**APPENDIX B.3**

**RAF PROJECT SAFETY COMMITTEE**

**HAZARDOUS MATERIALS AND DEVICES**

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DO NOT WRITE IN THIS BLOCK

Project: SAANGRIA-TEST Installation Period: 7 Jan – 6 Feb 2013

Aircraft: GV Beginning Date: 11 Feb 2013

Instrument Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Ending Date: 28 Feb 2013

1. Instrument: G-V Automated Dropsonde System

2. Function: Provides vertical profiles of thermodynamic and winds

3. Principal Investigator: Terry Hock

 Address: NCAR Foothills Lab FL-1

 Telephone: 303-497-8767

4. Instrument Operator(s): Terry Hock, Dean Lauritsen, Charlie Martin

5. Is this instrument commercially produced? No

6. If so, please list name and address of manufacturer:

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

7. Please list serial number of the instrument:

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Please attach a copy of the manufacturer’s instruction manual for the device. If this is not possible, attach a copy of those pages of the instruction manual which describe the principles of operation, hazard warnings, safety features, and safety rules.

8. If the instrument is not commercially produced, please provide information requested below:

 Designed by: Terry Hock, Dean Lauritsen, Charlie Martin, Cindy Bradley, Steve Rauenbuehler, Xuangyong Xu, Nick Potts

 Organization: EOL/ NCAR

 Address: Boulder, CO

 Telephone: 303-497-8767

 Built by: DFS/EOL/NCAR, ISF/EOL/NCAR, CDS/EOL/NCAR

 Organization: EOL/NCAR

 Address: Boulder, CO

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9. Describe principles of operation, hazard warnings, safety features:

 The new automated G-V dropsonde system is composed of a sonde storage and ejections system located in the baggage compartment. There is also an equipment (telemetry chassis, computer, keyboard, monitor) rack in the L6 position in the cabin. The computer system in L6 controls all operations of the system. The most significant safety hazard could be the opening of the launch tube from the outside to the baggage compartment of the G-V. The size of this opening would be 2.0" diameter hole (3.14 in2). There are two valves to prevent this from occurring. The other hazard would be if the sonde strikes the aircraft during ejection.

 During normal use, a single dropsonde is released from the storage system into ejection tube, by the use of solenoids and motors. The ejection tube has a lower gate valve or Ejection Gate Valve (EGV) which is controlled by a solenoid, there is also an upper Safety Gate Valve (SGV) controlled by a motor. Once a sonde is loaded into the ejection tube, the SGV must be closed prior to the opening of the EGV for sonde launch, there is a mechanical interlock between the two valves which prevents the EGV from opening if the SGV is not closed. A secondary safety prevention is the use of limit switches for the state if the SGV, if the electronic control unit senses that the SGV is not closed, then it will prevent the signal to activate the opening of the EGV. There is also a Trigger Lock Safety Servo which must also be released before the EGV can be opened, this occurs just prior to the launch command being sent. There are three safety separate safety features designed into the system to prevent the opening of both gate valves at the same time. In the cockpit there is a pilot Interlock switch that must be enabled before the system will allow the ejection of a dropsonde from the aircraft. Many steps have been taken in the design to mitigate risks with the automated launcher. The sonde itself has a mass just under 6 oz. it if strikes the aircraft fuselage, it is expected to have minimal impact to the flight safety to the aircraft due to its low mass. The ejection technique for deploying the sondes is the same as when using the larger sondes, the original system with the larger sondes has demonstrated (when working properly) that sondes do not strike the aircraft. There are no known hazards with the equipment rack in L6.

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10. If the instrument is commercially produced, has it been modified? NA

11. If modified, describe the modification.

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**All investigators please answer the following:**

12. Does the instrument contain, use, or produce:

 Radioactive materials No Compressed gases No

 Other ionizing radiation No Non-ionizing radiation No

 Flammable liquids No Laser No

 Radar No Flammable gases No

 Explosive materials No Toxic materials No

13. If any of the categories were checked, specify the material below (for example, amount, energy levels, physical form, etc.).

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

14. Please list all other chemicals you will use on board this aircraft in your experiment.

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15. If your experiment consumes or discharges materials, will you need to carry additional

 materials on board?

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16. What and how much extra materials will you need to carry?

 Dropsondes will be self contained within the instrument, extra dropsondes not be carried external to the instrument itself, but stored within it.

17. What kind of container will you need to carry these materials?

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18. If the device utilizes a laser, please classify the laser according to ANSI Z 136.1-1973 (circle one).

Class: I II III IV

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1. If your laser will be operating at a wavelength that is not eye safe, what procedures will

 be established to minimize the danger to yourself and other project participants?

 \_\_\_\_\_\_please attached a separate document covering this question\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

20. If you are using compressed gas cylinders, what is the maximum pressure expected for each cylinder type?

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21. Will you be re-filling any compressed gas cylinders yourself, either at JeffCO or during the field deployment?

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22. Are there any other hazards associated with the instrument itself, the required ground support equipment or the experiment which have not so far been covered in this questionnaire?

 None

23. How would you describe the probability of an accident resulting from the presence and use of your instrument on board the NCAR aircraft?

 Dropsonde systems have been routinely used on multiple aircraft for the past 40 years with no known accidents. This system is very similar to the past dropsonde system that has operated on the G-V since its arrival to NCAR with no safety accidents during its operation. The new automated system is based upon the same concepts as the manual launcher for ejecting sondes from the aircraft. The probability of an accident is low based upon past similar system including the NASA Global Hawk.

24. How would you describe the severity of such an accident?

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25. What precautions will you take to decrease the probability and the severity of an accident? If any documented safety procedures from your home facility or university are available, please attach a copy of said materials to this form.

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 January 9, 2013 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Date Signature of principal investigator or operator

 Terry Hock

 Printed name of principal investigator or operator

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 Reviewed by

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Date