

Delivering concurrent training solutions for C-5 Galaxy Aerial Refueling Part Task Trainer upgrades

The Customer

United States Air Force
C-5 MATS Program Office

The Situation

Trainer lacks concurrency with aircraft.

After the Air Force retired the C-141 and began upgrading its fleet of C-5s, the Aerial Refueling Part Task Trainers (ARPTT) at Dover AFB, Travis AFB, and Lackland AFB retained characteristics designed to support outdated aircraft. These trainers presented pilots with significant differences from the aircraft they will fly. Physical and technological aspects of the trainers required updates to better reflect the controls and traits of the C-5M Super Galaxy model.

The Challenge

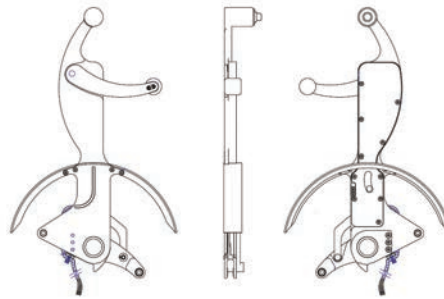
The C-5M upgrade includes a redesigned throttle quadrant and the newer GE CF6 engine, both of which needed to be reflected in the Dover AFB ARPTT trainer. The engine upgrade requires modifications to the aerodynamic model to simulate the C-5M's engine performance. Trainers at all three bases were originally a dual air-frame design that supported the since-retired C-141; the trainers featured obsolete C-141 seats that did not offer the look or feel of the C-5 platform.

An additional problem at all three Air Force bases was a tanker roll issue. This software problem induced a slight right wheel offset in the receiver after the tanker is commanded into a left bank.

The Solution

As prime contractor, Nakuuruq Solutions led the efforts to achieve 100% concurrency at each of the Air Force bases providing ARPTT trainers in each of the needed areas and updated documentation and formal Acceptance Test Procedures.

Throttle quadrant—Nakuuruq used computer numerically controlled (CNC) milling to reproduce the upgraded throttle handles, reducing costs while providing the form and feel of the C-5M. Nakuuruq adapted these handles to the existing throttle pulleys and left the remainder of the throttle quadrant intact.



Nakuuruq milled updated throttle handles for the ARPTT trainer that reflect the form and feel of the C-5M.

Aerodynamic model—Nakuuruq upgraded the aerodynamic model to reflect the performance of the C-5M and its new GE-CF6 engine. The upgrade is fully integrated into the throttle upgrade and the engine performance simulation reflects the operating envelope in the ARPTT.

Tanker roll fix—Nakuuruq analyzed the software model to identify the cause of the tanker roll problem and developed corrective code to eliminate the issue. Nakuuruq demonstrated the correction to government Subject Matter Expert pilots before the fix was incorporated into the training load build.

C-5 seat upgrade—Because the C-5 seat would not fit the trainer flight deck, Nakuuruq purchased, refurbished, and modified commercially available aircraft seats built by the same manufacturer as the C-5 seat to replace the obsolete C-141 seat. Nakuuruq also designed and milled new seat rails that met requirements for surface tolerance and the seat vibration mechanisms.

Sky background films—Three new background films were provided to meet ARPTT needs and avert a possible obsolescence issue in the future.

The Benefits

Nakuuruq took several innovative steps to reduce costs and trainer downtime for the government without sacrificing the quality or capabilities of the ARPTTs:

- Reverse engineered and fabricated throttle handles rather than purchase costly parts from the OEM.
- Milled seat rails instead of purchasing expensive extruded aluminum rails.
- Test fitted the new C-5M throttle handles on a spare throttle quadrant.
- Eliminated the requirement for a sky background scene that the program office, SMEs, and the TSSC acknowledged would not be used.



Upgrades to the ARPTT achieved concurrency with fleet aircraft and improved the validity of training. Nakuuruq Solutions produced and installed updated throttle handles, seats, and background films while updating the simulator's software to reflect C-5M performance and capabilities.