

NCAR/Earth Observing Laboratory (EOL)/Research Aviation Facility (RAF)

Document Number: PS-24-010

Title: Approval of Research Equipment Wiring for Use on NSF/NCAR GV, SN 677

Date: May 17, 2005

NSF and NCAR have established that the GV will be maintained and operated as a certified civil aircraft. Thus, investigator equipment packages must meet certain regulatory requirements. Specifically, all wiring insulation must comply with Federal Aviation Regulations (FAR) Part 25.869(a) (4), Fire Protection: Systems. This regulation requires insulation on electrical wire and electrical cable to be self-extinguishing when tested in accordance with part I of appendix F of 14 CFR Part 25. FAA Form 8110-3, are used to document that the wire/cables satisfy this regulatory requirement, when signed by a qualified person (i.e. a FAA Designated Engineering Representative). The installation on the aircraft must also comply with a number of requirements; this compliance will normally be handled by staff from the NCAR/EOL/Research Aviation Facility; however time for proper installation (e.g. wire attachment, etc.) and documentation must be factored into the timeline for every installation.

NCAR will assist investigators in helping them comply with the regulatory requirements; however, the investigator is ultimately responsible for providing the proper documentation as to the type of wire that will be used in their equipment package and verification that the wire meets the applicable requirements defined above.

The RAF will stock some wire/cable in-house, which has passed flammability testing. The RAF can provide small quantities of approved wiring from RAF stock under special circumstances. However, users should not assume NCAR can provide wiring for all their equipment needs. Below we list the guidelines that are used to comply with FAA requirements, so that investigators and instrument builders can use approved wire in their instruments. However, users should contact Kurt Zrubek, kurt@ucar.edu, RAF Engineering and Instrumentation, for assistance in interpreting and complying with these requirements (and the installation timeline) early in the design process.

The following wire satisfies the requirements of the FAA specification and can be used on the GV:

1. Wiring specifically listed in FAA Advisory Circular 43.13-1B, Tables 11-11 Open Wiring and 11-12 Protected Wiring (specific types of MIL-W-22759, MIL-W-81044, and MIL-W-81381 wire),
2. Wiring for which an existing FAA Form 8110-3 can be supplied

The following wire is exempted from the requirements of this specification and can be used on the GV:

3. Wiring within commercial off the shelf (COTS) equipment chassis, computers, monitors, etc. Commercial power strip are NOT acceptable, unless they are modified with an aircraft approved circuit breaker and aircraft approved wire.

4. Wiring provided by a manufacturer to interconnect two or more COTS units (i.e. keyboard and mouse wires, monitor cables, etc.)

The following wiring shall be shown by the instrument builder to comply with the FAA requirements. Compliance is provided with data that clearly defines the wire as to manufacturer and part number and a Form 8110-3 from a FAA authorized burn test facility (manufacturer data sheets stating compliance with FAA flammability requirements are not sufficient and thus NOT acceptable):

5. All user fabricated interconnecting wiring (i.e. from box to box, box to aircraft interface, etc.).
6. Wiring internal to any user fabricated equipment chassis. Custom built, (i.e., exclusively contracted) instruments and any instruments built by third parties must also comply.

The above includes any special purpose wire such as high-speed data wire, fiber optic cable, coax cable, etc. It is recommended that Teflon jacketed wire be used in these situations as this material is known to pass the flammability testing requirements. Polyvinyl chloride (PVC) wiring is not permitted for these applications without specific approval due to hazards associated with smoke and noxious fumes.

The following paragraph provides guidance for meeting the applicable FAA requirements. Some manufacturer's burn test their wire and can provide the necessary Form 8110-3. PIC Wire & Cable, www.picwire.com and Electronic Cable Specialists www.ecsdirect.com are examples. PIC Wire & Cable uses Skandia, Inc. for flammability testing. Skandia will supply the 8110-3 for the PIC wire they have previously tested for a small fee. For wiring without prior approvals, a sample of the specific wire (approximately a 10 ft) with identifying documentation from the manufacturer (i.e. part number) will need to be submitted to a designated burn test facility. A packing list for the wire will suffice for the identifying documentation provided the packing list includes the type of wire purchased, the manufacturer and the manufacturer's part number. The following information must also be provided with the request:

Make of the aircraft: Gulfstream,
Model: GV,
Serial number: 677, and
Registration number: N677F

NCAR has used the company Flame Out (402-795-2122) recently to show compliance for research wiring with the FAA regulations. Skandia, Inc (815-393-4600) is another recommended facility. The facility must have an in house flammability DER to witness the test and provide the FAA Form 8110-3. Once the wire passes the test, the test facility will then issue the 8110-3 compliance form. The 8110-3 will reference the supplied wire per manufacturer and part number and the GV via make, model, and serial number.