

ARSAG

AERIAL REFUELING SYSTEMS ADVISORY GROUP

Guidance document

Aerial Refueling Computer Planning Software Design Guide

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EXECUTIVE SUMMARY

This product identifies the baseline for computer-based AR planning software. Highlights the minimum required inputs and outputs fields the software should provide. This document narrows the focus for industry in the development of AR planning software--not in how the software conducts calculations, but rather acceptable fields of information and data the program delivers. Standardizing the information output will lead to common planning expectations and decisions, enhancing interoperability between partner nations.



**ARSAG Workshop / DOD Joint Standardization Board (JSB) for Aerial Refueling Systems
PROJECT INITIATION FORM (PIF)**

Items 1 through 3 to be Completed by Requester					
1. PROJECT SPONSOR OR INITIATING AGENCY					
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2. PROJECT REQUEST					
Project Purpose and Scope	Construct operational level optimization product(s) development guide for coalition AR planning. This product would lay the baseline for computer-based AR planning software. This baseline would lay out the required inputs and outputs the software must use and provide. This would help focus industry in the development of planning software, not in how the software does the calculation, but rather in the information it accepts and the data the program delivers. This standardization will increase the interoperability of AR mission planning by standardizing the information required. This document will provide the required standardization for planning software much like the boom-receptacle design documents for the system hardware.				
Proposed Project Title:	Operational Level Optimization Product(s) Development Guide for Coalition AR Planning Aerial Refueling Computer Planning Software Design Guide				
Proposed Product Outcome: (Mark with X)	ARSAG Document:	Guide Document		Recommended Requirements	
		X			
	Input to DoD Standardization Document:	Specification	Standard	JSSG	Other
	Input to NATO Document:	ATP/STANAG	STANREC	SRD	Allied Publications
			X		
Input to Industry Document:	Standard		Other		
Would you be willing to participate as Document Manager for your proposed project?			Yes	X	No
3. PROJECT TIMELINE					
Project Request Submittal Date:	Date	12 DEC 2018			
Requested Completion Date:	Date				
Item 4 to be Completed by ARSAG					
4. PROJECT DISPOSITION					
Project Request Receipt Date		12 Dec 2018			
		JSB Chair		JSB Deputy Chair	
Approved as ARSAG Project: Initial & Date		F.H.C. 12 Dec 2018		D.A.B. 12 Dec 2018	
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		ARSAG Executive Director (ED)			
Approved as ARSAG Project: Initial & Date		D.H.K. 12 Dec 2018			
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REFERENCES

<i>N°</i>	<i>TITLE</i>	<i>REFERENCE</i>	<i>ISSUE</i>	<i>DATE</i>	<i>SOURCE</i>
1.	Aerial Refueling Clearance Initiation Request, DTIC AD1025799		R1	31 Jan 2017	ARSAG Document No. 16-88- 98R1
2.					

ASSOCIATED DOCUMENTS

<i>TITLE</i>	<i>REFERENCE</i>	<i>ISSUE</i>	<i>DATE</i>	<i>SOURCE</i>
ARSAG Aerial Refueling Clearance Process Guide, Doc # 43-08-14.			21 August 2014	DTIC No. AD1025796
Aerial Refueling Boom/Receptacle Systems & Interface Recommended Requirements ARSAG No. 02-88-12R			12 September 2019	DTIC No. AD1090244
Aerial Refueling Pressure Definitions & Terms, Design & Verification Guidance ARSAG No 03-00-03R1			20 October 2010	DTIC No. AD1025801
Aerial Refueling Test Methods Guide, ARSAG No. 41-09-15			13 April 2015	DTIC No. AD1030015
Standardized Technical Data Survey, ARSAG No. 17-81-03R2			6 September 2016	DTIC No. AD1027954
Aerial Refueling Probe/Drogue Systems Design Guide ARSAG No. 04-06-18			15 October 2015	DTIC No. AD1064517
Aerial Refueling Boom/Receptacle Guide, ARSAG No. 20-08-17			28 July 2017	DTIC No. AD1048313
Aerial Refueling Systems Incident Investigation Guide, ARSAG No. 50-17-19			27 July 2019	DTIC No. AD1076311
Automated Aerial Refueling Concept of Operations Guide Rev. R1 ARSAG No. 60-20-32 R1			31 July 2020	DTIC No. 1109141

ABBREVIATIONS AND TERMINOLOGY

AR	Aerial Refueling
AAR	Air-to-Air Refueling
ALTREV	Altitude Reservation
ATO	Air Tasking Order
BDA	Tanker equipped with Boom Drogue Adapter refueling system
BOM	Tanker equipped with only Boom refueling system
BWD	Tanker equipped with Boom & Wingtip Drogue refueling system
CBD	Tanker equipped with Boom & Centerline Drogue refueling system
CDT	Tanker equipped with Centerline & Wingtip Drogue refueling system
CLD	Tanker equipped with only Centerline Drogue refueling system
EMCON	Emissions Control
MOG	Maximum on Ground
OCA	Operational Compatibility Assessment
OPCON	Operational Control
TACON	Tactical Control
TCA	Technical Compatibility Assessment
UTC	Coordinated Universal Time
WTD	Tanker equipped with Wingtip Drogue refueling system

1. Introduction

This document is designed to recommend standardized input requirements, optimization parameters, and output format for potential software solutions to AR planning. Current systems lack inter-system interoperability, scalability, sufficient databases, capability to automatically recalculate cancelled pairings, visibility of global AR tracks, and automated accountability for nation-specific caveats and equipment limitations.

The document is formatted into four main sections: receiver requirement information, tanker requirement information, critical information requirements, and overall functions the optimization tool must accomplish.

2. Required Inputs and Outputs

2.1 Mandatory Field for Receiver Requirements

2.1.1 Refueling Request Information

The refueling request should originate from the receiver unit or the organization responsible for requesting support. This request should contain enough information for the system to be able to process and schedule the AR activity. This request should contain, at a minimum, all the information specified in paragraphs 2.1.1 through 2.1.5.

- **Receiver Number, Nation, Type (to include manned or unmanned), Tail Number, Call Sign, & Additional Information/Restrictions**
- **Date & Time of Requested AR**

The AR request must include the calendar Day (in UTC time) as well as Air Tasking Order Day (if applicable). In addition, the start time of the AR event **MUST** be in UTC time. Add a check box to indicate if the receiver time is flexible. If the box is checked, a drop-down menu will open to enter the specific amount of time in days/hours/minutes.

- **Location & Altitude of Requested AR**

The location of the AR event should include at a minimum either a commonly defined area and alternate (if applicable), ALTREV or latitude/longitude and the requested Flight/Block Level of the event.

Free text may be entered to further define requirements by the requestor.

- **AR System Type**

Define applicable/requested AR system type according to the below configurations:

- BDA = Boom Drogue Adapter
- BOM = Boom
- BOM + CDT = Boom, Centreline Drogue, Wingtip Drogue
- BWD = Boom, Wingtip Drogue
- CBD = Boom, Centreline Drogue
- CDT = Centreline Drogue, Wingtip Drogue
- CLD = Centreline Drogue
- WTD = Wingtip Drogue
- WTD + BDA = Wingtip Drogue & Boom Drogue Adapter

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- WTD + BDA = Wingtip Drogue & Boom Drogue Adapter

- **Fuel Quantity, Unit and Type Requirement**

Planners should have the ability to input request in pounds or kilograms and have the system automatically convert from one fuel unit to the other. A field should be included to accommodate any special fuel requirements or specific fuel types required by the receivers.

2.1.2 Receiver Performance Data

The system should include an automated interface with existing architectures to gather the required receiver performance data to include, but not limited to:

- Cruise and AR Fuel burn rate
- Fuel capacity
- Fuel transfer rate for AR system
- Altitude range for operations
- Cruise speed envelope
- AR speed envelope
- Cleared tanker database for the specific receiver in question
- Receiver fuel policy requirements, e.g. fixed fuel reserves, variable fuel reserves, etc.
- Divert Requirements
- Air-to-Air TACAN

2.1.3 AR Communication Plan

The system should allow the requestor to specify the communication equipment types onboard the receiver aircraft and applicable EMCON procedures. Free text may be entered to further define communication requirements by the requestor.

2.1.4 Requestor Contact Information

At a minimum, a field must be available for the requestor to load all relevant information. This information must contain, but is not limited to:

- Point of Contact Name
- Point of Contact Office
- Daytime & after-hours Commercial Telephone Number with Country Code
- Requestor/Organization Contact Email Addresses

2.1.5 Receiver Special Considerations

A free text field should be available to specify special considerations.

2.2 Mandatory Fields for Tanker Requirements

2.2.1 Tanker Number, Nation, Type (to include manned or unmanned), Location, Call Sign, & Additional Information/Restrictions

2.2.2 Tanker Unit Information

At a minimum, a field must be available to load all relevant information. This information must contain, but is not limited to:

- Point of Contact Name
- Point of Contact Office
- Daytime & after-hours Commercial Telephone Number with Country Code
- Requestor/Organization Contact Email Addresses
- Flight Duty Period
- Unit's Number of Taskable Lines per Day
- Maintenance Turn Time
- Maximum fuel load
- Tanker configuration and number
- Sortie Generation Rate
- Approved Operating Bases with Maximum on Ground (MOG) limitations

2.2.3 Tanker Performance Data

The system should include an automated interface with existing architectures to gather the required tanker performance data, to include but not limited to:

- Cruise and AR Fuel burn rate
- Fuel capacity
- Altitude range for operations
- Cruise speed envelope
- AR speed envelope
- Cleared receivers database for the specific tanker in question
- Tanker fuel policy requirements, e.g. fixed fuel reserves, variable fuel reserves, etc.
- Minimum time to reconfigure between AR systems
- Minimum time between receiver formations
- Configuration time prior to initial refueling operations
- Ability of the tanker to be refueled while airborne and specify AR system required
- Tanker cell formation qualification
- Divert Requirements
- Air-to-Air TACAN

2.2.4 AR System Type

Define AR system type according to the below configurations:

- BDA = Boom Drogue Adapter
- BOM = Boom
- BWD = Boom, Wingtip Drogue
- CBD = Boom, Centreline Drogue
- CDT = Centreline Drogue, Wingtip Drogue
- CLD = Centreline Drogue
- CWT = Boom, Centreline Drogue, Wingtip Drogue
- WTD = Wingtip Drogue
- WTD + BDA = Wingtip Drogue & Boom Drogue Adapter

The ability to indicate if the AR system is automated

2.2.5 Tanker Communication

The ability for the tanker unit to specify the communication equipment types onboard the tanker aircraft and applicable EMCON procedures. Free text may be entered to further define communication requirements by the tanker.

2.2.6 Tanker Special Considerations

A free text field should be available to specify special considerations.

A check box to indicate if the tankers are tied to specific large packages of aircraft.

Drop-down section to input ground alert requirements:

- Number of tankers required
- Alert time requirements is required
- AR System requirements (BOM, BWD, CBD, etc.)
- Alert Status (1-hr alert, 2-hr alert, etc.)
- A check box to indicate if the tankers are tied to specific large packages of aircraft
- A free text field should be available to specify special alert considerations.

2.3 Critical Information Requirements

2.3.1 Operation Command & Control

A free text field to list the agencies or organizations that have OPCON and TACON of the overall operation or portions thereof and where the tanker-receiver clearance authority resides (if different).

2.3.2 Operation Specific Special Use Considerations

A free text field should be available to specify special considerations.

2.3.3 Prioritization of AR Requests

The ability to prioritize the AR requests based on the Operational Commander's intent

2.3.4 Country/Unit Specific Considerations, Limitations & Caveats

The ability to input considerations, limitations & caveats that may impact AR operations including, but not limited to:

- Existing clearances
- Specific information about the Receiver nation/unit
- Specific information about the Tanker nation/unit
- Specific information about the airspace nation, to include diplomatic clearance timelines and contact information

2.3.5 Funding Arrangements

A free text field to identify any pre-existing or anticipated funding/reimbursement sources (if applicable), to include either monetary arrangements or service exchange derivatives.

2.4 The Optimization/Planning Tool

2.4.1 Inputs to the Optimization/Planning Tool

- Receiver data from Section 2.1
- Tanker data from Section 2.2
- Critical Information Requirements from Section 2.3
- Planner defined fuel transfer rate for tanker refueling system and receiver type

2.4.2 Outputs from the Optimization Tool

- Individual tanker planned offload and additional fuel available
- Total tanker fuel available
- Total fuel airborne
- Total fuel tasked
- Tanker basic flight plan
- Visual confirmation that the pairing address the TCA/OCA, legal and fiscal arrangements
- Automatically transfer the AR pairing into the applicable ATO production system
- Flag any missing data
- Flag any unpaired scheduled receivers
- Assign alert tankers based on alert requirements
- Compute the next available takeoff day & time for each tanker
- Update of the tanking plan to account for delayed or added/cancelled receivers and/or changes in offload requests during the planning phase
- Ability to store, retrieve, duplicate, & update the plan
- The ability for the user to customize the display of the output
- Tanker/Receiver pairings
 - Tanker Nation
 - Tanker call sign
 - Tanker Configuration (BOM, CLD, WTD, BDA, BWD...)
 - Tanker total offload vs potential offload & fuel efficiency
 - Tanker On Station Time in UTC
 - Location or AR Area Name
 - Altitude
 - Receiver Nation
 - Receiver call sign
 - Receiver Slot Time in UTC
 - Receiver Number & Type
 - Requested Fuel Offload in both pounds & kilograms
 - Communication Information

2.4.3 What the Optimization Tool Shall Do

- Automatically talk to existing systems
- Recognize types of tanker/receiver AR systems and determine compatibility
- Offer an optimized solution but allow for manual pairing
- Automated tanker/receiver matching
- Apply user inputs & constraints for planning
- Be filterable
- Refresh data at a rate commensurate with existing/interfacing systems
- Allow for input of funding agreements & legal agreements
- Generate reports and metrics for operational assessments
- Provide for system user contact lookup
- Allow for Unit contact look up
- Provide remote authorization function for red card holder use etc.