



10 September 2007

NSA/0835(2007)-DPP/2946

See Distribution List: EAPC(NPC – PHEWG)

STANAG 2946 DPP (EDITION 2) – AIRCRAFT FORWARD REFUELLING EQUIPMENT

References:

- A. DPP(LOG)(2005)0208(FUELS), dated 20 December 2005 (Edition 2 Ratification Draft 2) (English version)
- B. DPP(LOG)(2006)0001(FUELS), dated 06 January 2006 (French version)

- 1. The enclosed NATO Standardization Agreement, which has been ratified by nations as reflected in the **NATO Standardization Document Database (NSDD)**, is promulgated herewith.
- 2. The references listed above are to be destroyed in accordance with local document destruction procedures.

ACTION BY NATIONAL STAFFS

- 3. National staffs are requested to examine their ratification of the STANAG and, if they have not already done so, advise the Chairman, NATO Pipeline Committee (AC/112) of their intention regarding its ratification and implementation.

A handwritten signature in blue ink, appearing to read 'Juan A. Moreno', is written over a horizontal line.

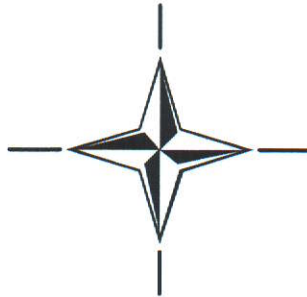
Juan A. MORENO
Vice Admiral, ESP(N)
Director, NATO Standardization Agency

Enclosure:

STANAG 2946 (Edition 2)

NATO Standardization Agency – Agence OTAN de Normalisation
B-1110 Brussels, Belgium Internet site: <http://nsa.nato.int>
E-mail: van-exem.philippe@hq.nato.int – Tel 32.2.707.4564 – Fax 32.2.707.4843

**NORTH ATLANTIC TREATY ORGANIZATION
(NATO)**



**NATO STANDARDIZATION AGENCY
(NSA)**

**STANDARDIZATION AGREEMENT
(STANAG)**

SUBJECT: AIRCRAFT FORWARD AREA REFUELLING EQUIPMENT

Promulgated on 10 September 2007

A handwritten signature in blue ink, belonging to Juan A. Moreno. The signature is fluid and cursive, with a long horizontal stroke at the end. It is positioned above the printed name and title.

Juan A. MORENO
Vice Admiral, ESP(N)
Director, NATO Standardization Agency

RECORD OF AMENDMENTS

No.	Reference/date of Amendment	Date Entered	Signature

EXPLANATORY NOTES

AGREEMENT

1. This NATO Standardization Agreement (STANAG) is promulgated by the Director NATO Standardization Agency under the authority vested in him by the NATO Standardization Organisation Charter.
2. No departure may be made from the agreement without informing the tasking authority in the form of a reservation. Nations may propose changes at any time to the tasking authority where they will be processed in the same manner as the original agreement.
3. Ratifying nations have agreed that national orders, manuals and instructions implementing this STANAG will include a reference to the STANAG number for purposes of identification.

RATIFICATION, IMPLEMENTATION AND RESERVATIONS

4. Ratification, implementation and reservation details are available on request or through the NSA websites (internet <http://nsa.nato.int>; NATO Secure WAN <http://nsa.hq.nato.int>).

FEEDBACK

5. Any comments concerning this publication should be directed to NATO/NSA – Bvd Leopold III - 1110 Brussels - BEL.

Agreed English/French texts

STANAG 2946
(Edition 2)

NAVY/ARMY/AIR

NATO STANDARDIZATION AGREEMENT
STANAG

AIRCRAFT FORWARD AREA REFUELLING EQUIPMENT

Related documents: STANAG 2947 SILCEP - Technical Criteria for a Closed Circuit Refuelling System

STANAG 3105 ASSE - Pressure Refuelling Connections and Defuelling for Aircraft

STANAG 3149 DPP - Minimum Quality Surveillance of Petroleum Products

STANAG 3212 ASSE - Diameters for Gravity Filling Orifices

STANAG 3294 ASSE - Aircraft Fuel Caps and Fuel Cap Access Covers

STANAG 3632 AE - Aircraft and Ground Support Equipment Electrical Connections for Static Grounding

STANAG 3681 SILCEP - Criteria for Pressure Fuelling/Defuelling of Aircraft

STANAG 3756 SILCEP - Facilities and Equipment for Receipt and Delivery of Aviation Kerosene and Diesel Fuels

STANAG 7029 SILCEP - Characteristics of Aircraft Fuelling Hoses and Couplings

STANAG 7102 DPP - Environmental Protection Handling Requirements for Petroleum Handling Facilities and Equipment

AIM

1. The aim of this agreement is to provide standardized performance requirements and hardware interfaces to allow forward area turbine fuel refuelling of member nation aircraft (fixed and rotary wing).

AGREEMENT

2. Participating nations agree that the criteria established by the following paragraphs will apply in the selection of hardware for forward area refuelling equipment.

GENERAL REQUIREMENTS

3. The forward area refuelling equipment selected and provided for the purpose of cross-servicing shall have the capability of refuelling other member nations' aircraft and provide a desired refuelling turnaround time of 15 minutes or less for rotary wing aircraft and 20 minutes or less for fixed wing aircraft.

DETAILED REQUIREMENTS

4. Forward area refuelling equipment must be capable of safely performing both types of refuelling evolutions:

- a. Normal refuelling -- refuelling with engines shutdown and all non-refuelling systems inactive (also known as cold refuelling)
- b. Rapid refuelling – refuelling with one or more engines operating (also known as hot refuelling)

5. Forward area refuelling equipment must support both open port (gravity) and pressure refuelling techniques.

- a. Some nations' safety requirements may prohibit open port (gravity) rapid refuelling
- b. Pressure refuelling (using the STANAG 3105 adapter or STANAG 2947 Closed Circuit Refuelling equipment) is the preferred method for conducting rapid refuelling

6. Forward area refuelling equipment shall be capable of delivering the following flow rates:

- a. Open port (gravity) refuelling of all aircraft – minimum flow rate of 190 litres per minute (50 US gallons per minute) per refuelling point.
- b. Pressure refuelling:
 - (1) Closed circuit refuelling nozzle (rotary wing aircraft only) – minimum flow rate of 190 litres per minute (50 US gallons per minute) per refuelling point.

- (a) The provision of this capability is mandatory only for those member nations that operate rotary wing aircraft equipped with CCR refuelling adapters. Provision of this capability is optional for all other member nations.
- (b) As stated in STANAG 2947, system operating conditions are flow rates of 0 to 570 litres per minute (0 to 150 US gallons per minute) at 138 to 863 kPa (20 to 125 psi) nozzle inlet pressure. The closed circuit refuelling nozzle shall contain an internal pressure regulator to limit the nozzle outlet pressure so that it does not exceed 104 kPa (15 psi).

(2) Single point pressure refuelling nozzle.

- (a) Pressure limitation. As stated in STANAG 3681, the single point pressure refuelling nozzle outlet pressure shall not exceed 379 kPa (55 psi). Momentary surge pressure downstream of the nozzle shall not exceed 827 kPa (120 psi). Use of a hose end pressure regulator is an acceptable means to meet both requirements.
- (b) Systems designed for refuelling rotary wing aircraft – minimum flow rate of 190 litres per minute (50 US gallons per minute) per refuelling point.
- (c) Systems designed for refuelling fixed wing aircraft – minimum flow rate of 760 litres per minute (200 US gallons per minute) per refuelling point.

7. Refuelling nozzles

- a. Open port refuelling nozzles. Open port refuelling nozzle shall be sized to meet the gravity filling orifice interface dimensions specified in STANAG 3212. Open port refuelling nozzles shall be operated by a squeeze trigger grip. Fuel flow must cease when pressure on the trigger is released.
- b. Closed circuit refuelling nozzles. Closed circuit refuelling nozzle criteria are specified in STANAG 2947.
- c. Single point pressure refuelling nozzle. Single point pressure refuelling nozzles shall comply with the interface dimension requirements of STANAG 3105.

IMPLEMENTATION OF THE AGREEMENT

8. This STANAG is implemented when a nation has issued instructions that all future forward area refuelling equipment procured for its forces will meet the details of this agreement.