

MIT Drawing 85-10001.01

Rev. 01
Rev. 02

17 September 03
28 October 03

Initial Release
Remove vibration requirement

Statement of Work for NVIS Inc.

MIT intends to purchase one NVISOR SX Head Mounted Display (HMD) and associated Video Control Unit (VCU) Interface immediately, and 4 more HMDs in the next fiscal year. The first VCU Interface may be packaged in the standard commercial enclosure but the remaining four units require dual M43/M44 assemblies only. Dual channel VCU interface cards, 45W Power Supplies, and Dual Channel VCU Interface housings will not be required for these later assemblies. Although the units we are purchasing are based upon the design of a standard COTS model NVISOR SX, certain modifications must be implemented for use on the International Space Station. These modifications, and certain unique procedural requirements, are listed below.

Design modifications for compatibility with Space Station experiment usage:

1. Headphone accommodations must be removed.
2. Parts and materials proposed for use shall be submitted to MIT for assessment of compatibility with ISS requirements for acceptability, flammability, outgassing, offgassing, and fungus resistance.
3. Independent Printed Circuit Board (PCB) coupon analysis to MIL-P-55110 requirements or equivalent is desirable.
4. Electronic parts shall be of the highest quality level commonly available. The goal is to use only hermetically sealed (metal or ceramic package) microcircuits.
5. EMC design shall be sufficient for CE certification with conformance to ISS requirements as a goal.
6. Mechanical fabrication techniques shall assure stable optical alignment and calibration.
7. Thermal design shall assure that no individual electrical component on the PC boards exceeds a case temperature of 55°C in a 25°C ground laboratory environment.

Procedures unique to a Flight Program

8. In order to assure that the Flight items meet materials, cleanliness, and outgassing requirements, some NVIS Inc. internal manufacturing procedures will need to be generated. (These would assure, for instance, that cleaning solvents used in the course of manufacture do not introduce contaminants that would later cause

difficulties with outgassing tests.) MIT will assist NVIS Inc. in reviewing its existing procedures and writing such new procedures as may be required.

9. An acceptance test procedure shall be written by MIT, with concurrence by NVIS Inc. required, which demonstrates that the flight items meet all performance requirements in a laboratory environment (aka the Long Form Test). The Long Form Test typically includes such tests as power supply voltage margining, optical performance, *etc.* A reduced set of tests (aka the Short Form Test) shall be conducted during thermal testing, between vibration axis, *etc.* A Qualification Test is run only on the first deliverable flight item; all other flight items are only subjected to Acceptance testing.

The following are standard Quality requirements that will appear in our purchase order for flight units.

10. "MIT shall at all times upon reasonable notice to NVIS Inc., be allowed access to the NVIS Inc. facility for the purpose of inspection, progress evaluation, witnessing of fabrication, tests, packaging, *etc.* Such inspections will be made in a manner which will not disrupt or delay the work in progress. NVIS Inc. agrees to provide for the reasonable comfort, safety and convenience of any MIT visitor."
11. "For use in Space Flight. Materials, manufacturing, and workmanship of the highest quality standards are essential to safety and reliability. If you are able to supply the desired items with a quality which is higher than that of the items specified or proposed, you are requested to bring this fact to the immediate attention of the purchaser".
12. NVIS Inc. is to furnish an as-built EEE Parts List and as-built materials and processes lists. The lists is to contain the following information as applicable: part number or drawing number, nomenclature, amount code, part or material specification, part or material manufacturer, manufacturer's part number, mix formula, cure, environment, and process specification. This information shall be supplied electronically using a template supplied by MIT, or as negotiated with MIT (contact Brian Klatt at 1-617-253-7555).
13. All non-metallic materials shall be evaluated for fungus resistance. MIT will work with NVIS Inc. in conducting this evaluation.
14. The supplier shall furnish a Certificate of Compliance with the parts or material procured under this purchase order.
15. MIT source inspection is required. Please notify MIT Mission Assurance 2 weeks prior to delivery. Contact Brian Klatt at (617) 253-7555.

The following verification requirements will be performed by MIT on each flight item.

16. An ambient pressure thermal test will be run which subjects the flight item to excursions between -10 and +50C. (Qualification: 7 and one-half cycles; Acceptance: 1 and one-half cycles.) These tests are typically run in a dry nitrogen atmosphere to avoid condensation. At temperatures outside a defined operating range -- +10 to +30C, for example -- the test procedure might call for the flight item to be in an unpowered state.
17. Each flight item is required to operate for a minimum of 72 hours at room temperature while functioning, **plus** 96 hours while functioning, at 15°C below the maximum rating of the device or material with the lowest temperature rating in the article under test -- a meager attempt to reduce infant mortality.

18. The first delivered flight item shall be tested to demonstrate compliance with CE EMC requirements. Testing to Space Station requirements will be handled by MIT after acceptance and delivery.
19. Flammability, outgassing, and offgassing tests will be conducted by MIT after acceptance and delivery.

MIT will provided the following items for use in flight fabrication

20. Mounting and cabling of the M43/M44 video processing cards.
21. Conformal coating of all printed circuit assemblies.