STANDARDS RELATED DOCUMENT

AAR-SRD-1

A GUIDE TO OBTAINING AIR-TO-AIR REFUELING CLEARANCES AND COMPATIBILITY ASSESSMENTS

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NORTH ATLANTIC TREATY ORGANIZATION

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NORTH ATLANTIC TREATY ORGANIZATION (NATO)

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NATO LETTER OF PROMULGATION

16 May 2018

1. The enclosed Standards Related Document AAR-SRD-1, Edition B, Version 1, A GUIDE TO OBTAINING AIR-TO-AIR REFUELING CLEARANCES AND COMPATIBILITY ASSESSMENTS, which has been approved in conjunction with ATP-3.3.4.2 by the nations in the Military Committee Air Standardization Board (MCASB), is promulgated herewith.

2. AAR-SRD-1, Edition B, Version 1 is effective upon receipt and supersedes AAR-SRD-1, Edition A, Version 1 which shall be destroyed in accordance with the local procedure for the destruction of documents.

4. This publication shall be handled in accordance with C-M(2002)60.

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RECORD OF RESERVATIONS

CHAPTER	RECORD OF RESERVATION BY NATIONS
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RECORD OF SPECIFIC RESERVATIONS

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Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.	

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CHAPTER 1 INTRODUCTION

NOTE

THE PROCEDURE CONTAINED WITHIN IS INTENDED AS A GUIDE FOR NATIONAL OR MULTI-NATIONAL AAR CLEARANCE STANDARDIZATION.

THE PROCESS IS NOT MANDATORY AND DOES NOT SUPERSEDE NATIONAL PROCEDURES.

1.1. INTRODUCTION

An Air-to-Air Refuelling (AAR) Clearance is the result of assessed risk determined to be acceptable for conducting AAR between tanker and receiver aircraft as well as legal, financial and political considerations. In AAR there are two types of risk to consider—technical and operational. Technical risk is assessed through a Technical Compatibility Assessment (TCA). A TCA is accomplished to determine the airworthiness and technical risk of a tanker and receiver pairing. This is further discussed in Chapter 3. Operational Risk is assessed through an Operational Compatibility Assessment (OCA) discussed in Chapter 4. An OCA is accomplished to determine individual and organizational qualification and operational risk in conducting AAR.

1.2. BACKGROUND

1. This Standards Related Document (SRD) explains an acceptable means of complying with the above assessments and presents general guidelines for nations and organizations/agencies to navigate these processes. It also provides standardized definitions and terms to ensure greater international interoperability. There are three AAR Clearance categories (1, 2, & 3). These clearance category numbers are based on a TCA. However, before aircraft are tasked, the TCA should be considered in conjunction with an OCA as well as the legal, financial considerations. For the purposes of this document, a completed clearance means that technical and operational considerations have been addressed and a Commander can then task their assets. A published AAR TCA for a specific tanker/receiver combination only verifies that the subject tanker and receiver are technically capable of conducting AAR. Importantly, a TCA does not constitute an authority or clearance to conduct AAR operations. That authority is ultimately a Commander's decision which should take into account the results of TCAs and/or OCAs or any other considerations.

2. The national procedures for addressing all aspects of a clearance vary from nation to nation and specific procedures are not currently mandated by any NATO STANAG. Annexes to this SRD aim to supply nations with an acceptable means of complying with TCAs and OCAs. Ultimately, the conduct of AAR is the result of national and bi-lateral agreements.

1.3. AAR COMPATIBILITY REPOSITORY

1. In order to facilitate multi-national AAR operations, a repository of Compatibility Assessment documentation is required. The national and organizational SRDs to ATP-3.3.4.2 comprise the only common source where AAR compatibility details can be found. The AAR Compatibility and Clearance Matrix is a quick reference guide to the clearance and compatibility to what is reported by the nations in their SRDs.

The National/Organizational SRDs are the primary reference documentation and should always be referenced when planning or conducting AAR operations.

2. In order to ensure the most accurate clearance and compatibility information as is possible is available to commanders, planners and operators, nations and organizations should:

- Maintain accurate and complete SRDs in accordance with the template located at www.japcc.org/aar.
- Make SRDs available to their applicable crews.
- Submit their SRDs to the custodian of the AAR Compatibility and Clearance Matrix.

3. The matrix custodian will make SRDs available for international use and will update the above-mentioned matrix with updated clearance and compatibility information.

4. The AAR Compatibility and Clearance Matrix can be viewed at www.japcc.org/aar and its custodian can be reached at aar@japcc.org.

CHAPTER 2 AAR CLEARANCE CATEGORIES, REQUESTS AND DOCUMENTATION

2.1. AAR CLEARANCE CATEGORIES

There are three AAR Clearance categories. While clearances in total include the TCA, OCA and other considerations, the numerical assignment will be TCA-driven as further described in the paragraphs below. Ultimately, nations individually determine, through assessments, the clearance category of their own aircraft paired with another nation's aircraft. Therefore, a category assigned by the tanker or receiver nation when assessing their pairing can differ between the two nations.

2.1.1 Category 1

Definition. No requisite technical aspects regarding airworthiness/safety of flight for the targeted tanker/receiver pairing have been satisfied through acceptable means of compliance for the targeted scope specified by the nation requesting and/or conducting the analysis, beyond an in-principle form/fit desktop evaluation of available data.

Amplifying information. A level of safety as required by the agreed certification basis (set of criteria to be assessed by test, evaluation and certification community) cannot be assured for any portion of the scope of the AAR envelope. Mitigation of residual technical risk depends entirely on engineering judgement.

2.1.2 Category 2

Definition. Some of the requisite technical aspects regarding airworthiness/safety of flight for the targeted tanker/receiver pairing have been satisfied through acceptable means of compliance for the targeted scope specified by the nation requesting and/or conducting the analysis.

Amplifying information. A level of safety as required by the agreed certification basis (set of criteria to be assessed by test, evaluation and certification community) can be partially assured for the scope of the AAR envelope. Some aspects within the scope of the AAR envelope have not been evaluated, while the associated residual technical risk cannot be mitigated through limitations on the scope of the AAR envelope. For CAT 2 residual technical risks, the only mitigation resides in restricting the chance of exposure through limiting how long a clearance is valid.

2.1.3 Category 3

Definition. All requisite technical aspects regarding airworthiness/safety of flight for the targeted tanker/receiver pairing have been satisfied through acceptable means of compliance for the targeted scope specified by the nation requesting and/or conducting the analysis.

Amplifying information. The CAT 3 may be deliberately limited to any acceptable scope provided it has been completely evaluated for all required technical aspects within this scope. The full level of safety required by the pre-agreed certification basis can be assured, in accordance with applicable national requirements.

2.2 CONSIDERATIONS FOR ALL CATEGORIES

2.2.1 Risk

Each clearance category carries a different level, amount and type of risk. Broadly speaking, a CAT 1 has a higher level of risk than a CAT 2 which has a higher level of risk than a CAT 3. There are three owners of risk in terms of AAR—the tanker nation, the receiver nation, and the nation where the AAR event takes place, although, the location of the event may yet to be determined, thus, this risk is difficult to quantify. Risks to all three should be considered at the appropriate level. Lastly, nations should not be content to operate on CAT 1 clearances indefinitely unless the likelihood of the pairing conducting AAR Ops is remote. In which case, the CAT 1 would be simply an indicator to planners, that the pairing is a possibility.

2.2.2 Duration of validity

Clearances can have an open-ended duration of validity, but are subject to review if there are changes impacting key elements of the AAR Clearance such as changes in tanker/receiver equipment, visual aids, refuelling/mission procedures and other specifications to be eventually discussed in future versions of the Standardized Technical Data Survey (STDS, Annex B). In addition, it is recommended that all AAR clearances be reviewed periodically to ensure currency.

2.2.3 Cost

The cost of obtaining clearances will be mutually agreed by the tanker and receiver nations or a third party who may be involved in the clearance process.

2.2.4 Certification and the categories

Since CAT 1 and CAT 2 clearances do not satisfy the full level of safety required by the pre-agreed certification basis can be assured, these clearances would typically not qualify for certification by relevant aviation authority. Therefore, operations under a CAT 1 or CAT 2 would be akin to operations under an exemption having been subject of technical risk management. In contrast, a CAT 3 having satisfied all relevant certification specifications would qualify for certification by the relevant aviation authority. It is understood that at this time not all nations conduct certification under an independent aviation authority and thus the organization they do use might have equivalent terms such as “qualification” / “approval” which essentially equate to “certification” as it applies to this paragraph.

2.3 FORMALIZED AAR CLEARANCE REQUEST

A formal request for an AAR Clearance can be initiated by a tanker or receiver or third party. National Standards Related Documents (SRD) to ATP 3.3.4.2 outline to whom the request should be sent and may include what additional information should be included. If National SRDs do not contain a formatted request template, Annex A contains a suggested template and a list of suggested information to include with the request.

2.4. AAR CLEARANCE/AUTHORIZATION DOCUMENTATION

The formal authorization to conduct AAR varies by nation and may be manifested in an Execution Order, Operations Order, Air Tasking Order, schedule, or other formalized bi-lateral agreement. Nations at a minimum should reflect (in chart, list or other form) the status of TCAs and OCAs in their National SRD and should also list completed clearances to the maximum extent possible.

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CHAPTER 3 AAR TECHNICAL COMPATIBILITY ASSESSMENT

3.1 TECHNICAL COMPATIBILITY ASSESSMENT (TCA)

1. Safe, efficient AAR operations between two or more aircraft are dependent on their technical compatibility. NATO STANAGs provide standardized specifications for AAR equipment. The Technical Compatibility Assessment confirms that the aircraft are (or are not) able to mechanically couple, off-load or on-load fuel and then decouple without damaging either aircraft or creating an unsafe situation. The Technical Compatibility Assessment is conducted by the test and evaluation and engineering organizations of both tanker and receiver aircraft. There are multiple means of conducting a TCA which can include verification through analysis of flight, ground, or lab test data and/or validation through read-across using acceptable data collected previously or by third parties. Finally, even if all desired testing and data collection/analysis is completed, there may be some incompatibilities that are identified and limitations may need to be in place to negate this incompatibility.

2. Each nation should confirm via bi-lateral or multi-lateral agreements that the aircraft they operate complies with applicable agreed upon AAR design standards such as the following NATO standards. (Reference most current NATO ATP-3.3.4.5 STANAG 7191), NATO ATP-3.3.4.7 (STANAG 7215), NATO ATP-3.3.4.2 (STANAG 3971), and NATO ATP-3.3.4.6 (STANAG 3447)).

3.1.1 TCA Content

A TCA should include all available detail and may include, but is not limited to, all/or some of the following not included in ATP 3.3.4.2, aircraft documentation, or the tanker or receiver National SRD:

a. The specific aircraft and nations for which the TCA is valid

b. Compatibility envelope for the specified aircraft.

c. Limitations. The limitations specific to either the tanker or the receiver aircraft for the purposes of mitigating risk during AAR.

d. Procedural requirements specific to the tanker and receiver pairing.

e. Cautions and Warnings. The warnings and cautions for both the tanker and receiver.

f. General Information. Any additional information with respect to the aircraft and procedures, relevant to AAR.

g. Associated References. Documentation relevant to the compatibility certification process including existing compatibility documentation or data.

h. Continued airworthiness. Any limitations or procedural changes affecting the aircraft maintenance program should be addressed and incorporated in the relevant aircraft documentation such as maintenance manuals.

Note: The specific decision to ignore a portion or all of the TCA will be considered addressing that aspect.

3.2. CONSIDERATIONS FOR A SUCCESSFUL TCA PROCESS:

A successful outcome will be enabled by:

a. An open and rapid exchange of information between all agencies through any manner including but not limited to meetings to involve technical, operational and identified test agencies as well as aircraft hardware manufacturers.

b. Ready availability and maximum use of applicable technical information including full access to accurate data from all equipment manufacturers. Nations and commercial operators that appoint either the OEM or another representative as the platform Engineering Authority should confirm that responsibility for engineering related communication has been transferred to that party.

c. Ready availability and use of a fully completed Standardized Technical Data Survey (STDS) for receiver and tanker aircraft specifying refuelling method to be used. See ANNEX B for details on the STDS.

d. Mutual agreement on the applicable Certifications Specifications and Acceptable Means of Compliance.

e. An early consensus on AAR requirements including, but not limited to factors such as where will the AAR be conducted, in what weather, whether or not the AAR clearance is required for day and/or night operations, and if night vision devices will be used.

3.3. ELEMENTS OF THE TCA PROCESS

In order to accomplish a TCA, nations will identify the agreed scope that such assessment should cover. This scope is submitted in a request (ANNEX A). Once a request is accepted, there will be a need for sharing of relevant data to identify whether or not a requested technical compatibility is in principle feasible. An STDS as described in ANNEX B of this SRD can aid nations/organizations in fulfilling this requirement. After determining the feasibility of technical AAR compatibility within the agreed scope, the involved parties then must agree on the relevant criteria

against which to perform the assessment. This is often referred to as a “certification basis” although it is acknowledged that some nations may refer to this as “qualification” or “approval”. Certification Specifications covering all conceivable relevant criteria for certification of a tanker/receiver pairing known to date should be developed. These Certification Specifications are used for developing the certification plan which can take different forms in varying organizations. Such a plan will identify acceptable means of compliance. Where these acceptable means of compliance are identified as requiring flight test, a test plan is developed with applicable flight test techniques. ANNEX C through F of this SRD contain generic test plan suggestions for Boom/Receptacle and Probe/Drogue pairings as required.

3.4. SCOPE

Nations may agree to restrict the targeted/requested AAR envelope for various reasons such as a limited resource of money, time, and asset or personnel availability. It should be noted that even in the case of such a voluntarily limited scope, a TCA that satisfactorily meets all applicable certification specifications will still be able to support a CAT 3 clearance.

3.5. READ-ACROSS

The TCA process will be greatly assisted, and potentially accelerated, by the provision of previous AAR Compatibility Assessments and/or Clearances between specified receiver aircraft and specified tankers (from a different nation). Further, if the receiver aircraft data is technically and operationally similar (e.g. a variant of another nation’s receiver), the depth and scope of the AAR Compatibility Assessment Process may be significantly reduced. This read-across of information may contain evidence from previous Compatibility Assessments, AAR envelope parameters, cautions, warnings and general information that is important to note. Furthermore, accreditation of the organizations/authorities involved with production of the relevant data in the TCA used for read-across reference, renders this as acceptable data thus removing the requirement for verification.

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CHAPTER 4 AAR OPERATIONAL COMPATIBILITY ASSESSMENT

4.1 OPERATIONAL COMPATIBILITY ASSESSMENT

1. The Operational Compatibility Assessment (OAC) is a process which assesses the ability and risk of two aircraft, conducting AAR in accordance with operational considerations and procedures. This assessment considers operational aspects such as role, configuration, environment, procedures, crew training and currency.

2. ATP-3.3.4.2 details NATO AAR procedures with individual national SRDs covering data and procedures specific to AAR-capable countries, agencies and organizations. OCAs should be conducted by the command element that operates the aircraft being assessed. The applicable staff conducting an OCA should make every effort to brief their Commanders on the risk they will be accepting for the particular assessed pairing.

4.2 CONSIDERATIONS FOR OPERATIONAL COMPATIBILITY ASSESSMENT

An OCA should consider and may include, but is not necessarily limited to, all/or some of the below aspects. These aspects may or may not be addressed in ATP 3.3.4.2, aircraft documentation, or the tanker or receiver National SRD.

a. The specific aircraft and nations for which the OCA is valid.

b. Crew compliment (or composition), qualification, training, currency, and experience. Nations should decide whether they are satisfied with the above standards or those of the nation with which they will be conducting AAR. Considering a nation’s training/evaluation program does not necessarily require an audit. ATP 3.3.4.2 SRD 2 discusses some topics to consider with regard to training; however, each nation may have its own requirements for the applicable entity with whom they may be conducting AAR and these should be listed within their SRD.

c. Maintenance organization. For the purposes of the OCA, maintenance organization is considered to be how the maintenance units train and execute their maintenance programs. To address or consider maintenance organization for an OCA does not necessarily require an audit of such organizations.

d. Trust. Ultimately, an OCA, like a TCA and the entire compatibility and clearance process, relies heavily on trust and relationships between two nations.

e. Environment where AAR will be conducted to include threat, mission workload, and the use of Night Vision Devices.

f. Type of mission to be conducted before, during, or after the AAR by the receiver or tanker.

g. Operations tempo to include crew fatigue, duty cycles and circadian rhythm.

h. Operational necessity of a given pairing.

i. Political considerations and caveats.

Note: The specific decision to ignore a portion or all of the OCA is considered addressing that aspect.

To aid nations in completing an OCA, a template has been included at ANNEX G.

CHAPTER 5 OTHER CONSIDERATIONS OF AAR

5.1 OTHER CONSIDERATIONS OF AAR

Legal and financial agreements, memorandums of understanding, or common framework that permits the multinational AAR activity. Fiscal and legal arrangements are a critical component of being able to conduct AAR operations. Although these items are typically bilateral in nature, or tied to a specific operation or theatre, it is recommended that they be addressed early in the AAR clearance process. Many of the required agreements can take months to years to formalize.

5.2 LEGAL CONSIDERATIONS

Some key legal issues relate to liability in the case of an accident or incident. Possible legal mechanisms that could satisfy agreements are: Status of Forces Agreements, bi-lateral or multi-lateral agreements, Special Instructions (SPINS) or operations plans for specific theatres of operation. Third-party liability should also be considered with regard to who owns the airspace in, or the land over, which the AAR will be conducted.

5.3 FISCAL CONSIDERATIONS

Some of the key fiscal issues relate to how payment for flight hours and fuel will be handled, and how will transit time or loiter time be paid for if conducting operations with numerous nations. Compensation for services can be done using multinational/bi-lateral agreements such as the Air Transport and Air to Air Refuelling and other Exchange of Services (ATARES) Agreement, cross servicing agreements, replacement in kind agreements, Foreign Military Sales agreements, or with cash transfers.

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ANNEX A CLEARANCE COMPATIBILITY ASSESSMENT CHECKLIST INSTRUCTIONS

Annex A contains a suggested template and a list of suggested information to include with the request.

TCA Category sought. (CAT1, CAT2, CAT3)

- Estimated magnitude of support. Location and timeline of support required.
- Operational Mission Requirements
- Type of refuelling system involved. (hose/drogue, boom/receptacle, BDA or all three)
- Type and mark of all aircraft requiring AAR. (Can be model i.e. F-16D, receiver flagged nation)
- Authority for direct contact with receiver and tanker aircraft manufacturers, AAR system manufacturers, OEM or others.
- POC of receiver and tanker aircraft and AAR system manufacturers, OEM or others.
- Previous AAR clearances between the designated receiver and other tankers.
- Fuel type required

The Clearance Compatibility Assessment Checklist included in this Annex is produced and maintained by ARSAG and works in concert with the Standardized Technical Data Survey documents (ANNEX C , ANNEX D ANNEX E ANNEX F).

- The checklist is prepared to insure all aspects of the aerial refuelling operation are considered and to assist both the technical and operational agencies for assuring the tanker and the receiver aircraft are compatible for safe aerial refuelling operations. The category level 1, 2, or 3 is to be specified by the requesting agency. These 3 levels are described in paragraph **Error! Reference source not found.** of this SRD.
- The chart provides for assessment items for the three aerial refuelling methods, Boom/Receptacle, Probe/Drogue, and BDA Kit.

- The items for assessment consideration cover several areas of interface for both the tanker and the receiver aircraft. Some items apply to the tanker/receiver direct interface system and others are peculiar to each aircraft as designated.

- Evaluation Assessment: The evaluation assessment covers normal system functions, analysis, STDS questions completed, contractor data (interface documents), similarity claims to previous testing/analyses, restrictions, laboratory, and ground and flight tests with and without instrumentation.

- Category 1 Evaluations: It can be noted that actual testing may not be possible and therefore the evaluation assessment will necessarily be restricted to existing data obtained from contractor interface data and the STDS questionnaire (contractor technical documents etc. type data). In some cases similarity to other A/C may be used. Functional checks of all aerial and fuel systems should be a mandatory check as appropriate. The Category 1 should utilize AR restrictions when substantial technical/test data is not available. This could include fuel top-off restrictions (over pressure concerns), limited AR speeds and altitudes. When ground support equipment (GSE) is available it should be used to its fullest, for functional A/C systems checkout.

- Category 2 Evaluations: In order to remove or mitigate the operational restrictions, laboratory, ground, and/or flight testing may be possible during the Category 2 evaluation. Also, instrumentation may be necessary to provide quantitative data to verify design capability, i.e. probe strength, closure speeds, and/or boom pullout loads to ensure structural integrity. Actual ground tests with tanker to receiver hookups may be necessary during this phase. This category is used when some AAR restrictions are permissible but the AAR operational usage is low. Data retained from the Category 1 clearance may be valuable for use during the Category 2 evaluation.

- Category 3 Evaluations: When an organization plans to do AAR operations on a routine, ongoing basis a full tanker/receiver Compatibility Assessment should be sought. This AAR clearance may require considerably more testing & instrumentation to minimalize AAR restrictions, but the scope of testing will be defined by the bi-lateral parties. If the tanker/receiver combinations have previously been cleared for Category 1 and/or 2, those records should be maintained and may be useful in seeking Category 3 clearance evaluations and minimize re-evaluations.

- General: various methods of symbology may be used to fill in the square spaces after each assessment item. Examples are as follows:

  (#): Complied with N/A: Not applicable N/O: Not obtainable S/A: See Attached

Notes:

The evaluators of both the tanker and receiver for the clearance process should review the checklist items and identify other areas as needed that should be added to the list considering their particular aircraft and its aerial refuelling capability for tanker/receiver compatibility.

- The first column on the left side of the checklist chart should be completed by the evaluators using the Standardized Technical Data Survey (STDS) to fill in the appropriate paragraphs for each assessment item being evaluated. Likewise the second column from the left side of the checklist chart should be filled in using ARSAG “Test Methods Guide” document doc no.41-09-14WD dated 22 July ‘14 DRAFT for the appropriate assessment item being evaluated.

- It should be noted that the first column in the checklist addresses the functionality of the aerial refueling systems. Ground support equipment (testers) should be used to verify that all systems are in a “GO” condition before any aerial refueling missions are initiated.

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	dhkARSAG DOC dtd. 6dec. 13; rev.21jan.14 rev. corrections 4jan.14 rev 19 August '14	**Aerial Refueling Tanker/Receiver Clearance Compatibility Assessment Checklist**	A - Analysis C - Contractor Data Fu - Functional Ft - Flight Test G - Ground Test	/I - Instrumentation Req'd L - Lab Test R - Restrictions St - STDS Si - Similarity

Pg.	Assessment Item Tanker/Receiver A/C Boom/Receptacle Method	Category 1 Evaluation Assessment Fu	A	St	C	Si	R	Category 2 Evaluation Assessment Fu	A	ST	C	Si	R	G/I	F/I	Category 3 Evaluation Assessment Fu	A	St	C	Si	R	G/I	F/I	ARSAG STDS Para.	ARSAG Test Methods Para.
1.0	**AR Airspeed/Altitude Env**																								
	1.1 Tanker																								
	1.2 Receiver																								
2.0	**Boom Envelope**																								
	2.1 Tanker																								
	2.2 Receiver																								
3.0	**AR/Fuel Type**																								
	3.1 Tanker																								
	3.2 Receiver																								
4.0	**AR/Fuel System**																								
	4.1Press./Flow T.																								
	4.2 Press/Flow R.																								
	4.3 Surge Protection T.																								
	4.2 Press/Flow R.																								
	4.5 Press. Disc Setting R.																								
	4.6 Press. Regulation T.																								
	4.6 .1 Onboard regulator T.																								
	4 .6.2 Inflight Opr. Verification T.																								
	4.7 Press. Reg. R.																								
	4.8 Fuel Pumps Qt/Cap T.																								
	4.9 Fuel Level Ctrl. valves R.																								
	4.9.1 Gate/Leakage R.																								
	4.9.2 Poppet/Leakage R.																								
	4.9.3 Ball Valve/Leakage R.																								

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ANNEX B STANDARDIZED TECHNICAL DATA SURVEY: INSTRUCTIONS

When Standardized Technical Data Survey (STDS) survey blanks involve units of measure, it is requested they be identified for each numbered response. United States units of measure or metric units should be consistent throughout the document to avoid confusion. When differences exist, they should be clearly identified.

- Use additional sheets when the form does not provide adequate space.
- Label attachments in accordance with the appropriate sections.
- Specify tanker and/or receiver aircraft which are equipped with both systems, those that are aerial refuelable or ground convertible and tankers which have multipoint capabilities. Also, include requirements and time to perform the conversion.
- When the available data is not easily transformed into the survey format, submit data in the as available format describing the data parameters.
- When required and/or available, it is required that 3-view drawings with airplane coordinates be provided for each receiver aircraft and 5-view drawings for the tanker aircraft. The two additional views of the tanker should include rear and bottom views. The data required by the survey for lighting, markings, aerial refuelling hardware location and envelope, aerial refuelling receptacle/slipway structural skin reinforcement, and pilot's eye position should be illustrated on the drawings when practical.
- Those completing this document should be knowledgeable fuel/AAR systems engineers, manufacturers of aircraft, aerial refuelling systems, subsystems and components and/or familiar with published/verified AAR technical interface data.
- When provided component data should include applicable aircraft identity.
- For those receiver aircraft that can be equipped with a portable tanker package (buddy store), the applicable portions of the tanker section should be completed.
- When the survey is not clear and/or does not specifically address a significant feature which you feel needs addressed, request you correct the form as required and fill in the information.

AAR Envelope Development. A chart depicting altitude and airspeed (equivalent) as a function of gross weight must be submitted and should be a part of the completed STDS. The AAR envelopes of the tanker and receiver aircraft can be overlaid and compared at this stage to assist in Compatibility Assessment. Any operational issues may require further assessment during the Operational Compatibility Assessment.

Standardized Technical Data Survey (STDS). In an attempt to standardize the AAR clearances process and provide a template that details AAR equipment data specific to AAR-capable aircraft, the Standardized Technical Data Survey (STDS) is included as ANNEX B of this SRD. A properly completed STDS will contain the necessary tanker/receiver data based on its use of boom/receptacle or probe/drogue AAR equipment for the Compatibility Assessment. In future, there could be a possibility for nations to decrease the necessity for data sharing for TCAs by accepting a reference to agreed technical standards as in the case of design specifications already in NATO standards referenced above.

- The questions in the STDS address critical factors involving AAR altitude/airspeed capabilities, hardware mating interfaces, structural loads, fuel line pressure capabilities, fuel pressure regulation capabilities, formation aids (lighting/marking, director lights and status lights, rendezvous equipment, including radios, radar, etc.), emergency procedures/engine out capability, redundancy and more.

- Even before data has been entered into the STDS, the STDS document can be effectively used as a comprehensive technical and operational tool. It provides the critical questions that must be answered in planning for an aerial refuelling mission. It provides an excellent starting point to support a dialog between tanker and receiver aircraft compatibility evaluators.

- Data from the following disciplines are required to complete this survey and are included to assist distribution:

Aerial Refuelling System
Fuel System
Structures
Aerodynamic/Performance
Stability and Control
Hydraulics/Pneumatics
Electrical/Electronic
Mechanical
Crew Stations
External Lighting/Marking
Avionics (Radio/Navigation Rendezvous Equipment)
Test (Lab/Ground/Flight)
Aircraft Configuration Control

- When completed, this questionnaire may require special access control and/or military classification. The company/organization and or country filling in the data should identify that control information to the recipients of the completed document.

ABBREVIATIONS

ADF	Automatic Direction Finder
AM	Amplitude Modulation
AR	Aerial Refueling
ARO	Aerial Refueling Operator
BL	Buttline
BO	Boom Operator
CG	Center of Gravity
DF	Direction Finder
FFP	Ferry Flight Performance
FLIR	Forward Looking Infra-Red
FM	Frequency Modulation
FS	Fuselage Station
GPM	Gallons Per Minute
GW	Gross Weight
HF	High Frequency
HM	Hot Mike
IFF	Identification Friend or Foe
KEAS	Knots Equivalent Air Speed
LORAN	Long Range Area Navigation
NVG	Night Vision Goggles
NVIS	Night Vision Imaging System
PTT	Push to Talk
PSI	Pounds per Square Inch
PSIG	Pounds per Square Inch Gauge
SIF	Selective Identification Feature
TACAN	Tactical Air Navigation System
UARRSI	Universal Aerial Refueling Receptacle Slipway Installation
UHF	Ultra High Frequency
VHF	Very High Frequency
WL	Waterline

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ANNEX C STDS: TANKER AIRCRAFT BOOM EQUIPPED

TANKER AIRCRAFT (BOOM EQUIPPED)

For the most current version of references please visit http://www.arsaginc.com/

1. AIRCRAFT DESIGNATION

   a. Mission, Design, Series (Type, Model, Series) _____

   b. Familiar Name _____

   c. Primary Role/Mission _____

   d. Operating Country/Service _____

   e. Number in Inventory (Optional) _____

2. REFERENCES

   a. Flight Manual Designation _____

   b. Aerial Refuelling Operational Manual Designation _____

   c. Maintenance procedures (Optional)

   d. Identify any tanker interface document(s) attachment of documents (Optional)

	ATTACHED TO SURVEY	NOT AVAILABLE
3. NORMAL AERIAL REFUELING ENVELOPE Provide a chart depicting altitude and airspeed (equivalent) as a function of gross weight as illustrated in Attch 1.	☐	☐
4. ENGINE(S) OUT AERIAL REFUELING ENVELOPE Provide a chart depicting altitude and airspeed (equivalent) as a function of gross weight as illustrated in Attch 1 for minimum number of engines operating which will still permit aerial refuelling.	☐	☐
5. CRUISE PERFORMANCE (FERRY FLIGHT PERFORMANCE) Provide a chart depicting optimum altitude and optimum airspeed as a function of gross weight. Depict this performance curve on the AR envelopes required for survey questions 3 and 4 above.	☐	☐

6. FLIGHT RESTRICTIONS	ATTACHED TO SURVEY	NOT AVAILABLE
List operating restrictions/limitations involving or related to aerial refuelling operations.	☐	☐

7. FUEL AVAILABLE FOR TRANSFER TO RECEIVER AIRCRAFT

a. Provide a chart which depicts fuel available for transfer versus range and gross weight as illustrated in Attachment 2.	☐	☐
b. Provide a similar chart which depicts fuel available for Transfer versus time with aircraft operating at maximum endurance during the aerial refuelling operations. (Optional)		
c. Specify type of fuel (JP-4, JP-5, JP-8, etc.) used in constructing charts.		

8. AUTHORIZED FUELS

List types of fuel and fuel additives approved for use and their limitations (i.e., see Attch 3)	☐	☐

9. FUEL OFFLOAD FLOW RATE (at Boom Nozzle Inlet prior to nozzle/receptacle pressure drop)

a. Rate/Pressure/Distance (from nozzle tip) where measured _____GPM
See reference 2 for further information

_____PSIG

_____Inches

b. Provide a fuel flow versus pressure curve for all pumping configurations.	☐	☐

10. PRESSURE REGULATION, SURGE SUPPRESSION AND REFUELING SYSTEMS DESIGN PRESSURES
See reference 2 for further information

a. Pressure Regulation (Nozzle Inlet)	Zero Flow	Normal Flow
– Normal System	____PSIG	____PSIG
– Failed Regulator (Single)	____PSIG	____PSIG
– Other Single Failure Conditions (Identify failure mode(s) evaluated i.e. Hydraulic Flow Controllers)	____PSIG	____PSIG

_____

b. Other Delivery Pressure Relief Features, if present

– Type _____

– Cracking Pressure _____

– Flowing Pressure (GPM/PSI) _____

– Reseat Pressure _____

c. Surge Suppression Devices

– Type _____

– Capacity _____

– Precharge (Optional) _____

d. Refuelling System Design Pressures (PSIG) _____

– Operating *Defined in section 3.4 of reference 2* _____

– Limit (Proof) *Defined in section 3.5 of reference 2* _____

– Surge *Defined in section 3.6 of reference 2* _____

– Ultimate (Burst) *Discussed in section 3.7 of reference 2* _____

11. FUEL DUMP CAPABILITY (Optional)

a. Type system (i.e., wing dump mast, or through boom) _____

b. Maximum dump rate _____

	ATTACHED TO SURVEY	NOT AVAILABLE
12. CENTER OF GRAVITY (CG) MANAGEMENT		
Describe CG management method. Include restrictions in item 6.	☐	☐

13. MAXIMUM REVERSE FLOW DIRECTION REFUELING

Capable of reverse refuelling?	Yes	No

a. Rate _____GPM

b. Include restrictions in item 6.

14. FUSELAGE PITCH ANGLE DURING REFUELING

Provide angle of fuselage reference plane (waterline zero) to the ground at the following aerial refuelling airspeeds:
(+ indicates nose pitched up)

a. Maximum
_____Degrees

b. Minimum
_____Degrees

c. Nominal
_____Degrees

15. AERIAL REFUELING SIGNAL SYSTEM OVERRIDE CAPABILITY

a. Override capability exists YES _____ NO_____

b. Include restrictions in item 6 _____

16. BOOM INTERPHONE CAPABILITY TYPE

Identify the crewmembers who have the capability to talk over the boom interphone system.
Specify type push-to-talk (PTT) and or hot mike (HM).

Pilot_____
Co-Pilot_____
Navigator_____
Flight Eng _____
Boom Operator _____

17. INDEPENDENT DISCONNECT CAPABILITY

Does tanker have capability to disconnect from receiver with receptacle toggles in latched position (other than brute force)? YES____ NO_____

	ATTACHED TO SURVEY	NOT AVAILABLE
18. EXTERIOR LIGHTING	☐	☐

Provide illustration showing light locations, angular coverage, and areas illuminated for all exterior lights (i.e., see Attachment 4). for each light include type of light (incandescent, strobe, etc.), location in aircraft coordinates, lens colour, crew member having control, flashing or coding logic, intensity control/range (full rheostat dimming, step switch), NVG friendly, covert capability, etc. (Include Pilot Director Light operational coding in item 24).

19. EXTERIOR MARKING ☐ ☐

Provide illustration or description of tanker and boom markings which assist receiver formation positioning.

20. NVG COMPATIBILITY

a. Are the interior lights NVIS friendly? YES NO

b. Are the external lights NVIS friendly? YES NO

c. Do the external lights have a covert mode? YES NO
If yes describe basic mode (i.e. off vs. different spectrum)

21. RADIOS (Quantity, type, and frequency range)

a. HF Voice _____

b. VHF AM Voice _____

c. VHF FM Voice _____

d. VHF Navigation Receiver _____

e. UHF Voice _____

f. Satellite Communications _____

g. Other _____

h. Known EMI issues with any of the above YES NO
If yes, describe issues and restrictions below

_____

22. IFF/SIF

a. Transponder (quantity and type) _____

b. Interrogation Capability YES _____ NO _____

23. NAVIGATION AND RENDEVOUS EQUIPMENT (Quantity and type)

a. Inertial Navigation _____

b. Search Radar _____

c. Infrared (FLIR, etc.) _____

d. Electro-optical (television, etc.) _____

e. Rendezvous Radar Beacon _____

f. Doppler Radar _____

g. TACAN

Air-to-Air Mode _____

h. ADF _____

i. UHF DF _____

j. Celestial Navigation _____

k. LORAN (A or C) _____

l. Other _____

m. Known EMI issues with any of the above YES NO
If yes, describe issues and restrictions below

_____

24. BOOM PIVOT LOCATION (Optional)

a. Fuselage Station _____

b. Waterline _____

c. Buttline _____

25. BOOM LENGTH AND OPERATING ENVELOPE

	ATTACHED TO SURVEY	NOT AVAILABLE
Provide an illustration similar to Figure 3, AFGS 87166A (Attachments 5 and 6). Include the following:	☐	☐
a. Mechanical interference envelope	☐	☐
b. Refuelling disconnect envelope (Describe limits)	☐	☐
(1) Ground adjustment	YES ____	NO ____
(2) Flight adjustable by boom operator	YES ____	NO ____
	ATTACHED TO SURVEY	NOT AVAILABLE
c. Boom control envelope at maximum and minimum aerial refuelling airspeeds	☐	☐

d. Contact envelope ☐ ☐

e. Pilot Director Light coding ☐ ☐

f. Automatic load alleviation YES ____ NO ____

g. Describe automatic load alleviation limits ☐ ☐

26. BOOM STRENGTH Design Limit /Ultimate

a. Axial compression _____/_____

b. Axial Tension _____/_____

c. Radial _____/_____

d. Impact (compression) _____/_____

e. Telescoping tube extension/retraction force (Optional)

27. BOOM OPERATOR'S STATION WINDOW VISIBILITY ☐ ☐

Provide illustration showing field of view from design eye position and with normal head movement. Identify extensions to direct field of view obtained with mirrors, periscopes, television, etc. (See Attch 7)

28. AUTOPILOT AND STABILITY AUGMENTATION ☐ ☐

a. Identify type autopilot and stability augmentation systems.

b. Indicate considerations affecting aerial refuelling including whether normally used and impact on receiver if inoperative.

c. Include restrictions in item 6.

29. WAKE TURBULENCE ATTACHED TO SURVEY NOT AVAILABLE

Describe tanker flow field as a function of spanwise position and elevation relative to the tanker to a point 500 feet aft of the boom in terms of velocity and angle referenced to free stream for representative airspeeds, altitudes and gross weights. ☐ ☐

30. OTHER COMPATIBILITY INTERFACE DATA (Test + Design)

a. Identify non-compliance of refuelling boom and nozzle with military specifications and drawings. ☐ ☐

b. Include other information affecting aerial refuelling compatibility. ☐ ☐

c. Compliance with STANAG 7191

31. AERIAL REFUELING COMPATIBILITY INTERFACE DATA (TEST & DESIGN)

For tests conducted with receivers currently in the active inventory, provide the following: (Use additional sheets as necessary)

a. Agency conducting test _____

b. Test report number _____

c. Title of report _____

d. Date of report _____

e. Receiver aircraft (or test rig/simulator) utilized in test _____

f. Type test (rig, ground, mock-up, flight) _____

g. Type instrumentation _____

h. Report available from _____

i. Attach abstract or description of test _____

32. COMPONENT DATA (Optional)

a. Name of Component/Subsystem _____

b. Performance Criteria

(1) Weight (fully serviced hydraulic fluid) _____

(2) Airspeed/Altitude Limits _____

(3) Fuel Pressure Design Criteria (Operating/Proof/Surge/Ultimate {Burst}) _____

(4) Pressure drop at rated flow (i.e., 10 psig at 1200 gpm and nominal length) _____

(5) Component output performance (300 gpm at 80 psig) _____

(6) Pressure/Surge Relief ATTACHED TO SURVEY NOT AVAILABLE

☐ ☐

Cracking Pressure _____

Flowing Pressure (Press/Flow) _____

Reseat Pressure _____

(7) Closure time vs. flow plot _____

c. Power Requirements (Examples only)

(1) Hydraulic (2000 psi at 19.5 gpm) _____

(2) Electrical Power (4.5 amps/28 volts) _____

(3) Pneumatic (dry air/nitrogen 300 psi) _____

d. Sketch with outline dimensions and interface details for mounting and power supply hookup ☐ ☐

e. Validation Criteria Report Number _____

f. Specification Number _____

33. DATA ORIGIN

a. Responding organization (government symbol or company name and department) _____

b. Point of contact _____

(1) Name _____

(2) Title or position _____

(3) Telephone Number _____

(4) Fax Number _____

(5) E-Mail address _____

(6) Mailing address _____

c. Data Sources _____

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ANNEX D STDS: RECEIVER AIRCRAFT RECEPTACLE EQUIPPED

RECEIVER AIRCRAFT (RECEPTACLE EQUIPPED)

For the most current version of references please visit http://www.arsaginc.com/

1. AIRCRAFT DESIGNATION

   a. Mission, Design, Series (Type, Model, Series) _____

   b. Familiar Name _____

   c. Primary Role/Mission _____

   d. Operating Country/Service _____

   e. Number in Inventory (Optional) _____

2. REFERENCES

   a. Flight Manual Designation _____

   b. Aerial Refuelling Operational Manual Designation _____

   c. Maintenance procedures (Optional)

   d. Identify any tanker interface document(s) attachment of documents (Optional)

	ATTACHED TO SURVEY	NOT AVAILABLE
3. NORMAL AERIAL REFUELING ENVELOPE Provide a chart depicting altitude and airspeed (equivalent) as a function of gross weight as illustrated in Attch 1.	☐	☐
4. ENGINE(S) OUT AERIAL REFUELING ENVELOPE Provide a chart depicting altitude and airspeed (equivalent) as a function of gross weight as illustrated in Attch 1 for minimum number of engines operating which will still permit aerial refuelling.	☐	☐
5. CRUISE PERFORMANCE (FERRY FLIGHT PERFORMANCE) Provide a chart depicting optimum altitude and optimum airspeed as a function of gross weight. Depict this performance curve on the AR envelopes required for survey questions 3 and 4 above.	☐	☐

6. FLIGHT RESTRICTIONS

	ATTACHED TO SURVEY	NOT AVAILABLE
List operating restrictions/limitations involving or related to aerial refuelling operations.	☐	☐

7. USABLE FUEL CAPACITY

a. Internal _____

b. Max External _____

8. AUTHORIZED FUELS

List types of fuel approved for use and their limitations (i.e., see Attch 3)	☐	☐

9. MAXIMUM FUEL ONLOAD RATE (WHERE MEASURED) _____GPM@____PSIG

Provide a fuel flow versus pressure curve for each tank and all tanks filling.	☐	☐

10. MAXIMUM RATE OF FUEL DUMP (Optional) _____GPM

11. FUEL VENT CAPABILITY

Has the vent be certified capable to prevent overpressure in the event of a failed Level Control Valve (LCV) during aerial refuelling? YES NO

At what flow rate _____GPM
See reference 2 for further information

12. REFUELING SYSTEM DESIGN PRESSURES (PSIG)
For further information please see reference 2

a. Operation *Defined in section 3.4 of reference 2* _____

b. Limit (Proof) *Defined in section 3.5 of reference 2* _____

c. Ultimate (Burst) *Defined in section 3.6 of reference 2* _____

d. Surge *Discussed in section 3.7 of reference 2* _____

e. Tank Limit/Ultimate Pressure (DESIGN) _____
(Provide for each tank if different)

f. Failed Level Control Valve Tank Pressure (Measured)

(1) Maximum Tank Pressure(s) _____

(2) Inlet Pressure Conditions (specify location of Measurement, i.e. boom nozzle or receptacle manifold)

_____

	ATTACHED TO SURVEY	NOT AVAILABLE
13. CENTER OF GRAVITY (CG) MANAGEMENT		
Describe CG management method. Include restrictions in item 6.	☐	☐

14. REFUELING RECEPTACLE

a. Type (UARRSI, Extendible, i.e., descriptive terms) _____

b. Location of boom nozzle ball joint with nozzle latched into receptacle.

(1) Fuselage Station _____

(2) Waterline _____

(3) Buttline _____

c. Slipway/Receptacle

(1) Door Configuration (Clam shell, drop door, etc.) _____

(2) Size (length, width, and depth) _____

(3) Layout with dimensions. Provide three view drawings with F.S.s, B.L.s, W.L.s. ☐ ☐

d. Angle between receptacle axis and aircraft waterline. _____

e. Markings (location and type, i.e. reflective tape/paint) _____

f. Weight (including installation structure) (Optional) _____

15. ABILITY TO BE TOWED BY AERIAL REFUELING BOOM include restrictions in item 6 YES ____ NO _____

16. PRESSURE DISCONNECT SETTING

Identify pressure settings that initiate an automatic disconnect and the response time.

a. Pressure _____PSIG

b. Response Time _____Seconds

17. RECEPTACLE STRENGTH Design Limit / Ultimate

a. Axial compression _____/_____

b. Axial Tension _____/_____

18. STRUCTURAL REINFORCEMENT FOR BOOM NOZZLE LOADS ATTACHED TO SURVEY NOT AVAILABLE

Define lateral, vertical, and impact loads (limit and ultimate) and describe area protected). ☐ ☐

a. Slipway/Receptacle

_____

_____

_____

b. Surrounding Area

_____

_____

_____

19. MAXIMUM REVERSE FLOW DIRECTION REFUELING

Capable of reverse refuelling? Yes No

a. Rate _____GPM
Include restrictions in item 6.

20. BOOM RECEPTACLE LATCHING/UNLATCHING MODES
Actuation Time Max/Min (Seconds)____

a. Signal/System Manual (pilot initiated) YES____ NO_____

b. Signal System Override (via control switch) YES ____ NO_____

21. BOOM INTERPHONE CAPABILITY TYPE

Identify the crewmembers who have the capability to talk over the boom interphone system.
Specify type push-to-talk (PTT) and or hot mike (HM).

Pilot_____
Co-Pilot_____
Navigator _____
Flight Eng _____
Other_____

22. EXTERIOR LIGHTING

Attached ☐ NA ☐

Provide illustration showing light locations, angular coverage, and areas illuminated for all exterior lights (i.e., see Attachment 4). for each light include type of light (incandescent, strobe, etc.), location in aircraft coordinates, lens colour/frosted, crewmember having control, flashing or coding logic, intensity control/range (full rheostat dimming, step switch), NVG friendly, covert, etc.

23. NVG COMPATIBILITY

a. Are the interior lights NVIS friendly? YES NO

b. Are the external lights NVIS friendly? YES NO

c. Do the external lights have a covert mode? YES NO
If yes describe basic mode (i.e. off vs. different spectrum)

24. RADIOS (Quantity, type, and frequency range)

a. HF Voice _____

b. VHF AM Voice _____

c. VHF FM Voice _____

d. VHF Navigation Receiver _____

e. UHF Voice _____

f. Satellite Communications _____

g. Other _____

h. Known EMI issues with any of the above YES NO
If yes, describe issues and restrictions below

_____

25. IFF/SIF

a. Transponder (quantity and type) _____

b. Interrogation Capability YES ____ NO ____

26. NAVIGATION AND RENDEVOUS EQUIPMENT (Quantity and type)

a. Inertial Navigation _____

b. Search Radar _____

c. Infrared (FLIR, etc.) _____

d. Electro-optical (television, etc.) _____

e. Rendezvous Radar Beacon _____

f. Doppler Radar _____

g. TACAN
Air-to-Air Mode _____

h. ADF _____

i. UHF DF _____

j. Celestial Navigation _____

k. LORAN (A or C) _____

l. Other _____

m. Known EMI issues with any of the above YES NO
If yes, describe issues and restrictions below

_____

27. FUSELAGE PITCH ANGLE DURING REFUELING (each configuration)

Provide angle of fuselage reference plane (waterline zero) to the ground at the following aerial refuelling airspeeds:
(+ indicates nose pitched up)

a. Maximum _____Degrees

b. Minimum _____Degrees

c. Nominal _____Degrees

28. CANOPY/WINDSCREEN VISIBILITY

	ATTACHED TO SURVEY	NOT AVAILABLE
a. Provide illustrations showing field of view from cockpit (pilot and copilot) include restrictions such as munitions and canopy bows.	☐	
b. Include conditions for design eye position(s) and normal head movement		

29. FORWARD FIRING ORDNANCE (Type)

_____

_____

_____

30. AUTOPILOT AND STABILITY AUGMENTATION ☐ ☐

a. Identify type autopilot and stability augmentation systems.

b. Indicate considerations affecting aerial refuelling including whether normally used and impact on receiver if inoperative.

c. Include restrictions in item 6.

31. DISCONNECT CAPABILITY ☐ ☐

Describe method of achieving disconnect in each of the following conditions and subsequent sequence of events. Include restrictions in item 6.

a. Signal system override_____
_____
_____

b. Tension disconnect (ex. 10 ft/sec @ -65°F)_____
_____
_____

c. Failure mode (torque shafts) (Failure Load)_____
_____
_____

32. REFUELING ENVELOPE LIMITS (RECEIVER AIRCRAFT ENVELOPE)

Indicate envelopes relative to individual tanker types (i.e. KC-10, KC-135)

a. Azimuth (Provide envelope measurements in feet in lieu of degrees) _____

b. Elevation (Provide envelope measurements in feet in lieu of degrees) _____

c. Telescoping _____

	ATTACHED TO SURVEY	NOT AVAILABLE
33. TANKER BOOM/RECEIVER CANOPY/ WINDSHIELD CLEARANCE	☐	☐

Provide boom to canopy clearance for the flying boom at the most critical telescoping position and receiver aircraft at maximum pitch angle. Assume 0° azimuth for aircraft with centreline/top fuselage/high wing mounted receptacles and 10° azimuth (disfavouring canopy clearance) for aircraft with low wing-mounted receptacles or off-centre fuselage

a. Clearance at 20° boom elevation _____Inches

b. Clearance at upper disconnect limit (____°)(if other than 20° boom elevation) _____Inches

c. Provide distance from centre of receptacle face (engaged nozzle ball joint) to the windshield or canopy glass _____Inches

34. OTHER AERIAL REFUELING COMPATIBILITY DATA (Describe)

	ATTACHED TO SURVEY	NOT AVAILABLE
a. Fuel tank level control system, type and control	☐	☐
b. Fuel pressure surge protection	☐	☐
c. Level control valve (pre-check methods ground/flight)	☐	☐

d. Compatibility of receptacle/slipway installation with requested boom nozzle(s) (Physical restrictions with hookup and disconnect) ☐ ☐

e. Areas of incompatibility with requested aircraft (Aerodynamic restrictions, instabilities, etc.) ☐

35. AERIAL REFUELING COMPATIBILITY / INTERFACE DATA (Test + Design) ☐ ☐

For tests conducted with tankers currently in the active inventory, provide the following: (Use additional sheets as necessary)

a. Agency conducting test _____

b. Test report number _____

c. Title of report _____

d. Date of report _____

e. Tanker aircraft (or test rig/simulator) utilized in test _____

f. Type test (rig, ground, mock-up, flight) _____

g. Type instrumentation _____

h. Report available from _____

i. Attach abstract or description of test _____

36. COMPONENT DATA (Optional)

a. Name of Component/Subsystem _____

b. Performance Criteria

(1) Weight (fully serviced hydraulic fluid) _____

(2) Airspeed/Altitude Limits _____

(3) Fuel Pressure Design Criteria (Operating/Proof/Surge/Ultimate {Burst}) _____

(4) Pressure drop at rated flow (i.e., 20 psig at 1200 gpm) _____

(5) Component output performance (300 gpm at 80 psig) _____

	ATTACHED TO SURVEY	NOT AVAILABLE
(6) Pressure/Surge Relief	☐	☐
Cracking Pressure	_____	
Flowing Pressure (Press/Flow)	_____	
Reseat Pressure	_____	
(7) Closure time vs. flow plot	_____	
c. Power Requirements		
(1) Hydraulic (2000 psi at 19.5 gpm)	_____	
(2) Electrical Power (4.5 amps/28 volts)	_____	
(3) Pneumatic (dry air/nitrogen 300 psi)	_____	
d. Sketch with outline dimensions and interface details for mounting and power supply hookup	☐	☐
e. Validation Criteria Report Number	_____	
f. Specification Number	_____	

37. DATA ORIGIN

a. Responding organization (government symbol or company name and department)	_____
b. Point of contact	_____
(1) Name	_____
(2) Title or position	_____
(3) Telephone Number	_____
(4) Fax Number	_____
(5) E-Mail address	_____
(6) Mailing address	_____

ANNEX E STDS: TANKER AIRCRAFT DROGUE EQUIPPED

TANKER AIRCRAFT (DROGUE EQUIPPED)

For the most current version of references please visit http://www.arsaginc.com/

1. AIRCRAFT DESIGNATION

   a. Mission, Design, Series (Type, Model, Series) _____

   b. Familiar Name _____

   c. Primary Role/Mission _____

   d. Operating Country/Service _____

   e. Number in Inventory (Optional) _____

2. REFERENCES

   a. Flight Manual Designation _____

   b. Aerial Refuelling Operational Manual Designation _____

   c. Maintenance procedures (Optional)

   d. Identify any tanker interface document(s) attachment of documents (Optional)

	ATTACHED TO SURVEY	NOT AVAILABLE
3. NORMAL AERIAL REFUELING ENVELOPE Provide a chart depicting altitude and airspeed (equivalent) as a function of gross weight as illustrated in Attch 1.	☐	☐
4. ENGINE(S) OUT AERIAL REFUELING ENVELOPE Provide a chart depicting altitude and airspeed (equivalent) as a function of gross weight as illustrated in Attch 1 for minimum number of engines operating which will still permit aerial refuelling.	☐	☐
5. CRUISE PERFORMANCE (FERRY FLIGHT PERFORMANCE) Provide a chart depicting optimum altitude and optimum airspeed as a function of gross weight. Depict this performance curve on the AR envelopes required for survey questions 3 and 4 above.	☐	☐

	ATTACHED TO SURVEY	NOT AVAILABLE
6. FLIGHT RESTRICTIONS List operating restrictions/limitations involving or related to aerial refuelling operations.	☐	☐

7. FUEL AVAILABLE FOR TRANSFER TO RECEIVER AIRCRAFT

a. Provide a chart which depicts fuel available for transfer versus range and gross weight as illustrated in Attachment 2 for the following cases:	☐	☐

(1) Internal fuel only

(2) Maximum internal and external fuel

b. Provide a similar chart which depicts fuel available for Transfer versus time with aircraft operating at maximum endurance during the aerial refuelling operations. (Optional)

c. Specify type of fuel (JP-4, JP-5, JP-8, etc.) used in constructing charts.

8. AUTHORIZED FUELS

List types of fuel approved for use and their limitations (i.e., see Attch 3)	☐	☐

9. FUEL OFFLOAD FLOW RATE

a. _____GPM at_____PSIG

b. Provide a fuel flow versus pressure curve for all pumping configurations.	☐	☐

10. PRESSURE REGULATION, SURGE SUPPRESSION AND REFUELING SYSTEMS DESIGN PRESSURES
See reference 2 for further information

a. Pressure Regulation Coupling Regulated Outlet	Zero Flow	Normal Flow
– Normal System	____PSIG	____PSIG
– Failed Regulator (Single)	____PSIG	____PSIG
– Other Single Failure Conditions (Identify failure mode(s) evaluated i.e. Hydraulic Flow Controllers)	____PSIG	____PSIG

b. Surge Suppression Device

– Type _____

– Capacity _____

– Precharge (Optional) _____

c. Refuelling System Design Pressures (PSIG) _____

– Operating *Defined in section 3.4 of reference 2* _____

– Limit (Proof) *Defined in section 3.5 of reference 2* _____

– Surge *Defined in section 3.6 of reference 2* _____

– Ultimate (Burst) *Discussed in section 3.7 of reference 2*_____

11. FUEL DUMP CAPABILITY (Optional)

a. Type system (i.e., wing dump mast) _____

b. Maximum dump rate _____

	ATTACHED TO SURVEY	NOT AVAILABLE
12. CENTER OF GRAVITY (CG) MANAGEMENT		
Describe CG management method. Include restrictions in item 6.	☐	☐
13. DESCRIPTION AND LOCATION OF HOSE AND DROGUE MECHANISM	☐	☐

Provide illustration and indicate location in aircraft coordinates of drogue exit tunnel for internally mounted systems and/or external pods

a. AR System Weight _____

b. Installation/Structure Weight _____

c. Total Weight _____

14. REMOVABLE TANKER PACKAGE YES _____ NO_____

15. MAXIMUM NUMBER OF AIRCRAFT WHICH CAN BE REFUELED SIMULTANEOUSLY

    a. Indicate number of receivers which can be refuelled Simultaneously _____

    b. Include restrictions and/or limitations in item 6 _____

16. RADIOS (quantity, type, and range)

    a. HF Voice _____

    b. VHF AM Voice _____

    c. VHF FM Voice _____

    d. VHF Navigation _____

    e. UHF Voice _____

    f. Satellite Communications _____

    g. Other _____

    h. Known EMI issues with any of the above YES NO
    If yes, describe issues and restrictions below

17. IFF/SIF

    a. Transponder (quantity and type) _____

    b. Interrogation Capability YES____ NO____

18. NAVIGATION AND RENDEVOUS EQUIPMENT (Quantity and type)

    a. Inertial Navigation _____

    b. Search Radar _____

    c. Infrared (FLIR, etc.) _____

    d. Electro-optical (television, etc.) _____

    e. Rendezvous Radar Beacon _____

    f. Doppler Radar _____

g. TACAN
Air-to-Air Mode _____

h. ADF _____

i. UHF DF _____

j. Celestial Navigation _____

k. LORAN (A or C) _____

l. Other _____

m. Known EMI issues with any of the above YES NO
If yes, describe issues and restrictions below

	ATTACHED TO SURVEY	NOT AVAILABLE
19. EXTERIOR LIGHTING	☐	☐

Provide illustration showing light locations, angular coverage, and areas illuminated for all exterior lights (i.e., see Attachment 4). For each light include type of light (incandescent, strobe, etc.), location in aircraft coordinates, crew member having control, flashing or coding logic, intensity control/range (full rheostat dimming, step switch), lens colour/frosted, NVG friendly, covert capability etc.

	ATTACHED TO SURVEY	NOT AVAILABLE
20. EXTERIOR MARKING	☐	☐

Provide illustration or description of tanker and drogue markings which assist receiver formation positioning.

21. AUTOPILOT AND STABILITY AUGMENTATION	☐	☐

a. Identify type autopilot and stability augmentation systems.

b. Indicate considerations affecting aerial refuelling including whether normally used and impact on receiver if inoperative.

c. Include restrictions in item 6.

22. NVG COMPATIBILITY

a. Are the interior lights NVIS friendly?	YES	NO
b. Are the external lights NVIS friendly?	Yes	No
c. Do the external lights have a covert mode? If yes describe basic mode (i.e. off vs. different spectrum)	Yes	No

23. COUPLING DISCONNECT FORCE SETTINGS _____
(include tolerance)

24. DROGUE REFUELING ENVELOPE

	ATTACHED TO SURVEY	NOT AVAILABLE
Provide 3-view drawing illustrating the drogue refuelling envelope based on the optimum aerial refuelling envelope. Include, as a minimum:	☐	☐
a. Drogue exit tunnel in aircraft coordinates (Optional)	☐	☐
b. Drogue location at full trail, outer fuel transfer limit, and inner fuel transfer limit.	☐	☐
c. Off centre disconnect limits	☐	☐
d. Indicate horizontal, vertical, and lateral distances from hose/drogue to nearest aircraft structure	☐	☐

25. HOSE REEL PERFORMANCE

a. Maximum Response	_____FPS
b. Minimum Response	_____FPS
c. Extend Time	_____Sec
d. Rewind Time	_____Sec

26. WAKE TURBULENCE	ATTACHED TO SURVEY	NOT AVAILABLE
Describe tanker flow field as a function of spanwise position and elevation relative to the tanker to a point 500 feet aft of the drogue in terms of velocity and angle referenced to free stream for representative airspeeds, altitudes and gross weights.	☐	☐

27. OTHER COMPATIBILITY DATA

a. Identify deviations of aerial refuelling system from NATO STANAG 3447 and AFGS 87166 (Guide Doc.).	☐	☐
b. Include other information affecting aerial refuelling compatibility.	☐	☐
c. Fuel pressure surge protection	☐	☐
d. Provide physical dimensions of drogue (if not IAW STANAG 3447 and AFGS 87166A) (Guide Doc)	☐	☐

28. AERIAL REFUELING COMPATIBILITY INTERFACE DATA (Test + Design) ☐ ☐

(See ARSAG Website Doc. Reference #3) Attach #2 Here.
For tests conducted with receivers currently in the active inventory, provide the following: (Use additional sheets as necessary)
For further information see reference 3

a. Agency conducting test _____

b. Test report number _____

c. Title of report _____

d. Date of report _____

e. Receiver aircraft (or test rig/simulator) utilized in test _____

f. Type test (rig, ground, mock-up, flight) _____

g. Type instrumentation _____

h. Report available from _____

i. Attach abstract or description of test _____

29. COMPONENT (VENDOR) DATA

a. Name of Component/Subsystem _____

b. Performance Criteria

(1) Weight (fully serviced hydraulic fluid) _____

(2) Airspeed/Altitude Limits _____

(3) Fuel Pressure Design Criteria (Operating/Proof/Surge/Ultimate {Burst}) _____

(4) Pressure drop at rated flow (i.e., 10 psig at 1200 gpm and nominal length) _____

(5) Component output performance (300 gpm at 80 psig) _____

(6) Pressure/Surge Relief

	ATTACHED TO SURVEY	NOT AVAILABLE
	☐	☐

Cracking Pressure _____

Flowing Pressure (Press/Flow) _____

Reseat Pressure _____

(7) Closure time vs. flow plot _____

c. Power Requirements

(1) Hydraulic (2000 psi at 19.5 gpm) _____

(2) Electrical Power (4.5 amps/28 volts) _____

(3) Pneumatic (dry air/nitrogen 300 psi) _____

d. Sketch with outline dimensions and interface details for mounting and power supply hookup

	ATTACHED TO SURVEY	NOT AVAILABLE
	☐	☐

e. Validation Criteria Report Number _____

f. Specification Number _____

30. DATA ORIGIN

a. Responding organization (government symbol or company name and department) _____

b. Point of contact _____

(1) Name _____

(2) Title or position _____

(3) Telephone Number _____

(4) Fax Number _____

(5) E-Mail address _____

(6) Mailing address _____

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ANNEX F STDS: RECEIVER AIRCRAFT PROBE EQUIPPED

RECEIVER AIRCRAFT (PROBE EQUIPPED)

For the most current version please visit http://www.arsaginc.com/

1. AIRCRAFT DESIGNATION

   a. Mission, Design, Series (Type, Model, Series) _____

   b. Familiar Name _____

   c. Primary Role/Mission _____

   d. Operating Country/Service _____

   e. Approximate Number in Inventory (Optional) _____

2. REFERENCES

   a. Flight Manual Designation _____

   b. Aerial Refuelling Operational Manual Designation _____

   c. Maintenance procedures (Attachment of documents Optional)

   d. Identify any tanker interface document(s) (Attachment of documents Optional)

3. NORMAL AERIAL REFUELING ENVELOPE	ATTACHED TO SURVEY	NOT AVAILABLE
Provide a chart depicting altitude and airspeed (equivalent) as a function of gross weight as illustrated in Attch 1.	☐	☐
4. ENGINE(S) OUT AERIAL REFUELING ENVELOPE	☐	☐
Provide a chart depicting altitude and airspeed (equivalent) as a function of gross weight as illustrated in Attch 1 for minimum number of engines operating which will still permit aerial refuelling.		

5. CRUISE PERFORMANCE (FERRY FLIGHT PERFORMANCE) ☐ ☐

Provide a chart depicting optimum altitude and optimum airspeed as a function of gross weight. This shall include both a clean aircraft and/or with maximum external fuel. Depict this performance curve on the AR envelopes required for survey questions 3 and 4 above.

6. FLIGHT RESTRICTIONS	ATTACHED TO SURVEY	NOT AVAILABLE
List operating restrictions/limitations involving or related to aerial refuelling operations.	☐	☐

a. Maximum airspeed and/or mach restriction with probe extended. _____

b. Internal/external tanks which cannot be refuelled in flight. _____

7. USABLE FUEL CAPACITY

a. Internal _____

b. Max External _____

8. AUTHORIZED FUELS

List types of fuel approved for use and their limitations (i.e., see Attch 3) ☐ ☐

9. MAXIMUM FUEL ONLOAD RATE (WHERE MEASURED) ____GPM @____PSIG

(Provide a fuel flow versus pressure curve for each tank and all tanks filling.) ☐ ☐

10. MAXIMUM RATE OF FUEL DUMP (Optional) _____GPM

11. REFUELING SYSTEM DESIGN PRESSURES (PSIG)
For further information please see reference 2

a. Operation *Defined in section 3.4 of reference 2* _____

b. Limit (Proof) *Defined in section 3.5 of reference 2* _____

c. Ultimate (Burst) *Defined in section 3.6 of reference 2* _____

d. Surge *Discussed in section 3.7 of reference 2* _____

e. Tank Limit/Ultimate Pressure (DESIGN) _____
(Provide for each tank if different)

f. Failed Level Control Valve Tank Pressure (Measured)

(1) Maximum Tank Pressure(s) (Specify tank) _____

_____

_____

(2) Inlet Pressure Conditions _____
(specify location of measurement, i.e. coupling or probe nozzle/mast)

	ATTACHED TO SURVEY	NOT AVAILABLE
12. CENTER OF GRAVITY (CG) MANAGEMENT		
Describe CG management method. Include restrictions in item 6.	☐	☐

13. REFUELING PROBE NOZZLE

a. Fixed, removable, telescoping, or retractable (specify envelope if different than STANAG 3447). _____
See ARSAG website for latest version of STANAG 3447

b. Does the probe mast flex to alleviate loads? Yes No

c. Type nozzle (manufacture/part number) specify dimensions if different than STANAG 3447 and/or MS 24356. _____

d. Does the nozzle have a flexible tip? Yes No

e. Location of nozzle tip with probe mast in refuelling position.

(1) Fuselage Station _____

(2) Waterline Location _____

(3) Buttline Location _____

(4) Fuselage Clearance _____

f. Weight of probe mast. _____

g. Installation weight _____

h. Total weight _____

14. PROBE STRENGTH — Design Limit / Ultimate

    a. Axial Compression _____/_____

    b. Axial Tension _____/_____

    c. Radial _____/_____

    d. Impact Compression _____/_____

    e. Bending moment about the probe hinge point or probe attachment point. _____/_____

15. LOCATION OF PROBE HINGE OR PROBE ATTACH POINT

    a. Fuselage Station _____

    b. Waterline Location _____

    c. Buttline Location _____

	ATTACHED TO SURVEY	NOT AVAILABLE
16. EXTERIOR LIGHTING	☐	☐

Provide illustration showing light locations, angular coverage, and areas illuminated for all exterior lights (i.e., see Attachment 4). for each light include type of light (incandescent, strobe, etc.), location in aircraft coordinates, lens colour/frosted, crewmember having control, flashing or coding logic, intensity control/range (full rheostat dimming, step switch),NVG friendly, covert capability, etc.

17. RADIOS (Quantity, type, and frequency range)

    a. HF Voice _____

    b. VHF AM Voice _____

    c. VHF FM Voice _____

    d. VHF Navigation Receiver _____

    e. UHF Voice _____

    f. Satellite Communications _____

g. Other _____

h. Known EMI issues with any of the above YES NO
If yes, describe issues and restrictions below

_____

18. IFF/SIF

a. Transponder (quantity and type) _____

b. Interrogation Capability YES ____ NO ____

19. NAVIGATION AND RENDEVOUS EQUIPMENT (Quantity and type)

a. Inertial Navigation _____

b. Search Radar _____

c. Infrared (FLIR, etc.) _____

d. Electro-optical (television, etc.) _____

e. Rendezvous Radar Beacon _____

f. Doppler Radar _____

g. TACAN
Air-to-Air Mode _____

h. ADF _____

i. UHF DF _____

j. Celestial Navigation _____

k. LORAN (A or C) _____

l. Other _____

m. Known EMI issues with any of the above YES NO
If yes, describe issues and restrictions below

_____

20. FUSELAGE PITCH ANGLE DURING REFUELING (each configuration)

Provide angle of fuselage reference plane (waterline zero) to the ground at the following aerial refuelling airspeeds:
(+ indicates nose pitched up)

a. Maximum _____Degrees

b. Minimum _____Degrees

c. Nominal _____Degrees

21. CANOPY/WINDSCREEN VISIBILITY

	ATTACHED TO SURVEY	NOT AVAILABLE
a. Provide illustrations showing field of view from cockpit (pilot and copilot) include restrictions such as munitions and canopy bows.	☐	
b. Include conditions for design eye position(s) and normal head movement	☐	☐

22. FORWARD FIRING ORDNANCE (Type)

_____

_____

_____

	ATTACHED TO SURVEY	NOT AVAILABLE
23. AUTOPILOT AND STABILITY AUGMENTATION		
a. Identify type autopilot and stability augmentation systems.	☐	☐
b. Indicate considerations affecting aerial refuelling including whether normally used and impact on receiver if inoperative.	☐	☐
c. Include restrictions in item 6.	☐	☐

24. OTHER AERIAL REFUELING COMPATIBILITY INTERFACE DATA (Test + Design) (Describe)

a. Fuel tank level control system, type and control ☐ ☐

b. Fuel pressure surge protection ☐ ☐

c. Level control valve (pre-check methods ground/flight) ☐ ☐

d. Identify deviations of aerial refuelling system from NATO STANAG 3447 and AFGS 87166AB.

_____

_____

e. Include other information affecting aerial refuelling compatibility. ☐ ☐

25. AERIAL REFUELING COMPATIBILITY INTERFACE DATA (Test and Design)

For further information see reference 3 ☐ ☐

For tests conducted with tankers currently in the active inventory, provide the following: (Use additional sheets as necessary)

a. Agency conducting test _____

b. Test report number _____

c. Title of report _____

d. Date of report _____

e. Tanker aircraft (or test rig/simulator) utilized in test _____

f. Type test (rig, ground, mock-up, flight) _____

g. Type instrumentation _____

h. Report available from _____

i. Attach abstract or description of test _____

26. COMPONENT DATA (Optional)

a. Name of Component/Subsystem _____

b. Performance Criteria

(1) Weight (fully serviced hydraulic fluid) _____

(2) Airspeed/Altitude Limits _____

(3) Fuel Pressure Design Criteria (Operating/Proof/Surge/Ultimate {Burst}) _____

(4) Pressure drop at rated flow (i.e., 10 psig at 1200 gpm) _____

(5) Component output performance (300 gpm at 80 psig) _____

(6) Pressure/Surge Relief

	ATTACHED TO SURVEY	NOT AVAILABLE
	☐	☐

Cracking Pressure _____

Flowing Pressure (Press/Flow) _____

Reseat Pressure _____

(7) Closure time vs. flow plot _____

c. Power Requirements

(1) Hydraulic (2000 psi at 19.5 gpm) _____

(2) Electrical Power (4.5 amps/28 volts) _____

(3) Pneumatic (dry air/nitrogen 300 psi) _____

d. Sketch with outline dimensions and interface details for mounting and power supply hookup

	ATTACHED TO SURVEY	NOT AVAILABLE
	☐	☐

e. Validation Criteria Report Number _____

f. Specification Number _____

27. DATA ORIGIN

a. Responding organization (government symbol or company name and department) _____

b. Point of contact _____

(1) Name _____

(2) Title or position _____

(3) Telephone Number _____

(4) Fax Number _____

(5) E-Mail address _____

(6) Mailing address _____

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ANNEX G OPERATIONAL COMPATIBILITY ASSESSMENT TEMPLATE

NOTE: ANNEX G currently black awaiting on OCA Template from ARSAG. This ANNEX will be updated upon receipt of ARSAG documentation when the new STDs and OCA template are agreed upon. This work is currently ongoing.

AAR-SRD-1(B)(1)