



NATIONAL TEST PILOT SCHOOL APPLICATION FOR C-BAND TELEMETRY FREQUENCY

Introduction

The mission of the National Test Pilot School is to educate and train military and civilian aviation personnel so that each graduate enhances aviation knowledge, increases flight test competency, and improves aviation safety world-wide. Our mission is primarily accomplished through our professional courses and masters programs that provide graduate level flight test education and training to test pilots and flight test engineers who learn to safely and effectively plan, execute, and report on flight test programs for their military or civilian organizations. Our mission is further accomplished through NTPS' continuing education programs, flight test-related research programs, and flight test support activities that increase competency, safety, and the breadth of knowledge in the aviation and flight test professions.

Nature of Research

In order to accomplish its mission, the NTPS operates several aircraft used for training test pilots and flight test engineers. An integral part of the training is understanding the operation of flight test instrumentation and telemetry, and executing flight tests directed from a ground-based control room.

Flight test training includes demonstration flights as well as data collection flights for performance testing, where data such as engine parameters, air data and control positions are telemetered to the control room, and flying qualities testing where attitudes, rates and accelerations are monitored in the control room, and loads & flutter where strain gauge and accelerometer data are monitored real-time for limit exceedances.

Through its research wing, the National Flight Test Institute, NTPS also conducts various research projects in collaboration with research organizations such as NASA. Recent research projects include parameter identification (PID) and fused reality (FR).

Existing Communications Facilities

The flight test instrumentation is currently installed on a removable pallet. Components are interchangeable between aircraft fitted with instrumentation, however only one aircraft will be flown while transmitting telemetry at any given time.

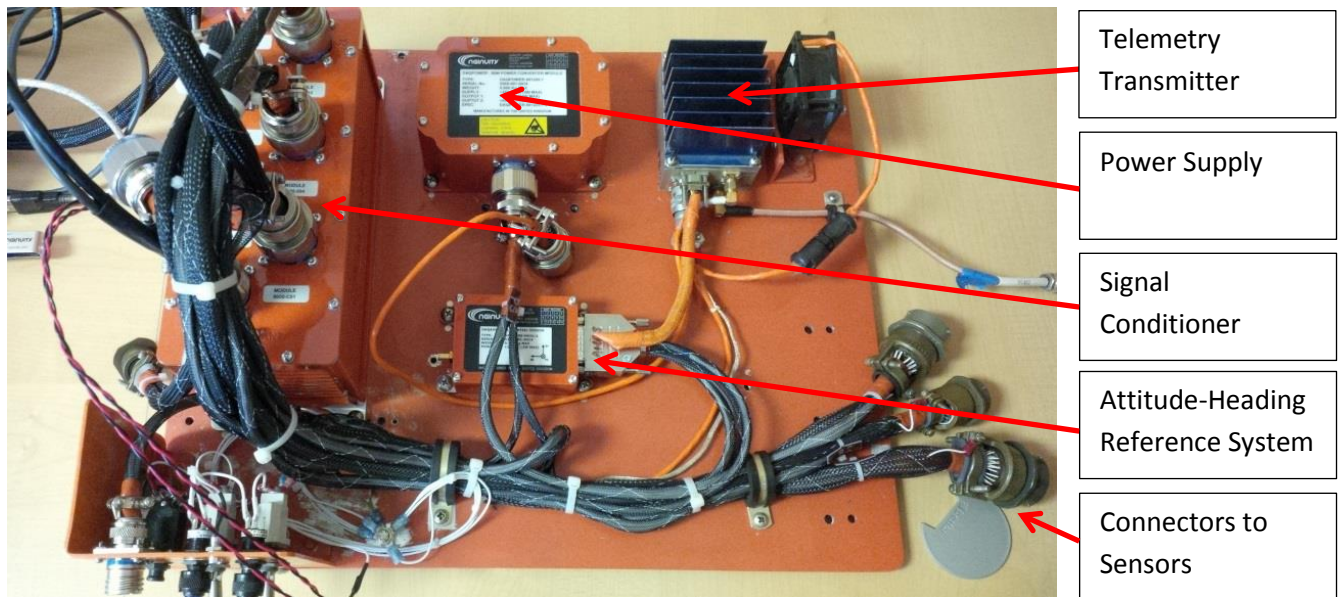


Figure 1: Instrumentation Pallet

The flight test instrumentation pallet is connected to various sensors positioned on the aircraft. Sensors include accelerometers, potentiometers and attitude-heading reference systems (AHRS). A signal conditioner does the multiplexing and analogue to digital conversion. The signal conditioner outputs a PCM data stream to the telemetry transmitter that transmits the data to the ground station.

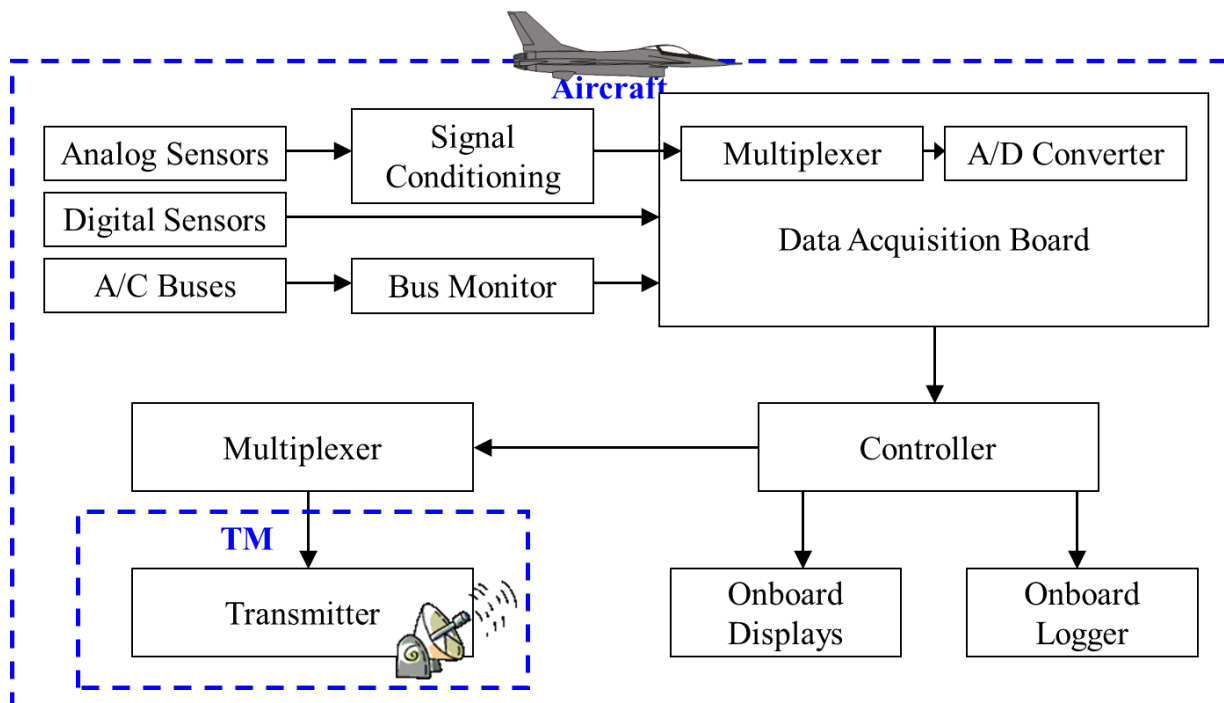


Figure 2: Aircraft Flight Test Instrumentation/Telemetry

NTPS currently operates a number of instrumented aircraft. Each of these aircraft will be capable of telemetry with the flight test instrumentation pallet installed, however only one aircraft will transmit at any time as only one receiver is available in the control room.



Figure 3. Aermacchi MB-326 Impala.

Single engine jet trainer, Instrumented for Performance and Flying Qualities (1 AC), Spin test training, Upset training, Loads and flutter TM system (1 AC). & Auto Pilot.



Figure 4. Bell OH-58C (2)

Single engine turbine helicopter, Night vision goggle compatible, Instrumented for Performance and Flying Qualities.



Figure 5. Bell UH-1N Huey,

Twin engine turbine helicopter, Night vision goggle compatible, Instrumented for Performance and Flying Qualities, LORAS / FLIR, SAS



Figure 6. MBB BO-105M (2)

Light weight, twin-engine, multipurpose helicopter, Instrumented for Performance and Flying Qualities.



Figure 7. Saberliner NA-265 (2)

Instrumented for Performance and Flying Qualities (1 AC), Business jet, 2 crew and up to 7 passengers.



Figure 8. Swearingen SA-226 Merlin II

Instrumented for Performance and Flying Qualities, Twin turboprop commuter aircraft.



Figure 9. Cessna 150 Optionally Piloted Aircraft
Instrumented for remotely piloted aircraft flight test training. The telemetry transmitter will be used to transmit video data to the ground station.

The NTPS telemetry room and control room are co-located in the NTPS administrative building and the receiver antennas are located on the roof directly above the control room.

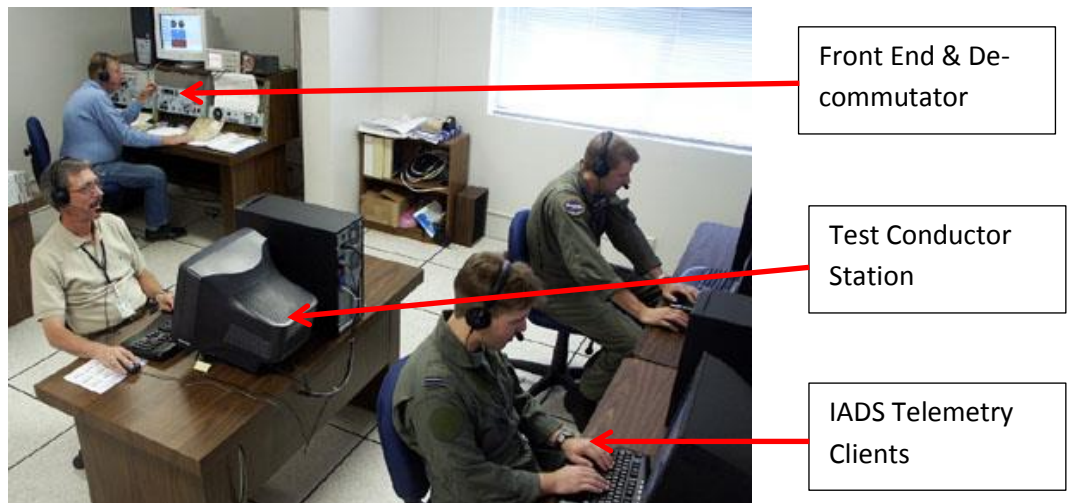


Figure 10: NTPS Control Room

The control room consists of a front-end where the signal is received, de-commutated and passed onto the control room software (IADS) as shown in Figure 11.

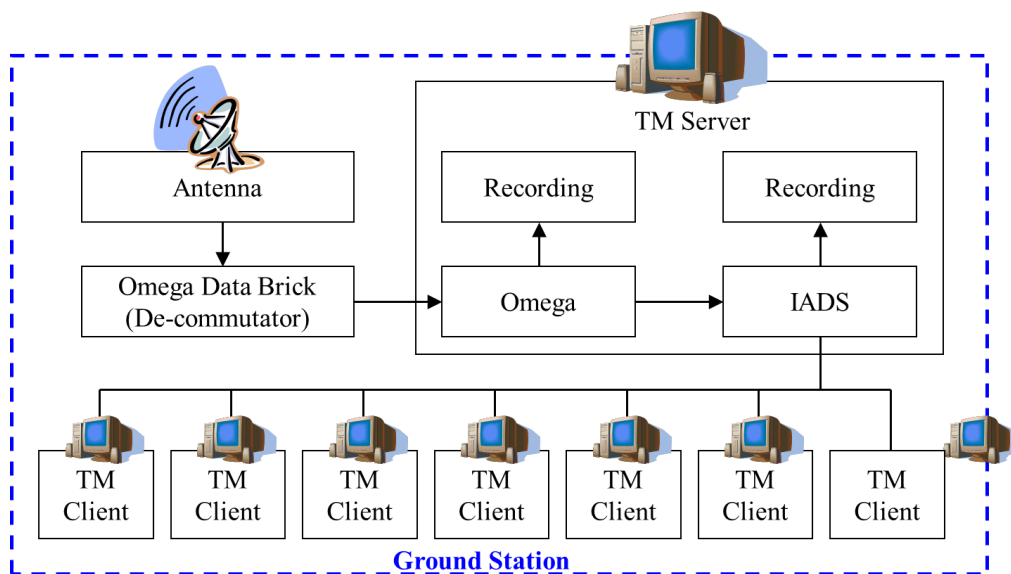


Figure 11: Control Room Architecture

The area of operation is depicted in the map below:

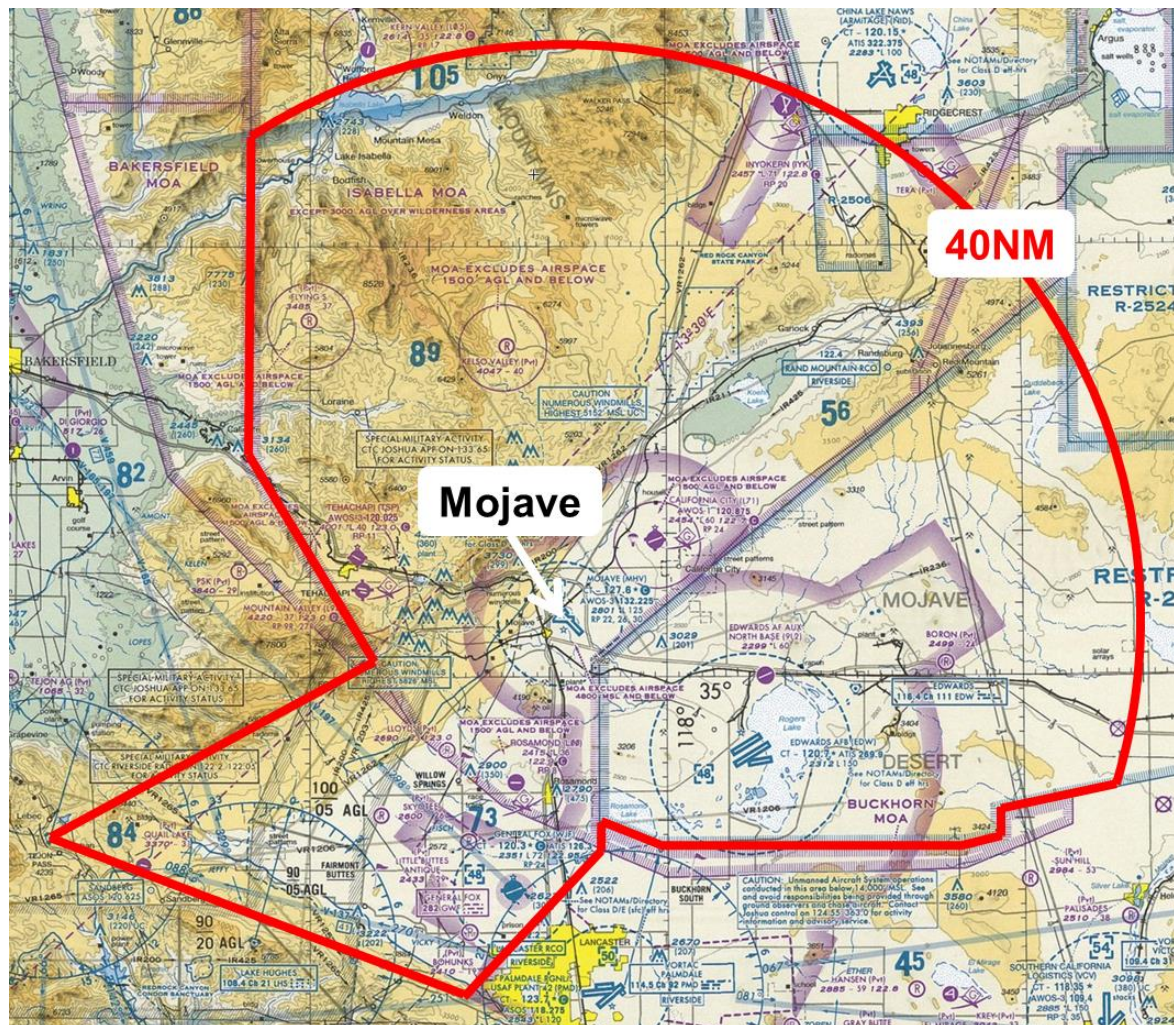


Figure 12: Area of Operation

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 as identified in Figure 12.

Inadequacies of Existing Facilities

NTPS has chosen to migrate to one of the new frequency bands allocated to Aeronautical Mobile Telemetry for flight testing. Existing telemetry bands, specifically within L-band, are being increasingly affected by encroachment from non-aerospace industries for personal communications (e.g., wireless web and cellular telephones) and entertainment (e.g. digital audio / video broadcast) use. The utilization of C-band for this purpose is appropriate to current frequency spectrum allocations and also aids the standardization efforts in flight test.