CONCERNS AND RECOMMENDATIONS OF THE
NASA SOUNDING ROCKET WORKING GROUP

JULY 18, 1990

1. ATTITUDE CONTROL SYSTEMS

The NSRWG applauds WFF efforts in improving the performance of attitude control systems. We are, however, concerned over potential failure modes in digital controllers and microprocessors arising from momentary "glitchs" in power lines or other transitory disturbances. We urge WFF to assess carefully the potential for flight failures in such systems as part of its design and implementation activity. One recommendation is the incorporation of "watchdog" circuitry to permit recovery from transient disturbances in microprocessors.

2. UPGRADE OF NASA FACILITIES AT THE WHITE SANDS MISSILE RANGE

The working group remains concerned about the lack of adequate communications for experimenters at NASA facilities at the range. In order to make decisions affecting launch times, experimenters need to have access to data bases, such as solar and geophysical data bases, that are located throughout the country. This can be accomplished by bringing their scientific computers to the range and using them to access and evaluate such data bases. Experimenters may also require data transfer between the range and home institutions to evaluate the results of instrument tests and integration. We recommend that six telephone lines for experimenter use be installed in the Bldg. N-200 and the VAB areas with the following characteristics: commercial quality voice grade single lines capable of computer communications at 2400 baud. These should not be multiple extension lines, so that they may be dedicated to computer use as needed.

3. IMPLEMENTATION OF DATA STORAGE AND DISTRIBUTION CAPABILITIES AT WFF.

The NSRWG recommends that the data handling facility at WFF co-ordinate its conversion to optical disc media with several large projects at GSFC/Greenbelt that are presently engaged in the same activity. The ISTP/GGS project is presently undergoing a Critical Design Review of its Central Data Handling Facility (CDHF) that will distribute data using optical discs. Since many investigators in the Sub-orbital program are also in the ISTP and other Goddard projects, capital and programming costs to experimenters could be minimized by making these systems compatible. Contacts in Greenbelt are Project Scientist, Mario Acuna, Code 695 (X 67258) and Deputy Project Scientist Mike Kaiser, Code 695 (X 65461).

4. NEW CAPABILITIES IN SUPPORT OF SCIENTIFIC INVESTIGATIONS USING SOUNDING ROCKETS AT THE POKER FLAT RESEARCH RANGE

The NSRWG expresses its general satisfaction with plans by the University of Alaska in support of both scientific and technical activities of sounding Rocket experimenters. We note that the new radar and heater beam equipment will be valuable to our programs and urge that they be designed with rocket experiments in mind. We identify the incoherent backscatter radar and the upgraded optical observatory as primary resources in support of the scientific objectives of rocket investigators and urge that they receive high priority in the Poker Flat Upgrade program. Communications of computer quality between PFRR and investigators' home institutions are a necessity and should receive high priority in the University of Alaska's plans for upgrading support facilities.

With regard to launch services, the installation of a long rail launcher will clearly improve launch options and should receive high priority. Expansion of the range to include the area northeast of Ft. Yukon (to the Canadian border) would also increase launch flexibility and should be pursued.

5. POTENTIAL IMPACT OF COMMERCIALIZATION ON THE SOUNDING ROCKET PROGRAM

The working group is seriously concerned that commercialization of suborbital launch services will have a devastating impact on the ability of university groups to carry out sounding rocket research. The current program offers the university community custom-configured science instrument (payload) integration services and in-flight support for the conduct of individual scientific investigations that are flown for space science research purposes only.

A key feature of the Suborbital Program is its ability to offer the research community a capability to respond quickly and efficiently to unique or rare scientific phenomena. This capability is important in terms of a) efficient schedule planning, b) schedule flexibility, and flexibility in execution. The study of Supernova 1987a, or the more recent flights to observe Comet Austin, could not have been scheduled within a commercial procurement process and could not have been supported by a NASA group that was not already "up to speed" in providing efficient launch services. It is clear that commercialization of launch services would result in an unacceptable risk of loss of unique scientific opportunities.

In addition, sounding rocket payloads may have multiple measurement systems that are integrated with supporting hardware and in-flight services at WFF, so that the payload and portions of the launch vehicle in effect become one. In addition, in-flight operational requirements, such as the deployment of booms and tethers and the release of secondary payloads, may interact with vehicle flight dynamics making it imprudent to separate payload launch service functions from payload integration activities.

The working group is also very much concerned about the potential loss of payloads as a new contractor worked his way up the "learning curve". Support for individual research programs is simply not adequate to cover the cost of instrument replacement so such a loss may mean the demise of an entire

university research effort. In addition, the group is concerned that the potential escalation of launch service costs may result in the elimination of a major fraction of rocket launches now supported and may make university research programs no longer viable as a training ground for graduate students in the space sciences.

For these reasons, we urge NASA Headquarters to take all possible action to seek an exemption for NASA scientific sounding rocket flights from the requirements for commercialization of launch services.

6. WFF POLICIES REGARDING APPOINTMENT OF PROJECT TEAMS AND ACCESS TO FACILITIES AFTER NORMAL WORKING HOURS

The working group requests WFF to review its current policies in these two areas. In the area of team appointments, calling for an experiment requirements data package sufficiently in advance of a project initiation conference (possibly before a date for the conference is set?) might allow WFF to assess its available manpower and assign suitable personnel that can participate both in the PIC and in the technical definition efforts that follow. Where such an arrangement is not possible, an effort must be made to transmit a clear and complete written summary of all experimenter/project agreements arrived at during the PIC, however tentative, to any new team members.

In the area of after-hours access to experiment integration areas at WFF, a more flexible policy of after-hours access, particularly when emergencies arise late in the working day, would make better use of experiment teams' time and travel resources. In many cases, these experiment teams are prepared to work long hours to maintain schedule and reduce their travel costs. If WFF has reservations regarding increasing access to its facilities, it might be appropriate to explain the ground rules and restrictions for access and equipment use at an initial experiment team/project meeting.

7. BUDGET PROSPECTS FOR THE NASA SOUNDING ROCKET PROGRAM

The working group remains alarmed at the failure of the rocket budget to be supported at a level that compensates for the level of technical inflation. Purchase prices of vehicles and prices that experimenters pay for goods and services have seen major increases since 1980 and funds have not been increased correspondingly. The result will be a decrease in the total number of missions flown and the frequency of missions per institution, with a major impact on the ability to provide data for graduate degrees. The situation also impacts the ability to improve launch capabilities, witness the rejection of project's request for Mark 70 boosters in FY 91. As a step to informing the wider community of this situation, members of the working group will contact the chairpersons on the Mission Operations Working Groups in their respective disciplines, and request time at a future meeting of those groups to explain the pending impacts of budget restriction and ask for the active support of the MOWGS in their reports to NASA discipline and division chiefs.

existing designs. We do, stress however that the reasons for sounding rocket missions are to obtain science data to meet the requirements and we do tailor payloads, as required, to do this. We feel that the blending of existing systems into specific payloads is about what is reasonable and required to best meet the usual experimenters' requirements in the frame of a fast response, flexible, low-cost program and still to maintain a reasonable number of missions per year.

QUESTION:

"... should science representatives participate in the failure/anomaly review board process..."

RESPONSE:

This has been incorporated into the review board process. The Principal Investigator, Project Scientist, and the Suborbital Program Manager are now invited to the review board meetings and all three were represented at the most recent meeting at WFF on June 4, 1990.

QUESTION:

"... whether the current capabilities for handling data at Wallops are sufficient and the need for upgrades in this area; ..."

RESPONSE:

The Wallops data handling digital telemetry system will be replaced with a new system during FY 91 and FY 92. The existing system, which is 15 years old, does not provide the digitizing rates currently required, the Central Processor Unit is obsolete, and the data storage capability needs to be upgraded to take advantage of modern technology. This area will be further addressed at the next SRWG meeting on July 17 - 18, 1990.

QUESTION:

"... and the identification of a process whereby WFF would provide support systems and launch capabilities for science payloads that requested met rockets for their research."

RESPONSE:

Existing standard Super Loki met rockets are currently utilized by NASA routinely. The current process for obtaining these standard systems is via request through the Observational Science Branch (Frank Schmidlin/Code 972) at the Wallops Flight Facility of GSFC. The sphere payload is a mylar one meter diameter sphere inflated after ejection which is then tracked by precision radar to determine atmospheric density and winds. The datasonde payload consists of a parachute with an attached temperature sensor (thermistor) and the associated telemetry system. High altitude winds are determined from radar track. These simple systems have been developed and improved over the past 30 years. There have been many, many development flights and design changes over

the years and many periods of high failure rates. This is related to illustrate the problems in building small ejectable payloads with a high fineness ratio which have to survive a very hostile ascent including 100 g's acceleration. There have been other Dart type payloads flown over the years such as the ozonsonde. Although the high acceleration Super Loki Dart is not very wind sensitive during burning, the booster tends to break up at burnout and drift large distances sometimes and there have been safety problems over the years with boosters impacting outside of the flight zones (such as on a private residential lot in Assawoman, Virginia near Wallops Island).

Another aspect is that the Dart payloads are an integral part of the launch vehicle and as such are designed and built mechanically more like a stage of a launch vehicle with fins, and thermal protection but also requiring telemetry antennas. Thus, payloads are not very interchangeable and each size Dart will probably require different fins, etc. Problems in developing Dart systems were demonstrated, for example by the ill-fated Viper-Dart E-field experiment which was sponsored by a Goddard Space Flight Center experimenter a few years ago. After several development flights including major design changes, the effort was terminated with no successful flights. The above illustrates the inherent problems and limitations with using Dart type payload configurations and very small short-burning boosters such as the Super Loki. We would probably not choose this type of system for development of a general type of sounding rocket capability and likely would require the development of a new motor to meet this type of requirement.

The question as to "The identification of a process ..." would be for the Headquarters Sounding Rocket Program Office to provide resources (additional civil service personnel would be required) on a continuing level of effort basis for a development program to establish and maintain this new and different type of payload and launch capability as part of the NASA Sounding Rocket Program. The scope and schedule would depend on the additional resources provided.

We believe that our May 25 Strawman Agenda responding to your initial draft for the upcoming SRWG meeting is responsive to the other points of your referenced memorandum. Please let us know, if this is not the case.

Larry J. Early

Attachments: 2