**Moog FORM 442 Supporting Data**

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**a. Nature of the research project being conducted**

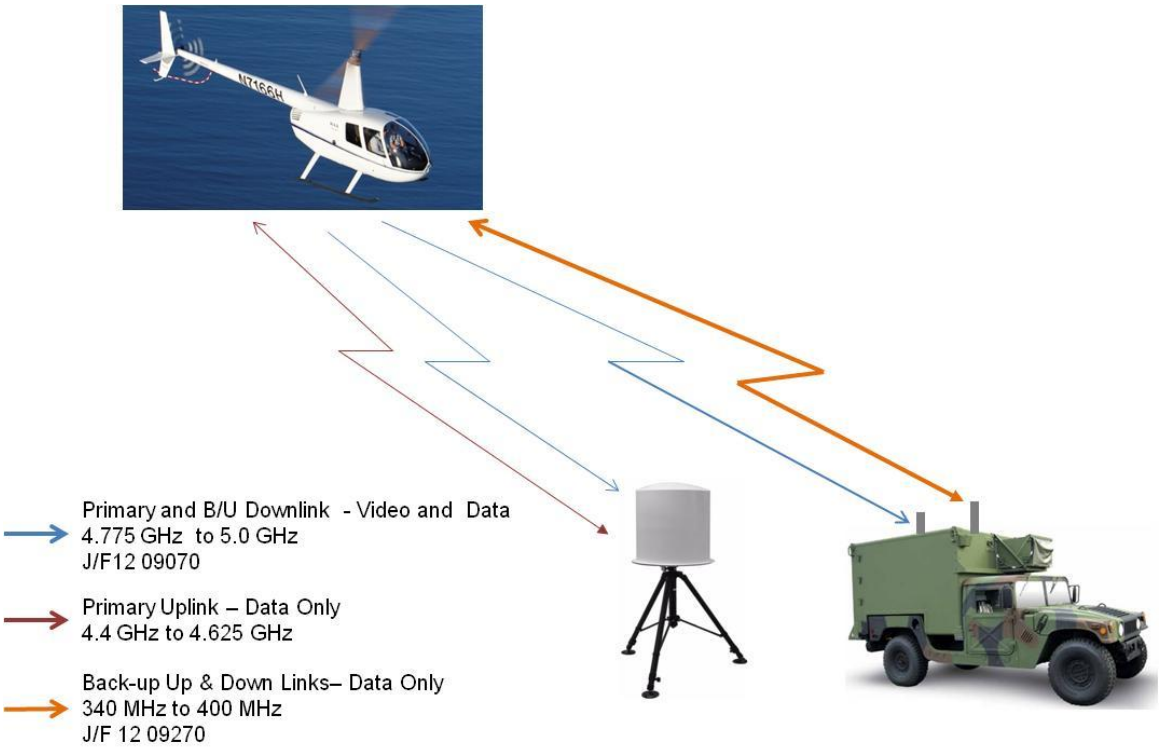
Moog Inc., Aircraft group (MAG) is developing an Airborne Vehicle Management System (AVMS) for use in Optionally Piloted Vehicles (OPV) and Unmanned Aircraft Systems (UAS) applications. As part of this effort MAG is purchasing existing off-the-shelf data link products to be used in conjunction with the AVMS to remotely control and monitor the OPV / UAS.

The objective of this project is the design, build, and test of a system consisting of an Optionally Piloted Vehicle under remote control of a HMMWV mounted, Moog developed Ground Control Station (GCS). Both the OPV and GCS include the integration of Radio Frequency (RF) equipment into the final Moog products.

The initial tests will be conducted in New York and will have an onboard safety pilot. This project is funded entirely by Moog.

**b. Necessary communications facilities**

Initial test program utilizes a Robinson R44 helicopter, modified to fly under control of the Moog GCS. The required communications equipment is depicted in the Figure 1 below.




A summary of the airborne and ground based emitters and their key characteristics are included in Attachment A.

c. **Existing communications facilities**

There are no existing facilities that could be used for this project. The Moog UAS utilizes data links that need to be dedicated to our application. The airborne equipment needs to integrated with the AVMS and the ground based communications equipment is integrated with the GCS controls an human interfaces.

## Attachment A – Moog UAS Transmitter Summary

| Item # | Mfg | Model No | Description | Beamwidth (Deg) | | Frequency (MHz) | | Tuning Resolution /Freq. Tolerance | Power (W) | ERP (w) | Mean / Peak | Modulating Signal | Emission Designator |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Horizontal | Vertical | Lower | Upper | | | | | | |
| **Airborne Transmitters** | | | **Mobile: Latitude N 42 33 34, Longitude W 78 20 15 , Operational Radius 26 Km** | | | | | | | | | | |
| 1 | BMS (See Note 1) | Helicoder 4, HC4--47-H | Video and Data Transmitter Primary Down link | 360.0 | 20.0 | 4,400 | 5,000 | 1 MHz +/-0.00025 % | 10.0 | 20 | Mean | COFDM (QPSK, 16QAM,64QAM) | 8M00D7W |
| 2 | BMS | Helicoder 4, HC4--47-H | Video and Data Transmitter Back-up Down link (Same as Primary) | 360.0 | 20.0 | 4,400 | 5,000 | 1 MHz +/-0.00025 % | 10.0 | 20 | Mean | COFDM (QPSK, 16QAM,64QAM) | 8M00D7W |
| 3 | FW | FGR2-CEU | B/U Data Transmitter (FHSS) | 360.0 | 20.0 | 902 | 928 | 230.4 KHz +/-0.00015 % | 1.0 | 2.0 | Mean | GFSK Freq Hopping | 230KF1D |
| **Ground Transmitters** | | | **Fixed (1) Strykerville, NY: Latitude N 42 45 55, Longitude W 78 27 36 377 Big Tree Rd. Strykersville, New York Wyoming County** | | | | | **Fixed(2)E. Aurora, NY: (For ground test only)** | | **Latitude N 42 48 14 , Longitude W 78 39 27 Moog, Plant 6 E. Aurora, New York Erie County** | | | |
| 1 | BMS | BMTII-22 | Command / data Transmitter Primary | 6.4 | 6.4 | 4,400 | 5,000 | 1 MHz +/-0.00025 % | 8.0 | 1,400 | Mean | FSK | 330KF9W |
| 2 | FW | FGR2-CEU | Data Transmitter (FHSS) Back-up | 360.0 | 20.0 | 902 | 928 | 230.4 KHz +/-0.00015 % | 1.0 | 2.0 | Mean | GFSK Freq Hopping | 230KF1D |

Notes:
1. BMS - Broadcast Microwave Services, Poway, CA ; FW - FreeWave Technologies, Boulder, CO
2. Frequencies can be changed remotely during a mission
3. The C-band emitters are tunable in 1 MHz increments within the upper and lower frequencies
4. FW radio is a Spread Spectrum transmitter using 7user selectable hopping bands
5. ERP includes allowance for cable losses