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Applicant:	Flight Research Inc
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The National Test Pilot School (NTPS) required an Unmanned Aerial Vehicle (UAV) to serve as a flight test instructional device. With few exceptions, UAVs cannot currently be operated in the National Airspace System (NAS) and are platforms that require extensive training for safe operation. Consequently, a Cessna 150 (Figure 1) was converted into a surrogate unmanned aerial vehicle (SUAV). The SUAV will always have a certified airplane pilot on-board who can deactivate the ground-controlled autopilot system at any moment. The aircraft was modified to be remotely operated using the Cloud Cap Piccolo II autopilot. The Piccolo autopilot allows the system to be controlled via Command Directed (CD) mode or in a Remotely Piloted Vehicle (RPV) mode. The SUAV system is currently configured to control the elevator, ailerons, and throttle from the Ground Control Station (GCS), shown in Figure 2. An Electro Optic/Infrared gimbal is currently being integrated onto the SUAV in the future to enhance the flight test training for systems evaluations. The SUAV was certified by the Federal Aviation Administration (FAA) as an optionally piloted aircraft (OPA) in August of 2010.



Figure 1 – Cessna 150



Figure 2 – GCS

The aircraft will be based at the National Test Pilot School, 1030 Flight Line Hangar 72, Mojave, CA, 93502. All flights are authorized by the FAA within a 40 nm radius area (containment area) as identified in Figure 3. This SUAV must be operated to avoid areas having heavy air traffic, and when operated in the vicinity of villages, towns, cities or other populated areas. The pilot must plan routing that will avoid densely

populated areas and congested airways. The majority of operations will take place in the Isabella military operating area (MOA).

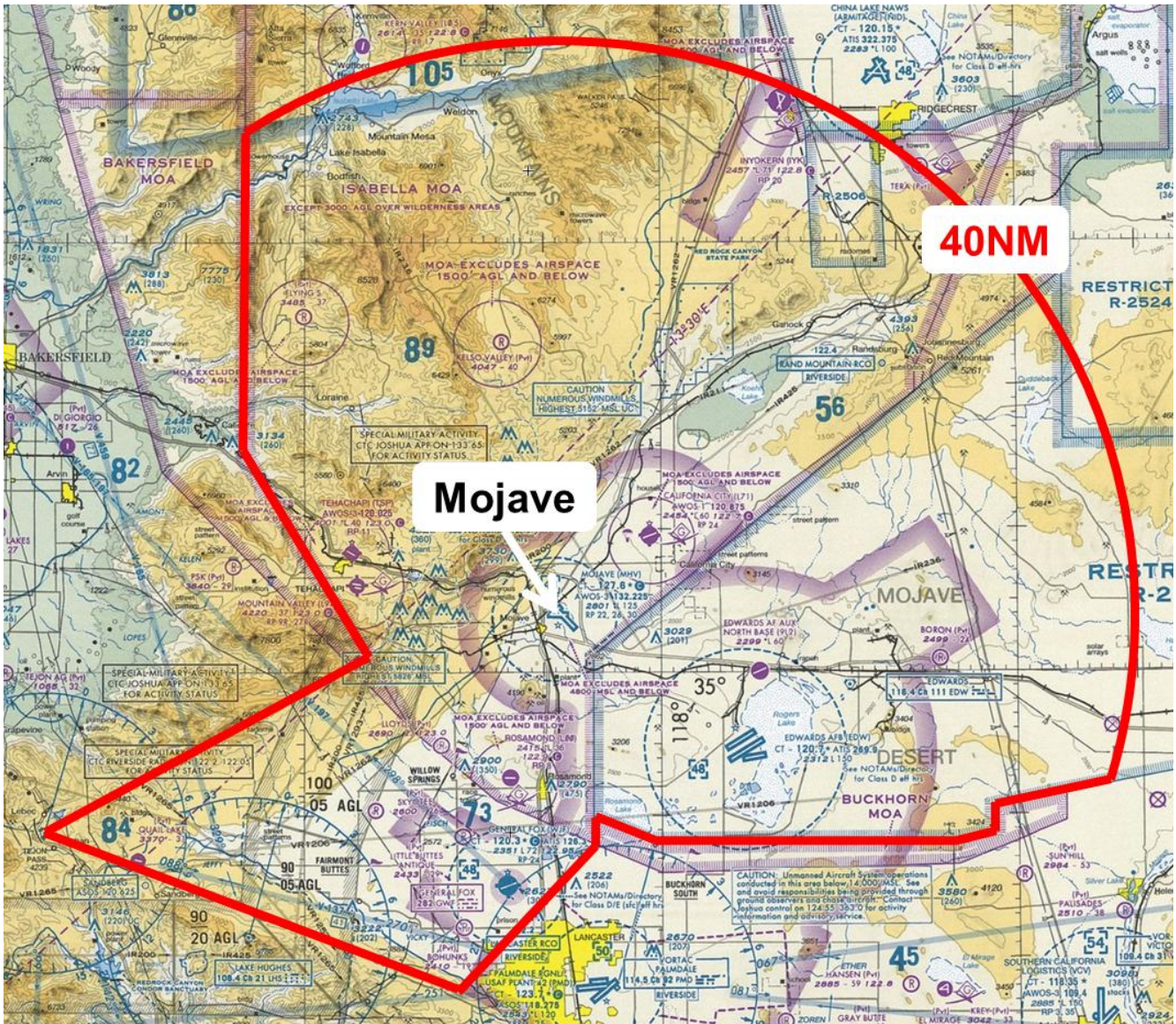


Figure 3 – SUAV Operating Area

The FCC previously granted a license to Flight Research Inc (Call Sign:WF2XLJ File Number:0276-EX-PL-2010) for the SUAV. This license allowed use of a 10W 2.4GHz Analog Video transmitter onboard the aircraft. Extensive datalink testing found the video link to be severely limited in range and the system was removed. The command and control datalink is currently an unlicensed 1W Microhard MHX910A radio installed in the Cloudcap Piccolo II autopilot. Extensive flight testing has been conducted to evaluate the command and control datalink. The Figure 4 depicts the acknowledgement ratio of the system out to approximately 30nm. The command and control datalink was found to only have a reliable signal within 10nm. To complete the desired mission the aircrafts command and control and video datalinks must provide a reliable signal out to 30nm.

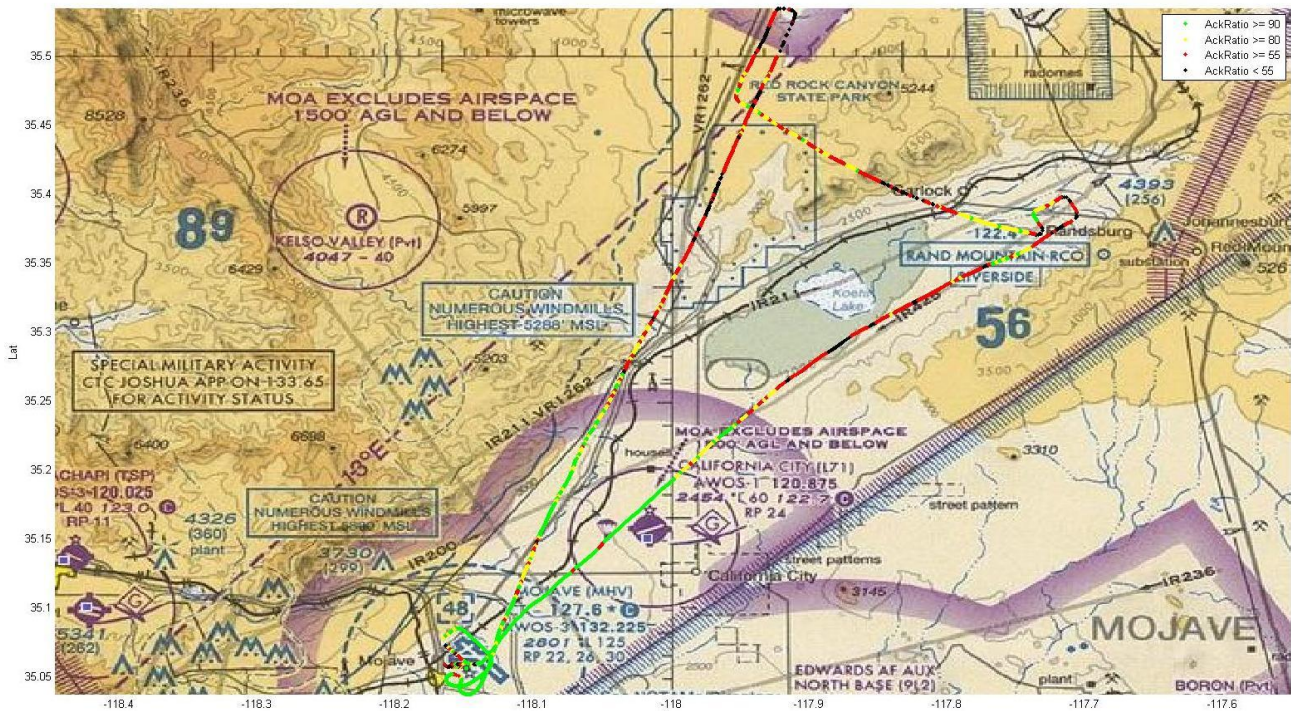


Figure 4 – Command and Control Datalink Flight Test

In order to obtain the required operating range it is planned to add install three 25W 900MHz Teletronics Bi-Directional SmartAmps. These amplifiers are particularly effective when used with Direct Sequence or Frequency Hopping Spread Spectrum radios. The amplifiers are planned to be installed in the aircraft. One amplifier will be installed with the Microhard MHX910A radio installed in the Cloudcap Piccolo II autopilot for command and control of the vehicle. The other two amplifiers will be utilized with two FreeWave HTP-900RE radios for EO-IR gimbal control and digital video transmission. The purpose of the SUAV is to fly the aircraft locally for research projects and as an academic exercise for students in a UAV flight test course. Students will execute tests in remotely piloted and command directed modes from a ground control station, collecting data employing typical flight test techniques and evaluating the system. A block diagram of the updated system is shown in Figure 5.

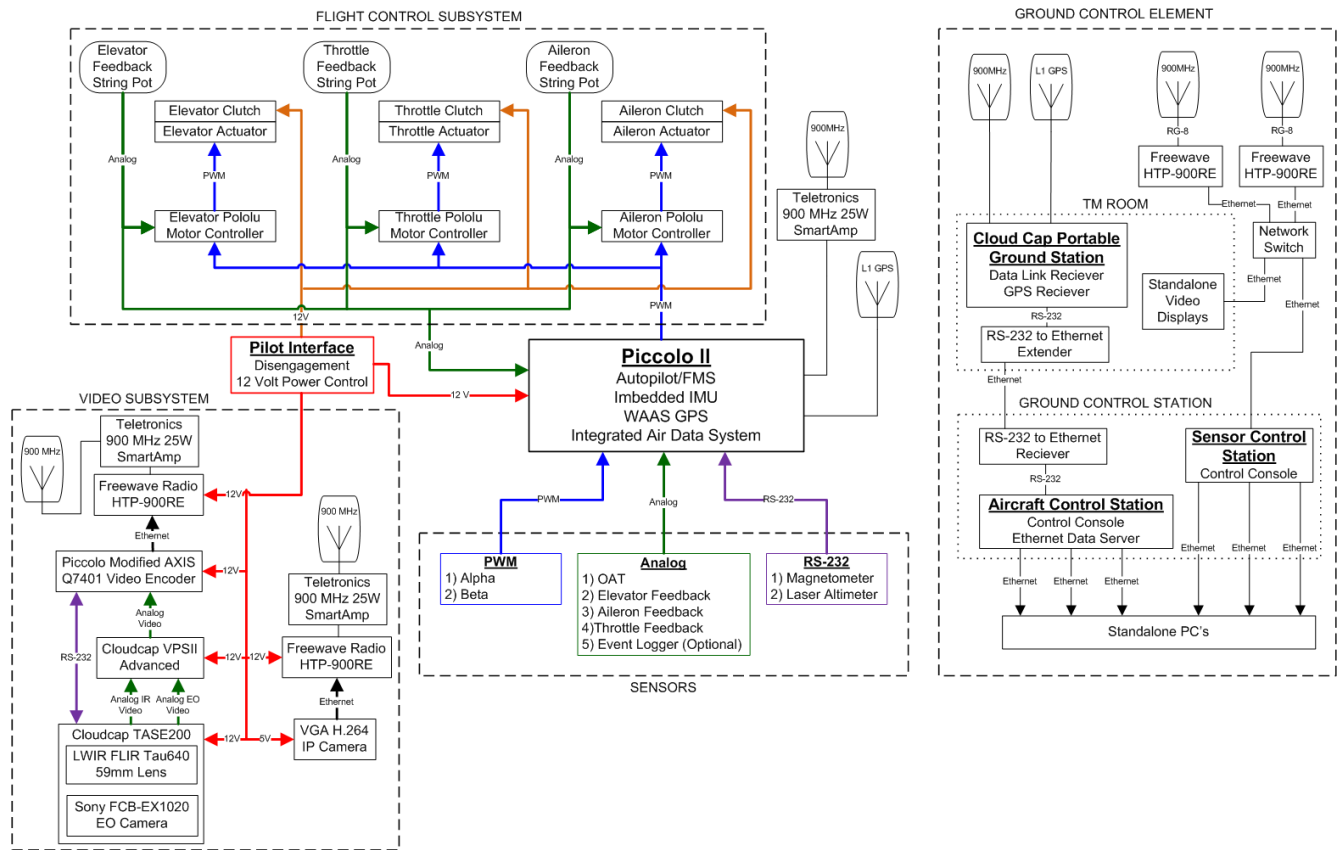


Figure 5 – Updated System Block Diagram

Three independent 25W amplifiers are anticipated to be utilized with spread spectrum frequency hopping radios. The anticipated antennas to be installed on the aircraft have a gain of 5dB. The ERP is estimated to be around 80 watts for each datalink. The ground station instructor in the GCS will maintain continuous verbal contact with the pilot aboard the SUAV via the aircraft’s dual King Kx 125 NAVCOM Very High Frequency (VHF) radios. If any interference is observed, the ground station instructor will verbally command the pilot to shut down power to the system. The ground station instructor will be an instructor at the National Test Pilot School [1030 Flight Line, Bldg. 72 Mojave, CA 93502 (661)824-2977]. Flight Research Inc. currently maintains licenses for two other telemetry frequencies. Previously we have been granted 5 year licenses for these frequencies. The SUAV system was previously granted a 2 year license for the 2.4GHz 10W analog video datalink. This system will continue to be utilized and developed over time and therefore we have requested a 5 year license.

If there are any further questions, please let me know.

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