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One Solution.



# The MRTT Mission Computer System

A Planning and Monitoring Tool  
for Air-to-Air Refueling

# The MRTT Mission Computer System

Currently in service installed in A310 MRTT and CC-150T tankers, although readily adaptable to other tanker aircraft, the MRTT Mission Computer System (MCS) brings all the features of a mission planning system normally used on the ground to the air refueling operator's workstation on board the aircraft, allowing flexible and efficient mission management without compromising safety. Under all conditions, operator workload is reduced by easy-to-interpret information displays, significantly enhancing situational awareness for the whole tanker crew.

Major benefits are:

- Situation awareness improvement
- Easy planning of world-wide towline and trail missions
- All mission relevant information included
- Rapid in-flight re-planning with "what-if" functionality
- Seamless integration into training simulator
- Identical planning software on industry standard laptop computer

"The MCS is a really superb system which instantly provides new tanker crews with the AAR mission management skill levels it would otherwise take them many hours of expensive training to achieve. It's been created by a company who clearly understand exactly what aircrew need for flexible, efficient AAR operations with the latest generation of tanker aircraft "

*Sqn Ldr Nick Wilcock,  
former RAF VC10  
Chief Flying Instructor  
and AAR Examiner.*

## Planning and monitoring AAR missions

Planning Air-to-Air Refueling (AAR) missions is a complex and demanding task, which requires a lot of knowledge and experience. Mission execution can involve taxing problems as a result of weather or technical conditions. Computer based planning methods can offer very significant advantages for both accurate planning and safe execution of AAR missions.

There are essentially two types of AAR missions:

- Towline missions

The tanker flies from a base to an Air-to-Air Refueling Area where it executes a predefined pattern and refuels receiver aircraft joining the tanker for the duration of pre-defined time slots.

- Trail missions

Trail Missions are used to extend the range of receiver aircraft to allow them to transit between different theatres of operation without the need for landing at en-route airfields.



During trail missions, the fuel onboard the tanker and receiver aircraft has to be monitored constantly in order to ensure that both tanker and receivers will reach their destination safely. Changes in weather conditions enroute or at destination or alternate airfields as well as technical conditions may require substantial deviation from the original plan.

Towline missions, on the other hand, may require quick decisions. When unexpected receivers request fuel in a critical, low-fuel state situation, the tanker crew needs to react quickly to meet such needs and to optimize mission execution while ensuring the safety of both the tanker and receiver aircraft.

Suitably trained and experienced crews are an indispensable prerequisite for all AAR operations. However, the MCS constitutes a tool by which precise critical decisions can be made, based on the dynamic situational awareness it provides. Training of AAR crews can be made quicker and more efficient, using the MCS in a suitable training environment as is currently being used by both the German and Canadian forces.

Map page showing the start of a trans-oceanic trail mission with the first refueling brackets and the associated last point of diversion (yellow triangle).

# Overview of System Functions

The MCS allows the creation of a complete advisory flight and fuel plan for single tanker AAR missions, both towline and trail, including:

- Flight track definition by nav database waypoints, user waypoints, airways, SIDS/STARS
- Climb, enroute and descend altitude profile
- Consideration of statistical or actual weather
- Selection of take-off, destination and alternate airfields
- Automatic trail planning with instant in-flight single-hose re-planning
- Independent flight planning for tanker and receivers from take-off up to a rendezvous point and from a split point to destination
- Planning and automatic optimization of refueling events under full operator control



The tanker's onboard fuel is calculated along the trail mission, taking the refueling events into account.

Flexible in-flight re-planning functions are provided, e.g. for

- On-Call receivers (towline mission)
- Dual hose/single hose re-planning
- Change of destination or alternate airfields
- Actual fuel consumption
- Technical limitations due to reduced capabilities of tanker or receiver

Comprehensive display features include:

- Moving map with nav database, main geographical features, planned and actual flight track, present position, AAR information
- Fuel graph (planned vs. actual)
- Fuel system status, fuel flow rates, monitoring of critical fuel levels
- Center of gravity progression
- Fuel transfer plan and status



This comprehensive overview of planned refueling events aids the fuel operator.

The system provides various options for data logging and printout:

- ICAO flight plan
- Mission card
- FMS data sheet
- Flight and Offload logs
- Mission log (free text)
- Various event logs

System Maintenance and housekeeping functions include:

- Built-in test (IBIT, PBIT, CBIT)
- Software and data loading
- Declassification (to NATO standards)

Pre-mission planning is accomplished using an industry standard laptop or desktop computer running Windows® XP. The software is identical to the in-flight software. Thus, all planning functions are also available onboard.

# MCS Equipment

## Hardware and Interfaces

The A310 MRTT Mission Computer System hardware comprises:



ARINC-600 LRU housing the MCS processing unit.

- Two ARINC-600 airborne computers in a common tray with forced cooling
- Two 15" LCD displays
- Control panel
- Keyboard and pointing device
- Ethernet switch

The MCS uses a total of 15 ARINC-429 channels and some discrete signals to receive data from A310 MRTT avionics systems such as FMS, clock, air refueling computer, air data computer etc. The MCS design prohibits sending of data to any of these systems.

The MCS interfaces to the cockpit ACARS printer via Ethernet, allowing printout of flight plans, FMS input data etc. directly in the A310 MRTT cockpit.

## Qualification

All MCS software has been developed in accordance with RTCA DO-178B, Level D and ABD0100. All MCS onboard hardware has been qualified in accordance with Airbus specifications and RTCA DO-160D.

## Funkwerk Avionics GmbH

Funkwerk Avionics GmbH is part of the German Funkwerk Group which develops and produces professional communication systems used in various areas of transportation. Further information can be found at [www.funkwerk.com](http://www.funkwerk.com).

Funkwerk Avionics GmbH is an EASA approved production and maintenance organisation (EASA Part 21G/Part 145). It develops, produces and sells avionics equipment and avionics system solutions in the areas of communication, navigation and displays. The company also offers the "Filser" product lines of TRT Mode S transponders and ATR VHF voice radios for general aviation.

Funkwerk Avionics also develops avionics equipment and system solutions for major OEM companies such as Airbus Deutschland, EADS Deutschland and public agencies such as Eurocontrol or the European Space Agency (ESA).

The MRTT Mission Computer System was developed by Funkwerk Avionics GmbH under contract from Airbus Deutschland GmbH.

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