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30/06/2016

Runway FOD Detection Systems, Distance Measuring Equipment, Tactical Air Navigation

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Runway FOD Detection Systems, Distance Measuring Equipment, Tactical Air Navigation

Runway FOD detection system, Distance Measuring Equipment (DME), Tactical Air Navigation (TACAN) system, VHF Omni-directional Radio Range (VOR), Direction Finder (DF)

Formed in 1951, Moog Inc. is a US publically traded company on the NYSE.

Moog acquired Femau Avionics Ltd. in 2009 and integrated its operations with the U.S. NaSS business sector. NaSS is part of Moog Aircraft Group, which represents over \$1B USD in annual revenue.

Major customers are Boeing, Airbus, Embraer, Bombardier, Lockheed and General Dynamics.

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Radar-based Runway FOD Automatic Detection System

FOD (Foreign Object Debris) detection system, designed by QinetiQ, consists of a millimeter radar plus MIL-SPEC camera systems mounted on a tower.

The scanning radar detects FOD and the high precision camera system slews to locate the FOD and verifies the presence and nature of FOD.

This system is in use at multiple airports including London Heathrow and Vancouver International, and has been approved for use by the FAA, CAA and other regulatory agencies.



Tarsier radar-based FOD detection system.

Tactical Air Navigation (TACAN) Equipment

MM-7000

Available in single or dual configurations with power options up to 5kW. The MM-7000 is Moog's third generation TACAN design. It can be installed in fixed-site, mobile or shipboard applications.

Moog's MM-7000 TACAN is fully compliant with NATO STANAG 5034, MIL-STD-291C and relevant ICAO Annex 10 requirements for TACAN services. Additionally, the MM-7000 has been environmentally tested and complies with specifications found in MIL-STD-167, MIL-STD-810G, MIL-STD-461F, MIL-STD-901, MIL-HDBK-217 and FAA-E-2996.

This TACAN design provides a "fail-soft" power amplifier configuration and complete redundancy in the dual configuration. Local and remote monitoring and control capabilities provide an intuitive user interface. Remote control and status can be provided up to 5 miles distant from the beacon-transponder using twisted pair cabling and in any location using a modem.

Electronics are based on latest current generation technology: surface mount CCAs and field programmable gate arrays. This design reduces CCAs to a minimum and achieves >60,500 hours MTBO.

Extensive BITE capabilities provide detailed system performance analysis through the control and monitoring interface. No specialized test equipment is required to maintain MM-7000 TACANs.

2010 TACAN

Available in single or dual configurations with power options up to 5kW. The 2010 TACAN can be provided as a fixed-site or mobile system. The system can also be integrated with a VHF Omni-directional Radio range (VOR) to provide VORTAC capabilities.

Moog's 2010 TACAN is fully compliant with NATO STANAG 5034, MIL-STD-291C and relevant ICAO Annex 10 requirements for TACAN services.

Moog has recently redesigned the 2010 TACAN to eliminate obsolescence and to improve performance. The new design achieved a high degree of commonality with the 2020 DME and many LRUs are the same. As a result of this redesign, Moog's 2010 TACAN now has a robust remote maintenance monitoring (RMM) capability for local and remote control of critical operating parameters. This capability provides advanced warning of potential outages which allows optimization of repair and service activities. A local status indicator panel is available for the system.

MM-7000MP

The MM-7000MP is a man-portable version of Moog's MM-7000 TACAN product line. It utilizes the same LRUs found in all other MM-7000 systems. System monitoring, diagnostics and control are identical to other MM-7000 family products.



Moog's TACAN family addresses any operational need.

Moog's MM-7000MP is the world's smallest lightest weight TACAN.

TACAN Antennas

Moog manufactures a variety of TACAN antennas specialized for optimum performance in harsh conditions. Antennas range from electronically-scanned systems for fixed-site installations to man-portable highly mobile applications to the standard naval shipboard system used by naval forces around the world.

Moog TACAN antennas include the following:

- 2010 fixed and mobile
- 900E large aperture fixed site
- 950E/ET medium aperture fixed and mobile
- AS-4502/T mobile and man-portable
- AS-3240/URN shipboard
- OE-273(V)/URN antenna group (includes the AS-3240

The newest antennas, 900E and 950E/ET, are Moog designed and Moog owns full intellectual property rights (IPR). These antennas offer superior performance for fixed and mobile installations. The 950ET is designed for expeditionary applications and weighs only 44kg.

Distance Measuring Equipment (DME)

2020 DME

Available in single or dual configurations with power options of 100W or 1kW. The 2020 DME can operate as a standalone system or in conjunction with another navigation aid such as an ILS, MLS, NDB, CVOR or DVOR.

Moog's 2020 DME is fully compliant with ICAO Annex 10 requirements for DME services.

Field-proven mean time between outages (MTBO) in excess of 800,000 hours have been achieved with this system. LRUs are common with the 2010 TACAN system. Mean time to repair (MTTR) is typically less than 15 minutes.

A robust RMM capability, based on MS Windows, shows operating parameters, overall system status, LRU status, alarm limits, diagnostics and test, amplifier status, transmitter control status and other key elements. A trend analysis facility allows early identification of potential failures which allows optimization of repair and service activities.



Moog's DVOR, CVOR and VORTAC systems for terminal and enroute applications.

Direction Finding (DF) Equipment

2030 DF

Moog's high-resolution DF system is suitable for military or civil operations. Both wide- and medium-aperture systems are available.

The 2030 DF can be delivered to cover aeronautical VHF and UHF frequencies as well as the VHF marine band. 2030 DF systems can be installed as fixed-site, mobile and shipboard applications.

Moog's 2030 DF employs a Doppler method to provide a high degree of accuracy in difficult site environmental conditions.

Multiple 2030 DF systems can be networked together to deliver large-scale national infrastructures to support auto-triangulation, multiple users and multiple frequencies. A robust RMM capability, tied into extensive BITE facilities, allows remote diagnostics down to a module level.

Auto-Triangulation

Moog's auto-triangulation system accepts DF information from two or more DF systems and automatically calculates transmitter position overlaid on customized mapping information.

Additional information such as flight/ship information, region/political boundaries, transmission frequency and danger areas can be combined to provide an accurate situational picture.



Moog DME and DF solutions can provide standalone or integrated with other systems.

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