1. **Introduction.** Sweden has one Lockheed-Martin C-130E tanker aircraft. The designation used within the Swedish Air Force (SweAF) is “TP-84T”. The tanker is mainly used for AAR training and for AAR during exercises, due to operational limitations.

2. **Tanker Aircraft Type**

   Lockheed-Martin C-130E. See Annex A for a detailed description of the C-130E.

3. **National AAR Clearance Process**

   To initiate an assessment for AAR technical compatibility between a receiver and the SweAF C-130E, or a tanker versus the JAS-39 Gripen the requesting nation's aircraft operator needs to submit a written request to the POC for the Swedish SRD and the POC for tanker/receiver clearances. The requesting nation must be prepared to provide required documents for technical assessment of the aircraft's AAR capability, such as a completed Standardized Technical Data Survey (STDS) and specific limitations or restrictions concerning AAR operations.

4. **Receiver Qualification and Currency on SweAF Tanker**

   1) Receiver pilot training is to be conducted in accordance with ATP 3.3.4.2 and applicable flight manuals, where the receiver pilots shall be familiar with the Swedish SRD. Before initial refuelling training is performed receiver pilots are to be briefed on AAR-procedures, -techniques, -communications and -emergency procedures. The theoretical part shall include tanker specifications and descriptions of the AAR-system.

   2) The AAR must be supervised during initial training and re-currency (more than 90 days since last AAR contact).

   3) Receiver pilots should be current during transfer flights or operational flights unless other stated by designated personnel in the SweAF.

   a. **AAR Equipment.** There are 2 Cobham Mk32B-904E removable underwing refuelling pods located between each wing-tip and the outboard engine. The refuelling hose is 23.6 m (78 ft) long and equipped with a JC Carter MA-4 coupling with a Sargent Fletcher high speed soft drogue, see Appendix 1. The
outer diameter of the Drogue is 70 cm (28 inches), and the weight of the drogue (without the coupling) is 6.5 kg (14 lbs).

b. **Refuelling Heights and Speeds.** The operational AAR envelope includes altitudes from 5,000 ft MSL to 25,000 ft STD and airspeeds from 220 KIAS to 250 KIAS, with C-130E engine limitations according to Figure 1 in Annex A.

c. **Maximum Transferable Fuel.** The SweAF C-130E has no specific fuel tank for AAR, which limits the offload capacity. The maximum fuel load is 28.028 kg (61662 lbs). The average fuel burn is 5000 lbs/h during transfer flights and 6000 lbs/h during AAR. The transferable fuel amount is dependent on sortie duration and altitude where the following numbers can be used as an rough estimate for planning purposes:

(1) An offload of 16,690 kg (37,000 lbs) is available for a 750 nm flight and 8260 kg (18,000 lbs) for a 1500 nm flight, assuming a fuel burn rate of 3330 kg/hr (6000 lb/hr) including diversion reserves according to MIL-C-5011A.

d. **Fuel Transferable Rate.** The fuel transfer rate will depend on the receiver and is ranging between 50 US gal/min (190 lit/min) and 300 US gal/min (1136 lit/min), which is the maximum fuel transfer rate.

e. **Regulated Fuel Pressure.** Fuel pressure at the drogue coupling is regulated to 45–55 psi by dual pressure regulators (MA-4).

f. **Fuel Types Available for AAR.** The fuel normally used by the SweAF is MC-75 (No anti-ice) or Jet A1 (MIL JP-8). Fuel type F34 can be provided upon request.

g. **Receiver Types Certified.** The aircraft types presented in Table 1 are certified and technically compatible to refuel form the C-130E.

<table>
<thead>
<tr>
<th>Country</th>
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<th>Technical Compatibility Assessment (TCA)</th>
<th>Clearance (2)</th>
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<tr>
<td>Czech Republic</td>
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<td></td>
</tr>
<tr>
<td>Finland</td>
<td>F/A-18 C/D Hornet</td>
<td>2016-05-20</td>
<td>CAT 3</td>
<td></td>
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<tr>
<td>Hungary</td>
<td>JAS-39 C/D Gripen</td>
<td>2012-05-03</td>
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<td>Sweden</td>
<td>JAS-39 C/D Gripen</td>
<td>2006-10-12</td>
<td>CAT 3</td>
<td></td>
</tr>
<tr>
<td>Switzerland</td>
<td>F/A-18 C/D Hornet</td>
<td>2017-03-15</td>
<td>CAT 3</td>
<td></td>
</tr>
<tr>
<td>Thailand</td>
<td>JAS-39 C/D Gripen</td>
<td>2012-05-03</td>
<td>X</td>
<td>No MOU</td>
</tr>
</tbody>
</table>

Table 1, AAR Compatible Receivers

**Note 1:**
The technical compatibility assessment (TCA) means that the receiver is certified (no further testing is required for the receiver) to perform AAR from the SweAF C-130E, in accordance with this SRD.

**Note 2:**
When bilateral agreements between Sweden and the receiver nation have been established the SweAF states which clearance level the receiver nation has achieved.
AAR Clearance Categories:

Category 1
CAT 1 is used when there is an urgent requirement for an AAR clearance due to war, conflict, contingency operation or other urgent operational need. This clearance will have a limited duration of validity.

Category 2
CAT 2 is used when there is an urgent requirement for an AAR clearance due to war, conflict, contingency operation or other urgent operational need, but with time available to conduct supplemental testing to reduce restrictions in the AAR clearance envelope or reduce limitations that would be imposed on systems/equipment during AAR. This type of clearance requires a thorough Compatibility Assessment, although a read-across may make only an academic Compatibility assessment necessary. This clearance should have a limited duration of validity.

Category 3
CAT 3 is used when an AAR clearance is required in support of routine AAR equipment as defined by the requester. The CAT 3 clearance can have an open-ended duration of validity. It is recommended that all AAR clearances are reviewed periodically to ensure currency.

h. Lighting. The C-130E is equipped with red anti-collision lights, formation lights and strip lights. Flood lights illuminate the hose and six AAR advisory lights at the pod aft fairing indicate Pod system status. For a detailed description of external lightning and Pod advisory lights see Appendix A3 and A4.

i. RV Aids. The C-130E has the following radio, navigation and RV aids:

   (1) VHF, UHF and HF radios.

   (2) VOR, DME, ADF and INS GPS.

   (3) UHF/DF.

5. Source Document


NOTE
WHENEVER A TANKER OR RECEIVER IS MODIFIED IN A WAY THAT MAY HAVE AN IMPACT ON AAR OPERATIONS, THE COMBINATION OF THE TANKER AND RECEIVER CONCERNING TECHNICAL COMPATIBILITY MUST BE REVIEWED. EACH NATION IS RESPONSIBLE TO INFORM APPLICABLE POC:S (ACCORDING TO NATIONAL SRD:S) OF MODIFICATIONS THAT MAY HAVE AN IMPACT ON AAR OPERATIONS.
6. **POC for National SRD**

SWEDISH ARMED FORCES Headquarters Air Force Department  
Attn: Claes Parkner SE-107 85 Stockholm  
Phone: + 46 8 788 81 96 Cell phone: + 46 70 512 81 96  
Mail: claes.parkner@mil.se

7. **POC for Tanker/Receiver Clearances**

FMV T&E  
Chief Test Engineer, Nils Lundqvist  
Nobymalmsvägen 5  
58013 Linköping  
Phone: + 46 13 243193 Cell phone: + 46 70 3128939  
Mail: nils.lundqvist@fmv.se

8. **POC for STANEVAL**

(As for National SRD)


10. **National Reservations**

   a. The SweAF C-130E is only cleared for the following RV Procedures: RV Alpha, RV Echo, RV Foxtrot and RV Golf.

11. **List of Annexes and Appendices**

**APPENDIX**  

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ANNEX A – C-130E

1. **Introduction.** Sweden has one Lockheed C-130E tanker aircraft. The designation used within the Swedish Air Force (SweAF) is “TP-84T”.

2. **AAR Equipment.** There are two Cobham Mk32B-904E removable underwing refuelling pods located between each wing-tip and the outboard engine, see Appendix A2. The refuelling hoses are 23.6 m (78 ft) long and equipped with JC Carter MA-4 couplings with Sargent Fletcher high speed soft drogues, see Appendix A4. The outer diameter of the Drogue is 70 cm (28 inches), and the weight of the drogue (without the coupling) is 6.5 kg (14 lbs).

3. **Refueling Heights and Airspeeds.** The operational AAR envelope includes altitudes from 5,000 ft MSL to 25,000 ft MSL and airspeeds from 220 KIAS to 250 KIAS, with C-130E engine limitations according to Figure 1.

![Figure 1, SweAF C-130E AAR Envelope](image-url)
4. **Maximum Transferable Fuel.** The SweAF C-130E has no specific fuel tank for AAR, which limits the offload capacity. The maximum fuel load is 28.028 kg (61662 lbs). The transferable fuel amount is dependent on sortie duration and altitude where the following numbers can be used as an rough estimate for planning purposes;

   a. An offload of 16,690 kg (37,000 lbs) is available for a 750 nm flight and 8260 kg (18,000 lbs) for a 1500 nm flight, assuming a fuel burn rate of 3330 kg/hr (6000 lb/hr) including diversion reserves according to MIL-C-5011A.

5. **Fuel Transfer Rate.** The fuel transfer rate will depend on the receiver and is ranging between 50 USgal/min (325 lbs/min) and 300 USgal/min (2112 lbs/min), which is the maximum fuel transfer rate.

6. **Regulated Fuel Pressure.** Fuel pressure at the drogue coupling is regulated by dual pressure regulators (MA-4) to a pressure ranging between 45 to 55 psi.

7. **Fuel Types Available for AAR.** The fuel normally used by the SweAF is MC-75 (No anti-ice) or Jet A1 (MIL JP-8). Fuel type F34 can be provided upon request. The following fuel types could be used by the C-130E:

   **C-130E Primary fuels:**
   - JP-8 MIL-DTL-83133 (F-34 )
   - JP-8+100 MIL-DTL-83133 ( F-37 )
   - JP-4 MIL-DTL-5624 ( F40)
   - JP-5 MIL-DTL-5624 (F44)
   - JET-A
   - JET-A1
   - JET-B

   **C-130E Emergency fuels:**
   - F-12, F-18, F-22

8. **Lighting.**

   a. **Aircraft Lights**
      The SweAF C-130E has red anti-collision lights located on the top and bottom of the fuselage. Wing leading edge illumination lights and blue formation lights are located on the upper surface of the wings and fuselage. To assist in night formation, three strip lights are located on each side of the aircraft at the following locations. See Appendix A3 for a detailed description of the exterior lights.
b. AAR Pod Advisory Lights
Six AAR advisory lights are located at the pod aft fairing according to Appendix A4.

c. Mark Facilities.
Fuel dump from wing-tips.


9. RV Aids. The C-130E has the following radio, navigation and RV aids:
   a. VHF, UHF and HF radios.
   b. VOR, DME, ADF and INS/GPS.
   c. UHF/DF.

10. Limitations / Restrictions
   a. The SweAF C-130E has no specific fuel tank for AAR, which limits the offload capacity. See paragraph 4.
   b. The AAR envelope is limited to 220 to 250 KIAS due to an increased risk for hose sine waves at lower airspeeds. The maximum airspeed is limited on altitudes above 14000 ft MSL due to engine limitations, with a maximum airspeed of 225 KIAS at 25000 ft MSL, see Figure 1.
   c. Flying with hoses extended is prohibited under actual moderate or severe icing conditions.
   d. Flying with hoses extended is prohibited under actual moderate or severe turbulence.
   e. Receiver drogue contacts using NVG is prohibited due to the lack of NVG compatible pod Advisory Lights.

11. List of Appendices

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<tr>
<td>Appendix A4</td>
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Figure 4, C-130E Dimensions
Cobham Mk32B-904E Refueling Pod

Hose markings and overall view with one receiver in fuel transfer zone
APPENDIX A3
C-130E EXTERIOR LIGHTS

Pod Advisory Lights and Fuselage Formation Light

Horizontal Tail Hose Flood Light and Inflight Refuelling Strip Light
Wing Tip Formation Light
12. **AAR Pod Advisory Lights**
Six AAR advisory lights are located at the pod aft fairing arranged in a semi-circular pattern with green, amber and red colours (two lights for each colour), according to Figure 1. The advisory lights indicate the AAR system status according to Table 1. NVG compatible advisory lights are located beside each regular advisory light, but not in function.

<table>
<thead>
<tr>
<th>AAR Pod Advisory Light</th>
<th>AAR System Status / Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steady Red</td>
<td>Pod malfunction or hose not in position / Do not make contact (If already in contact; disconnect and stay clear of hose)</td>
</tr>
<tr>
<td>Flashing red</td>
<td>Breakaway signal / Break away and stay out of hose</td>
</tr>
<tr>
<td>Steady Amber</td>
<td>Hose in full trail / System ready for contact</td>
</tr>
<tr>
<td>Steady Green</td>
<td>Fuel flow &gt; 50 US Gal/min / Confirm Fuel Flow</td>
</tr>
<tr>
<td>Flashing Amber and Steady Green</td>
<td>Hose pushed in close to inner refuelling limit with maintained fuel flow / Stop closure and increase distance to pod</td>
</tr>
<tr>
<td>Flashing Amber</td>
<td>Hose pushed in further than inner refuelling limit (Fuel flow stopped) / Increase distance to pod</td>
</tr>
</tbody>
</table>

Table 1, Advisory Lights

When conducting night AAR operations, the hose markings near the pod exit will be illuminated by two white POD tunnel lights.

The drogue canopy is equipped with six LED lights according to Figure 2. A pod and hose flood light with variable intensity is located on the leading edge tip of the horizontal stabilizer.
The Sargent Fletcher drogue canopy is equipped with six LED lights according to Figure 2.
## 1. General Information

The JAS-39 Gripen C/D is equipped with a telescopic retractable Air to Air Refueling probe located on the left side of the fuselage behind the air intake according to Figures 1 and 2.

The JAS-39C/D is not equipped with a probe light.

### Figure 1. Probe nozzle position JAS39C single seater

### Figure 2. Probe nozzle position JAS39D dual seater
2. **AAR Operations and Restrictions**

The AAR envelope includes airspeeds from 185 KIAS to 325 KIAS at altitudes up to 25000 ft MSL and airspeeds from 200 KIAS to 325 KIAS/M0.9 at altitudes from 25000 ft to 33000 ft MSL. The optimum airspeed during AAR is 280 KIAS.

Due to the lack of a probe light, refueling during night conditions is only recommended from a tanker with fully functional external lighting and drogues equipped with LED lights. Refueling during night conditions should be performed with care.

Primary fuel is F-34 (JP-8) and F-35 (JP-1). Receiver Pilots should be informed by tanker crew when JET-A1 fuel is transferred to register flight hours.

The preferred RV procedures are, in order of priority, Alpha, Echo, Golf and Foxtrot

---

**WARNING**

(BDA) DUE TO THE POSITION OF THE REFUELING PROBE, BDA REFUELING IS PROHIBITED

(POD) REFUELING WITH DEGRADED FLIGHT CONTROL SYSTEM IS NOT AUTHORIZED

---

**CAUTION**

(POD) A PIN LOCATED ON THE LOWER SIDE OF THE PROBE, BEHIND THE NOZZLE COULD CAUSE DAMAGE TO THE DROGUE CANOPY
3. General Information
The F-18C/D Hornet is equipped with a retractable Air to Air Refueling probe located on the right side of the fuselage in front of the cockpit, see Figure 1.
The F-18C/D has a probe light located close to the mounting for the refueling probe arm.

4. AAR Operations and Restrictions
The AAR envelope includes airspeeds from 175 KIAS to 300 KIAS at altitudes up to 40000 ft MSL.

Primary fuels:
- JP-8 MIL-DTL-83133 (F-34)

Alternate fuels:
- JP-4 MIL-DTL-5624 (F40)
- JP-5 MIL-DTL-5624 (F44)
- JET-A1 could be used for a maximum of 10 fh.
- JP-8+100 MIL-DTL-83133 (F-37) only used as emergency fuel