

AERO TEST SOLUTIONS FOR HELICOPTERS

KOREAN AEROSPACE RESEARCH INSTITUTE

Summary

Korean Aerospace Research Institute (KARI) required a leading-edge test capability to help develop and build 245 utility helicopters over a 16-year period. Moog supported this unprecedented production project through the design and installation of a robust and flexible structural test solution.

Background

As part of a multi-billion-dollar procurement project by the Korean Ministry of National Defense, KARI was charged with developing an aero test solution to perform a wide range of structural full-scale tests and 12 independent tests. The institute turned to Moog to meet their stringent test requirements, provide a comprehensive software training program for KARI engineers and deliver a high level of test flexibility, technical performance and hands-on expertise.

Specifically, the KARI objectives included:

- Supply the hydraulic system, actuator and data acquisition system to carry out fatigue and static structural tests for the helicopter rotor system
- Install the hydraulic system in the rotary wing aircraft laboratory to supply the flow used for the hydraulic actuators for the fatigue test
- Integrate the data acquisition system with hydraulic control equipment specified and used by KARI

Moog was selected to develop the aero test solution for the Korean Helicopter Program, despite KARI's previous 15-year relationship with a well-established competitor.

Project success factors

The following criteria played an important role in the selection process for this assignment:

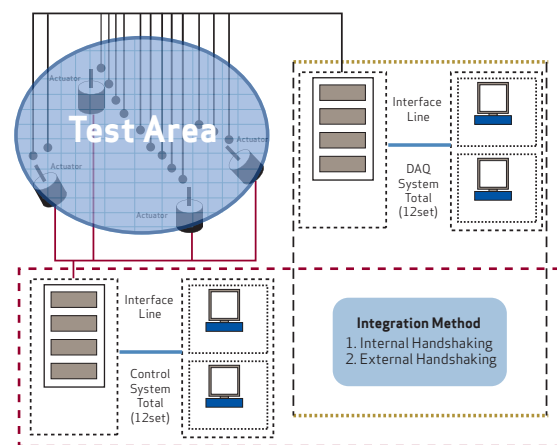
- A solid match between price and test capabilities
- A comprehensive proof of concept demonstration by Moog engineers
- Previous experience with similar installations
- Knowledge, expertise and support from Moog engineers particularly Moog's unique technical knowledge and experience in helicopter test techniques

After design and development, the system was delivered as planned and test controllers installed within three days by Moog engineers.

The technical challenge

The requirements of the aero test solution include:

- Apply and measure force to simulate and test real-time durability and resistance of helicopter components especially fatigue tests on rotor hub, swash plates and blades
- Integrate seamlessly with the Institute's existing data acquisition systems in their new test labs

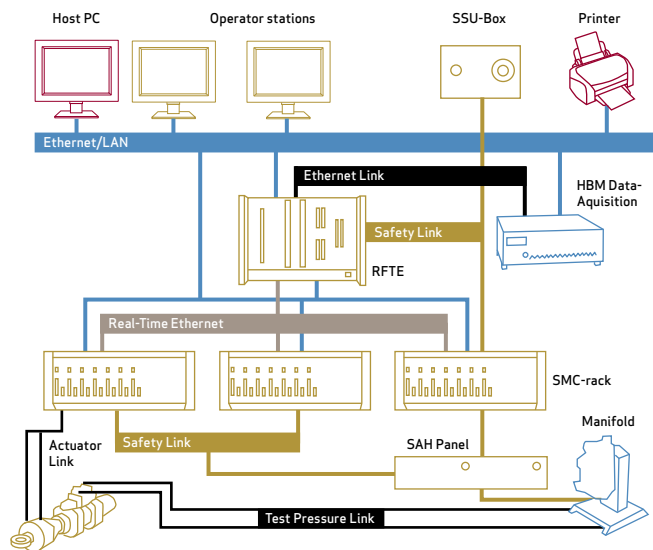


Moog concept for control and data acquisition for the Korean Helicopter Program.

TEST	GOAL
Main Rotor Hub	<ul style="list-style-type: none"> • Simplified structure/increased efficiency
Engine	<ul style="list-style-type: none"> • Digitization of all functions • Independent dual channel Full Authority Digital Engine Control (FADEC) with high level of safety
Fuel Tank	<ul style="list-style-type: none"> • MII crash resistant
Landing Gear	<ul style="list-style-type: none"> • Superior landing performance over comparable helicopters
Blade	<ul style="list-style-type: none"> • High-performance hovering element • Increased lifespan

The Korean Helicopter Program required a flexible, scalable approach to accommodate a variety of potential component tests as listed above and deliver the desired results.

The Moog solution



The Moog Test Controller System architecture is tailored to KARI's specific requirements.

Moog engineers collaborated closely with the test engineers at KARI to provide the most effective, and tailored aero test solution. The key consideration for the entire Moog Test Controller System architecture was flexibility both in terms of test protocols and growth potential.

The system features:

- Six cabinets with 16 control channels each
- A 256-channel HBM Data Acquisition System



The KARI application featured multiple cabinets with 16 control channels in each.

- A new software functionality that allows Real-Time Ethernet-based data transfer between the command generator (Real-Time Front End) and the localized control loops creating a high integrity connection
- A dedicated Ethernet interface for the transfer of force, position and spectrum data from the Moog Test Controller to the data acquisition system (CatMan), and for activating actions (e.g., Take Snapshot) on the CatMan System

Currently, KARI's test program simultaneously runs eight distinct and independent component tests. KARI plans to develop new facilities to run more ambitious test plans based on the Moog system's potential.

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Korean Helicopter Program
Mobium/PDF/0809

Benefits of the Moog Aero Test System

The new aero test system offers KARI a multitude of benefits ranging from cost efficient operation, virtually unlimited flexibility and total access to local Moog expertise and ongoing system support. Specific performance benefits include:

- **Load Control System**—One cabinet can work two independent tests, therefore providing 12 total workstations. KARI can perform 12 different tests independently with up to eight-channel control stations or one full-scale test. In both cases, up to 96 channels can be used.
- **Data Acquisition System**—The load control system has been set up to communicate seamlessly with two different data acquisition external systems, HBM and VTI. This provides KARI with the flexibility they require to address their wide range of tests.
- **Test Comparison and Analysis**—Because the two systems are connected via Ethernet, KARI can directly cross-check data from the load control system and data acquisition system through time stamps. This allows all data to be stored and archived faster and more efficiently on a hard disk for post-test analyses.

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For further information on the KARI aero test system installation, contact test@moog.com