description. An externally mounted boom assembly is installed on the aft lower fuselage of the aircraft. The boom is approximately 28 feet (8.5 metres) long from the pivot point to tip of the boom ice shield fairing. The boom inner telescoping fuel tube can be extended approximately 19 feet (6.4 metres) for a total boom length of over 47 feet (14.3 metres). Key features of the AAR Boom System include the following.

(1) Boom control. The boom is operated remotely by the boom operator at the Remote Aerial Refueling Operator (RARO) station located just behind the flight deck. The Boom operator flies the boom using a redundant fly by wire control system, and high resolution stereo vision system to make a contact with a properly positioned receiver.

(2) Automatic Load Alleviation System (ALAS). ALAS is designed to automatically reduce the stress loads between the boom nozzle and the receiver receptacle. Sensors in the boom detect loads on the boom structure, and send a signal to the Boom Control Software (BCS). The BCS then sends flight commands to the boom to relieve the load.

(3) Automatic Disconnect. The KC-767 has an automatic disconnect feature. When the boom exceeds the preset disconnect limits, a disconnect will be triggered automatically. The disconnect limits vary with receiver types.

(4) Independent Disconnect System (IDS). The KC-767 has IDS which allows the tanker to disconnect even when the receiver’s toggles get stuck in the latched position.

b. Boom Envelope Limit. The AAR boom limits of movement are shown in Annex A, Appendix A1, Figure A1-1. Green Pilot Director Lights (PDL) Envelope and Automatic Disconnect Envelope may vary with receiver type.

c. Lighting

(1) Pilot Director Lights (PDL). PDL is mounted longitudinally along the bottom of the fuselage between the nose landing gear and the main landing gear and is used to direct receiver aircraft during boom AAR. The PDL
consists of two rows of lights: the left row for elevation and the right row for telescoping. Receiver pilot can request boom operator to adjust brightness. (see Annex A, Appendix A2, Figure A2-1)

(a) PDL Indications - General.

(i) Up / Down. The elevation lights consist of one green, two amber, two red triangular panels, and two illuminated white letters; U (UP) at the forward end, and D (DOWN) at the aft end. The lights signal offer the receiver visual cues to correct its position (up or down), while a single green bar indicates that the receiver is in the correct position. The letters are dimly illuminated by background lights.

(ii) Aft / Forward. The telescoping lights consist of one green, two amber, two red, and four white rectangular panels, and two illuminated white letters; A (AFT) at the forward end, and F (FORWARD) at the aft end.

(b) Approaching Contact. Prior to contact the boom operator uses a “coaching” switch on the Telescope Control Stick (TCS) to instruct desired corrections. The lights and letters signal desired receiver corrections forward or aft, up or down, in the Boom envelope limits.

(c) In Contact. The PDL remains illuminated when the receiver is in contact. The PDL is programmed to automatically signal the receiver pilot with a visual indication of corrections required to maintain the proper refueling position. The yellow and red lights indicate that the receiver is approaching the edge of the permitted boom envelope limits.

(d) Breakaway. All PDL, except the background lights, will flash for 10 seconds during a breakaway.

(e) Failure to Illuminate on Contact. If the PDL does not illuminate when a receiver makes contact, the receiver should disconnect, report to the boom operator and await instructions. If refueling is continued without PDL indications, verbal corrections from the boom operator will be provided.

(2) Boom Lighting

(a) Flood Light. The boom floodlight is a variable intensity red light used to illuminate receiver. This light is located at the very tail of the tanker fuselage. Receiver pilot should not keep watching this light during night AAR to keep adapted to darkness.

(b) Boom Nozzle and Marker Lights. The boom nozzle fairing contains two fluorescent lights and one incandescent white light. The two fluorescent lights are located in the upper portion of the boom nozzle fairing and are used illuminate telescoping tube markings during night AAR. The white incandescent light in the bottom of the nozzle fairing is
used to illuminate the boom nozzle for the boom operator during night AAR.

(3) Aircraft lighting. There are several aircraft lightings. Receiver pilot can request boom operator to adjust brightness. (see Annex A, Appendix A2, Figure A2-2)

(a) Rendezvous Lights.

   (i) General. The rendezvous lights are located on the upper and lower fuselage. Rendezvous lights allow receiver aircraft to distinguish between different tankers in a formation. They also aid the receiver in visually locating the tanker during rendezvous. The rendezvous light system consists of two strobes that can be individually set to red, white, or an NVG compatible mode. The pilot can set both rendezvous lights to flash, in the selected color combination. The rendezvous lights are synchronized so the upper and lower strobes flash at the same time. After completion of Rendezvous, lower rendezvous light will be turned off for daytime operation, and both off for night operation.

   (ii) Breakaway. The lower rendezvous lights will be turned ON and RED for all breakaways.

(b) Formation Lights. The airplane has NVG compatible LED formation light strips on the both sides of forward and aft fuselage and on both sides of the vertical stabilizer. Also there are a set of formation lights on each wing tip.

(c) Centreline Reference Lights. Two NVG compatible LED light strips are located along the fuselage underside centreline.

(d) Underwing, Underbody Lights. Several lights are mounted on engine struts and under fuselage to illuminate portions of the under wing surfaces and a portion of the under fuselage.

d. Fuel system

(1) Maximum Transferable Fuel. Total fuel load is approximately 160,000 lb or approximately 72,800 kg Transferable fuel is dependent on the sortie duration and reserve fuel requirements; typically about 100,000 lb (45,360 kg) is available for transfer on a 4 hr flight.

(2) Fuel Transfer Rate. The receiver type determines the number of pumps. The fuel system provides flow rate up to 900gpm (6,000 lb/min or 2,735 kg per minute) at a regulated 50 psig. Offload rate varies with the number of AAR pumps. The Aerial Refueling Control System (ARCS) controls the number of AAR pumps automatically by receiver type.

(3) Regulated Fuel Pressure. Fuel is delivered to the receiver at a regulated pressure approximately 50 psig (3.45 bar).
(4) **Fuel Types Available for AAR.** JASDF typically uses JP-4A.

(a) **Primary Fuels.** The primary fuels are Jet A(F30), Jet A-1(F35) and Jet B(F45).

(b) **Alternate Fuels.** The alternative fuels are JP-4(F40), JP-5(F44), JP-8(F34) and JP-4A.

e. **RV Aids.** The KC-767 has the following Communication and Navigation aids:

(1) **Communication.** UHF, VHF, HF, Inmarsat SATCOM, Military (Superbird) SATCOM and boom interphone. Boom is equipped with a Boom Interphone System which permits direct communication with suitably equipped receivers.

WARNING

WHEN BOOM IS DEPLOYED AND A RECEIVER AIRCRAFT IS WITHIN ½ MILE, HF TRANSMISSION IS PROHIBITED.

(2) **Navigation.** FMS(GPS and IRU), VOR, TACAN, Military TCAS and WX radar. There is no UDF, radar skin paint or radar beacon available.

(a) **TACAN.** When utilized in the BEACON mode, the KC-767 TACAN will provide the receiver with a bearing and distance to the tanker. The INVERSE mode provides the tanker with a bearing and distance to the receiver. The preferred tanker TACAN mode is A/A INVERSE and BEACON. The receiver shall be in A/A T/R mode.

(b) **Flight Management System (FMS) for RV Delta.** For the RV Delta (Point parallel) rendezvous, the KC-767 FMS computes a reciprocal track and an optimum turn point using variable bank angle turning. The FMS assumes the receiver is flying from ARIP to ARCP track at the mission planned airspeed. Receiver should notify to the tanker when passing at the ARIP for the most efficient rendezvous.

(i) **Tanker Offset and Turn Range.** The turn range and offset chart for a tanker bank angle of 25 degrees (Chapter 2 - ANNEX 2D RV Delta (Point Parallel) Figure 2D-4) most closely predicts the turn range and offset at the rendezvous turn point. The KC-767 FMS computes an offset leg based upon current conditions and airspeeds. The offset leg will approximate a 25-degree bank angle turn.

(ii) **Receiver Actions – ARIP to ARCP.** For a Point Parallel rendezvous, a positive identification of receiver arrival at the ARIP is required to compute an accurate rendezvous. Position data from
A/A TACAN, IFF/TCAS, or a radio call is required to initiate the rendezvous procedure.

(c) Mark Facilities. In response to a receiver request to “Mark” the tanker can dump fuel and/or switch on High Intensity Lighting.

3A. Basic Operation.

a. AAR Heights and Speeds. The KC767 is capable of refueling from 10,000ft MSL to 30,000ft MSL, at speeds from 200KIAS to 350KIAS (except where Mach limited). See – Appendix A3, Receiver Data, for recommended altitudes and airspeeds for each receiver.

b. Normal operation.

(1) When ready to refuel, the boom is lowered from its stowed position and about 10 feet (3 metres) of the retractable portion is extended by the boom operator.

(2) When cleared, the receiver will move to astern position.

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<th>WARNING</th>
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THE RECEIVER MUST STABILIZE IN THE ASTERN POSITION AND ATTAIN A ZERO RATE OF CLOSURE. IF THE RECEIVER FAILS TO ATTAIN A STABILIZED POSITION, OR IT BECOMES APPARENT THAT A CLOSURE OVERRUN WILL OCCUR, BREAKAWAY PROCEDURES WILL BE INITIATED BY EITHER THE TANKER OR RECEIVER. FAILURE TO DO SO COULD RESULT IN A MID-AIR COLLISION.

(3) Boom operator will clear the receiver to move to contact position, if after receiver stabilizes at astern position. Receiver will move to and stabilize at contact position with slow and stable closure rate (approximately 1 foot per second (0.3 metres per second)).

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
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</table>

EXCESSIVE CLOSURE RATE COULD CAUSE THE TANKER TO DESCEND INTO THE PATH OF THE RECEIVER. THE TANKER PILOT MUST BE PREPARED TO DISCONNECT THE AUTOPILOT TO PREVENT ALTITUDE DEVIATIONS. THE TANKER OR RECEIVER IS TO INITIATE A BREAKAWAY AT THE FIRST INDICATION OF A CLOSURE OVERRUN.
(4) When the contact position is achieved, the boom operator flies the boom to the receiver aircraft’s receptacle and extends the boom to make a contact; locking toggles in the receptacle operate to hold the boom nozzle in contact.

(5) The receiver then maintains its position within the boom envelope limit.

(6) To make a normal disconnect, the receiver releases the receptacle toggles (this may also be effected remotely by the boom operator) and remains stabilized in the contact position until the boom operator confirms a disconnect has been achieved; the receiver then moves to the astern position.

4A. Receiver Types Certified. AAR data such as altitudes and airspeeds, fuel transfer rates and maximum number of refueling pumps to be operated for a particular receiver are published at Appendix A3. In addition, Appendix A3 provides boom operators with receiver information essential to achieving safe AAR operations. Appendix A4 provides visual reference to assist receiver pilots achieve the correct KC-767 astern and contact position.

5A. Source Documents.

J.T.O.1C-767(K)-1
J.T.O.1C-767(K)-2

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<tr>
<td>Appendix A4</td>
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NOTE

GREEN PDL ENVELOPE AND AUTOMATIC DISCONNECT ENVELOPE MAY VARY BY RECEIVER TYPE.
APPENDIX A2 – ANNEX A TO NATIONAL SRD-JAPAN

KC-767 EXTERIOR LIGHTING

Figure A2-1 – KC-767 Pilot Director Lights Illumination Profile
Figure A2-2 – KC-767 Exterior Lighting (1/3)

Figure A2-2 – KC-767 Exterior Lighting (2/3)

Formation lights
Right position lights
Anti-collision lights (white strobe) (left & right)
Lower rendezvous lights (red/white/NVG)
Landing lights (left & right)
Taxi light
Logo lights (4) (white)
Runway turnoff lights (left & right)
Upper rendezvous lights (red/white/NVG)
Wing (illumination) lights
Left position lights (red & white)
Formation lights
Anti-collision lights (white strobe) (left & right)
Formation
Upper rendezvous
Pilot director
Lower rendezvous
Boom flood
Figure A2-2 – KC-767 Exterior Lighting (3/3)
**APPENDIX A3 – ANNEX A TO NATIONAL SRD-JAPAN**

**RECEIVER DATA – FOR KC-767 TANKER**

**A3.1. Introduction.** This Appendix provides data essential for safe boom operations with appropriately equipped receiver aircraft. As well as offering information about the location of the UARRSI, it lists receiver aircraft equipment in close proximity to the receiver receptacle that must be avoided to prevent damage during refueling operations.

**A3.2. AAR Mission Planning and In-flight Data.** The following table provides AAR planning data for all receiver aircraft with a technical clearance to conduct refueling operations with the KC-767 tanker.

<table>
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<tr>
<th>Type</th>
<th>OPTIMUM ALT/CAS/MACH</th>
<th>RCVR RV CAS</th>
<th>OVERRUN CAS/MACH</th>
<th>RPM/ PUMPS</th>
<th>EQUIPMENTS</th>
<th>VISIBILITY SINGLE/MULTI</th>
<th>FLOOD LIGHT</th>
<th>DISC LIMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>UHF</td>
<td>VHF</td>
<td>HF</td>
<td>A/A TCN</td>
</tr>
<tr>
<td>F-2A/B</td>
<td>30,000/300/0.80</td>
<td>330</td>
<td>330/0.82</td>
<td>4000/2</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>F-15J/DJ</td>
<td>30,000/300/0.80</td>
<td>330</td>
<td>330/0.82</td>
<td>4000/2</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>RADAR LOCK</td>
</tr>
<tr>
<td>KC-130H</td>
<td>5,000-10,000/205</td>
<td>220</td>
<td>220</td>
<td>4000/2</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>C-2</td>
<td>25,000ft/ /280kt 0.72M</td>
<td>300</td>
<td>300</td>
<td>6,000/4</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

*Source: JASDF*
A3.3. Receiver specific information.

a. F-2A/B.

(1) General information.

(a) The F-2A/B has a UARRSI receptacle which is located 30 feet from the nose on aircraft centerline, 12.3 feet aft of the canopy.

(b) The F-2B receptacle is located 7.8 feet aft of the canopy.

(c) There is a 7.7-inch high antenna on the upper fuselage centerline, 5.6 feet forward of the receptacle.

(d) On F-2B models, the antenna is 6.3 inches higher than F-2A models.

(e) F-2 has a tapering fillet at the base of the vertical stabilizer approximately 2.6 feet aft of the receptacle. There is a 7.3 inches high antenna on the filet, approximately 4.3 feet aft of the receptacle.

(f) There is AR light, slipway light and AR floodlight on the upper fuselage, and only slipway light can be varied in intensity.
(2) AAR procedures

CAUTION

WHEN IN CONTACT, THE BOOM FAIRING AND THE ANTENNA LOCATED FORWARD OF RECEPTACLE MAY CONTACT IF BOOM ELEVATION IS HIGHER THAN 25.8 DEGREES AND TELESCOPE IS SHORTER THAN 6 FEET.

NOTE

F-2A/B DOES NOT HAVE MANUAL BOOM LATCHING (MBL) CAPABILITY.

AT HIGH ALTITUDE AND HIGH SPEED REGION, THE TRIM ENVELOPE (BOOM FLYABLE REGION AFFECTED BY AERO DYNAMIC FORCE, VARY BY ACTUAL FLIGHT ENVIRONMENT) MAY BE NARROWER THAN BOOM DISCONNECT LIMIT. SO BEFORE CONTACT, THE BOOM OPERATOR MUST CHECK THE TRIM ENVELOPE AT THE ACTUAL ENVIRONMENT AND ASSUME THAT ENVELOPE AS BOOM DISCONNECT ENVELOPE.
b. F-15J/DJ.

(1) General information.

(a) The receptacle on the F-15J/DJ has a fold down door which forms a small slipway. It is located 30 feet from the nose and 3 feet left of centerline in the aircraft wing root area.

(b) Lights for the slipway are in the receptacle and on the aft portion of the canopy which illuminates the area around the receptacle.

(2) AAR procedures

CAUTION

DO NOT ATTEMPT CONTACT IF THE FORWARD AAR DOOR IS VIBRATING. CONTACT WITH THE BOOM MAY CAUSE LOSS OF THE AAR DOOR.

NOTE

TO ASSURE SUCCESSFUL CONTACT, PRECISE POSITIONING OF THE BOOM STRAIGHT INTO THE RECEPTACLE IS REQUIRED. THE NOZZLE TIP MAY HANG-UP ON A GAP IN THE FORWARD END OF THE RECEPTACLE SLIPWAY. THE TIP MAY ALSO HANG-UP ON THE RECEPTACLE FORWARD ROLLERS IF ATTEMPTING CONTACT FROM EITHER SIDE OF THE SLIPWAY.

F-15J/DJ HAS ON-OFF TYPE SLIPWAY LIGHT AND FLOOD LIGHT AND THESE LIGHT MAY TOO BRIGHT, SO RECEPTACLE MAY SHINE IN THE LIGHT AND MAY TOO BRIGHT TO SEE FOR BOOM OPERATOR.

F-15J/DJ HAS MANUAL BOOM LATCHING (MBL) CAPABILITY.
c. KC-130H.

(1) General Information
   (a) The C-130 has a UARRSI receptacle located 12 feet AFT of the nose and 5.5 feet behind center window on fuselage centerline.
   (b) Distance lead-in stripes are located in front of the receptacle at 1-foot intervals.
   (c) Approximately 17 inches forward of the receptacle is a set of lights offset on both sides to illuminate the area around the receptacle.
   (d) There is additional lighting in the slipway area.

(2) Rendezvous Procedures
   (a) Overtaking rendezvous
       An overtaking rendezvous will be normally used combined with RV-Golf (Enroute) or RV-Delta (Point parallel rendezvous or Modified point parallel rendezvous). Tanker commences to overtake the receiver, maintaining 1000 ft vertical separation, aiming to pass to overhead a boom receiver or at least 2 wingspans to the right of a receiver.
       (i) For the overtaking RV-Golf (Enroute), the receiver arrives at the ARIP at the RV altitude -1,000 ft and the RV control time and the tanker arrives at the ARIP at the RV altitude and the RV control time plus 1 minute.
       (ii) The overtaking RV Delta (point parallel rendezvous) uses normal RV Delta procedures except the tanker plans to roll out behind the receiver.

NOTE

When executing an overtaking rendezvous with more than one tanker, delay adjusting airspeed, lowering the flaps, or maneuvering to AAR formation until all aircraft are established on the AAR heading.
(3) Closure Procedures
   (a) The receiver will maintain 215 KIAS until 1/2 NM in trail, then slow
during closure to reach the astern position at 200 KIAS.

(4) AAR Procedures

CAUTION

BOOM NOZZLE POSITION SHALL BE MONITORED CLOSELY PRIOR TO
CONTACT AND FOLLOWING DISCONNECT AS RECEPTACLE TO
PROPELLER LINE DISTANCE IS ONLY 15.5 FEET.

NOTE

BANK ANGLE DURING AAR WITH C-130 RECEIVERS WILL BE LIMITED TO 15
DEGREES.
d. C-2.

(1) General Information
   (a) The C-2 has a UARRSI receptacle located 21 feet AFT of the nose.
   (b) Distance lead-in stripes are located in front of the receptacle at 1-foot intervals.
   (c) An Escape hatch is located 5.5 ft forward of receptacle and right of aircraft centre line.
   (d) There is a VHF antenna 9.5 ft forward of receptacle.
   (e) There is a set of light in the slipway area.

(2) AAR Procedure
   (a) Boom operators must be alert to the C-2's capability of rapid movement in pitch axes within the AAR envelope.
   (b) The boom operator must aggressively advise the receiver to slow the rate of closure to approximately 1 foot per second.
   (c) Tanker airspeed and altitude changes must be made smoothly and cautiously while the receiver is in or near the contact position. Any airspeed or altitude adjustment required by the tanker due to aerodynamic effects of the receiver should be accomplished after the receiver is stabilized in the contact position.
   (d) Contact should not be attempted until the receiver has stabilized in the contact position.
   (e) A maximum of 4 AR pumps may be used.
WARNING

· EXCESSIVE CLOSURE RATE MAY CAUSE THE TANKER TO DESCEND INTO THE PATH OF THE RECEIVER. THE PILOT MUST BE PREPARED TO DISCONNECT THE AUTOPILOT TO PREVENT ALTITUDE DEVIATIONS. INITIATE A BREAKAWAY AT THE FIRST INDICATION OF A CLOSURE OVERRUN.

· BOOM OPERATORS MUST BE ALERT TO THE RECEIVER’S CAPABILITY OF RAPID MOVEMENT. MONITOR THE RECEIVER’S RATE OF MOVEMENT AND USE SOUND JUDGMENT IN DETERMINING WHEN TO INITIATE A DISCONNECT, TO ENSURE THAT THE NOZZLE DISCONNECTS FROM THE RECEPTACLE PRIOR TO GETTING INTO A POSITION WHERE NOZZLE BINDING CAN OCCUR. IF RECEIVER MOVEMENT IS TOWARD THE INNER LIMIT, BOOM OPERATORS WILL EXERCISE SOUND JUDGMENT IN INITIATING A DISCONNECT OR BREAKAWAY PRIOR TO THE RECEIVER EXCEEDING THE LIMIT OR OVERRUNNING THE TANKER.

NOTE

C-2 has manual boom latching (MBL) capability.
APPENDIX A4 – ANNEX A TO NATIONAL SRD-JAPAN

KC-767 REFUELING - VISUAL REFERENCES

A4.1. Refueling Position - Visual References. When moving forward from the astern position to the contact position, the visual references used by receiver aircraft pilots permit them to position their aircraft so that they remain within the tanker's AAR envelope. The following paragraphs provide guidance to assist pilots achieve the correct position.

A4.2. Echelon Position. (Typical)

Typical echelon position for the closest receiver is as follows.

a. Elevation. Align upper sides of forward entrance door, wingtip and rear entrance door, or forward and aft fuselage formation lights and wingtip formation light.

b. Azimuth. On the line of trailing edge of main wing and abeam of the tip of left and right horizontal stabilizer.
A4.3. F-2A/B

a. Astern position

Alignment: fuselage centre line

Eye height: Boom nozzle

b. Contact position.
A4.4. F-15J/DJ.

a. Astern position

Alignment: Slightly inside of fuselage side-line.

b. Contact position

Eye height: Boom nozzle
A4.5. **KC-130H.**

a. **Astern position**

Alignment: fuselage centre line

Eye height: Boom nozzle

b. **Contact position**
A4.6. c-2.

a. Astern position

TBD

b. Contact position

TBD
## Subject

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1B Introduction.
The KC-130H is a tactical tanker/transport. That provides aerial delivery of troops and cargo.
Additional task performed is Helicopter Air to Air Refueling (HAAR).

2B Receiver Types Certified. UH-60J

3B HAAR Equipment.
a. AR Pods. The KC-130H has 2 high speed drogue equipped refuelling stations, one mounted on each wing outboard of the engines.

   (1) Description.
   Each refueling station consists of an Integrated Air Refuelling System (IARS) refuelling pod, 87 ft (26.5 m) of hose, a MA-4A reception coupling, and a variable drag drogue (VDD) with an inside diameter of 24 inch (0.61 m).

   NOTE
   In-flight checks of AR systems and rendezvous equipment should be accomplished as soon as practicable after take-off.

   (2) Basic Operation.
   Fuel flows when the hose is pushed in 5ft (1.5 m); flow continues provided the hose is maintained in the refuelling range, between 62-82 ft (18.9 – 24.9 m) of hose extension.

   (3) Hose. The tanker will normally have two hoses extended (the tanker may elect to extend only one hose on missions that do not require the use of both hoses).
   The black hoses are marked with a 1 ft (0.3 m) white band each 10 ft (3 m) and a 5ft (1.5 m) orange band marking the 20ft (6.1 m) long refueling range. When hose slack and whip occur and are observed by the tanker scanner (usually loadmaster) or reported by the receiver pilot, the receiver will be instructed to return to the observation position.
   During refuelling, the receiver should maintain a position on the hose midway between the two 5 ft (1.5 m) bands indicating the refueling range.
(4) Coupling. A self-sealing reception coupling in the drogue prevents the flow of fuel from the hose until it is engaged with the receiver probe. In order to ensure proper locking of the probe to drogue coupling, a positive closure rate should be maintained until after initial contact. Incomplete locking action could result in fuel spraying from the coupling. Fuel can be transferred with incomplete coupling only while the receiver pushes inward on the drogue.

**WARNING**

Excessively hard contact between probe and drogue can damage the refuelling nozzle. Should the drogue become unstable from probe contact causing sections of the cloth material to fail, it is possible for the drogue to collapse and for the hose to retract fully into the pod.

**WARNING**

Rotor blade contact with the heavy reception coupling or refuelling hose can result in significant damage to the rotor system resulting in severe vibrations or failure of the rotor blades and loss of helicopter control.

**CAUTION**

Wing/prop turbulence can cause uncontrolled settling. If settling occurs while connected to the drogue, disconnect immediately. Failure to disconnect may result in damage to the probe and possible rotor blade-to-probe contact.

**CAUTION**

Contact with a malfunctioning drogue that is rotating at greater than one revolution per second may damage the probe nozzle lock ring; a clockwise rotating drogue could result in partial or complete un-threading of the probe nozzle. Therefore, contacts with this type of drogue malfunction should be restricted to operational necessity.
CAUTION

Off-center disconnects can damage the refuelling nozzle. Report any drogue or coupling damage to the tanker crew.

MA-4A.

The receiver disconnect angle (the angle between the hose coupling and the receiver probe) must be limited to a pull-off angle of 20° off-center or less due to the limit of the MA-4 hose coupling. Additionally, the receiver must disconnect within a 40° cone centered about the free in-flight trail position of the hose.

b. AAR Pod lighting. At the aft end of the refuelling pod are three overt and three infrared (IR) status lights; both sets are red, amber, and green. Refer to Figure B-1, B-2 and B-3.

Figure B-1 – IARS Pod Status Lights
### Figure B-2 AR Pod Status lights (Overt)

<table>
<thead>
<tr>
<th>IARS Mode/Configuration</th>
<th>Left Red</th>
<th>Center Amber</th>
<th>Right Green</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakaway/Any condition</td>
<td>Flash</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Stowed/Trail/Response Test/Rewind/Passive</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Standby, Regulator outlet pressure within limits</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
</tr>
<tr>
<td>Standby, Regulator outlet pressure out of limits</td>
<td>On</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Standby, Regulator outlet pressure within limits and motor overload present</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Tension, hose length &gt; outer fuelling range</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Tension, hose length in fuelling range, fuel flow &lt; 50 gpm (190 lb/min)</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Tension, hose length in fuelling range, fuel flow ≥ 50 gpm (190 lb/min)</td>
<td>Off</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>Tension, Fuel Flow ≥ 50 gpm (190 lb/min), hose length within 5 ft (1.5 m) of inner fuelling range</td>
<td>Off</td>
<td>Flash</td>
<td>On</td>
</tr>
<tr>
<td>Tension, Fuel Flow &lt; 50 gpm, (190 lb/min), hose length within 5 ft (1.5 m) of inner fuelling range</td>
<td>Off</td>
<td>Flash</td>
<td>Off</td>
</tr>
<tr>
<td>Tension, hose length &lt; inner fuelling range</td>
<td>Off</td>
<td>Flash</td>
<td>Off</td>
</tr>
</tbody>
</table>

### Figure B-3 AR Pod Status lights (Covert)

<table>
<thead>
<tr>
<th>IARS Mode/Configuration</th>
<th>Left Red</th>
<th>Center Amber</th>
<th>Right Green</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakaway/Any condition</td>
<td>Flash</td>
<td>Flash</td>
<td>Flash</td>
</tr>
<tr>
<td>Stowed/Trail/Response Test/Rewind/Passive</td>
<td>On</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Standby, Regulator outlet pressure within limits</td>
<td>Off</td>
<td>On</td>
<td>Off</td>
</tr>
<tr>
<td>Standby, Regulator outlet pressure out of limits</td>
<td>On</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>Standby, Regulator outlet pressure within limits and motor overload present</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Tension, hose length &gt; outer fuelling range</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Tension, hose length in fuelling range, fuel flow &lt; 50 gpm (190 lb/min)</td>
<td>Off</td>
<td>Off</td>
<td>Off</td>
</tr>
<tr>
<td>Tension, hose length in fuelling range, fuel flow ≥ 50 gpm (190 lb/min)</td>
<td>On</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>Tension, Fuel Flow ≥ 50 gpm (190 lb/min), hose length within 5 ft (1.5 m) of inner fuelling range</td>
<td>On</td>
<td>Flash</td>
<td>On</td>
</tr>
<tr>
<td>Tension, Fuel Flow &lt; 50 gpm, (190 lb/min), hose length within 5 ft (1.5 m) of inner fuelling range</td>
<td>Off</td>
<td>Flash</td>
<td>Off</td>
</tr>
<tr>
<td>Tension, hose length &lt; inner fuelling range</td>
<td>Off</td>
<td>Flash</td>
<td>Off</td>
</tr>
</tbody>
</table>
d. Exterior Lighting - KC-130H aircraft have overt and covert anti-collision lights. Drogue illumination is provided by overt and infrared (IR) pod and hose illumination lights located on the outboard leading edge of the horizontal stabilizer. These illumination lights have variable intensity controls. KC-130H have two modes of HAAR pod status lights, IR (covert) and normal.

<table>
<thead>
<tr>
<th>KC-130H Tanker Exterior Lighting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lights</strong></td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>a</td>
</tr>
<tr>
<td>b</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>a</td>
</tr>
<tr>
<td>b</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
</tbody>
</table>

4B Refuelling Height/Altitude and Speeds.

a. Height/Altitude Band. HAAR height/altitude band is from 1,000 ft AGL to maximum service ceiling. KC-130H aircraft normally ingress and conduct RV procedures at HAAR altitude.

b. Maximum Hose Extension/Retraction Speed. The maximum hose extension/retraction speed is: 180 KIAS/KCAS with the variable drag drogue (VDD).

c. Speed Range – Variable Drag Drogue. The refuelling airspeed range for the variable drag drogue is 110 to 180 KIAS/KCAS.

d. Maneuver. Tankers should limit bank angle to 30° in the air refuelling configuration to prevent tanker stall. However, if terrain or weather is not a factor, bank angle should be limited to 15°. At high density altitudes and/or high gross weights, the receiver may experience rotor blade stall at bank angles less than 30°. Careful consideration of helicopter limitations should be made with respect to bank angle at high density altitudes.

NOTE
At the receiver’s request, the tanker may use asymmetrical power to reduce turbulence when the right refuelling position is used.
5B Maximum Transferable Fuel. Maximum transferable fuel loads vary with mission type and length. KC-130H aircraft is capable of installing Cabin Auxiliary Fuel Tank (CAFT) to increase transferable fuel. Burn rates provided below are based on a low-level flight profile to and from the HAAR track.

<table>
<thead>
<tr>
<th>Normal fuel load</th>
<th>Fuel load with CAFT</th>
<th>Fuel available after 4HR flight w/o CAFT</th>
<th>Tanker burn rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>58,268 lb (26,430 kg)</td>
<td>81,904 lb (37,151 kg)</td>
<td>34,268 lb (15,543 kg)</td>
<td>6,000 lb/hr (2,720 kg/hr)</td>
</tr>
<tr>
<td>8,568 gal</td>
<td>12,044 gal</td>
<td>5,039 gal</td>
<td>882 gal/hr</td>
</tr>
</tbody>
</table>

NOTE: Fuel loads are based on JP-8 at 6.8 lb/gal.

6B Fuel Transfer Rate. The rate of fuel transfer during HAAR is governed by several factors: the transfer rate capability of the receiver aircraft; the tanker fuel system configuration; and the mode of tanker refueling system operations.

7B Regulated Fuel Pressure.
The IARS pump is designed to provide fuel at varying pressures up to 120 psi at the drogue. Fuel pressure is programmable to accommodate receiver aircraft limitations and needs. Receiver must coordinate required/maximum fuel pressure prior to refuelling if different from the table below.

NOTE
At the delivery pressures the table below, the helicopter tanks may be filled to top off with no valve closure restrictions.

<table>
<thead>
<tr>
<th>Receiver</th>
<th>Pressure (PSIG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UH-60J</td>
<td>35</td>
</tr>
</tbody>
</table>

8B Fuel Types Available for HAAR.
   a. Recommended Fuel. The primary fuel are JP-8 (F-34), JP-4 (F-40), JP-5 (F-44)
   b. Alternate Fuels. Alternate fuels include: Jet A-1 (F-35), Jet A, Jet B.

9B Mark Facilities. Overt or IR strobes and fuel dump.

10B Tanker Dimensions. Aircraft diagram is at Appendix 2 to this Annex. The KC-130H is 97.8 ft (29.8 m) long, with a wingspan of 132.6 ft (40.4 m); the aircraft height is 38.5 ft (11.7 m) and the stabilizer span is 52.7 ft (16.1 m).

11B RV Aids. The KC-130H has the following radar, navigation and RV aids:
   a. VHF, UHF, HF, and SATCOM.
   b. VOR, TACAN, ADF, GPS and INS.
   c. UHF-DF, A/A TACAN (DME only)
d. Weather Radar

12B Source Documents.
J.T.O.1KC-130H-1

List of Appendices.
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APPENDIX B2 TO NATIONAL SRD-JAPAN

KC-130H – EXTERIOR LIGHTING

WING TIP TAXI LIGHTS

POD & HOSE ILLUMINATION LIGHTS

NAVIGATION LIGHTS

LANDING LIGHTS

ANTI-COLLISION STROBE LIGHT

TAI XI LIGHTS

FORMATION LIGHTS

LEADING EDGE LIGHTS

NOTE
TWO YELLOW FUSELAGE LIGHTS AND ADDITIONAL RED AND GREEN WING TIP LIGHTS HAVE BEEN ADDED.

B = BLUE
G = GREEN
R = RED
W = WHITE
Y = YELLOW

AIRPLANES MODIFIED BY TO 1C-130-1776
APPENDIX B3 – ANNEX A TO NATIONAL SRD-JAPAN

RECEIVER DATA – FOR KC-130H TANKER

B3.1. Introduction. The KC-130H is a multi-role, multi-mission tanker/transport that provides in-flight refueling to helicopters when required. Additional tasks performed are aerial delivery of troops and cargo, emergency medevac, evacuation missions, SAR for fighter aircraft involved in overwater flights.

B3.2. AAR Mission Planning and In-flight Data. The following table provides AAR planning data for all receiver aircraft with a technical clearance to conduct refueling operations with the KC-130H tanker.

<table>
<thead>
<tr>
<th>Type RCVR</th>
<th>OPTIMUM ALT/CAS/MACH</th>
<th>RCVR RV CAS</th>
<th>OVERRUN CAS/MACH</th>
<th>RPM/ PUMPS</th>
<th>EQUIPMENTS</th>
<th>VISIBLE SINGE/MULTI</th>
<th>FLOOD LIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>UH-60J</td>
<td>1,000-3,000/120</td>
<td>120</td>
<td>4000/2</td>
<td>X X X X</td>
<td>1NM/2NM</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Source: JASDF

B3.3. Receiver specific information

UH-60J

a. General information

(1) The UH-60J has a probe which is 5feet 7inch (14feet extended) length.
(2) There is an additional light for probe
(3) Rendezvous procedures
   (a) HEAD-ON RV (RV BRAVO)
(b) HEAD-ON OFFSET RV (RV DELTA)
(c) TANKER ORBIT RV (RV ECHO)
(d) EN ROUTE (OVERTAKING) RV (RV GOLF)
(e) RANDOM RV (RV HOTEL)
APPENDIX B4 – ANNEX A TO NATIONAL SRD-JAPAN

KC-130H REFUELING - VISUAL REFERENCES

A4.1. Refueling Position - Visual References. After complete join-up, move to observation position. When tanker ready to transfer fuel, receiver move to pre-contact position. When moving forward from the pre-contact position to the refueling position, the visual references used by receiver aircraft pilots permit them to position their aircraft so that they remain within the tanker’s AAR envelope. The following paragraphs provide guidance to assist pilots to achieve the correct position.

A4.2. Observation Position. (Typical)
Typical observation position for the closest receiver is as follows.
  a. Elevation.
     Above horizontal stabilizer.
     Align horizontal stabilizer tip and national flag marking.
     The horizon cuts on the line of one third of the vertical stabilizer.

  b. Azimuth.
     Outside wingtip and slightly after of tail.
     Align horizontal stabilizer tip and national flag marking.

UH-60J
a. Observation position

Reference Point 1
Reference Point 2

Reference Point 1: The horizon cuts on the line of one third of the vertical stabilizer.
Reference Point 2: Align horizontal stabilizer tip and national flag marking.
b. Pre-contact position

Pre-contact position is 5 to 15 feet from the drogue. Align the corner of flap and pod pylon.

c. Refueling position

Reference Point 1: Pilot nearer to the tanker should look down the dump tube. Reference Point 2: The hose should be in refuelling range.