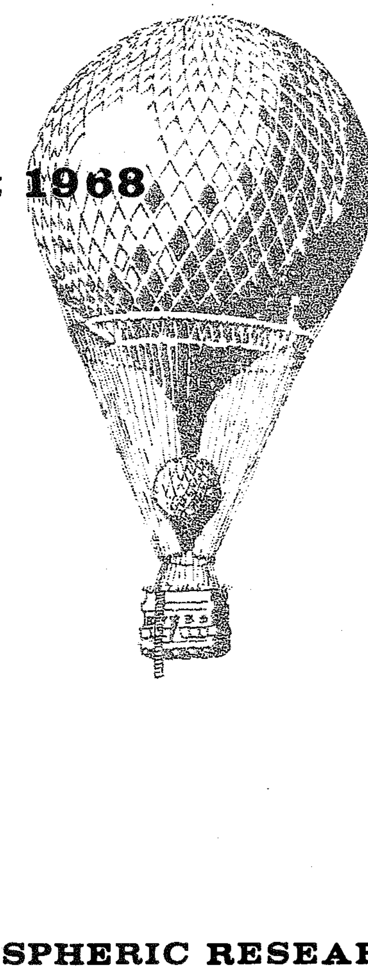
NCAR Scientific Balloon Facility



Annual Report 1968

NATIONAL CENTER FOR ATMOSPHERIC RESEARCH
BOULDER, COLORADO

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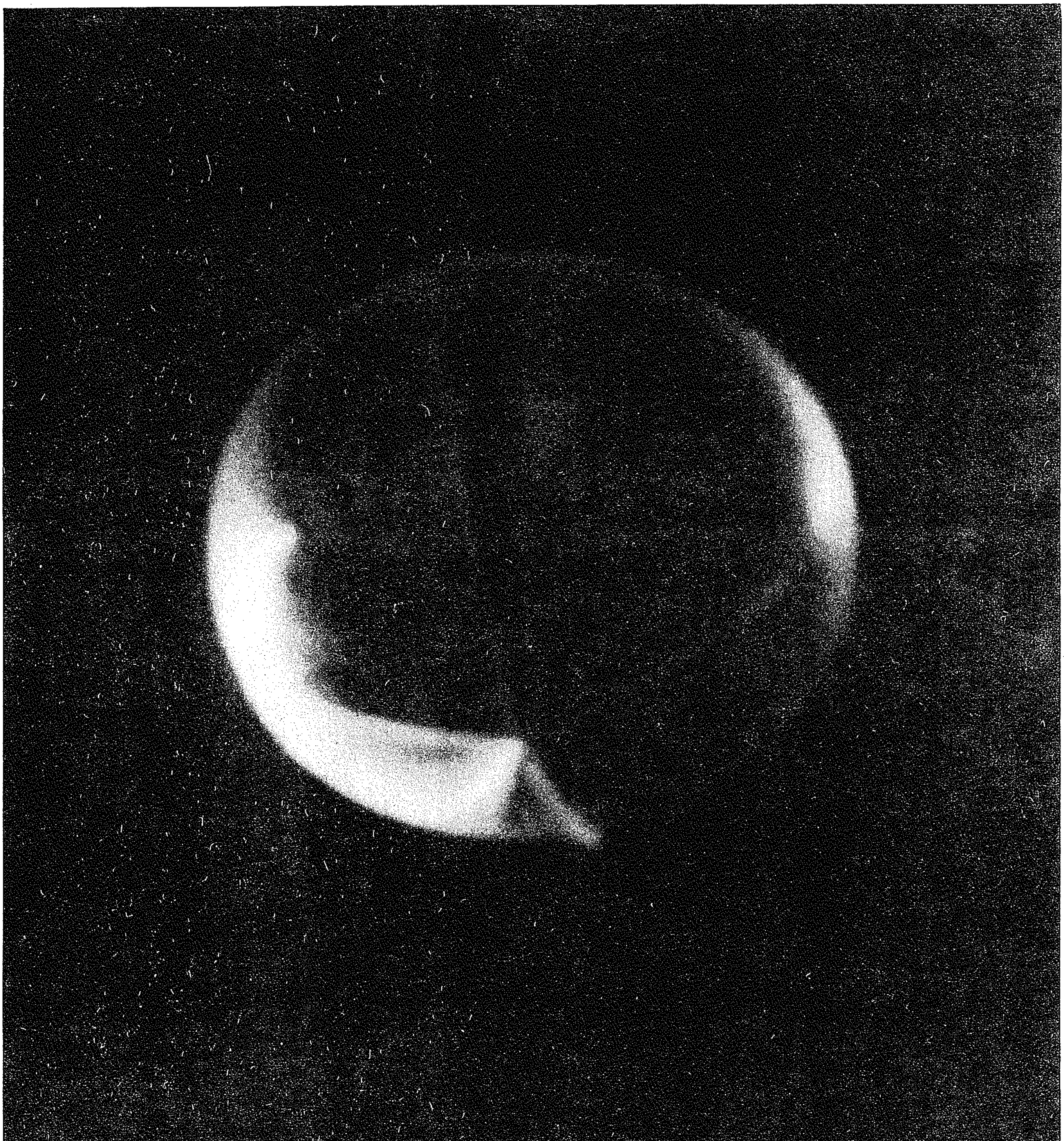
NCAR SCIENTIFIC BALLOON FACILITY

ANNUAL REPORT

1968

10 JANUARY 1969

A scientific balloon floating high in the sky is rarely seen by the uninitiated except at sunrise or sunset when it takes on a red glow in a partially darkened sky. This picture of a 10.6 x $10^6 ft^3$ Winzen StratoFilm balloon floating at 120,000 feet at sunset shows why such balloons give rise to numerous UFO reports. Even with the magnification achieved with a Questar telescope, the details are hazy enough to lend an aura of mystery.



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NCAR SCIENTIFIC BALLOON FACILITY

ANNUAL REPORT, 1968

I. SUMMARY

A total of 74 flights were flown from Palestine, Texas and Page, Arizona during the year. One flight was flown by Raven Industries, Inc. from Albuquerque, New Mexico.

Eighty-one percent of the Palestine and Page flights were operationally successful, the best record to date for NCAR. Of the failures, 8% were balloon failures, 7% were electronics failures, 3% were due to weather, and 1% failed because of other operational errors. The failure rate due to balloon failure was one-half as great this year as in 1967, but slightly greater than in 1966. The failure rate due to electronics was greater this year than 1967 and less than 1966. More extensive use of complex telemetry and command systems this year presented increased opportunity for electronic failure and increased the demands on electronics personnel. Unfortunately NCAR was not able to fill an opening at Palestine for an electronics engineer, nor was it able otherwise to ease the load for overworked electronics personnel.

Several NCAR operational records were established. A gross load of 6,729 pounds was successfully launched; a flight time of 42 hours was achieved; and a 15 x 10^6 ft^3 balloon was flown successfully.

Research and Development achievements of note included a new design for a superpressure balloon, testing of a contoured top balloon for tandem systems, testing and selection of a pressure sensor for low pressures, and flight testing of several position locating systems including the NASA OPLE system. A new command-control concept was developed, and equipment for testing it was ordered. Significant progress was made on the conceptual design and test hardware for a system to restrain a balloon during inflation and also on a system to deploy the payload and all of the balloon except the bubble after launch. Reports on a steerable parachute test and on launch and balloon restraint work were completed during the year.

Few administrative changes were made. Funding limitations would have prevented the Facility from flying many more than the 75 flights flown, but limited funding to scientific programs apparently restricted requests for flight assistance also. Therefore no legitimate request for flight service was refused.

The NCAR Panel on the Scientific Use of Balloons met twice, and NCAR personnel also met with representatives of the Balloon Industry twice and with representatives of industry and government once. The meeting with industry and government representatives resulted in the formation of a Committee on Scientific Ballooning Standards (ad hoc). Initial efforts of the committee are directed toward adoption of uniform terminology and nomenclature for scientific ballooning and toward safety and balloon packaging standards. Mr. Justin H. Smalley of NCAR was elected chairman of the committee.

II. DEVELOPMENT

FACILITIES

The Flight Station at Palestine was improved during the year by the completion of a 60' x 70' launch vehicle storage shelter, a 20' x 40' addition to the Coronascope building to give scientists additional space in which to prepare their experiments, and a 20' x 20' antenna platform which was built on top of the NW end of the Operations building. Also a 20' x 40' welding shop was enclosed in the southeast corner of the Helium Storage Shelter.

At Boulder, a contract has been let to erect a 24' x 42.5' prefabricated steel staging building at the Marshall Field Site. This building is expected to be completed during early 1969.

Facilities at Page have not changed. Tracts of land are available for the construction of a staging building and a launch pad. Plans for these have been drafted but not approved, and they have not been funded.

ELECTRONIC SUPPORT SYSTEMS

During the year efforts to improve ballooning instrumentation have continued along several lines. A command-control concept, using a revised address technique and a modified bit rate, has been developed. The Facility has ordered updated balloon-borne, aircraft-borne and ground, command equipment for evaluation. It has also decided upon and ordered, for evaluation, equipment to be used in converting telemetry frequencies from VHF to UHF. Numerous pressure sensors were thoroughly tested and the Rosemount Model 830A has been selected for operational use. Although the Rosemount is already being used on those operational flights floating at pressures below 7 mb on which telemetry is also being used, it will be more useful when development now under way provides coverage of the full range of atmospheric pressures. Instrumentation for three major and two minor flights has been prepared by the Instrumentation R & D Group this year. One of the flight instrumentation programs was directed toward obtaining more precise real-time balloon system positions, and it has shown that balloon systems can be located within one nautical mile using available navigation systems.

BALLOON DESIGN AND MATERIALS

Theoretical and experimental work on balloon design have been continued throughout the year. Theoretical methods, making use of finite element analysis, are leading to better understanding of simple models of thin film structures, but these models must be made much more realistic to provide useful knowledge about a partially inflated balloon. Theoretical work has also resulted in a design for a superpressure, polyethylene balloon. Such a balloon can be manufactured in large sizes from polyethylene using standard fabrication techniques. At the end of the year, preparations for testing the design included dissemination of a request for bids for fabrication and testing of models. The aerodynamic pressure distribution on an axially symmetric balloon during ascent was also studied theoretically during the year.

A contoured tow balloon for use in a tandem system was designed in 1967. In May 1968 a full scale model was tested on the ground under conditions simulating flight. The test was considered to have demonstrated that such a balloon can withstand the stresses of flight. Its contoured shape should substantially improve its handling characteristics during launch; it will be used as soon as a tow balloon of its size is required for a flight.

Two balloons, each of approximately $15 \times 10^6 ft^3$ volume, were flown with scientific payloads. One, a Winzen capped balloon, flew successfully for more than 40 hours; the other, a Raven cone-top balloon, failed during ascent. The failure of the Raven balloon occurred due to an apparently remediable design defect, but NCAR has no plans at present to continue to experiment with large cone-top balloons. A $2.94 \times 10^6 ft^3$ balloon with a record of failure was fitted with a cone top to test the feasibility of recovering some otherwise useless balloons of that size. It will be test flown in 1969.

Materials testing was reduced in scope during 1968 over past years. Biaxial tests at $23^{\circ}C$ and $-80^{\circ}C$ were conducted on two standard films to develop basic data on the biaxial strength characteristics of these films. Also the effects of thermal and strain cycling on biaxially stressed films were studied.

BALLOONING SYSTEMS AND TECHNIQUES

Most of the R & D on ballooning systems and operations during the year, apart from instrumentation and balloon design, was directed toward the inflation and launch phase of operations. Some effort was devoted to testing a steerable parachute, and a conceptual study of operations to obtain very long duration flights was conducted. A pneumatic device for holding the balloon just below the bubble was completed and tested in the laboratory. In principle it permits all of the balloon except the bubble to be kept in the box during inflation and laid out parallel to the wind immediately prior to launch. Several models of portable wind screens have been tested in a wind tunnel. Studies of the forces in cable restrained launch systems such as Stonehenge have been completed, and reports covering the analysis and tests of them have been written. A study of various systems to deploy a balloon, all except the bubble, after launch resulted in the selection of a promising system and the development of an energy absorption device (brake) to lower the payload and uninflated portion of the balloon. Refinement of the braking system and development of rigging were continuing at year's end.

III. OPERATIONS

FLIGHT SERVICES AT NCAR FIXED FACILITIES

Sixty-eight flights were flown from the NCAR Scientific Balloon Flight Station at Palestine, Texas and 6 were flown from Page, Arizona during the year. One of these was a test flight flown for evaluation of a particular balloon. The rest were all flown in connection with a scientific experiment. In addition to the 74 NCAR flights, considerable support was provided the Strátoscope II operation during April and May.

Overall operational reliability increased by 7% over any previous year of NCAR operations. Sixty (81%) of the 74 flights were operationally successful; 14 (19%) were failures. These are listed below:

Balloon	6
Electronic	5
Weather	2
Operations	1

Balloons, as in 1967, accounted for most failures. Two of these were on half mil balloons carried over from 1967. These had the old 480 tape on them which accounted for most of the balloon failures in 1967. One was a classic leaker that went slowly to altitude then started back down when all ballast had been expended; two failed during or immediately after launch; only one was an "old fashioned" ascent failure, bursting at 63,800 feet.

The decided increase in flight failures due to electronic malfunctions was mainly due to faulty equipment; two were PCM equipment failures for the same experiment (the cause has been determined and is being corrected); two were command receiver failures due to a defective reed and transistor respectively; and the final failure was due to erroneous timer setting. Although, the flights were failures according to NCAR criteria, only one resulted in a complete scientific failure (see Flight Summaries for details).

Two weather failures were charged, one due to trajectory toward Mexico and one because weather grounded the tracking aircraft. In both cases, more than half the planned scientific data were obtained.

The one operations failure resulted from damage to a balloon during bubble erection with the Dudley Observatory's top mounted load. This was a calculated risk, and the same maneuver had been accomplished numerous times before without damage. However, in the future an aerial platform will be used to preclude re-occurence of this type failure.

While packages continued to grow in size and complexity, there were no significant operational changes during the year. Three new records were achieved; a gross load of 6,729 lbs was successfully launched, a flight time at altitude of 42 hours was accomplished, and a 15 x 10^6 ft^3 balloon was successfully flown.

There were no incidents reported with respect to ground or air safety connected with any flight. There were no major damage claims and all minor damages were handled by the recovery crews to everyone's satisfaction.

Comparisons with past years are shown in Figs. 1 through 4. Figures 5 through 9 are pictures of newly acquired equipment and buildings at Palestine.

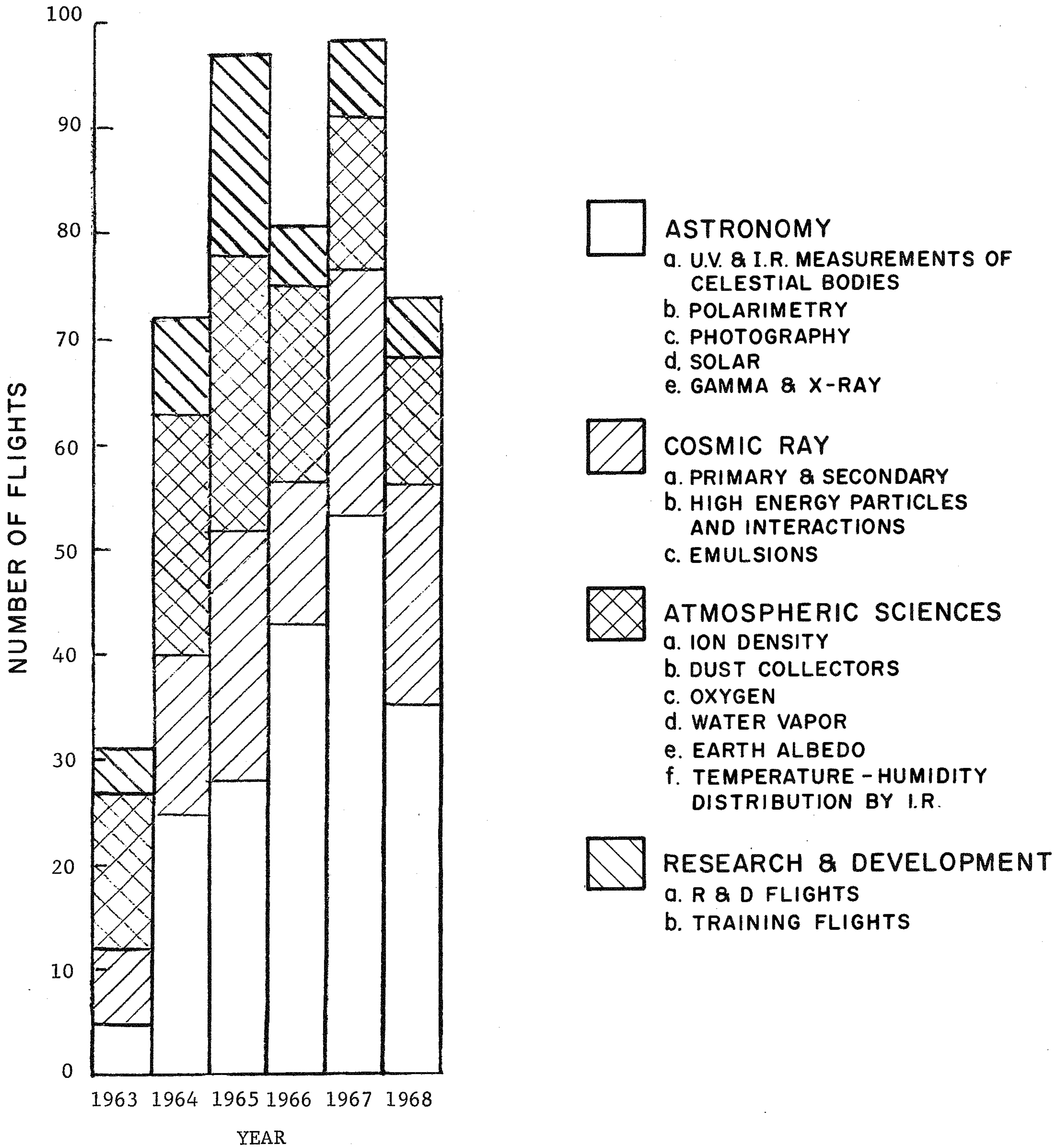


Figure 1. This chart shows how NCAR balloon flight support has been distributed among the following broad scientific disciplines: I-Astronomy, II-Cosmic Ray Physics, III-Atmospheric Sciences, and IV-Balloon Research and Development.

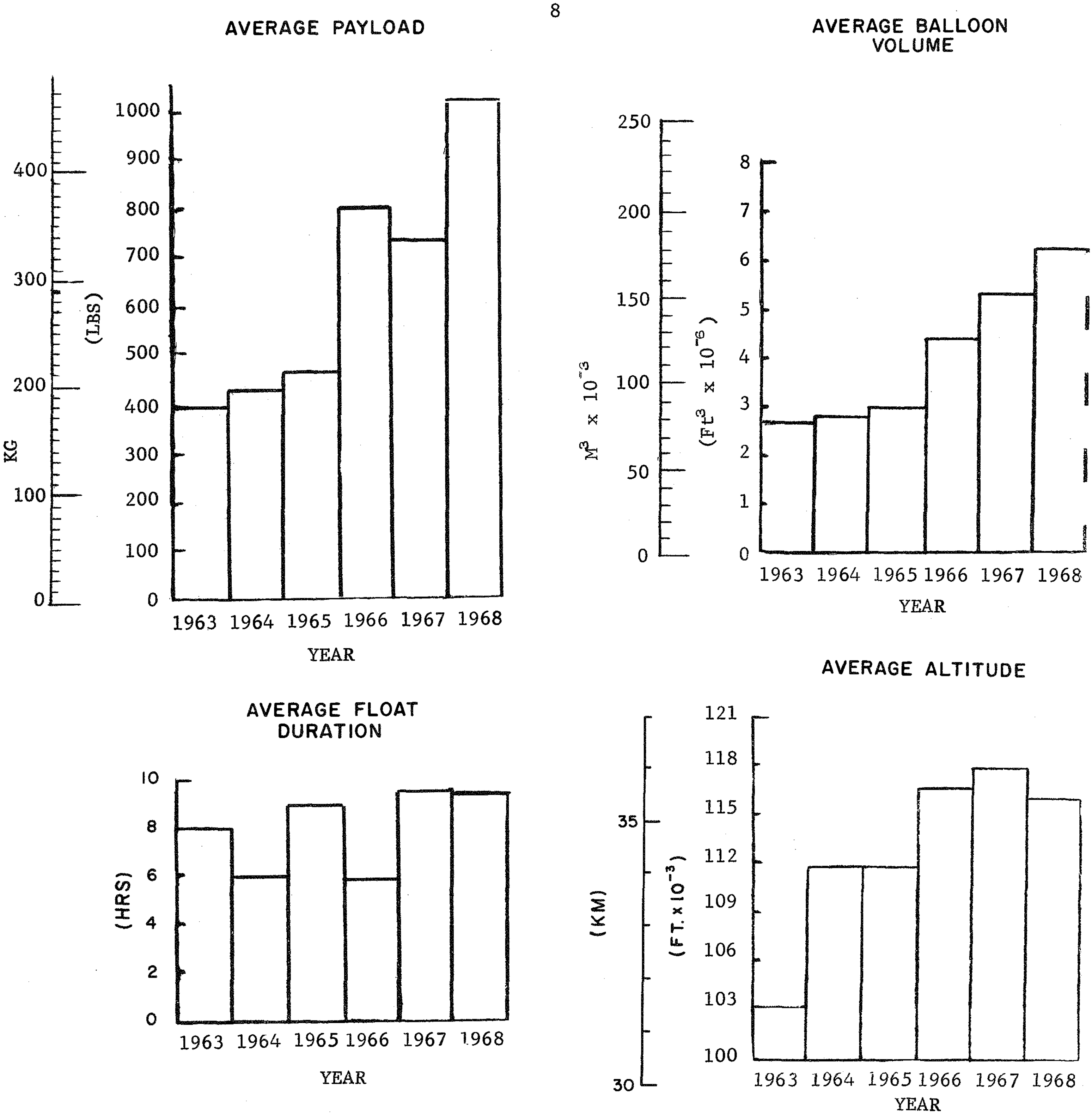


Figure 2. These graphs, taken from the NCAR balloon flight record, show trends that have occurred in ballooning characteristics. The trends in average payload, balloon volume and float altitude are expected to continue. Unless something can be done to extend the recovery area, e.g., develop acceptable at-sea or in-flight recovery methods, the average float time is not likely to increase greatly.

The data for 1963 are based on 5 months of operations, but they are believed to be representative of state-of-the-art ballooning at that time.

The data for 1968 is based on operations to 4 December 1968.

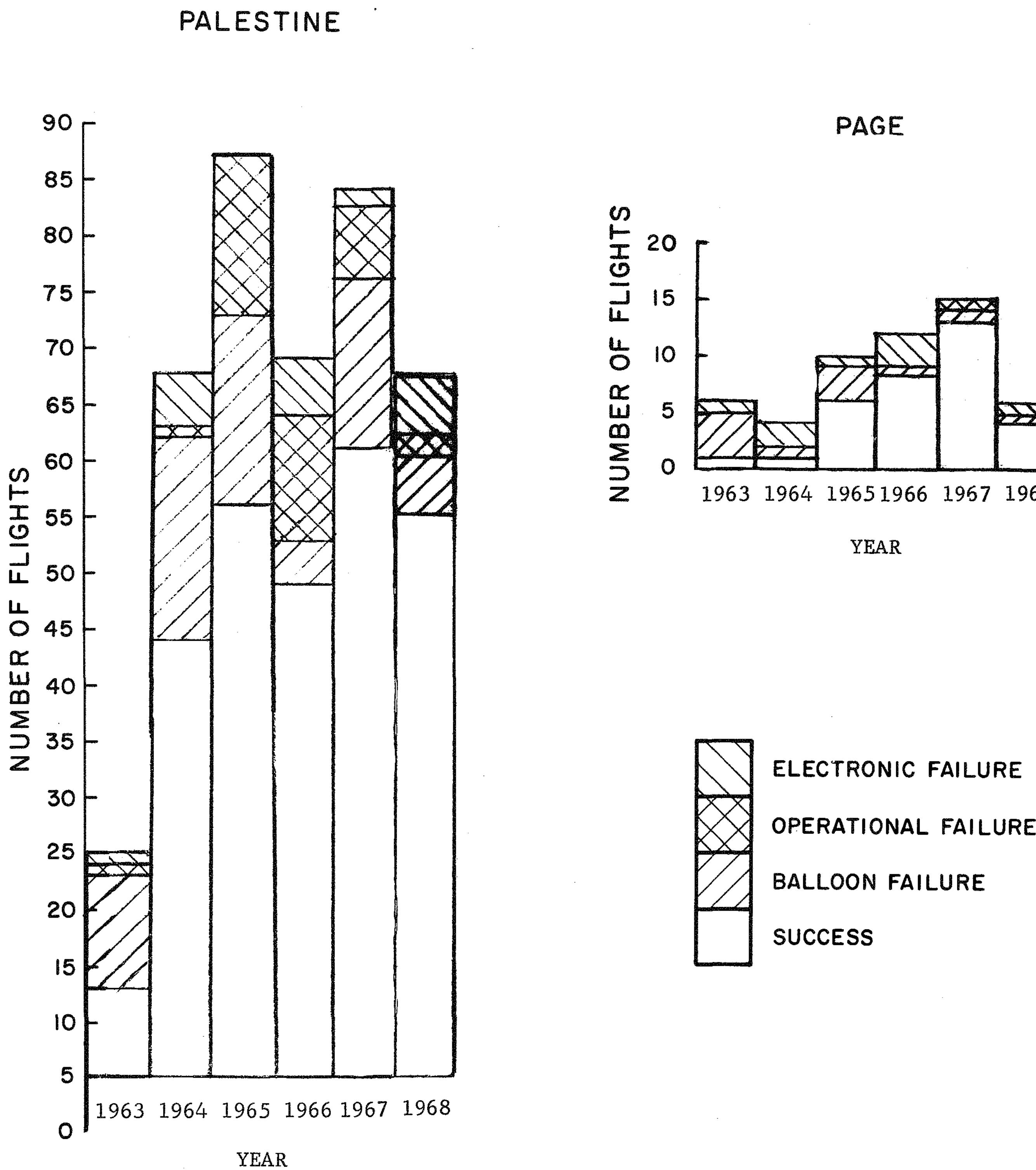


Figure 3 . The number of flights attempted from Palestine (Texas) and Page or Litchfield Park (Arizona) are shown by years. The number and cause of flight failures are also indicated.

Figure 4 . The bargraph of Activity Index is intended to show by a single number our total productive effort in flight operations from 1963 to 1968. The index is defined by the following formula:

$$I = (N-0.25f)\ \frac{\overline{w}}{w_s}\ 2^{\left(\frac{\overline{a}-a_s}{11}\right)} \quad \text{where}$$

N = Number of flights attempted

f = Number of flight failures

$\overline{w}$ = Mean payload of all N flights

w_s = "Standard" payload weight of 400 pounds

$\overline{a}$ = Mean of the float altitudes of all N flights in thousands of feet

a_s = "Standard" float altitude of 100 in thousands of feet

The exponential formulation is used because, if all other factors are constant, the effort required doubles approximately for each 11,000-foot increase in float altitude. In computing this index, failures of the scientific instrumentation are not included.

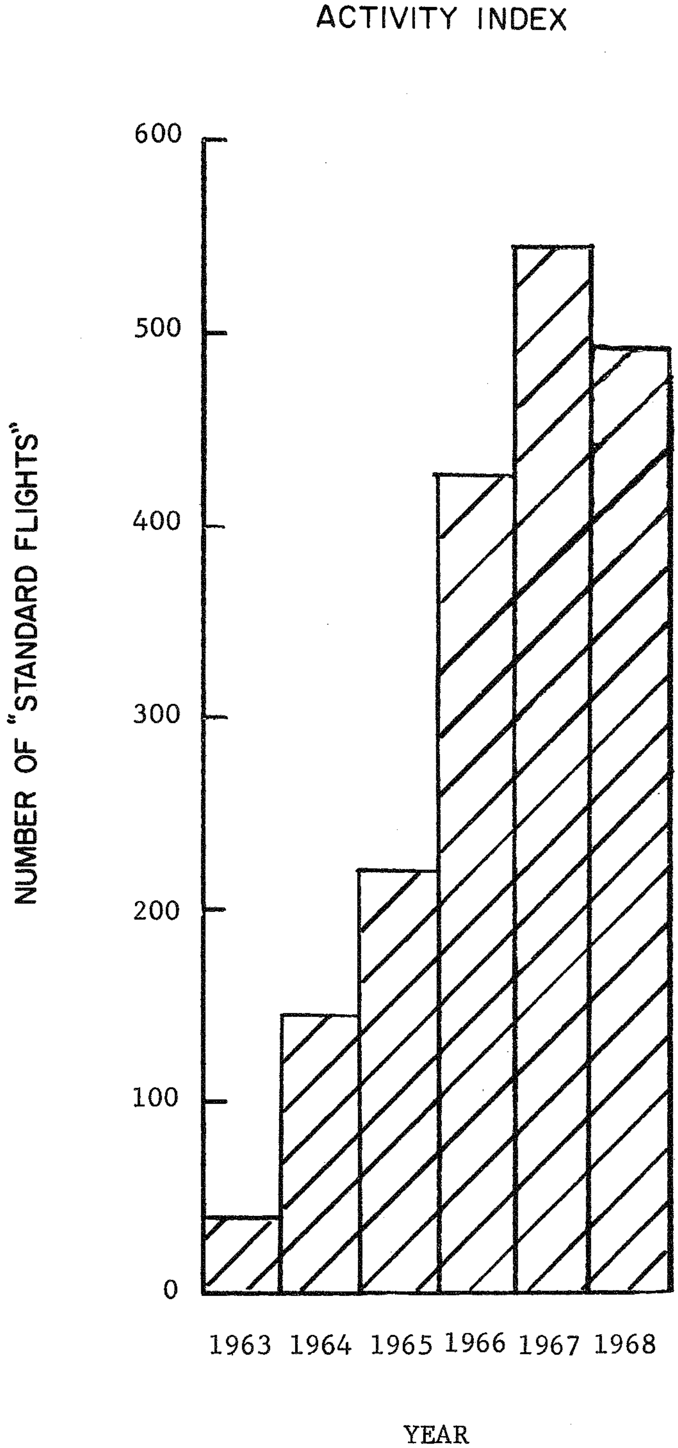


Figure 5. This van, obtained from government surplus, now houses a Balloon Facility telemetry and command ground station. It provides greater mobility and more working space than the trailers used heretofore.

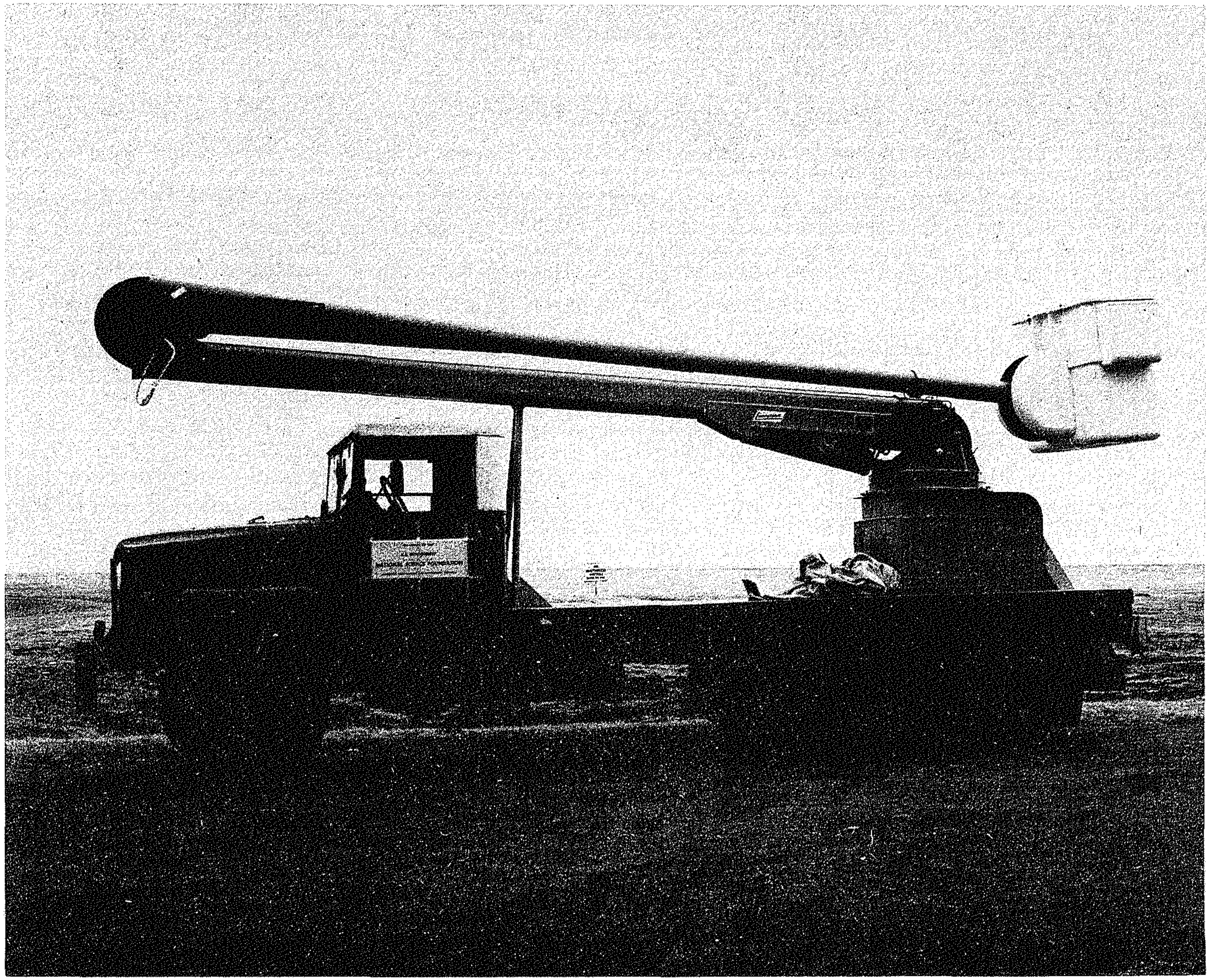


Figure 6. A new personnel aerial platform tower mounted on NCAR's first launch truck enables balloon technicians to inspect and, if necessary, repair balloons during inflation. It is also used to assist in the inflation of top-loaded balloons.

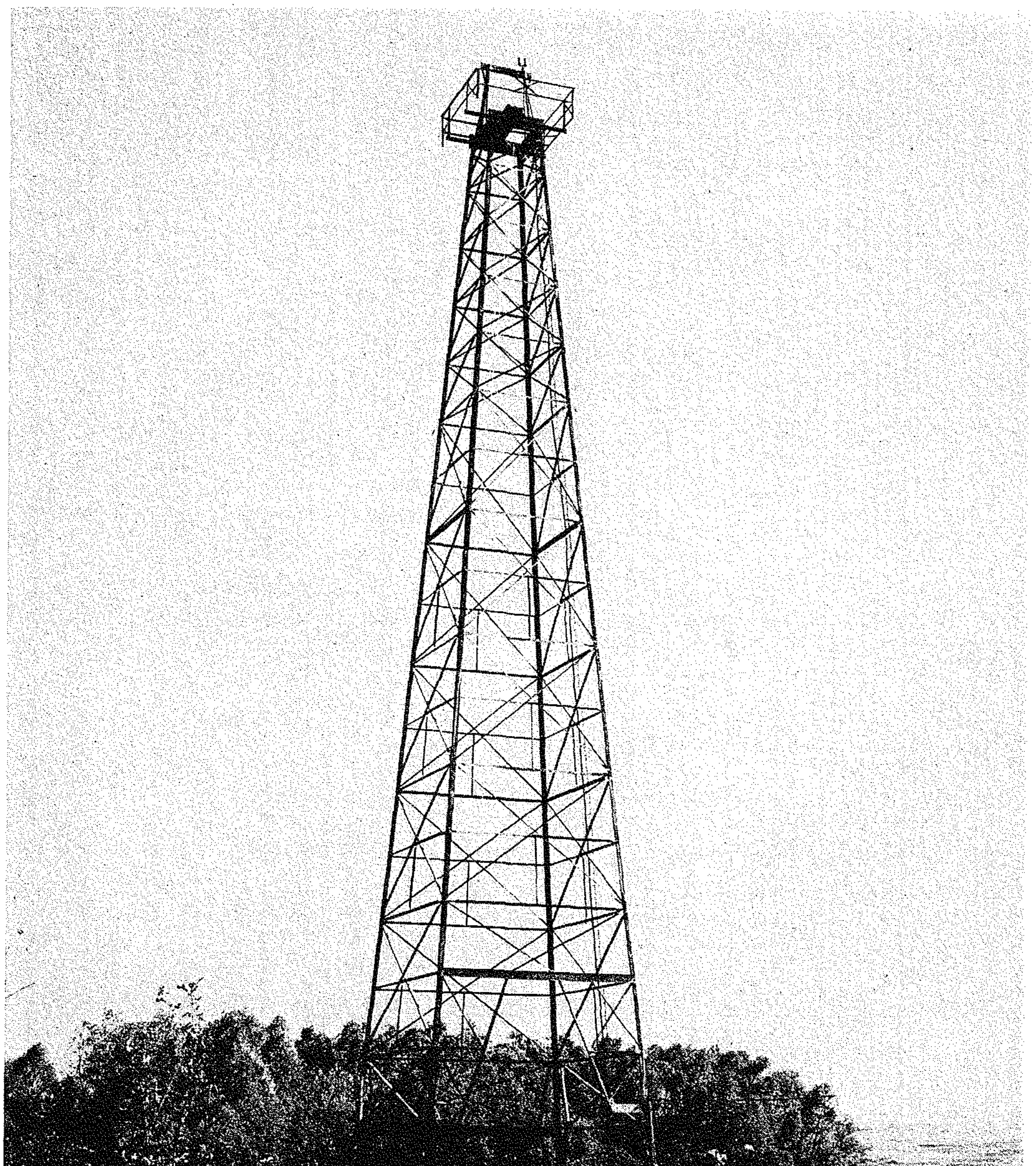


Figure 7. An old oil well derrick now serves NCAR as a test tower. Any suspension system which must have special characteristics can be tested on this tower if its length does not exceed 120 feet.

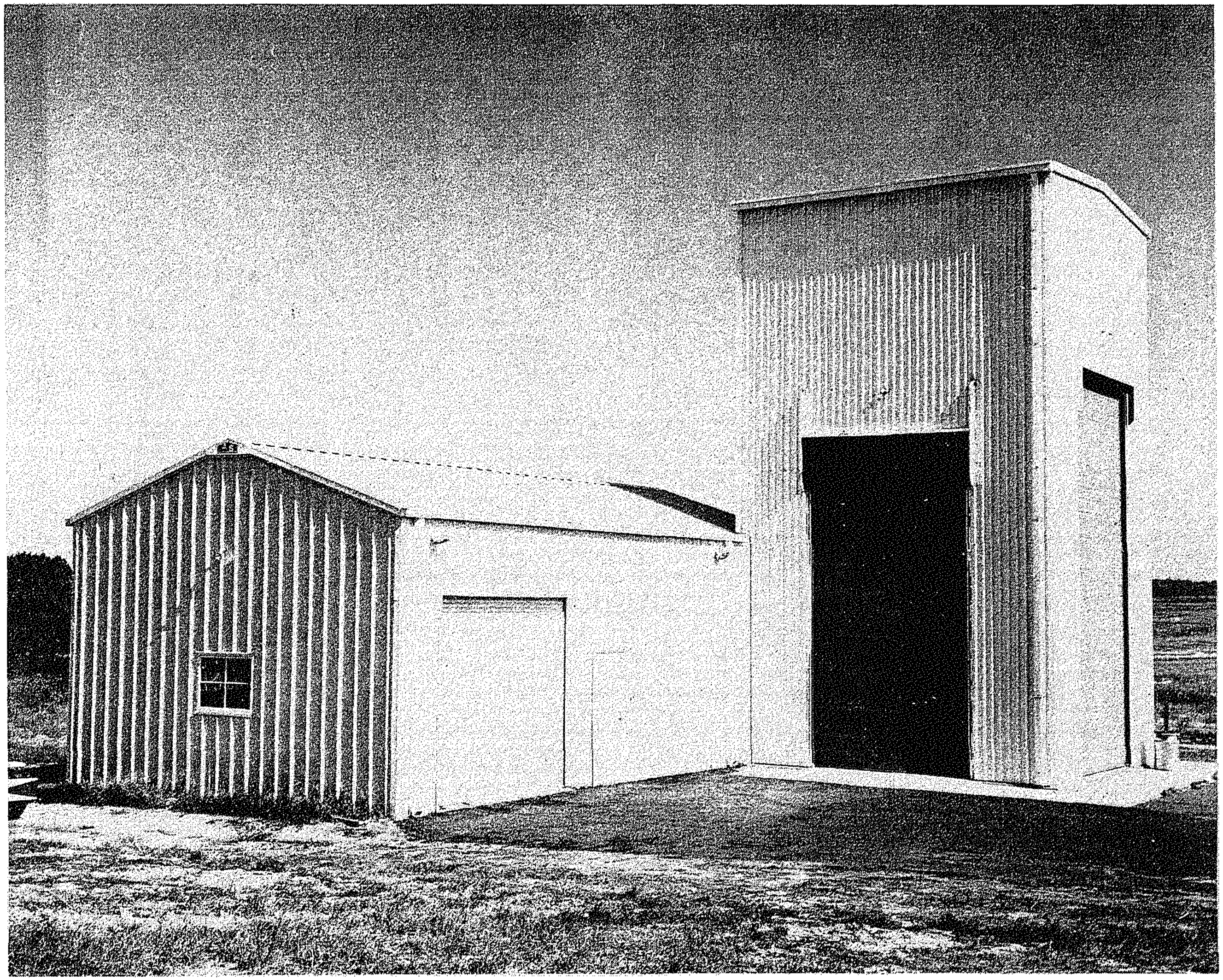


Figure 8. The Coronaport has for several years served those scientists who needed to suspend their experimental equipment for checkout prior to flight. A new 20' x 40', air-conditioned addition now provides work space for Coronaport users.

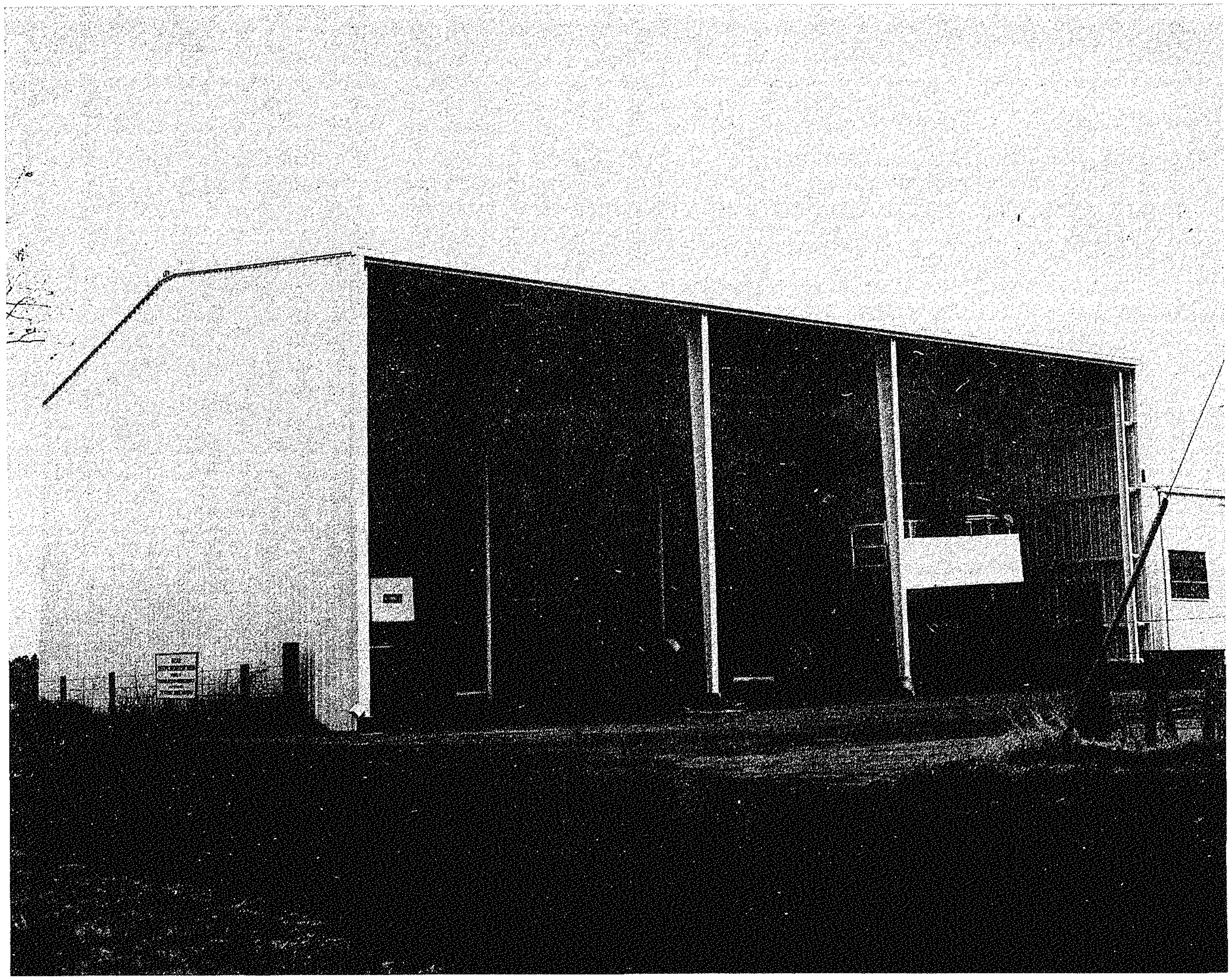


Figure 9. This 60' x 70' shelter protects the Facility's large vehicles from the ravages of sun and weather. One has but to touch a launch vehicle which is exposed to the sun at Palestine on a hot summer day to appreciate how important this shelter is to the rigging crew.

IV. ADMINISTRATION

PERSONNEL

The staff of the Scientific Balloon Facility on 31 December 1968 consisted of forty-three full time employees and four part time casual assistants. The NCAR full time staff is classified as follows:

	Boulder	Palestine	Total
Administrative	2	2	4
Secretarial	2	2	4
Engineers	8	4	12
Meteorologists	0	2	2
Technicians	2	18	20
Maintenance	0	1	1
Total	14	29	43

At year's end a vacancy exists at Palestine for an electronic engineer. Every effort is being made to fill this billet.

The contract personnel at Palestine on 31 December 1968 consisted of two aircraft pilots under subcontract with Winzen Research, Inc., four security guards from Southern Security, Inc., and one ESSA meteorologist. During the year two ESSA meteorologists departed and were replaced by NCAR personnel as reported below. The one ESSA meteorologist remaining will stay on until June 1969 to provide continuity of service.

Six full time casual assistants were employed at Palestine during the summer vacation period to assist with ballooning operations.

Staff changes during the year were as follows. On 2 January 1968 Stephen W. Kovacs transferred to the Balloon Facility as an R & D technician from the Atmospheric Dynamics Department of LAS. Also on 2 January 1968 Paul Bass resigned his position as an Electronics Technician at Palestine. On 1 February 1968 Gerald A. Rhoads assumed the duties of Assistant Operations Supervisor at Palestine. Mr. Rhoads was previously a Winzen Research, Inc. pilot at Palestine. On 15 March 1968 Howell O. Poff was hired as a Ballooning Technician at Palestine.

On 30 April 1968 Mrs. Elizabeth A. Holden resigned her position as a secretary in the Boulder office and was replaced on 20 May 1968 by Miss F. Ann Sheehan. On 7 June 1968 Harold L. Baker resigned his position as an R & D Engineer in Boulder. Due to the current shortage of funds and personnel ceilings, we were unable to hire a replacement for Mr. Baker. On 15 July 1968 William J. Landsperger and on 1 October 1968 Daniel D. Christianson joined the staff as meteorologists at Palestine.

On 14 October 1968, Mr. Claude Morel of the Meudon Observatory, France, joined the Balloon Facility as a scientific visitor for the period from mid-October 1968 to mid-January 1969.

FUNDING

Funding during FY 1968 continued to be well below optimum. As a result, operations again had to be given priority over research and development in the competition for limited funds.

Construction during the year was limited to a vehicle storage shelter, an addition to the Coronaport building, a small welding shop, and an antenna platform on the Operations Building at Palestine. At Boulder a contract has been let for a small prefabricated Staging and Storage Building at the Marshall Site.

A breakdown of funds expended in FY 1968, in major categories, follows:

1. Administration		$ 55,509
(a) Salaries, Benefits and Travel	$ 46,628	
(b) Supplies, Services and Equipment	8,881	
2. Research and Development		196,012
(a) Salaries, Benefits and Travel	129,353	
(b) R & D Projects	66,659	
3. Operations		847,392
(a) NCAR Support		55,080
(1) Salaries, Benefits and Travel	19,894	
(2) Operational Expenditures	35,186	
(b) University Support		792,312
(1) Salaries, Benefits and Travel	286,162	
(2) Operational Expenditures	506,150	
4. NASA Contract Funds		379,458
(a) Research and Development	84,087	
(b) Flight Support	245,967	
(c) NIMBUS "B" Flight Tests	22,255	
(d) HAPPE Descent System Test	4,206	
(e) Project Support (FROST)	22,943	
5. Construction - Palestine		32,932
TOTAL FUNDS EXPENDED		$1,511,303

PANEL MEETINGS

Two meetings of the NCAR Advisory Panel on the Scientific Use of Balloons were held during the year. The first was held in Boulder on 26 and 27 February 1968. Dr. John W. Firor welcomed the Panel members. Dr. Daniel F. Rex outlined a recent presentation he had made to the NSF concerning Balloon Facility plans through 1974. Separate funding for the Balloon Facility was discussed. Dr. Rex stated that separate funding would not only relieve the present competition for funds allocated to the atmospheric sciences, but would increase flexibility of the total NCAR structure and strengthen the position of ballooning in general. Dr. Firor commented that at this time he felt NSF is amenable to the proposed change of the Balloon Facility to a true national facility and with increased financial support. The Panel recommended that NCAR reconsider the projected Balloon Facility staffing, particularly at Palestine, to insure that it is adequate to meet the balloon requirements anticipated in 1970.

Dr. Rex said that the Balloon Facility plans a third meeting with Balloon Industry representatives on May 16 and 17, 1968 to discuss the possibility of establishing standards in certain areas in ballooning, and to review again conditions affecting both the Industry and NCAR. Pursuant to Panel Action of the November 1967 meeting, Dr. Rex suggested a joint Balloon Industry-Panel meeting in the fall of 1968. The Panel discussed the suggestion at some length and came to the conclusion that NCAR should prepare a preliminary agenda for a joint meeting after the Industry meeting to be forwarded to Panel members for review. If the majority of the Panel believes a meeting to be worthwhile, such a meeting would be scheduled.

The Panel reviewed the Annual Report. The following recommendations were made:

1. That NCAR investigate practical approaches for improving the quality control exercised in the manufacture and packaging of balloons.

2. Urged that at the earliest possible time tracking and recovery pilots be made members of the NCAR staff and not remain subcontractor personnel.

3. That NCAR investigate the feasibility of providing systems of giving real time knowledge of geographical balloon position over the entire trajectory range if required by the scientific experiment.

4. That the NCAR staff be complimented on the quality of the Annual Report.

The Panel recommended a revised format to be used in preparing the Five-Year R & D Plan to be presented at the next regular meeting.

Mr. Alvin L. Morris reported on actions taken on prior panel recommendations.

Dr. Oscar L. Cooper was to have presented to the Panel a statement concerning NCAR's R & D effort in connection with command equipment. There was not sufficient time for a complete presentation and the Panel asked to receive in writing before the next meeting an account of the Balloon Facility's approach to this integral part of ballooning.

Dr. Richard Kurz of NASA Manned Spacecraft Center presented a program to study the primary cosmic radiation in the energy range of 10^{10} to 10^{14} eV. Ultimate objectives for balloon-borne investigations are to expose a 10,000-lb experiment for 20 hours at 120,000 ft. The Panel after much deliberation pointed out that NCAR should enhance its capabilities for heavy load launches, and if it is to be a national facility it must have the capability to handle programs such as this. The Panel recommended that NCAR develop a heavy load ballooning capability, such as required by the CRISP program, without substantially reducing the level of support now being provided by the Balloon Facility to the scientific community at large.

The second Panel meeting was held on 28 and 29 October in Boulder, Colorado. The Panel was pleased to see that representatives of Industry met with NCAR personnel to discuss mutual problems. It noted that no concerted action was taken in the form of recommendations that should be considered by the Panel. Individual questions raised at the Industry meeting were considered. The Panel encouraged continuing discussions.

The Panel endorsed the policy of the Balloon Facility in providing reasonably complete shop facilities for the use of experimenters in checking out their equipment before flights and in refurbishing equipment between flights. In making this endorsement, the Panel recommends that NCAR personnel should not normally construct a significant amount of experimental equipment for experimenters.

The Panel desires NCAR to continue its current practice of providing an experimenter with objective estimates of the reliabilities of various balloons to aid the experimenter and his sponsors in the choice of the most appropriate vehicle. At the same time the Panel urges NCAR to press more vigorously toward the development and use of larger balloons in accordance with previously established priorities in the R & D program.

The Panel requested the Balloon Facility to prepare for the next meeting a resume of the reliability engineering procedures used at Palestine.

Mr. Morris reported on the current status of the Balloon Facility and reviewed activity since the last meeting. One item covered was the responses from scientists desiring balloon flights from the tropical regions of the Southern Hemisphere. Mr. Morris stated that a launch site in Brazil would meet the requirements of the majority of scientists, and that if scientific reaction is sufficiently positive such an expedition could be mounted two years from now. The National Academy of Science recommends that one or more scientists assume the leadership for the scientific community and contact the Space Science Board for support in making recommendations to sponsoring agencies. If requested, NCAR is willing to assume responsibility for the logistics of the operation. Panel members interested in Southern Hemisphere flights indicated a willingness to reduce northern latitude flights in favor of the expedition. There appeared to be a consensus that the requirement for a Southern Hemisphere operation would probably exist on a continuing basis.

As requested by the Panel at its last meeting, Mr. Morris presented a revised personnel plan. An increase in personnel will be delayed until FY 1971 when it is hoped that budget restrictions will be eased. Funds for construction of a new and larger launch pad at Palestine are included in the proposed FY 1971 budget. Mr. Morris also reported that the Facility is being assisted by Mr. Patrick Cooke of NASA in reviewing current quality control procedures. It is hoped that recommendations can be presented at the next meeting. Mr. Morris further reported that during a recent balloon flight, radar, GMD, photography and theodolites were used to check the real time trajectory of a balloon against position data received by interrogating a balloon-borne OMEGA transponder via a synchronous satellite. Check positions obtained by each method were very close to the satellite positions. Until NCAR can use a satellite, real time trajectory problems may be solved by using a radar transponder on the balloon and letting the FAA determine the position, or by interrogating an OMEGA transponder directly from a ground station or an airplane. Both possibilities will be explored as funding and priorities permit.

Dr. Oscar L. Cooper presented his evaluation of six pressure sensors. After extensive evaluation, it has been determined that the Rosemount transducer has performed the most satisfactorily. Panel members urged Dr. Cooper to make the Rosemount sensor available for all balloon flights as quickly as possible.

The Balloon Facility Current Command System Concept was discussed. In order to insure maximum flexibility in future scientific balloon flights, the Panel recommended that the NCAR command system have the capability of being externally commanded from an experimenter's console or computer and that an output from the new NCAR telemetry demultiplexer be made available for operation of an experimenter's display console or computer.

Mr. Karl Stefan presented the Five-Year R & D Plan. Discussion centered on particular parts of the Plan. There seemed to be agreement among Panel members that there will be an increased scientific interest in long duration flights and that development of large superpressure balloons should be given the same R & D priority given to carrying heavier payloads to higher altitudes.

Membership in the Panel during 1968 was as follows:

Gordon A. Newkirk, NCAR - Chairman
James K. Angell, ESSA
George W. Clark, MIT
Robert E. Danielson, Princeton University
Urner Liddel, NASA
Peter Meyer, University of Chicago
Laurence E. Peterson, University of California, San Diego
C. J. Waddington, University of Minnesota
Charles S. Tilton, Air Force Cambridge Research Laboratories (DOD member)
Henry Demboski, Office of Naval Research (Alternate DOD member)

Dr. Robert E. Danielson was selected by the Panel to be its chairman for the ensuing year.

BALLOON INDUSTRY-NCAR MEETING

Representatives from Raven Industries, Inc., the G. T. Schjeldahl Co., and Winzen Research, Inc. met with representatives of NCAR at Boulder on 17 May 1968.

Dr. Daniel F. Rex, Chairman of the meeting, welcomed the participants. He reviewed the recent change in the administrative structure of NCAR.

On the previous day, an informal group consisting of representatives of the Balloon Industry and NCAR had met to discuss the feasibility and desirability of establishing standards within Ballooning. Justin H. Smalley presented the conclusions of the working session to the meeting. The group concluded that establishment of standards could be useful to both the user and the manufacturer of balloons and recommended that NCAR be asked to contact potentially interested parties to form and to be a part of a committee to generate balloon standards. The Balloon Facility agreed to make available publication services as required for forthcoming documents, limited secretarial assistance and to provide some degree of financial assistance for expenses incurred in the course of developing standards, e.g., providing a meeting room.

The members of the meeting concurred with the substance and recommendations of the working session.

During the 1967 meeting a request was made for a meeting between Industry representatives and the NCAR Panel on the Scientific Use of Balloons. This request was presented to the Panel at the 6, 7 November 1967 meeting and further discussed during the 26, 27 February 1968 meeting. The Panel concluded that NCAR should prepare an agenda for the joint meeting to be circulated to the Panel members prior to the scheduling of the meeting. After some discussion, the Balloon Industry representatives concluded that if NCAR could serve as an effective mechanism to keep both Industry and Panel members advised of each other's needs and plans, there would be no need at the present time to hold a joint meeting. Industry representatives reserved the right to alter their stance on this point if future developments indicate a need to change. NCAR agreed to carry out this function.

Mr. Vincent E. Lally reviewed the upcoming programs leading to the Global Atmospheric Research Program (GARP) now scheduled to be operational in 1976. Mr. Robert S. Kubara reviewed NCAR thoughts about a Southern Hemisphere balloon expedition.

The next agenda item was a review of Industry-NCAR relationships. During discussion of the agenda item, a difference of opinion was apparent as to the most productive means of realizing the desired objectives of the Balloon Industry, the scientists who use balloons as vehicles for their experiments, and the Balloon Facility.

Representatives of the Balloon Industry were critical of NCAR's reluctance to buy and encourage the use of balloons beyond the 10.6 million cubic foot size, NCAR's approach to learning the specific factors contributing to success or failure in balloon flights, and objectives and assigned priorities within the NCAR R & D Program. The opinion was expressed that NCAR discourages scientists from using balloons larger than 10.6 million cubic feet, preferring to stay with tried systems instead of encouraging further advances in ballooning. Industry representatives felt that the balloon materials presently used are adequate for balloons of very large sizes; that extrapolation to the large sizes is practicable if the critical safety factors are analyzed and taken into account. The most difficult problem according to one Industry group is devising an appropriate launch method for the larger balloons.

Representatives of one of the Balloon companies presented a prepared statement which was critical of certain phases of the Palestine operation, our R & D effort, and what seemed to them to be an attempt to develop or maintain competition in Industry.

The NCAR position was stated in the following terms. The Balloon Facility was established to serve scientific research using balloons as the supporting vehicle. To this end, Facility programs are principally divided into Operations and R & D. The Operations program is designed to provide both a reliable and, as nearly as possible, an optimum method for flying each scientific experiment. It has been the experience of the Balloon Facility that the majority of scientists using the services of the Facility are primarily interested in a flight that will provide the desired results with the least risk to the experimenter's scientific equipment. This does not mean that scientists, in general, are satisfied with state-of-the-art balloon performance, but few are willing to risk their experiments on unproven balloons and untried methods. Consequently, the Balloon Facility has felt an obligation to state to scientists the probability of success in as realistic terms as possible.

The R & D Program is designed to further knowledge in areas, such as how a balloon flies and the environmental stresses it is subject to in the course of a flight, so that extrapolations to larger sizes for higher altitudes can be made in an orderly and predictable manner. Further knowledge is also desired about the most appropriate materials and methods to be used in the manufacture of balloons, devising launch methods to suit various balloon sizes and launch conditions, refinement of electronic support equipment, and recovery methods.

It was pointed out that since funds for NASA projects have been limited, NASA scientists may in the future turn more to balloons. NASA scientists (in contrast to NASA-sponsored university scientists) are more inclined to state requirements for an experiment and not be limited to what is considered to be the state-of-the-art. This includes not only balloon sizes, weight of payloads, but flight durations. Such a trend would provide support for the development of means of lifting heavier payloads to higher altitudes for longer periods.

It was stated that NCAR is not in a position to either maintain or promote a competitive situation with the Balloon Industry, but it is especially wary of doing anything to destroy competition.

Industry Representatives present at the meeting:

Raven Industries, Inc.
Paul S. White
James A. Winker

G. T. Schjeldahl Co.
Ronald J. Niccum
Richard J. Slater

Winzen Research, Inc.
Walter F. Martin
Jean R. Nelson
Don R. Williams

NCAR Representatives present:

Daniel F. Rex
Alvin L. Morris
Robert S. Kubara
Vincent E. Lally
James M. Shoemaker
Justin H. Smalley
Karl Stefan
Betsy Holdsworth, Sec'y

SCIENTIFIC BALLOONING STANDARDS COMMITTEE (ad hoc)

1. A meeting was held on 23 August 1968 at the Minneapolis-St. Paul International Airport Terminal. The attendees and the organizations represented were:

Don R. Williams, Winzen Research, Inc.
Jean R. Nelson, Winzen Research, Inc.
Robert L. Ray, Winzen Research, Inc.
Walter F. Martin, Winzen Research, Inc.
Patrick W. Cooke, NASA Headquarters (Code KR)
Sig Stenlund, G. T. Schjeldahl Co.
Ron Niccum, G. T. Schjeldahl Co.
Tom Fairhurst, ONR
Mike Evanick, ONR
Henry Demboski, ONR
Alvin L. Morris, NCAR
Justin H. Smalley, NCAR
Karl Stefan, NCAR
Arthur O. Korn, AFCRL
Capt. Manuel (Bob) Love, Det. 31, 6th Wea. Wg., Goodfellow AFB
CMSgt. Ralph M. Stevens, Det. 31, 6th Wea. Wg., Goodfellow AFB
Mike Pavey, Raven Industries, Inc.
Jim Winker, Raven Industries, Inc.

2. The purpose of the meeting was to discuss the desirability and the possibility of forming a committee to establish certain standards for the scientific ballooning community. It was unanimously agreed that a committee for such a purpose was indeed desirable. Accordingly, a committee was formed and the following name chosen:

Scientific Ballooning Standards Committee (ad hoc).

3. The membership of the Committee is comprised of the following eight groups: Air Force Cambridge Research Laboratories, NASA Headquarters, Detachment 31 - 6th Weather Wing, Office of Naval Research, Raven Industries, Inc., G. T. Schjeldahl Co., Winzen Research, Inc., and the National Center for Atmospheric Research. For purposes of adopting Committee recommendations, each of the eight groups is to have one official representative as designated by each organization. Attendance at Committee meetings is not restricted to these official representatives.

4. The object of this Committee is to recommend standards for the ballooning community.

5. The purpose of standardization is to establish uniform semantics, procedures and hardware, where practical, and to further the reliable and economical manufacture and performance of balloon systems.

6. The first chairman shall be Mr. J. H. Smalley of NCAR. The chairmanship shall be rotated as determined by the Committee at a later date.

7. Meetings shall be held once every six months. The chairman shall call the meeting and prepare an agenda to be distributed in advance of the meeting.

8. Working procedures of the Committee shall be determined by the chairman as the occasion and need arises. The normal procedure will be to form sub-committees to investigate a particular standard. Their findings and recommendations will then be presented to the full Committee at a regular Committee meeting.

9. A sub-committee was established on terminology and nomenclature as follows:

BALLOONS AND BALLOON DESIGN:	J. Winker (RI) - Chairman
	J. Dwyer (AFCRL)
	J. Munson (GTS)
	J. Nelson (WRI)
	J. Smalley (NCAR)
ELECTRONICS:	M. Love (Det. 31, 6th W.W.) - Chairman
	O. Cooper (NCAR)
	R. Cowie (AFCRL)
	G. Rupp (RI)
	D. Thon (WRI)
OPERATIONS:	A. Korn (AFCRL) - Chairman
	M. Evanick (ONR)
	R. Schafer (GTS)
	R. Stevens (Det. 31, 6th W.W.)

10. A second sub-committee was formed for:

BOXING BALLOONS:	J. Dwyer (AFCRL) - Chairman
	J. Nelson (WRI)
	M. Pavey (RI)
	A. Shipley (NCAR)
	S. Stenlund (GTS)

11. A third sub-committee was formed for:

SAFETY:	R. Ray (WRI) - Chairman
	M. Evanick (ONR)
	R. Kubara (NCAR)

12. The above members are, of course, subject to the approval of the membership organizations.

V. PLANS FOR 1969

In calendar year 1969 the Facility plans to:

- Continue to provide flight support.

  The Palestine crew plans to initiate flights in January from Roswell, N.M. Experience at Page, Arizona and a new survey of available high level wind data lead to real doubt about Page as a winter site. Experience at Roswell will provide some additional data, but a decision about a permanent winter site is not urgent and will not be made in the near future.

- Complete construction of a small Staging and Storage Building at the Marshall Site at Boulder, and resurface the launch pad at Palestine.

- Continue to improve ballooning systems and techniques to meet operational demands. Development in the areas of instrumentation, operations and design will be emphasized.

  In particular, telemetry capability will be extended and equipment will be changed to conform to the new 1470 MHz frequency required by the FCC on January 1, 1970. Digital command systems will more and more supplant tone systems, and the new pressure sensor system will become operational for all levels during the year.

  New launch techniques, taking advantage of the balloon restraint devices, in-flight deployment equipment and the operational procedures being developed to go with them, will be tested. Hopefully, they will make launches of large balloon systems from a quite limited pad area feasible.

  The exciting work on polyethylene superpressure balloons will be pursued with vigor. If the design concept is as good as it appears from early model tests and stress analyses, the Facility plans to fly a full scale test balloon during 1969. Other design and balloon structural work will be continued.

APPENDIX A.

PROGRAM SUMMARIES

NCAR SCIENTIFIC BALLOON FACILITY
PROGRAM SUMMARY
1968

Title: BALLOON OPERATIONS DEVELOPMENT

Objectives: To apply modern engineering methods and technology to the problems of balloon operations. Most present operational techniques have evolved through intuitive engineering in the field. A quantitative understanding of the operational requirements of scientific ballooning should lead to improvements in present techniques and equipment and to the development of new ones, making it possible to carry out scientific programs not now feasible.

Ballooning operations consist of preparing a balloon system for flight, inflating the balloon, ground checking all parts of the system, launching it, tracking and controlling it according to a pre-stated flight plan, recording telemetered data, returning the system to the surface safely, and recovering the system for evaluation or re-flight. Operations R & D aims to understand all aspects of "operations" and seeks to improve and extend every phase.

Specific objectives during 1968 were as follows:

1. Continue development of a selected configuration of an in-flight deployment system (a launch concept in which the uninflated portions of the balloon are packaged for launch and then deployed during flight).

2. Continue studies toward selection of an optimum wind screen design for protection of balloons during inflation.

3. Develop a restraint device for single cell balloons which would provide the launch features of the transfer tube in dual balloon systems.

4. Determine feasibility of a steerable parachute for guiding balloon payloads to landings in preferred locations.

5. Study means of alleviating parachute opening shock for payloads dropped from balloons.

6. Provide more complete parachute performance information to operating crews.

Program Conduct:

1. In-Flight Deployment

In late 1967 a contract was made with the G. T. Schjeldahl Co. to conduct a study of various concepts which might lead to a system of deploying a balloon train in flight. This study was restricted to conventional balloon systems, and it indicated that one critical development component would be the energy absorber for the lowering device. The optimum energy absorber design now appears to be a series of cylinders in which energy is converted from mechanical to thermal energy by friction of a nylon webbing passing over the cylinders. See Fig. 1.

In July 1968 another contract was made with the same company to test a prototype energy absorber, to integrate the unit into a balloon system and to make a test flight of the system. The period of the contract is seven months and the test flight will be made in 1969.

At the present time extensive tests are being made using 1 in. and 3 in. webbings to obtain design parameter information.

2. Wind Screen Study

Studies are now in progress by Dr. E. J. Plate, Colorado State University at Ft. Collins, using their wind tunnels to determine flow patterns around various wind screen configurations and various types of screen material. The aim is to provide a protected area in which a balloon may safely be inflated when ambient surface winds are as high as 20 kts. The results of this study will then be used to design a screen which is sufficiently portable to be used at various locations on the launch pad at Palestine.

The first phase of this study, a general flow and turbulence study, will be completed in January 1969.

3. Single Balloon Restraint Device

The launching of payloads with the Stonehenge system has demonstrated that balloon launching under the restraint of a cable to the base of the helium bubble has many advantages over the conventional dynamic launch. However, consideration of such an arrangement for single cell balloons has not been possible because of the lack of an attachment point for the cable at the base of the helium bubble. Information developed in the "Train Strain Relief Project" discussed on page A-22 indicates the possibility of attaching the restraining cable to a pneumatic clamp device at the base of the helium bubble in single celled balloons. Therefore during the year, we initiated work through subcontract with Raven Industries, Inc. for the design and fabrication of such a device. The NCAR staff is developing design criteria through use of

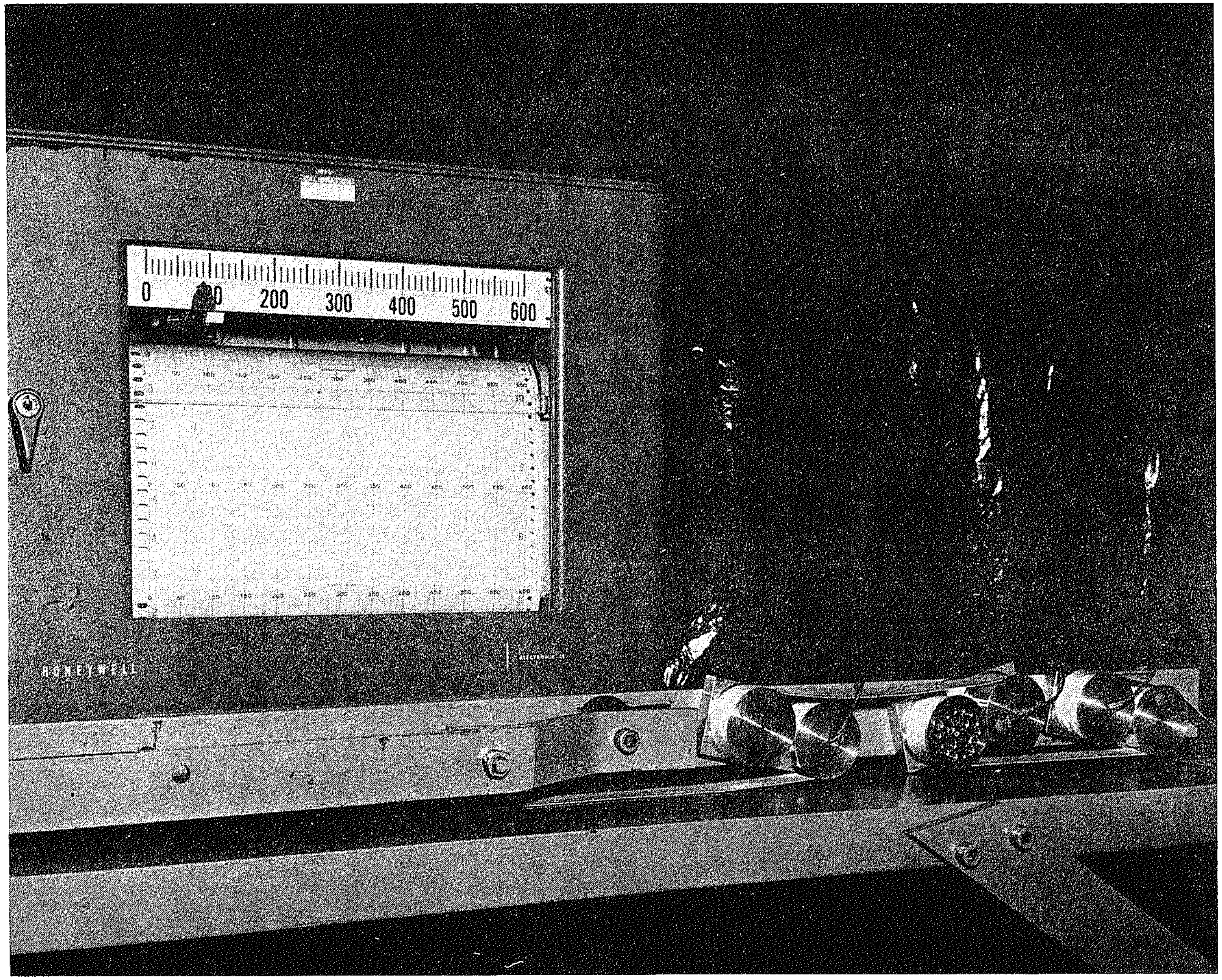


Figure 1. Energy Absorption Device.

A nylon tape slides over stationary cylinders. Input tension controls the tape speed.

mathematical models and computer programs developed for the Stonehenge project. It is too early to predict just how successful this device will be in practical applications, but laboratory tests are favorable. A photograph of the first experimental device is shown in Fig. 2. This first prototype has been tested by clamping it about a dummy polyethylene balloon as shown and pulling the balloon with a 2,000-lb force. No damage occurred to the balloon material.

4. Steerable Parachute

For the purpose of testing the feasibility of landing payloads in a preferred area, a 16-ft diameter controllable parachute was purchased from Pioneer Parachute Co. and a mechanical servo unit which was to operate the parachute was built at NCAR. These items were furnished to Raven Industries, Inc. for testing on their parachute test range. The test drops were made from an airplane at 15,000 ft for the purpose of determining the ability of a controller on the ground to land the payload in a desired location.

This effort was completed in July 1968 with encouraging results. The controller with no previous experience in controlling any similar system (such as model aircraft) could, after 3 or 4 practice drops, consistently control the landing point to within 100 yds. Figure 3 shows the parachute during a test drop.

Toward the end of the program a small amount of effort was directed toward controlling the parachute from the aircraft. It appears that this is practicable and has advantages over controlling the descent from the ground.

5. Pre-Release Parachute Deployment

The present practice of releasing payloads from balloons requires that the parachute be deployed by dynamic interaction with the air after the parachute is released from the balloon. Evidence from some drops from high altitudes indicate that the forces are excessive and may result in parachute damage or failure. The probability of failure appears to increase as release altitude increases.

Preliminary tests have been made in-house with a method for partially opening the parachute prior to release. With this pre-release opening, the parachute should fill with air while velocity and dynamic forces are still low.

6. Parachute Performance Information

Information available concerning parachute descent from high altitudes has been limited to a few standard size parachutes. Through use of the computer this information has been expanded to include all standard size parachutes and parachutes with diameters from 10 to 100 ft in 5-ft increments. The information relates descent rate and time spent in each 10,000 ft altitude increment from sea level to 150,000 ft to parachute size and payload weight.

Results:

1. In-Flight Deployment

A promising in-flight deployment configuration has been chosen and is being developed.

2. Wind Screen Study

Wind tunnel studies are being made of various wind screen configurations.

3. Single Balloon Restraint Device

A promising configuration has been selected and is in process of development.

4. Steerable Parachute

The technical feasibility and operational advantages of recovery of payloads by a steerable parachute has been demonstrated.

5. Pre-Release Parachute Deployment

Preliminary investigation indicates potential usefulness for this concept. Work is continuing in an effort to find a practical method of opening the parachute prior to its release from the balloon.

6. Parachute Performance Information

Extensive graphs of parachute performance information have been developed and passed to the Palestine Operations crew.

Future Plans:

1. In-Flight Deployment

Design, fabrication and flight test of a prototype system should be accomplished in the first half of 1969. Results of this test will be used to design operational in-flight deployment systems through the next two to three years.

2. Wind Screen Study

After completion of the general parametric study, a specific wind screen configuration will be selected and studied in detail from both an aerodynamic and structural point of view. As soon as

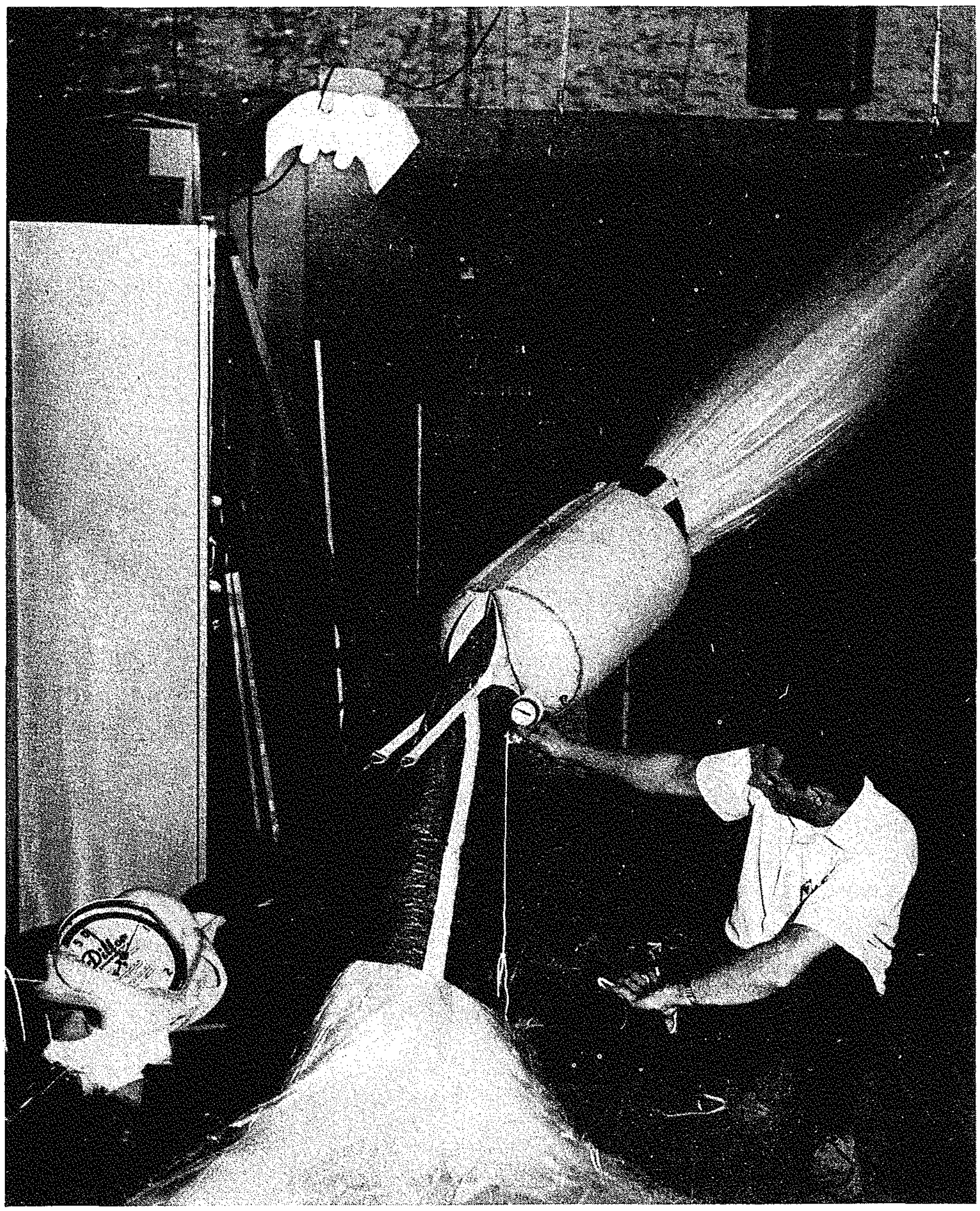


Figure 2. Single Balloon Restraint Device

This experimental device is clamped on a balloon as shown and inflated to 25 PSIG. It has withstood balloon tensions up to 2,000 lbs without damage to the balloon material.

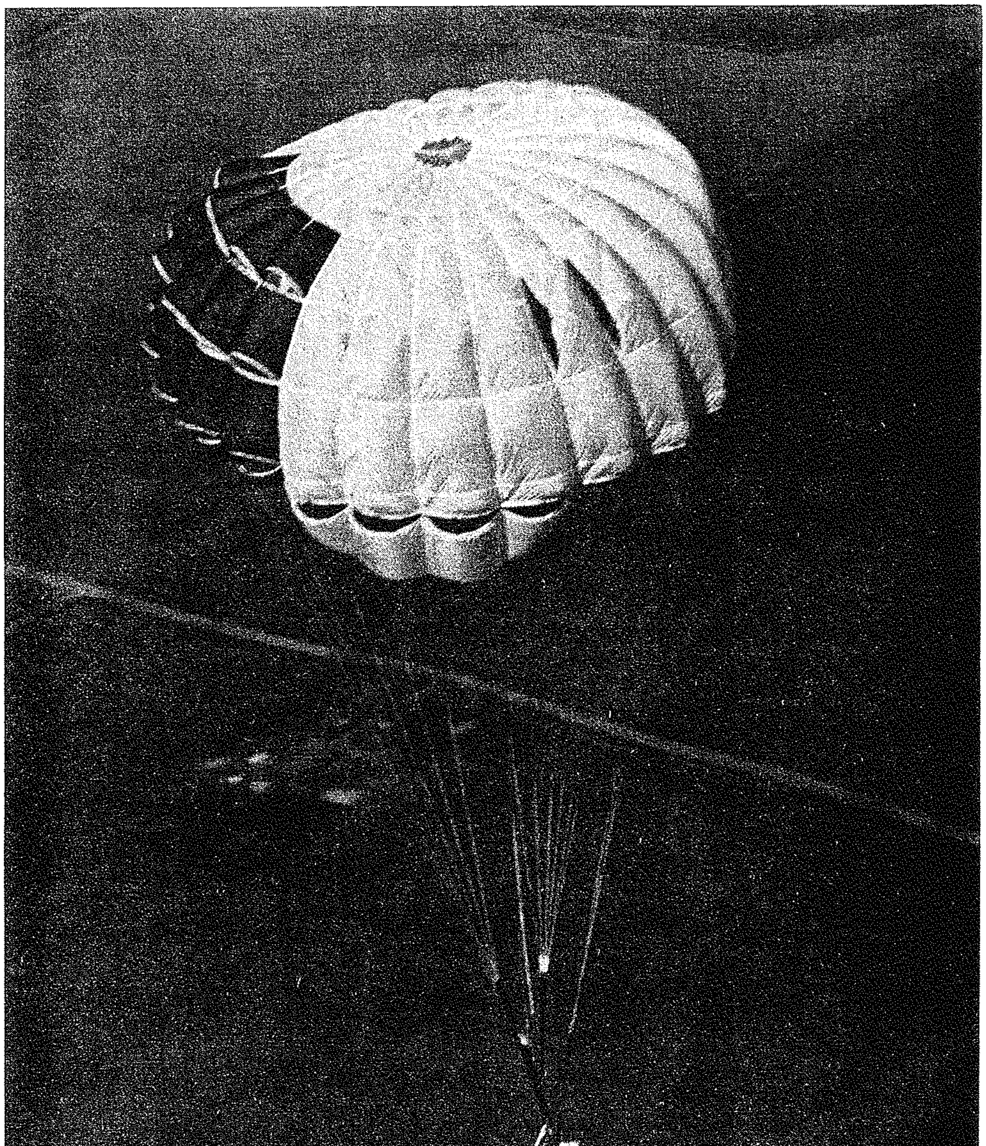


Figure 3. Steerable parachute descending under radio control. Glide angle 45°.

funds permit thereafter a full scale wind screen will be constructed and tested. When operational suitability has been established, it will be transferred to our Palestine Base for use.

3. Single Balloon Restraint Device

A collar to which a restraining cable may be attached immediately below the bubble on typical single celled balloon systems should be completed during the first half of 1969. Analytical and field studies will be combined to determine its range of usefulness. A restraint device is most urgently needed for use with large balloon systems where the limited running room at the Palestine Base creates problems for a conventional dynamic launch.

4. Steerable Parachute

It is planned to use the experimental system for small scale experiments in field operational situations. Results of these experiments will be used for establishing operational system criteria. Steerable parachute systems for operational use will be developed when funding permits, tentatively in 1972. This information, however, may prove useful sooner in special project applications.

5. Pre-Release Parachute Deployment

Current experiments will be continued and if feasibility is demonstrated development for operational use will proceed during 1969, if funds permit.

6. Parachute Performance Information

An attempt will be made to design a simple table or hand computer for field use.

NCAR SCIENTIFIC BALLOON FACILITY
PROGRAM SUMMARY
1968

Title: BALLOON DESIGN RESEARCH

Objectives: To conduct theoretical studies of the balloon vehicle considered as a structure. These studies are to provide the bases for design changes for improved reliability and increased capability--load, altitude, duration and flight characteristics. A specific objective is to determine the stress distribution in the typically highly asymmetric balloon from inflation through launch and ascent.

To develop a thorough understanding of the balloon system as a dynamic vehicle subject to diverse aerodynamic and thermodynamic influences. It is intended that this will lead to an ability to predict and control the motions of the balloon during flight.

Program Conduct: The program consists of several projects which are discussed individually in the following paragraphs. Balloon design research includes both analytical and experimental efforts. During this year because of funding limitations, the balloon experimental program has been curtailed as compared to last year. However, good progress has been made in analytical areas and in preparations for future flight experiments.

1. Finite Element Analysis

The study of a balloon as a structure utilizing the finite-element method has proceeded slowly. The theoretical development was completed by Mr. J. S. Tandon, a visiting scientist, and programmed for the computer. Difficulties with a model of a balloon led us to study a "simpler" case. The simple case was a flat membrane clamped at the edges and pressurized from one side. It was found that this problem was not simple. The solution for deformations due to a pressure load diverges if initial stresses are assumed zero. The difficulties encountered have been overcome and the "simple" case has been quite instructive. The finite elements are triangular in shape. Such elementary matters as how the nodes are numbered, in which order, and whether the elements contain obtuse angles have been shown to require great care. Since most flat membranes will have an axis of symmetry, one is tempted to reduce the amount of computer storage required by taking advantage of this symmetry. Numerical examples, however, have shown that the resulting deformations of partial models are not identical with complete models. The calculated stresses in each element are located essentially at the centroid of the element. It is desirable to know the stresses at the boundaries of the object under study. Therefore, a program has been written to extrapolate the stresses to the edges of the boundary as well as to contour both the deformations and the stresses on the computer plotter.

2. Polyethylene Superpressure Balloons

The use of conventional polyethylene balloons for long duration soon pass the point of diminishing returns because of the ever increasing ballast requirements. The use of Mylar superpressure balloons would eliminate the need for ballast, but in the very large sizes, they suffer from questionable reliability and high cost. A concept for a polyethylene superpressure balloon using "standard" balloon manufacturing techniques has been proposed. The concept envisions supporting the high internal pressure with the usual meridional load tapes. The circumferential stresses are kept within a range which the gas barrier can support by utilizing essentially the elastica shape and by providing excess material between load tapes. This balloon is known as the e-Balloon. If gas integrity can be maintained in such a balloon, it holds promise for a relatively inexpensive superpressure balloon.

3. Aerodynamic Pressure Distribution

The late Ralph H. Upson was retained as a consultant to study the aerodynamic pressure distribution over a balloon. An informal paper was submitted by him deriving a simplified expression for the velocity around a body of revolution considered as a combination of point sources and sinks. Some computer analyses of his work has been conducted. It shows promise of providing an adequate estimate of the pressure distribution over a rising balloon. This work will be incorporated into the study of the stresses in a rising balloon.

4. Cone Top Retrofit Project

It has been rather conclusively demonstrated that certain balloons have an area of high stress during ascent which makes the balloon susceptible to failure. A flight of such a balloon was reported in the 1967 Annual Report. The Vista-Cone design has been proposed as a method of improving the deployment of the balloon material during ascent. It also has been proposed as a method of eliminating the stress band. Accordingly, a contract was undertaken with Raven Industries, Inc. to add a Vista-Cone to the top of a balloon with a history of failure due to the stress band. A 2.94 MCF Viron balloon with a cone added has been delivered, and if this flies successfully, it will demonstrate that the Vista-Cone can be used to overcome the stress band. Also, there are several balloons in the NCAR inventory with a history of repeated failure. It should be possible then to use these balloons which are now a total loss by adding a Vista-Cone top at a cost less than the replacement cost.

5. Contoured Tow Balloon

A static inflation test of the smoothly contoured tow balloon was made in May, 1968. The test was conducted in the Armory at Minneapolis, Minnesota. All previous designs of launch balloons used in tandem systems have been of a cylindrical-type design. This balloon might be characterized as being semi-tailored with cylinder ends. As discussed in the 1967 Annual Report, the design was further modified with an allowance for an aerodynamic top load while rising. The purpose of the semi-tailored shape was to reduce drag in a horizontal wind field by the elimination of excess material. The material of the balloon was Mylar film reinforced with Dacron scrim and with additional meridional Dacron yarns added to a 15-inch wide center section of each gore. To provide for some simulation of aerodynamic loading, a cable was attached to the zenith apex of the balloon. Load cells were attached to both this cable and at the nadir of the balloon. In addition to the normal temperature, pressure and humidity measuring devices, strain gages were attached at 5 stations along the center line of two gores. The test simulated an inflation and launch of a tandem balloon system. After full inflation, the start of gas transfer was simulated by increasing the internal pressure in the balloon. This is the most critical time for the launch balloon. At maximum conditions the balloon had 8,500 lbs of gas lift and a pressure at the base of 0.58 inches of water. This condition was maintained in excess of one-half hour, a considerably longer time than would be experienced in flight. A photograph of the fully-inflated balloon is shown in Fig. 4 . Higher altitudes were simulated by mixing air with the helium and bleeding off part of the lift, at the same time maintaining the anticipated internal pressure. The maximum circumferential strain measured was 2.25 percent, 10 feet from the top end fitting. The greatest meridional strain measured was 1.66 percent--also 10 feet from the top end fitting. (Both strains were measured within the 15-inch wide reinforced band in the middle of the gore.) The test showed that the balloon performed as designed. It was recommended that it be used as the launch balloon for the Spectro-Stratoscope balloon flight. The only problem encountered was a tendency to snag the reinforcing threads during handling. In a few cases, snagging the thread tore a small hole in the Mylar. This indicates a need for handling the balloon during layout and inflation inside a protective sleeve.

6. Film Strain Gages

The strain gages for measuring film strain used on test flights to date have been found to be deficient in several areas. They have been found to be excessively sensitive to supply voltage, length of wire from strain sensor to telemetry package, and temperature. A procurement was initiated to develop and acquire strain gages which would be less sensitive in these areas. Whereas the previous gages relied on a light source and a photoelectric

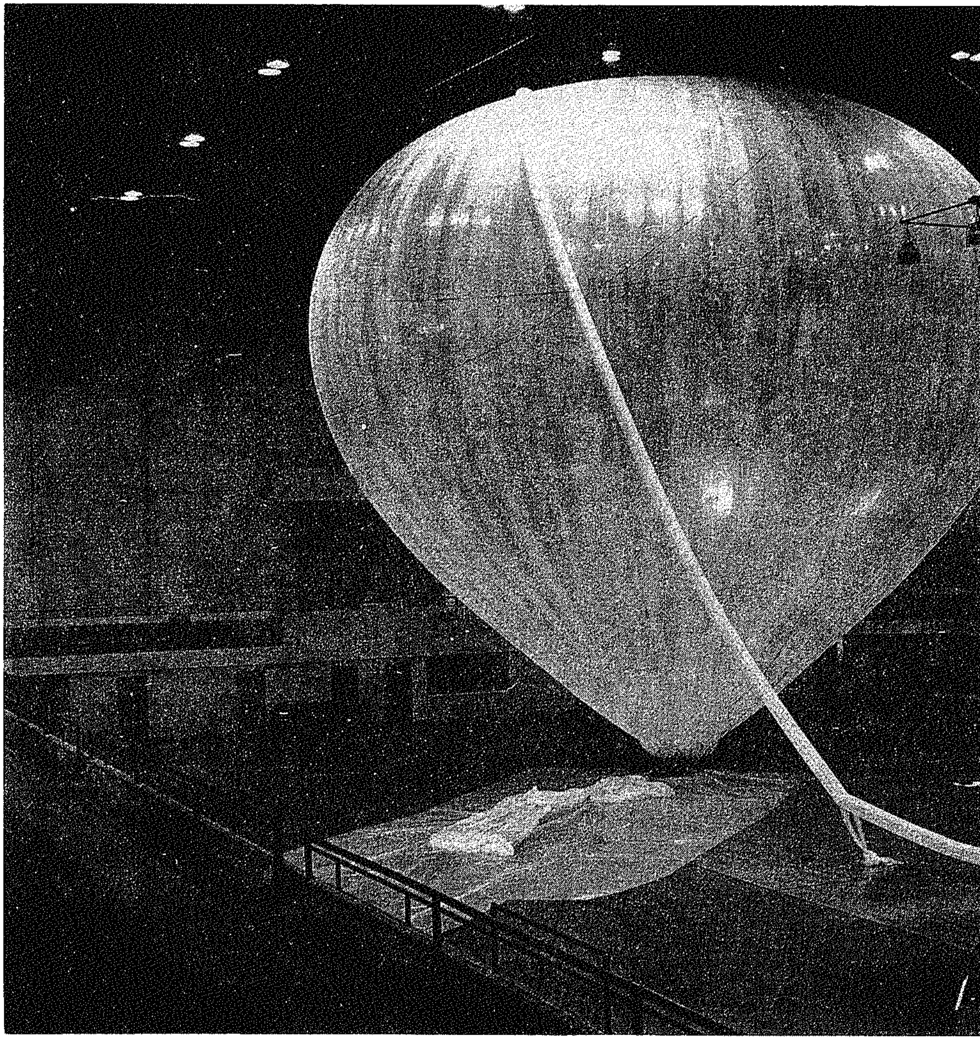
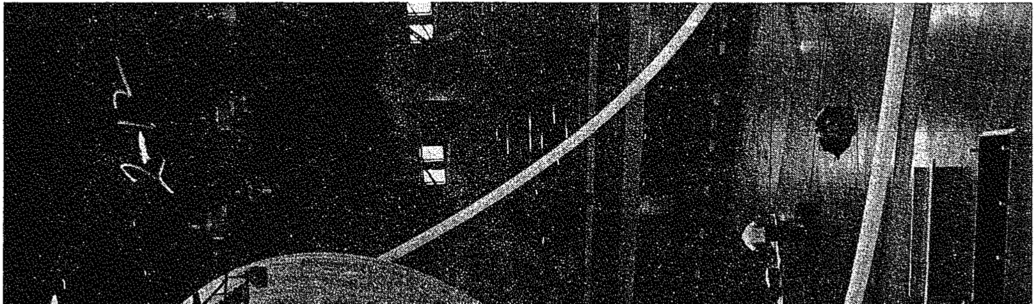


Figure 4. Contoured tow balloon undergoing flight simulation test.



cell, the new gages utilize a variable reluctance. A photograph of the strain sensor and its accompanying oscillator is shown in Fig. 5 . The sensor is supplied with 10 volts DC; in turn, it puts out a constant voltage varying in frequency between 100 kc and 150 kc. The frequency is changed by a variable reluctance slider in a coil. By varying the length of the slider, various gage lengths can be accommodated with the same strain sensor. The signal from the strain sensor is transmitted to a modulator located at the top of the balloon. A photograph of the modulator is also shown in Fig. 5 . The modulator is supplied with 28 volts DC. It provides the 10 volts for the strain sensor and converts the variable frequency to a zero to five volt DC output for the telemetry system. The 10 volt supply is sufficient for approximately 100 strain sensors. To handle more than one sensor, a commutator must be inserted in the circuit between the sensor and the modulator. Laboratory tests show the system to be usable between $+50^{\circ}C$ and $-75^{\circ}C$. The greatest sensitivity to temperature is in the 10 volt supply which varies by approximately 0.75 volts through the $+50^{\circ}C$ to $-75^{\circ}C$ temperature range. When measured to an accuracy of 0.01 volts, the 10 volt supply is constant for an input of 28 ± 4 volts. The biggest deficiency at the present time is the linearity of the output. The fact that the output is non-linear does not affect the accuracy, but it makes the data reduction less convenient. The linearity of the output can be improved by more precise cutting of the variable reluctance slider. These strain gage units will prove to be rugged and versatile.

7. Thermal Radiation Effects

It is recognized that a balloon reacts to a change in the thermal radiation environment with a very long time constant. As a result when altitude changes are sensed, corrective action is very wasteful of either ballast or gas. Since the greatest influence on the balloon motion is the thermal environment, a sensor is needed which will enable us to predict subsequent balloon motions. A study contract was undertaken with A. D. Little, Inc. of Cambridge, Massachusetts. The result of their study is reported in "Study of Balloon-Borne Instrumentation to Detect Thermal Radiation Transients which Influence Balloon Stability". They found through computer studies that a 10 percent change in the radiation field can result in altitude changes of 500 to 1,500 ft in a one-hour period. Their report contains a discussion of the disturbances which alter the vertical stability of balloons, a definition of the characteristics of the instrumentation required as determined by a computer perturbation analysis, and a brief review of available instrumentation. They conclude that relatively simple and inexpensive instrumentation could be developed. An example of the type of instrument they feel would be acceptable is a "non-grey" spherical radiometer whose absorbing surface is identical to the balloon fabric. It is anticipated that NCAR will eventually develop such a radiometer.

8. Special Balloon Flights

During the year five special balloon flights were made in connection with operational requirements, but with research and development connotations.

A. Two 15 million cubic foot balloons were built for a scientist whose experiment required a higher altitude than achievable by proven 10.6 million cubic foot balloons. One of the balloons was manufactured by Winzen Research, Inc. using their standard design techniques extrapolated to a 15 million cubic foot size, and this balloon flew extremely well with a 40-hour flight duration. The second 15 million cubic foot balloon was manufactured by Raven Industries, Inc. with their recently developed "cone top" configuration which had had one successful flight in a 9 million cubic foot size. A previously undetected inherent defect in the detail design caused failure of this balloon. However, the cause was determined and should be remediable with a small design change.

B. A 9 million cubic foot balloon fabricated with a polyethylene cap was contributed by Raven Industries, Inc. for flight test by NCAR. The balloon was used to carry several balloon-oriented NCAR experiments and met design performance specifications.

C. A failure of a standard 5 million cubic foot Raven balloon and some other considerations led NCAR to question the reliability of this type balloon. Therefore, two of them were flown at NCAR expense, carrying a scientist's experiment, to check the reliability of the balloon design. Both balloons performed according to specification and it was concluded that the design is adequately reliable for scientific uses.

9. Solar Balloon Study

An analytical study was made of possible application of large solar heated hot air balloons for stratospheric flights. It was determined that a 10 million cubic foot conventional plastic balloon could carry a 100-lb load as high as 120,000 ft in the daytime, however, no practicable method was discovered for preventing excessive descent rates at night. Since helium assists would be required to raise the balloon initially to float altitude, there appears to be no practicable application for the concept.

Results:

1. Finite Element Analysis

Although this method of analysis was found to be more complex than previously assumed, excellent progress has been made in comprehending the intricacies of the problem and in preparing to

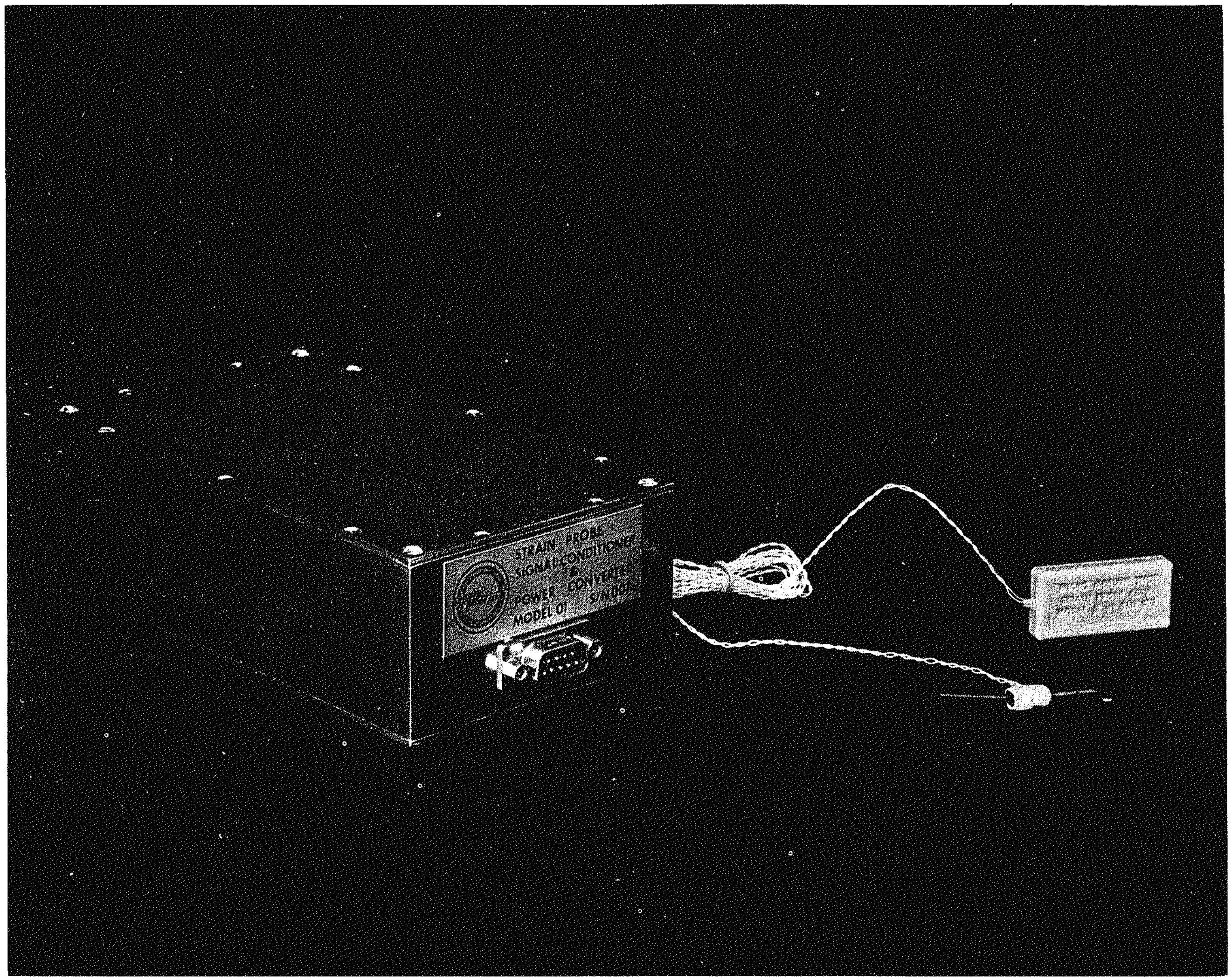


Figure 5. Photo of the strain sensor, its oscillator (small white tablet just above the sensor) and the modulator. The sensor is mounted on the balloon skin, the oscillator on a nearby load tape, and the modulator on the top end fitting.

apply the technique to specific balloon problems.

2. Polyethylene Superpressure Balloons

Preliminary study has indicated feasibility for the concept, and a decision has been reached to proceed with experimental studies.

3. Aerodynamic Pressure Distribution

A promising method for handling aerodynamic pressure distribution calculations for computer studies of balloon structures has been developed.

4. Cone Top Retrofit Project

Work is proceeding towards testing the effectiveness of a conical top for alleviating balloon failures attributed to "stress band" problems.

5. Contoured Tow Balloon

Design criteria and techniques for a contoured tow balloon have been proven in full scale simulated flight tests. Actual flight test is still required.

6. Film Strain Gages

A very promising film strain gage based on variable magnetic reluctance has been developed for use on full scale balloon flight tests.

7. Thermal Radiation Effects

This study has clarified the role of radiation in altitude control of a balloon. It should be an important contribution to the understanding and control of balloon vertical motion.

8. Special Balloon Flights

A 15 million cubic foot Winzen balloon, a 9 million Raven capped balloon, and two 5 million cubic foot Raven balloons were flown successfully to establish a degree of confidence in these balloon designs. A 15 million cubic foot Raven "cone top" balloon failed due to an apparent design defect. The defect appears to be remediable.

9. Solar Balloon Study

A solar heated stratospheric balloon although theoretically possible was determined to not have application for practical scientific experiments at this time.

Future Plans:

1. Finite Element Analysis

Following the apparent success with flat membranes, we shall return to the study of the balloon. Such items as the number of elements to use, the effects of non-linear material properties, the adequacy of studying only a portion of a rotationally-symmetric balloon, and the methods of presenting the results will be studied. An immediate need is to incorporate into our model the fact that not only does the material have non-linear properties in tension, but that it can support no compression whatsoever. That is, the model will have to admit buckling in certain elements.

2. Polyethylene Superpressure Balloons

A subcontract for model studies and full scale prototype fabrication will be initiated in the near future.

3. Aerodynamic Pressure Distribution

The method which has been developed for determining pressure distribution over a balloon will be incorporated into future structural analytical procedures. No further work on pressure distribution per se is required.

4. Cone Top Retrofit Project

The 2.94 MCF balloon with the Vista-Cone added will be test flown at Palestine. Results of this test will determine future action.

5. Contoured Tow Balloon

Fly the scrim contoured tow balloon as soon as possible. This is a tested balloon suitable for carrying a scientific payload, but its performance will be studied and compared with cylinder top balloon performance.

6. Film Strain Gages

These strain gages will be incorporated into our balloon experimental program.

7. Thermal Radiation Effects

After a suitable radiometer has been developed, it will be flown on a multitude of flights on which ambient air temperature and pressure are also measured. The output of the radiometer will then be correlated with these two measurements. It is anticipated that this will enable us to predict ballasting and valving requirements more accurately than the present method of watching for altitude changes.

8. Special Balloon Flights

Such flights will be carried out as necessary to meet operational requirements.

9. Solar Balloon Design

No further investigation of this concept is planned, however, the data and analysis techniques may be useful for other investigations.

NCAR SCIENTIFIC BALLOON FACILITY
PROGRAM SUMMARY
1968

Title: BALLOON MATERIALS DEVELOPMENT

Objectives:

1. To monitor developments in the materials field which may be of significance to balloon structures.

2. To acquire basic information on the optimum characteristics of materials to be used in balloon walls, wall reinforcements and payload suspensions.

3. To develop superior test methods for use in materials evaluation and in production quality control.

4. To develop materials specifically designed for optimizing balloon structure.

Program Conduct:

The Materials Program this year has continued to be limited to matters of immediate need and to those matters sufficiently basic to be of clearly long range interest. This limitation has been set in order to permit emphasis on determination of balloon structural responses to flight conditions. This determination of balloon structural requirements will permit at a future date a more precise definition of needed materials properties, at which time R & D emphasis can be confidently placed on materials development.

The NCAR staff has performed the R & D planning and management function while most of the technical work has been accomplished through subcontract and consulting arrangements with industry. Primary work consisted of three testing programs.

The first of these programs tested two standard balloon films for biaxial stresses, both balanced and unbalanced, at 23°C and at -80°C. These tests have developed basic biaxial strength characteristics of these films and work on this testing program is still continuing.

The second testing study was made on the effects of thermal and strain cycling on biaxially stressed balloon films. Such a study is important because balloon films during flight do go through temperature changes with different combinations of stress, and investigation in this area has been limited. The tests showed that although measurable effects do occur, in general, the thermal-cycling did not significantly change the performance qualities of polyethylene balloon film. (The test specimens did not include heat seals.) In 1967 a series of tests was made to learn the effects of repeated uniaxial loads on balloon films. A follow-up study investigating repeated biaxial stresses has been pursued during 1968, but is not yet complete.

Thirdly, a review and refinement of previous tests on impact toughness of balloon films was conducted during 1968. Significant differences were found among different types of polymers and it was found that cold and brittle films absorb less impact energy than warm and ductile films. It was also found that data from impact toughness tests are greatly affected by surface friction effects so that great care must be exercised to obtain valid and comparable data with this type of test.

Various new films were studied on the basis of manufacturer's specifications to determine the possibility of balloon applications. Some proprietary films hold possible promise.

Attempts to use glass filaments as load tape reinforcements a number of years ago resulted in complete failure. However, glass filaments have very attractive strength properties; and glass filament materials have advanced in recent years to the point where they should now be reconsidered as reinforcement in balloon load tapes.

The reinforcing and repair adhesive tape developed in 1966 by NCAR subcontract has now become the standard tape for balloon use through the industry. Performance has been excellent, but it is quite expensive and some effort has been expended during 1968 in searching for a less expensive alternate tape. Some encouraging progress has been made through joint efforts of NCAR, Hauser Research and Engineering Co. and the 3M Co. It has been found that Dow Corning adhesive #282 prepared with an ether solvent can be applied directly to a polyethylene strip to give suitable adhesive properties. The remaining problem area is a suitable release agent for the backing paper.

Results:

Basic data for polyethylene films have been developed in the area of biaxial stress and strain at various temperatures and as affected by thermalcycling under strain. Data were also developed for film impact energy absorption. Testing techniques were also evaluated and refined.

Some new materials have been found to hold possible promise for balloon applications.

Progress has been made toward finding lower cost processes for manufacturing balloon repair tape.

Future Plans:

1. Complete evaluation of the significance of biaxial and cold toughness tests.

2. Complete a survey of biaxial stress performance and repeated load and yield effects of standard balloon films and apply results toward development of more precise design strength criteria for polyethylene.

3. Evaluate prospective new balloon materials.

4. Continue efforts to reduce production costs of reinforcement adhesive tapes for manufacture of NCAR balloons.

5. When balloon structural requirements are more specifically understood, establish emphasis on development of materials to meet the requirements.

NCAR SCIENTIFIC BALLOON FACILITY
PROGRAM SUMMARY
1968

Title: BALLOONING SYSTEMS RESEARCH

Objectives: To conceive and investigate ballooning systems and determine their potential use for scientific ballooning; to quantify and predict their behavior; and to investigate and develop system components.

Program Conduct:

1. Tandem Balloon System

This project provides mathematical bases for predicting performance during inflation, erection and launch in a wind field. Three reports were prepared on this subject: "Test Report, Stonehenge Launch Test, October, 1967"; "Forces in a Cable-Restrained Balloon System"; and "Design of the Stonehenge Launch System". The first included information pertaining to the behavior of a specific tandem balloon system as well as describing the Stonehenge test, and publication is not planned. The second report describes the analytical basis and procedures for determining forces, and will be issued as a Technical Note early in 1969. The third report describes the Stonehenge launch method and is intended to be a "handbook" for crews using this method. This report is being printed for publication as NCAR-TN-40.

2. Flight Train Strain Relief

This investigation was carried out under subcontract to develop a means to relieve the strain from the lower portion of an inflated single-cell balloon. A final report on this project was issued by the subcontractor in February with an addendum in May. Indications are that a successful strain relief device can be built for operational use; valid limits appear to have been established; but only an operational test program will be able to verify the limits. Useful data concerning friction of polyethylene surfaces was also developed.

3. Long Duration Flights

A need has been expressed by several scientific groups for flights of 30 to 100-pound experiments for periods of 90 days to one year. Accordingly, a proposal was written for development of this capability and submitted to NASA/MSC in September. The proposal included: development of the balloon vehicle and Southern Hemisphere launch and tracking sites; flights of 30 pounds at 5 mb for 90 days; flights of 100 pounds at 3 mb for 90 days; tracking and recovery of as many of the experiments as possible. As of this date no formal reply has been received concerning the proposal.

Results:

1. Tandem Balloon System

Two reports covering tests and analytical information for Stonehenge and other cable restrained launch techniques have been completed.

2. Flight Train Strain Relief

Development and fabrication of an experimental prototype device has been carried to the point of readiness for operational testing and a report has been written.

3. Long Duration Flights

Concept development for a balloon system with potential flight durations up to a year has been completed and a proposal for support was submitted to NASA.

Future Plans:

1. Tandem Balloon System

Upon receipt of 1969 funds additional components of the jettisonable launch balloon fitting will be designed, fabricated and tested.

2. Flight Train Strain Relief

The subcontractor's final report is being edited and will be issued as a Technical Note in 1969. Operational testing will be postponed until funding is available.

3. Long Duration Flights

Future work depends upon the availability of funding.

NCAR SCIENTIFIC BALLOON FACILITY
PROGRAM SUMMARY
1968

Title: ELECTRONIC SUPPORT SYSTEMS

Objectives: To design and develop electronic systems and components; to evaluate standard equipment required for the conduct of scientific balloon flights; and to give assistance to programs having special electronics support requirements.

Program Conduct: Specifications were written, proposals were evaluated and subcontracts were awarded for the development of a miniaturized, integrated circuit, PCM command decoder and an aircraft PCM command encoder. A ground station encoder is also being modified for use with the new PCM command system which will incorporate an address code to allow eight 32-channel decoders to be operated concurrently. The digital logic is similar to the original command system except that the bit periods and pulse durations have been cut in half. Negotiations are under way for the purchase of a reliable command receiver for use with the new PCM command system. This is to be a stable receiver with good interference rejection characteristics.

A subcontract has been awarded for the development of a digital timer which can be advanced or retarded by command during flight. This timer may be preset for delays up to 99.9 hours in steps of 0.1 hours. The prototype unit will have three preadjusted output closures; however, the unit is designed to accommodate several closures as required.

UHF equipment, including a parametric amplifier, down converter, receiver tuner, transmitter and antenna have been ordered for converting to the L-Band UHF telemetry band which is mandatory in 1970. The antenna is an 8-foot parabolic dish mounted on a pedestal which is remotely controllable in azimuth and elevation.

A balloon flight was made for comparison of several pressure-altitude transducers. Table 1 presents some significant data from this flight. As a result of this flight and other flights and tests, a Rosemount Model 830A unit has been selected for routine operational use. The pressure range of these sensors is limited, and three sensors will be combined to make a full-range altitude system.

Engineering and technical support has been provided for the design of two flight packages which are being used in connection with tests of two position determination systems. One balloon, flown in New Mexico, was a test flight for an Interrogation, Ranging and Locating System (IRLS) while the other, launched from Palestine, Texas, carried an OMEGA Positioning and Locating

FLIGHT 396-P, 20 MAY 1968

TIME	M/P	ROSEMT	PACE	U of M α-tron	HYPS	NRC α-tron	PHOTOB	BAROC	RADAR
09:35	4.74	3.53	3.55	3.53	3.42	3.55	4.3	4.48	
09:43	4.65	3.48	3.51	3.46	3.31	3.63	4.2	4.30	3.447
09:51	4.69	3.50	3.52	3.53	3.29	3.69	4.2	4.15	
10:02	4.58	3.43	3.46	3.44	3.25	3.76	4.0	4.10	
10:34	4.30	3.25	3.26	3.29	3.10		3.85	3.95	

Balloon Theoretical Altitude: 3.4 mb (127K ft)

Legend

M/P - Metro-Physics, Inc.
ROSEMT - Rosemount
U of M - University of Minnesota
HYPS - Hypsometer
NRC - NRC Alphatron
PHOTOB - Photobarograph
BAROC - Barocoder

Table 1. Pressure Sensor Comparison

Experiment (OPLE). Both systems use satellites in connection with balloon position determination.

Electronic support has been provided for two short-range balloon flights from the Boulder laboratory. One flight carried University of California equipment for using LORAN navigation signals for balloon position determination. The other flight carried chaff in the form of random-length dipoles attached to the balloon film for use as radar signal reflectors.

Electronic interface liaison with several scientific groups has been accomplished during the past year. These groups include Fraunhofer Institut, University of Liege, NCAR High Altitude Observatory, Massachusetts Institute of Technology and NASA Manned Spacecraft Center.

Laboratory test equipment has been supplemented with the addition of a digital printer and a digital clock for use primarily for real time data presentation from balloon flights.

Results: There have been several major accomplishments during the year. One is the development of a new command-control concept using the address technique and modified bit rate, and the move toward procurement of updated balloon-borne, aircraft and ground command equipment. Evaluation equipment for conversion to UHF telemetry has been decided upon, and equipment is being purchased. An accurate digital timer, capable of being reset by command, is being developed on outside contract and will be delivered soon. A pressure-altitude sensor has been selected, and circuit development is being done for a full-range system and for aircraft readout of balloon altitude. The instrumentation for three major and two minor balloon flights has been prepared by the R & D group during the year. Preliminary work has been done for the development of a consolidated flight package for electronic support equipment. Other interface circuits, projects, equipment development and technical assistance have been provided by the R & D group.

Future Plans: Plans are to continue efforts toward improving the electronic instrumentation capabilities of the Balloon Facility. UHF telemetry equipment will be evaluated during the latter part of FY 1969 and conversion from VHF will occur in FY 1970. Evaluation of the new PCM command equipment will continue. This will include the aircraft, balloon and ground station equipment. Efforts will continue toward development of a consolidated support instrumentation package for standard electronic support requirements. Interface circuit design for pressure-altitude sensors, both balloon-borne and aircraft readout, will be continued. An on-board digital recorder for pressure, temperature and time data will be designed. Communication relaying techniques using the balloon will be improved.

Telemetry and other balloon support instrumentation for small-scale local balloon flights is anticipated during the coming year. A low-cost flight timer is being developed for use with expendable instrumentation.

Continued liaison effort with research scientists who use balloons is expected.

NCAR SCIENTIFIC BALLOON FACILITY
PROGRAM SUMMARY
1968

Title: CRYOINFLATION SYSTEM

Objectives: To develop a low cost liquid hydrogen (LH_2) inflation system compatible with scientific ballooning requirements and practical for field programs.

Program Conduct: Supplying helium for large-scale field programs normally involves great expense and complex logistic problems. For example, a field program using one million cubic feet of lift gas would require 770 standard (10" diam by 20 ft long) high pressure cylinders.

Advances in cryogenics have provided new approaches to this logistic problem by making it possible to store and transport suitable inflation gases in the liquid state at low pressures. A comparison study showed that the most economical and practicable liquid gas to consider for field application is liquid hydrogen. One 10,000 gallon liquid hydrogen trailer can provide more than one million cubic feet of lift gas at a cost one-seventh that of gaseous helium, not including transportation expenses. The gross weight of the system is only 40,000 lbs as compared with 600,000 lbs for high pressure cylinders, which represents an order of magnitude difference in transportation costs.

The Cosmodyne Corporation, under subcontract to NCAR, is developing a cryoinflation system capable of delivering gaseous hydrogen at a continuous rate of 42,000 SCF/hr at a temperature within 25°C of ambient temperatures. Delivery capability is maintained within the ambient temperature range of -7 to 38°C. This cryoinflation system, as shown in Fig. 6, stores and vaporizes liquid hydrogen, superheats the gas, and delivers gaseous hydrogen at measured flow rates.

The flowmeter is designed to deliver a totalized mass flow with accuracies of ± 1%. The readout is calibrated in standard cubic feet at any elevation.

Results: Feasibility tests were completed during October 1968. Several minor problems were detected with the system, and it was returned to the manufacturer for further work.

Future Plans: A final acceptance test is scheduled for February 1969. If the system meets NCAR specifications, it will be accepted for field use.

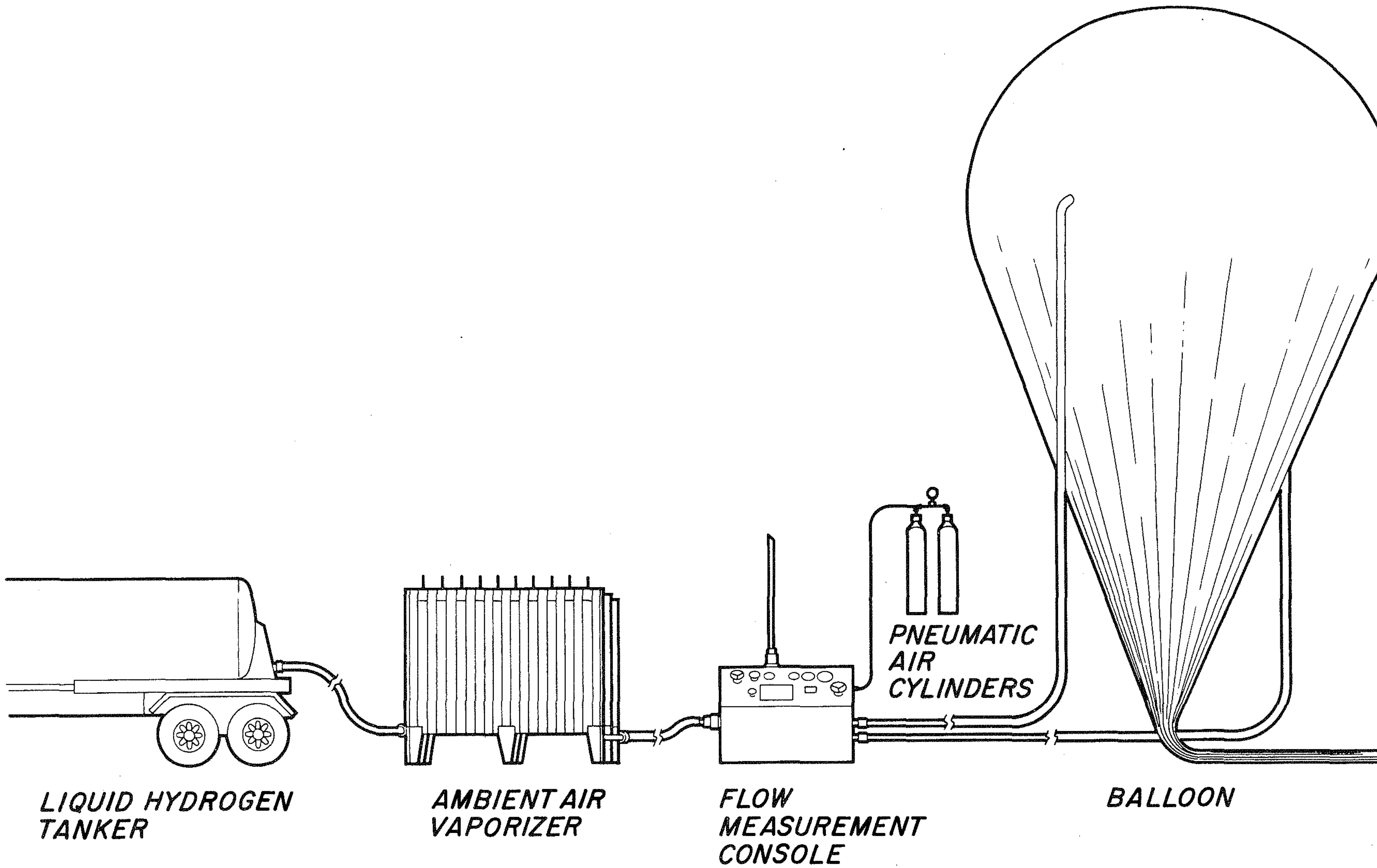


Figure 6. Schematic diagram of the cryoinflation system being developed for NCAR by The Cosmodyne Corporation.

NCAR SCIENTIFIC BALLOON FACILITY
PROGRAM SUMMARY
1968

Title: STATISTICAL STUDY OF BALLOON PERFORMANCE

Objectives:

1. To determine, through careful statistical study of data from past flights, whether available data provide clues to balloon performance.

2. To devise, if practical, a data reporting system which will assure the reporting and beneficial use of pertinent performance data.

Program Conduct: During this year the computer file of balloon performance data has been used for a rigorous statistical analysis in a search for significant correlations between various flight factors and balloon failure. Data recorded from 634 flights were studied.

A set of 46 numerical factors (independent variables) were examined by means of a stepwise regression program which resulted in a regression equation of those variables on failure. The program was designed to retain only that combination of variables which contributed significantly to the variability of the independent variable, failure. Significance was tested by means of the Fischer F test at the 5% significance level. Regression equations were determined for several balloon categories; these are shown as column headings in Table 2 .

Although the independent variables were chosen because of their physical association with the balloon during manufacture, shipment or flight and each has an opportunity to affect the success of a balloon in flight, the statistical correlation with balloon failure does not assure us that a causal relationship exists. It does suggest that we should suspect and examine more carefully possible causal relationships associated with the variables which are statistically most significant. For example, surface area correlates positively with balloon failure, suggesting that a balloon with a large surface area presents greater opportunity for imperfections which may lead to failure than one with a small area.

Although the statistical treatment establishes that the correlations between failure and the variables retained were significant, the correlations are all sufficiently low that all taken together in the regression equation for all balloons (Column 1, Table 2) explain less than 16% of the variance in the dependent variable. The variance explained is the square of the regression correlation coefficient, i.e., R^2.

Table 2. Correlation Coefficients of those Balloon Flight Parameters which Correlated Most Significantly with Balloon Failure. R is the Regression Correlation Coefficient of all those Parameters Shown in the Column on Failure.

FAILURE TYPE	BURSTS AND LEAKERS			BURSTS	LEAKERS	BURSTS	LEAKERS	BURSTS	LEAKERS
BALLOON TYPE	ALL	TAPELESS	TAPED	ALL	ALL	TAPELESS	TAPELESS	TAPED	TAPED
Surface Area	33-		23-	51-		10+		44-	
Volume		19-				17-			
Capped	17+		12+	24+				10+	
Latitude	13-	3+	12-		34-				17-
Number Gores	11+	8+	6+	15+				12+	
RATE OF ASCENT Avg. 30K - 60K	10-		7-			3+	30-		
Avg. to Max. Altitude		8-		18-		14-	13+	18-	
Load on Top of Balloon		10-	4+				29-		4+
Minimum Temperature		6-		7+		11-			
Gore Width		5+							
Duct Area								5+	12-
Duct Distance above Bottom of Balloon							23-		
Number of Ducts					18-		22+		
Theoretical Float Alt.					6-				3-
Tape Strength					5+				5+
Date of Launch						4-			
$(\text{Date of Launch})^2$						4+		14+	
Load Below							4-		
Sigma							13+		
Regression Correlation Coefficient R	.39	.46	.411	.44	.33	.48	.56	.49	.36

As has been commonly supposed, increased balloon size correlated with increased balloon burst rates. Of the balloon size parameters, surface area was the most significant. Reinforcement of the top of the balloon with a cap correlates with a decrease in balloon bursts.

Balloon failure due to leaks did not correlate most significantly with the same factors as did balloon bursts, and the most significant was latitude of flight. Fewer leaks occurred at lower latitude.

Non-quantitative factors such as balloon manufacturer, barrier material, etc., were also analyzed using residuals from the regression analyses. Material was the only factor which showed a statistically significant relationship, StratoFilm and X-124 being superior to previous polyethylenes.

Results: A statistical analysis of 634 flights was accomplished in a search for possible correlations between various parameters and balloon failures. The data are summarized in Table 2. The correlations are all low, and no outstanding cause of failure can be isolated. The results demonstrate that the source of failure in balloons during flight may be ascribed to any one of many factors, some known, some probably not even suspected. We must therefore keep our guard up and continue to be extremely cautious in all things pertaining to the integrity of the balloons we fly.

Future Plans: Continue recording balloon flight data in a computer file. Institute, if practical, a semi-automatic method of sequential sampling of NCAR balloon system performance to determine statistical performance trends as they occur. This will serve to detect significant trends as early as possible.

NCAR SCIENTIFIC BALLOON FACILITY
PROGRAM SUMMARY
1968

Title: SPECTRO-STRATOSCOPE

Objective: The objective was to provide support for the preparations and flight of a 4,000-lb telescope from Palestine for Professor K. O. Kiepenheuer of Fraunhofer Institut in Freiburg, Germany. The support consisted of providing a project engineer for the ballooning portion, the consulting services of an electronics technician for telemetry, space at Palestine for four months preparation of the instrument, launch of the instrument with less than 1 g acceleration, flight and recovery of the instrument.

Program Conduct: In November 1966 a flight was made using a version of this instrument to collect engineering data. That instrument did not contain the main bearing to support the observing section of the scope. Data gathered on that flight included temperature at 83 locations throughout the flight and information on their ability to control the telescope during flight.

After their arrival for the last flight on 1 August 1968, the instrument was made ready on 9 November. Weather conditions delayed launch until 19 November.

Results: As indicated above the first flight resulted in excellent engineering data. As a consequence some modifications were made to decrease thermal problems. The main bearing and the mechanisms to protect it were not tested, however; and immediately after launch (90 sec.), the limiting mechanism on the telescope jammed and remained in this condition until the flight was terminated after 3 hours of the 8 hours desired at float.

The jamming of the mechanism was attributed to a number of factors:

a) Although no accelerometers were on the instrument, the launch, relative to other similar launches, appeared to be somewhat rougher and accelerations possibly exceeded 1 g.

b) A feature of the portion of the scope which contained the seeing axis was that this portion was freely floating through a limited range at launch. Immediately after launch, the seeing axis traveled to the stops.

c) An automatic feature of the limiting device was activated immediately after launch and resulted in the mechanism being jammed throughout the flight.

Some temperature data on the telescope were obtained; no other engineering or scientific data were obtained.

Future Plans: An early estimate made by personnel of Fraunhofer Institut was that the telescope could not again be made ready for flight prior to mid-1970. The following are changes which will be made for the next operations:

a) The telescope will be made rigid throughout during launch by a positive lock on the seeing axis to other portions of the instrument.

b) A support will be added to the main arm of Tiny Tim to reduce motion in the arm at launch and possibly reduce some of the payload accelerations. However, it is not likely that an appreciable improvement in the launch can be realized.

NCAR SCIENTIFIC BALLOON FACILITY
PROGRAM SUMMARY
1968

Title: COSMIC RAY EMULSION PLASTIC EXPERIMENT (CREPE)

Objectives: To provide technical consultation and complete flight services to NASA (Dr. Donald E. Hagge) and the University of Bristol (Professor Peter H. Fowler) on ballooning portions of the CREPE experiment. Flight requirements were to expose nuclear emulsions and plastics in search of cosmic rays at a float altitude of approximately 130,000 feet for forty hours on two balloon flights.

Program Conduct: A contract was awarded to NCAR by NASA to conduct the balloon program. Two balloons, each built by a different manufacturer, were chosen as primary balloons for the program. One was a 15.0×10^6 ft^3 balloon built by Winzen Research, Inc.; the other was a 15.4×10^6 ft^3 balloon built by Raven Industries, Inc. Two 10.6×10^6 ft^3 balloons were provided for backup. NCAR also designed and built gondolas with special slide mechanisms for the emulsion.

Results: Flight 432-P was launched successfully on the 15.0×10^6 ft^3 balloon on 22 September 1968. It floated at approximately 135,000 feet until terminated after thirty-nine (39) hours and forty-two (42) minutes. This balloon is the first 15.0×10^6 ft^3 balloon to be flown, and the largest, to that date, flown by NCAR.

Flight 433-P was launched on 25 September 1968 using the 15.4×10^6 ft^3 Raven Vista-Cone balloon. The balloon ascended slowly to 10,000 feet, and the flight was terminated because of balloon failure. The gondola was returned to the balloon base in good condition.

Flight 434-P was launched on 26 September 1968 using a 10.6×10^6 ft^3 backup balloon. The balloon floated at an altitude of approximately 126,500 feet for a period of forty-two (42) hours and six (6) minutes. This flight established a duration record for NCAR.

Future Plans: All objectives of this program have been achieved.

NCAR SCIENTIFIC BALLOON FACILITY
PROGRAM SUMMARY
1968

Title: JOINT NASA-NCAR BALLOON SYSTEM LOCATION STUDY

Objectives: To test various methods of accurately locating a balloon system in flight. The primary systems to be checked were the NASA IRLS (Interrogation Recording Location Sub-system) and the OPLE (OMEGA Position Locating Experiment) systems. Both make use of a man-made earth satellite.

Program Conduct: Two flights had been flown in 1967 to test non-satellite location systems, e.g., a down looking camera, radar, GMD, visual fix from aircraft, instrument fix from aircraft, etc. The balloon burst during ascent on the first of these. The second was quite successful and showed that within effective range, well prepared radar and GMD were sufficiently accurate to serve as checks on either IRLS or OPLE. The aircraft fixes were not sufficiently accurate. The best fixes were obtained by photographing a long plumb bob against the earth and then comparing photographs with an accurate topographical chart.

To get an ample number of IRLS fixes for a valid evaluation, several days of flight duration will be needed. We cannot count on being sufficiently close to well calibrated radar sets throughout a long duration flight to use radar as a primary source of position data. Also a flight of long duration will be difficult unless the launch site can be selected on short notice to take advantage of the best available trajectory conditions. Consequently we planned to carry the flight package, crew, and essential launch equipment in an airplane, a DC-3, to a launch site which will be selected as near the scheduled launch date as possible. We felt that we needed at least one practice flight under this plan before being faced with a satellite data flight.

Raven Industries, Inc. was chosen to provide a flight crew for the flights, including the practice flight. The flight package was prepared at the Raven offices at Sioux Falls, South Dakota, and on Friday, 5 April 1968, we decided that Albuquerque, New Mexico, promised the best trajectory and surface conditions for launch early the following week. Arrangements were made for helium to be available on 9 April, and the DC-3 was flown to Albuquerque with the equipment and crew on Sunday, 7 April.

Surface winds were too strong for launch on 9 April, but trajectory winds appeared to be nearly ideal. We expected to reach eastern Kentucky or Tennessee 56 hours after launch. Surface conditions were improving, and we rescheduled the launch for 10 April at 0600 MST.

Preparations were completed, and the launch on Wednesday occurred only 6 minutes after the scheduled time. Everything appeared to be going well. The balloon took an initial trajectory toward the west, but the wind data for that day led us to expect that it would later move north and then back east. Winds were very light at float altitude.

Tracking was accomplished by optical theodolite and aircraft. About mid-afternoon the balloon was clearly descending, and the ballast command did not appear to be getting through. The flight was therefore terminated, and the flight package was recovered in excellent shape that evening.

Although flight duration was disappointing, we had accomplished every aspect of our mission except prolonged tracking. We felt we could carry out a flight under the conditions demanded when the satellite was in orbit. Therefore, although we could have reflown the flight within two or three days we decided against doing do.

We learned, on developing the film, that the camera had malfunctioned during the flight. It had just been serviced at the factory and tested extensively by us before the flight, but on return to the factory we learned that its drive motor had a dead commutator bar. On subsequent flights a backup camera will be flown.

Preparations were made to fly the first scientific data flight within about 10 days after the NIMBUS B satellite was put into orbit. Unfortunately the satellite did not get into orbit, and no IRLS flight has yet been flown.

The first flight with OPLE equipment was scheduled for August; and on August 26, the target date, the flight was launched from Palestine, Texas. Launch occurred at 0711.5 CDT, 11.5 minutes after schedule. The flight was tracked by radar, optical theodolite, GMD and camera as well as by the NASA OPLE system.

Results: The results are shown in Fig. 7 . Although the OPLE positions were systematically south and east of positions determined by the other methods, the vector differences were surprisingly small. The flight was considered to have been completely successful.

In spite of its success, there were some problems. Neither camera photographed the complete trajectory. In one case the camera was at fault; in the other the camera was not turned off after one satellite interrogation and ran out of film. These problems have been analyzed, and changes are being made in preparation for the next flight.

Future Plans: Another OPLE flight is planned for January 1969. It will be flown at a higher level where wind speeds will be greater.

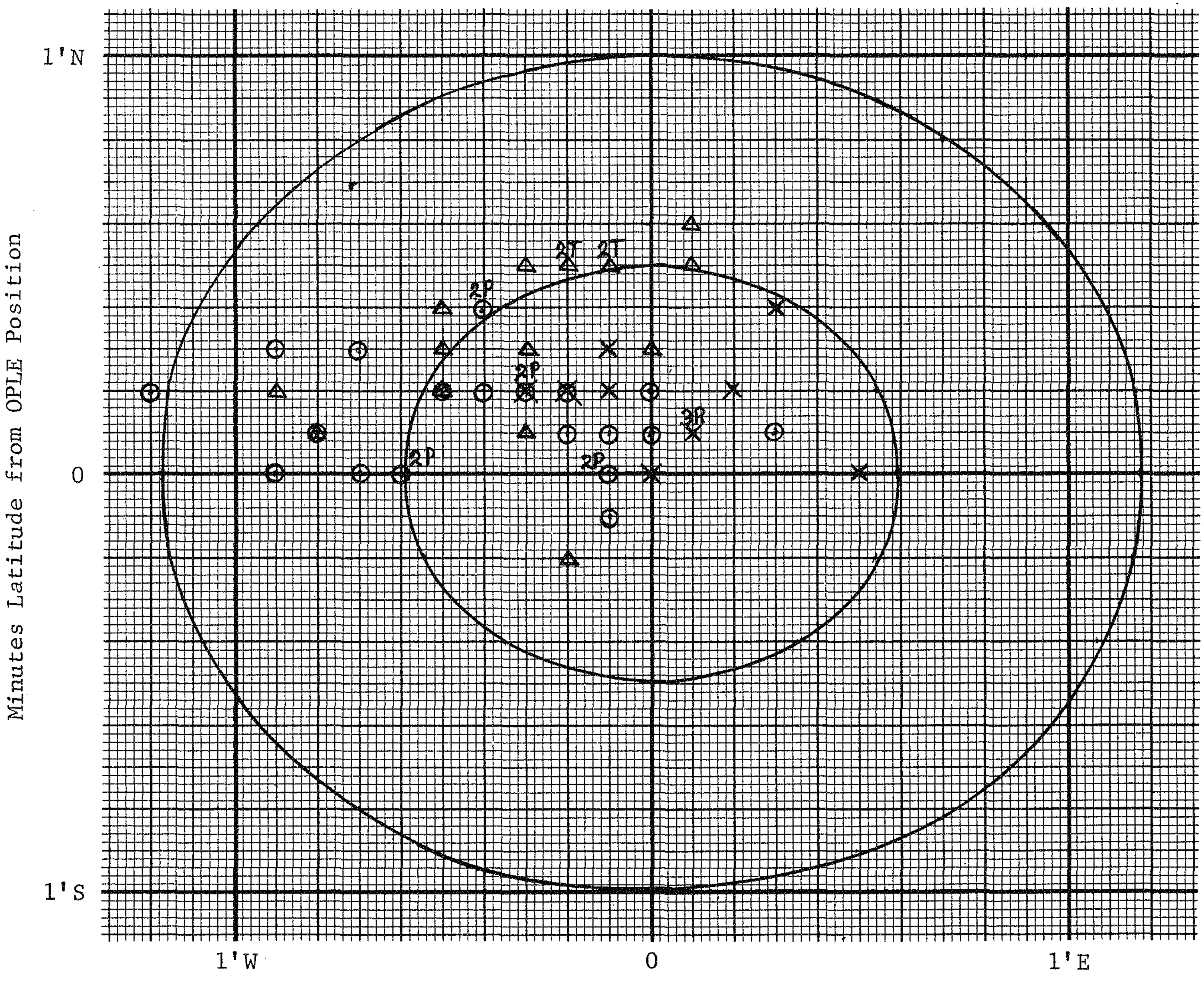


Fig. 7. Distribution of locations determined by photography (⊙), radar (✕), and optical theodolite (△). When more than one value falls on the same position, that position is marked with the number of such points and a letter to show the type of fix. The ellipses are ½ and 1 nautical mile from the origin. From NCAR OPLE flight of 26 August 1968.

It will move eastward whereas the August flight moved westward. These present somewhat different problems to the OPLE system in its relation to the ATS III satellite which is used as a data relay.

The NIMBUS B-2 satellite is scheduled to be orbited in March, 1969. Two balloon flights will flown in conjunction with it. One will be flown as soon as possible after the satellite is in orbit. The other will be flown during the spring wind reversal. We shall strive to accomplish a flight of several days duration with the latter.

Additional flights will be flown only if necessary to accomplish the IRLS or OPLE missions.

NCAR SCIENTIFIC BALLOON FACILITY
PROGRAM SUMMARY
1968

Title: HIGH ALTITUDE PARTICLE PHYSICS EXPERIMENT

Objectives: To provide technical consultation to the Space Sciences Laboratory of the University of California at Berkeley on ballooning portions of the Particle Physics Experiment.

Program Conduct: Consultation on flight operations including launch methods and procedures, meteorology, balloon design and subcontractor liaison will be provided to both SSL and the operations subcontractor on a mutually agreeable basis. In addition, flights will be conducted from NCAR sites on request.

Results: A formal report of the review of '67 operations was published in February. One result of this review was that a Descent Systems Test was planned to qualify the parachute system for subsequent scientific flights. NCAR was requested to conduct the test flight from Palestine. Preparations began in February and in March a formal proposal was made by NCAR to NASA/MSC, the funding agency, for support of the test. The contract was approved in April.

Balloons were purchased from both the G. T. Schjeldahl Company and Raven Industries, one as back-up for the other. NCAR funding was provided for a new set of Stonehenge anchor circles, a new large-capacity inflation spool and a balloon to be used in testing the inflation spool.

Preliminary helicopter drop tests by NASA at White Sands were delayed, the first test not taking place until the end of July. By this time the scientific portion of HAPPE had been re-directed to concentrate work on a Small Super Conducting Magnet Program. Additional preparation by NASA for the Descent Systems Test was delayed and in November NCAR was directed to ship the test balloons to the Air Force Cambridge Research Labs facility at Holloman Air Force Base where they will be used for testing directed toward the CRISP program.

In August a trajectory study was made for the SSCM program and in October a tracer balloon was flown from Boulder as a test of a LORAN navigational system for SSCM.

Future Plans: The HAPPE balloon program has been de-activated for the time being and contractual responsibility for the Descent Systems Test is being removed. Future work will deal only with the Small Super Conducting Magnet (SSCM) program and the exact details of NCAR participation are not yet known.

NCAR SCIENTIFIC BALLOON FACILITY
PROGRAM SUMMARY
1968

Title: COSMIC RAY IONIZATION SPECTROGRAPH PROGRAM

Objectives: To provide technical consultation and flight services to the Cosmic Ray Physics Section of the Manned Spacecraft Center of NASA.

Program Conduct: A Project Support Planning Document was submitted to NASA in January. The subjects discussed in the document included launch method, balloon system, land recovery system, launch site and staging facilities, balloon command/control system, scheduling, contractual arrangements, and costs. A supplement was submitted in February with an extensive trajectory study.

The Planning Document was presented to the Advisory Panel at the February meeting and a presentation was made by Dr. Richard Kurz of MSC describing the program. The Panel approved of NCAR participation in the program, provided that there was no serious conflict with other projects at the Scientific Balloon Flight Station.

Results: In April Dr. Kurz notified the Facility that the Air Force Cambridge Research Labs had been chosen as the principal agency for CRISP balloon support. A contract was subsequently consummated with the Air Force for this purpose.

Future Plans: There will be no further direct action on this program. Consultation will be provided to NASA on a specific request basis.

NCAR SCIENTIFIC BALLOON FACILITY
PROGRAM SUMMARY
1968

Title: INTEREST IN SOUTHERN HEMISPHERE ZERO PRESSURE BALLOON PROGRAM

Objective: To determine the extent of scientific interest in a ballooning expedition to the Southern Hemisphere.

Program Conduct: A number of scientists have expressed a desire for equatorial or Southern Hemisphere balloon flights. In response to this interest, we have prepared a questionnaire designed to provide information about the scientific objectives of these flights and their support requirements.

Results: Questionnaires have been received from a large group of scientists (Table 3). It appears that there are two different and distinct interests. First, those who want to make astronomical observations in the Southern Hemisphere. To them, the latitude is not particularly critical. The other category includes those who are interested in high energy particle research. They are particularly interested in flights at low geomagnetic latitude in order to exclude lower energy particles.

Future Plans: The next step will probably be a meeting of interested people, including agency representatives, at which the scientific objectives of an expedition can be discussed. If an expedition is proposed, a representative group of scientists should take the lead in preparing a joint proposal to an appropriate federal agency.

NCAR will provide whatever assistance is desired in preparing the proposal and in providing consultation concerning balloon support and management.

TABLE 3

Information from Experimentalists Requesting Participation in Southern Hemisphere Program

SCIENTIST AND AFFILIATION	EXPERIMENT	GEO-MAGNETIC LATITUDE	GEO-GRAPHIC LATITUDE	ALTITUDE	DURATION	TIME OF YEAR	REMARKS
Aitken, Dr. D.W. Dept. of Physics Standford U Standford, California	High resolution spectroscopy of the known celestial x-ray sources	0°	N/A	3 mb	8 hrs	Nov. - Feb.	There are at least ten celestial x-ray sources with rather well defined positions which are sufficiently intense for observations with my system. Only 3 of these lie in the Northern Celestial Hemisphere. All remaining bright sources lie at low galactic latitudes.
Anderson, Dr. K. & Hurley, K. Space Science Lab., U of California, Berkeley	To use a highly colimated scintillation counter. To look for x-rays from Quasi-Stellar objects. Examine previously discovered x-ray sources and/or try to detect the presence of new x-ray sources	$\sim 0^{\circ}$	S of equator	3 mb	8 hrs	N/A	A Southern Hemisphere site allows us to examine portions of the sky which cannot be seen at all in the U.S., and portions which can be observed in the U.S. only through many grams of atmosphere.
Bingham, Dr. R.G. Boeing Scientific Research Labs, Seattle, Wash.	X-ray astronomical telescope; search for discrete sources in Southern sky	N/A	-20°S	3 mb	16 hrs	Oct. - March	--

(More)

SCIENTIST AND AFFILIATION	EXPERIMENT	GEO-MAGNETIC LATITUDE	GEO-GRAPHIC LATITUDE	ALTITUDE	DURATION	TIME OF YEAR	REMARKS
Bowyer, Dr. C.S. Dept. of Astronomy, U of California, Berkeley	The Southern Hemisphere sky will be searched of high energy x-rays (15-100 Kev) with a large area x-ray detector. In addition, individual objects of special interest (such as unusual opticals or radio objects, or known low energy x-ray objects). Spectral information will be obtained for any source observed	0 to 40°S	0 to 90°S	3 mb	20 hrs	N/A	Segments of the Southern Hemisphere sky including regions and objects of high astrophysical interest cannot be observed from balloons launched from Northern Hemisphere sites.
Chubb, Dr. T.A. U.S. Naval Research Lab., Washington, D.C.	Mapping of Southern skies, especially in Gallactic Center and Vela Puppis region for high energy x-ray sources, using highly colimated xenon-filter proportional counters	N/A	20-40°	3 mb	As long as possible	N/A	Too much slant air mass for study of these sources from Northern Hemisphere.
Clark, Dr. G.W. & Lewin, Dr. W.H.G. MIT Center for Space Research Cambridge, Mass.	Possibilities: detailed studies of the unusual behavior of CenXR-2; study of large & small Magellanic Clouds, variability, spectrum & position determination of the high energy x-ray sources near the center of the Southern sky	Closer to 0° the better	$\leq + 10^{\circ}$	3 mb	10 hrs	N/A	Continuation of studies of x-ray sources in the Southern sky.

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SCIENTIST AND AFFILIATION	EXPERIMENT	GEO-MAGNETIC LATITUDE	GEO-GRAPHIC LATITUDE	ALTITUDE	DURATION	TIME OF YEAR	REMARKS
Friedlander, Dr. M.W. Dept. of Physics Washington U St. Louis, Mo.	Large area detector for ultra heavy cosmic rays	Cut-off of 6GV	28°S or closer to the equator	3-5 mb	15 hrs	N/A	--
Frost, K.J. Goddard Space Flight Station Greenbelt, Md.	X-ray and gamma ray astronomy experiments in the 0.020 Mev to 20 Mev range	N/A	$\sim 30^{\circ}$	3 mb	5 hrs	N/A	Southern Hemisphere location required to observe x-ray sources near the Gallactic Center.
Frye, Dr. G.M. Case Western Reserve U. Cleveland, Ohio	(a) To measure the flux of atmospheric neutrons at the geomagnetic equator to compare with previous results at 40°N Geomagnetic Equator; (b) Gamma ray survey to measure atmospheric gamma ray flux at the Geomagnetic Equator & search for primary gamma radiation from equatorial objects	0°	0 to 15°S	3 mb	10 hrs	N/A	Proximity to Geomagnetic Equator in Southern Hemisphere offers advantages over currently available balloon facilities.
Gehrels, Dr. A.M.J. Lunar & Planetary Lab, U of Arizona, Tucson, Ariz.	Polariscope flight to measure the interstellar polarization in the Southern Milky Way	N/A	10-20°S	4 mb	12 hrs	May	Optimum conditions would be in May for reasons of ozone height and the availability of stars in the inner spiral arm.

SCIENTIST AND AFFILIATION	EXPERIMENT	GEO-MAGNETIC LATITUDE	GEO-GRAPHIC LATITUDE	ALTITUDE	DURATION	TIME OF YEAR	REMARKS
Gibbons, Dr. J.H. Oak Ridge Nat'l. Lab, Oak Ridge, Tennessee	Search of Southern skies for possible astronomical gamma rays ($60 \leq E \leq 2000$ KeV) emitted by the sources to gain information leading to a better understanding of the physical mechanisms responsible for the r-process nucleo synthesis of heavy elements	N/A	$\geq 30^{\circ}$	3 mb	10 hrs	April - October	Sources not visible, or not visible for a sufficient period of time in Northern Hemisphere.
Haymes, Dr. R.C. Dept. of Space Science, Rice U., Houston, Texas	Search for gamma radiation from Southern Hemisphere celestial objects	Low	Equator and 35°S	3 mb	8 hrs	N/A	Reduced atmospheric absorption of gamma radiation from celestial objects that have zero or negative declinations.
Kaplon, Dr. M.F. Dept. of Physics & Astronomy U of Rochester, Rochester, N.Y.	(a) Gas Č Counter for composition study at en/nucleon >40 Bev (b) Energy spectrum of electrons from 10-50 Bev wing gas Č Counter and lead glass radiator (c) Large area detector for super high Z-elements (x-ray film technique)	$\sim 0^{\circ}$	N/A	2 mb	12 hrs	Summer	Geomagnetic equator reduces background from low energy particles.

SCIENTIST AND AFFILIATION	EXPERIMENT	GEO-MAGNETIC LATITUDE	GEO-GRAPHIC LATITUDE	ALTITUDE	DURATION	TIME OF YEAR	REMARKS
Korff, Dr. S.A. Dept. of Physics New York U., New York, N.Y.	Search for ultra-high energy neutrons including possible solar neutrons. This involves flying a fast-neutron detector to high elevations	0°	N/A	High as possible	6 hrs	June - Sept.	Equatorial zone cuts down the background of undesired events by an order of magnitude or more.
Lockwood, Dr. J.A. Dept. of Physics U of New Hampshire, Durham, New Hampshire	Fast neutron and gamma ray detector with PSD to separate neutrons from gamma rays with a complete charged-particle shield enclosing n-γ detector	Near Geomagnetic Equator	N/A	3 mb	15 hrs	N/A	Higher vertical cutoff rigidity. Now limited to $Pc < Gv$.
Martel, Dr. E.A. NCAR, Boulder	Trace gas profile measurements up to 30 km (CH_4, H_2, NE, N_2O, CO_2 and others); samples	N/A	$10\text{-}35^{\circ}S$	10 mb	10 hrs	N/A	Significant differences in CH_4, CO_2 and N_2O profiles are to be expected and these differences are of considerable scientific interest for evaluation of sources sink and transport processes.
Overbeck, Dr. J. MIT, Cambridge, Massachusetts	X-ray astronomy with emphasis on x-ray sources in the Southern sky with an oriented gondola and low background x-ray detector	Low	0° or Southern	2.5 mb	12 hrs	N/A	X-ray sources in the Southern skies can be studied for a longer time through less atmosphere.

SCIENTIST AND AFFILIATION	EXPERIMENT	GEO-MAGNETIC LATITUDE	GEO-GRAPHIC LATITUDE	ALTITUDE	DURATION	TIME OF YEAR	REMARKS
Peterson, Dr. L.E. Physics Dept. U of California, San Diego LaJolla, Calif.	(a) Determine spectra and time variations of cosmic x-ray sources in Southern skies (b) Search for gamma ray sources	$< 40^{\circ}$	30°	3 mb	10 hrs	Sept. - May	Southern Hemisphere only place Galactic Center can be viewed from balloons because of atmospheric absorption.
Seeman, Dr. Nathan U.S. Naval Research Lab., Washington, D.C.	Gamma ray telescope designed to detect sources of cosmic gamma rays in the energy interval 30-100 Mev	$\sim 0^{\circ}$	Southern	3 mb	10 hrs	N/A	(a) Equatorial location would reduce low energy charged particle background rates; (b) Opportunity to observe Gallactic Center and other Southern sky objects.
Stiller, Dr. B. Lab. for Cosmic Ray Physics, U.S. Naval Research Lab., Washington, D.C.	Cosmic ray experiment using research nuclear emulsions designed to study the age of the cosmic radiation	0°	N/A	3 mb	12-72 hrs	N/A	A geomagnetic equatorial balloon launch site offers distinct advantages for cosmic ray research.
Underhill, Dr. A. Sterrewacht Utrecht, THE NETHERLANDS	A small scanning spectrometer with resolution of 1 A° mounted in a steerable yoke gondola to scan selected sections of the spectrum of stars in the range 2000-3000 A°	N/A	$20\text{-}30^{\circ}$S	4 mb	8 hrs	Spring	Can observe important bright O and B stars which are accessible only from the Southern Hemisphere. The bright stars of these types are not accessible from the Northern Hemisphere.

Southern Hemisphere Program

SCIENTIST AND AFFILIATION	EXPERIMENT	GEO-MAGNETIC LATITUDE	GEO-GRAPHIC LATITUDE	ALTITUDE	DURATION	TIME OF YEAR	REMARKS
Waddington, Dr. C.J. School of Physics & Astronomy U of Minn., Minneapolis Minnesota	Combination of spark chambers & nuclear emulsions designed to study the characteristics of the primary heavy nuclei in the cosmic radiation together with the nuclear interactions of these heavy nuclei in various target materials	0°	N/A	3 mb	> 10 hrs	N/A	In order to study the high energy nuclei, it is essential to go to the Southern Hemisphere.
Webber, Dr. W.R. U of Minnesota, Minneapolis Minnesota	(a) Scintillation Counter Telescope for heavy nuclei; (b) Various x-ray telescopes	$< 10^{\circ}$	Equatorial	4 mb	4 hrs	Sept - November	Southern Hemisphere site offers following advantages: a. High geomagnetic cut off (equator); b. Access to Southern latitude x-ray sources.

END OF TABLE

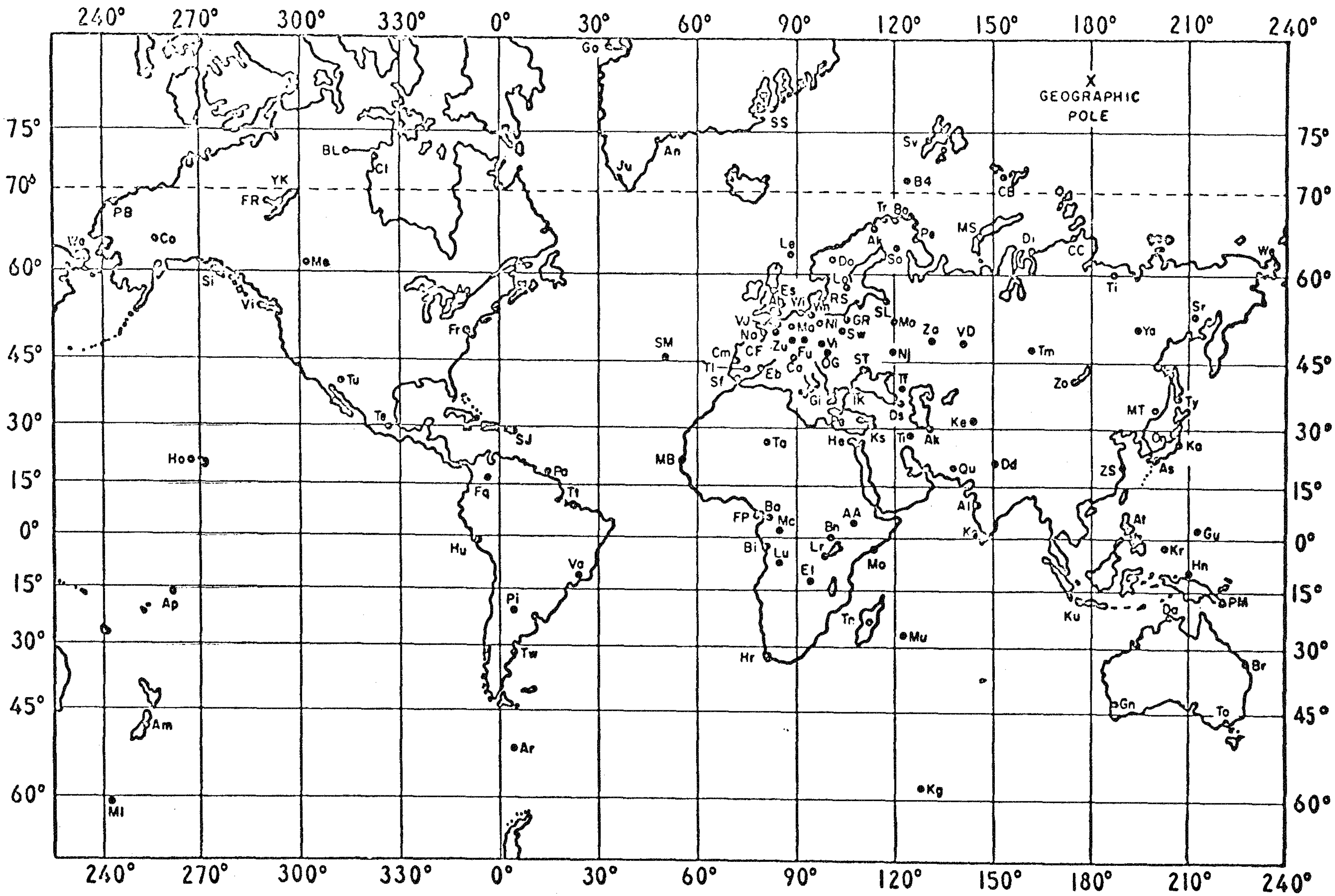

Fig. 8. The world in geomagnetic coordinates, Mercator projection, showing magnetic observatories.

APPENDIX B

FLIGHT SUMMARIES

SUMMARY—1968 FLIGHTS

FLIGHT & PAGE NUMBER	DATE	EXPERIMENTER & ORGANIZATION	TYPE OF EXPERIMENT	BALLOON VOLUME X 10^6 ft^3	GAUGE & MATERIAL	MANUFACTURER	PAYLOAD WEIGHT (LBS)	FLOAT TIME (HRS)	PRESSURE FLOAT ALT. (MB)	FLIGHT SUCCESS
372-PA B-8	Jan. 5	T. Gehrels U/Arizona	Observe Venus in January 1968 phase	10.6	0.9 mil poly 0.9 mil cap	Winzen	1,883	5.7	4.9	Weather failure
373-PA B-9	Jan. 9	L. E. Peterson U/California, S.D.	Search for gamma ray line emission from SCO XR-I	10.6	0.5 mil poly 0.7 mil cap	Winzen	768	7.0	2.4	Success
374-PA B-10	Jan. 12	R. M. Lucas, G. Hall A. D. Little	Measure internal gas and air temperature during launch, sunset, sunrise	0.25	1.5 mil poly	Raven	331	16.0	24.3	Success
375-PA B-11	Jan. 13	L. E. Peterson U/California, S.D.	Measure X ray spectrum of M-87	10.6	0.5 mil poly 0.7 mil cap	Winzen	812	---	5.35	Balloon failure
376-PA B-12	Jan. 15	A. E. Metzger JPL	Measure X ray source Cygnus XR-I between 20 and 100 KEV	5.25	0.7 mil poly	Winzen	401	6.0	2.83	Success
377-PA B-13	Jan. 17	L. E. Peterson U/California, S.D.	Search for gamma ray line emission from Cygnus XR-I	6.0	0.5 mil poly 0.5 mil cap	Winzen	673	8.5	3.0	Success
378-P B-14	Feb. 3	A. H. Barrett MIT	Measure oxygen spectrum	1.11	0.75 mil poly	Raven	772	---	---	Balloon failure
379-P B-15	Feb. 10	P. W. Hodge U/Washington	Engineering evaluation of paddle reel; collect meteoric dust particles	2.94	0.7 mil poly	Winzen	519	4.9	4.9	Success
380-P B-16	Feb. 12	A. H. Barrett MIT	Measure oxygen spectrum	1.6	1.0 mil poly	Winzen	853	1.1	10.85	Success
381-P B-17	Feb. 24	A. H. Barrett MIT	Measure oxygen spectrum	1.6	1.0 mil poly	Winzen	862	0.7	11.6	Success
382-P B-18	Feb. 27	D. A. Kniffen, C. E. Fichtel GSFC	Search for gamma rays from Crab Nebula and Cygnus regions	10.6	0.7 mil poly 0.7 mil cap	Winzen	947	3.5	2.84	Success
383-P B-19	Mar. 4	D. A. Kniffen, C. E. Fichtel GSFC	Investigate Albedo gamma rays produced in nuclear interactions of energetic charged particle cosmic rays with nuclei in the earth's atmosphere.	2.94	0.75 mil poly	Winzen	563	5.2	4.63	Success
384-P B-20	Mar. 23	J. D. Strong U/Massachusetts	Measure far infrared from the sun	2.94	1.5 mil poly	Winzen	2,882	5.9	16.6	Success
385-P B-21	Mar. 14	J. J. Lord U/Washington	Expose nuclear emulsion stack for as long as possible at 100,000 plus feet	2.94	1.0 mil poly	Winzen	945	3.7	7.1	Balloon failure

SUMMARY—1968 FLIGHTS

FLIGHT & PAGE NUMBER	DATE	EXPERIMENTER & ORGANIZATION	TYPE OF EXPERIMENT	BALLOON VOLUME $X\ 10^6\ ft^3$	GAUGE & MATERIAL	MANUFACTURER	PAYLOAD WEIGHT (LBS)	FLOAT TIME (HRS)	PRESSURE FLOAT ALT. (MB)	FLIGHT SUCCESS
386-P B-22	Mar. 24	D. A. Kniffen, C. E. Fichtel GSFC	Search for gamma rays from Cygnus XR-I	10.6	0.7 mil poly 0.7 mil cap	Winzen	987	5.8	2.78	Success
387-P B-23	Apr. 5	D. A. Kniffen, C. E. Fichtel GSFC	Search for gamma rays from Cygnus XR-I	10.6	0.7 mil poly 0.7 mil cap	Winzen	930	3.1	3.1	Success
389-P B-25	Apr. 15	J. J. Lord, R. E. Gibbs U/Washington	Expose nuclear emulsion stack for as long as possible at 100,000 plus feet	2.94	1.5 mil poly	Winzen	1,221	18.8	10.6	Success
390-P B-26	Apr. 24	W. H. G. Lewin MIT	Measure X ray flux from Scorpio XR-1	10.6	0.7 mil poly 0.7 mil cap	Winzen	1,246	13.6	3.4	Success
391-P B-27	Apr. 25	E. L. Chupp U/New Hampshire	Monitor high energy neutron spectrum >20 MEV	5.25	0.7 mil poly	Winzen	683	9.7	3.35	Success
392-P B-28	Apr. 30	W. R. Webber U/Minnesota	Study X rays from Cygnus region of sky	4.85	0.7 mil poly	Winzen	471	11.7	3.55	Success
393-P B-29	May 1	J. W. Overbeck MIT	Search for gamma rays from the reactions of nuclei on the sun and in stars	5.0	0.75 mil poly	Raven	970	---	---	Balloon failure
394-P B-30	May 5	J. W. Overbeck MIT	Search for gamma rays from the reactions of nuclei on the sun and stars	6.0	0.5 mil poly	Winzen	975	8.3	4.2	Success
395-P B-31	May 19	K. A. Anderson U/California, Berkeley	Engineering evaluation of stabilized platform, cosmic ray background counter	10.6	0.7 mil poly 0.7 mil cap	Winzen	1,126	11.6	3.55	Success
397-P B-33	May 21	L. E. Peterson U/California, S.D.	X ray telescope to measure energy spectrum of Scorpius XR-I	10.6	0.5 mil poly 0.7 mil cap	Winzen	956	11.8	2.55	Success
398-P B-34	May 24	J. Klarmann Washington U.	Investigate transiron elements in cosmic radiation	10.6	0.7 mil poly 0.7 mil cap	Winzen	1,157	14.2	3.36	Success
399-P B-35	May 29	G. T. Chapman Oak Ridge National Labs	Measure gamma rays at altitudes above 115,000 feet	10.6	0.7 mil poly 0.7 mil cap	Winzen	1,394	9.4	3.65	Success
400-P B-36	May 29	J. J. Lord U/Washington	Expose nuclear emulsion stack for as long as possible at 100,000 plus feet	2.90	1.5 mil poly	Winzen	1,200	16.6	9.4	Success

SUMMARY—1968 FLIGHTS

FLIGHT & PAGE NUMBER	DATE	EXPERIMENTER & ORGANIZATION	TYPE OF EXPERIMENT	BALLOON VOLUME X 10^6 ft^3	GAUGE & MATERIAL	MANUFACTURER	PAYLOAD WEIGHT (LBS)	FLOAT TIME (HRS)	PRESSURE FLOAT. ALT. (MB)	FLIGHT SUCCESS
401-P B-37	June 4	J. W. Overbeck MIT	Sodium iodide crystal detector	10.6	0.7 mil poly 0.7 mil cap	Winzen	1,112	6.8	3.3	Electronic failure
402-P B-38	June 6	J. J. Lord U/Washington	Expose nuclear emulsion stack for as long as possible at 100,000 plus feet	2.90	1.5 mil poly	Winzen	1,157	16.9	8.95	Success
403-P B-39	June 9	C. L. Hemenway Dudley Observatory	Test dust collector with aluminum pellets	1.25	1.0 mil poly	Winzen	250	---	---	Operations failure
404-P B-40	June 9	L. E. Peterson U/California, S.D.	High energy resolution X ray telescope to observe Cygnus X-I and Crab Nebula	6.0	0.5 mil poly	Winzen	871	10.7	3.23	Success
405-P B-41	June 11	C. L. Hemenway Dudley Observatory	Test of meteoric dust collector	1.25	1.0 mil poly	Winzen	253	0.7	7.3	Success
406-P B-42	June 27	A. H. Barrett MIT	Measure microwave emission of molecular oxygen in the earth's atmosphere	5.0	0.75 mil poly	Raven	718	6.9	4.4	Success
407-P B-43	June 27	L. E. Peterson U/California, S.D.	High energy resolution X ray telescope to observe Cygnus XR-I, Serpent, Cygnus	10.6	0.5 mil poly 0.7 mil cap	Winzen	968	8.0	2.8	Success
408-P B-44	July 5	A. H. Barrett MIT	Measure microwave emission of molecular oxygen in the earth's atmosphere	5.0	0.75 mil poly	Raven	1,068	5.4	5.2	Success
409-P B-45	July 11	J. H. Shaw, J. Riccio JPL	To determine temperature profile from cloud tops to 4 mb	10.6	0.7 mil poly 0.7 mil cap	Winzen	1,444	6.0	3.6	Success
410-P B-46	July 16	F. W. Floyd MIT	High angular resolution of X ray telescope	10.6	0.7 mil poly 0.7 mil cap	Winzen	1,266	6.9	3.33	Electronic failure
411-P B-47	July 18	G. M. Frye Case Western Reserve Univ.	Measure high energy neutrons produced during solar flares at the sun	2.94	0.7 mil poly	Winzen	806	7.2	5.8	Success
412-P B-48	July 19	F. Mainschein Oak Ridge Nat'l Lab	Neutron spectrometer	2.90	1.5 mil poly	Winzen	1,061	3.1	8.35	Success
413-P B-49	July 22	W. F. Hoffmann Inst. for Space Studies	Sky survey at 300 μ and 80 μ	0.360	0.75 mil poly	Raven	370	2.3	17.35	Electronic failure

SUMMARY—1968 FLIGHTS

FLIGHT & PAGE NUMBER	DATE	EXPERIMENTER & ORGANIZATION	TYPE OF EXPERIMENT	BALLOON VOLUME X 10^6 ft^3	GAUGE & MATERIAL	MANUFACTURER	PAYLOAD WEIGHT (LBS)	FLOAT TIME (HRS)	PRESSURE FLOAT ALT. (MB)	FLIGHT SUCCESS
414-P B-50	July 24	G. M. Frye Case Western Reserve Univ.	Measure high energy neutron albedo flux	10.6	0.7 mil poly 0.7 mil cap	Winzen	1,073	1.4	3.12	Success
415-P B-51	July 25	W. F. Hoffmann Inst. for Space Studies	Sky survey at 300 μ and 80 μ	0.360	0.75 mil poly	Raven	389	10.5	17.5	Success
416-P B-52	July 29	J. J. Lord U/Washington	Expose nuclear emulsion stack	2.90	1.5 mil poly	Winzen	1,125	5.1	9.0	Weather failure
417-P B-53	July 30	W. F. Hoffmann Inst. for Space Studies	Measure extended emission from interstellar material in spectral region 60-150 μ	0.360	0.75 mil poly	Raven	365	11.3	17.35	Success
418-P B-54	Aug. 2	J. J. Lord U/Washington	Expose nuclear emulsion stack	2.90	1.5 mil poly	Winzen	1,107	16.7	9.0	Success
419-P B-55	Aug. 3	J. Klarmann Washington U.	Measure cosmic radiation	4.0	0.7 mil poly	Winzen	496	7.7	3.30	Success
420-P B-56	Aug. 6	G. M. Frye Case Western Reserve Univ.	Measure direction and intensity of cosmic gamma radiation	10.6	0.5 mil poly	Winzen	928	4.3	12.75	Balloon failure
421-P B-57	Aug. 13	C. L. Hemenway Dudley Observatory	Collect micrometeoric dust particles	1.25	1.0 mil poly	Winzen	295	0.5	7.4	Success
422-P B-58	Aug. 17	G. M. Frye Case Western Reserve Univ.	Measure low energy gamma rays with spark chamber	10.6	0.7 mil poly 0.7 mil cap	Winzen	858	5.0	2.82	Success
423-P B-59	Aug. 17	D. Pierson NASA, MSC	Test launch system. Flight operations conducted by NASA.	0.135	---	---	30	---	12.5	Success
424-P B-60	Aug. 21	J. J. Lord U/Washington	Expose nuclear emulsion stack	2.90	1.5 mil poly	Winzen	1,202	20.6	9.2	Success
425-P B-61	Aug. 26	G. Hilton, GSFC A. L. Morris, NCAR	OPLE position and location experiment with the ATS-III satellite	0.36	1.5 mil poly	Raven	1,095	8.9	45.0	Success
426-P B-62	Aug. 29	J. J. Lord U/Washington	Expose nuclear emulsion stack	2.90	1.5 mil poly	Winzen	1,159	19.33	9.3	Success
427-P B-63	Sept. 4	R. C. Haymes Rice Univ.	Engineering evaluation of gamma ray monitoring equipment	0.080	1.0 mil poly	Raven	162	5.6	31.3	Success

SUMMARY—1968 FLIGHTS

FLIGHT & PAGE NUMBER	DATE	EXPERIMENTER & ORGANIZATION	TYPE OF EXPERIMENT	BALLOON VOLUME $X 10^6 ft^3$	GAUGE & MATERIAL	MANUFACTURER	PAYLOAD WEIGHT (LBS)	FLOAT TIME (HRS)	PRESSURE FLOAT ALT. (MB)	FLIGHT SUCCESS
428-P B-64	Sept. 7	J. A. Lockwood U/New Hampshire	Measure gamma rays and neutrons	2.94	0.7 mil poly	Winzen	681	8.6	5.6	Success
429-P B-65	Sept. 17	D. Ramsden U/Southampton	Search for gamma rays with sensitive telescope using spark chamber	10.6	0.7 mil poly 0.7 mil cap	Winzen	2,355	7.8	4.69	Success
430-P B-66	Sept. 18	A. E. Gaide Observatory/Geneva	Observe Orion and Gemini in low resolution photographic spectro-photometry	10.6	0.7 mil poly 0.7 mil cap	Winzen	841	5.5	2.80	Success
431-P B-67	Sept. 19	J. Klarmann R. M. Walker Washington Univ.	Expose nuclear emulsions and plastics in search for cosmic rays	10.6	0.7 mil poly	Winzen	1,620	39.7	3.16	Success
432-P B-68	Sept. 22	P. H. Fowler U/Bristol	Expose nuclear emulsions and plastics in search for cosmic rays heavier than iron	15.0	0.6 mil poly 0.8 mil cap	Winzen	1,536	39.7	2.85	Success
433-P B-69	Sept. 25	P. H. Fowler U/Bristol	Expose nuclear emulsions and plastics in search for cosmic rays heavier than iron	15.4	0.75 mil poly Vista Dome II construction with mylar scrim dome	Raven	1,496	0	N/A	Balloon failure
434-P B-70	Sept. 26	P. H. Fowler U/Bristol	Expose nuclear emulsions and plastics in search for cosmic rays heavier than iron	10.6	0.7 mil poly 0.7 mil cap	Winzen	1,486	42.1	3.10	Success
435-P B-71	Sept. 30	G. M. Frye Case Western Reserve Univ.	Neutron detector to measure high energy neutrons during solar flares	2.94	0.7 mil poly	Winzen	889	11.4	6.65	Electronic failure
436-P B-72	Oct. 10	G. T. Chapman Oak Ridge Nat'l Lab	Search for gamma rays	6.0	0.7 mil poly 0.7 mil cap	Winzen	1,340	10.0	5.05	Success
437-P B-73	Oct. 11	R. T. Bettinger U/Maryland	To determine the vertical ozone distribution and total ozone content from atmospheric albedo in the UV	6.0	0.7 mil poly 0.7 mil cap	Winzen	1,406	6.4	5.1	Success
438-P B-74	Oct. 25	W. H. G. Lewin J. E. McClintock MIT	X ray observation of M-87 and Scorpio X-1	10.6	0.7 mil poly 0.7 mil cap	Winzen	1,385	7.4	3.45	Success
439-P B-75	Oct. 28	K. J. Frost GSFC	Gamma ray spectrometer to observe 50-400 KeV gamma radiation from celestial X ray source	10.6	0.7 mil poly 0.7 mil cap	Winzen	1,026	4.6	2.95	Success

SUMMARY—1968 FLIGHTS

FLIGHT & PAGE NUMBER	DATE	EXPERIMENTER & ORGANIZATION	TYPE OF EXPERIMENT	BALLOON VOLUME X 10^6 ft^3	GAUGE & MATERIAL	MANUFACTURER	PAYLOAD WEIGHT (LBS)	FLOAT TIME (HRS)	PRESSURE FLOAT ALT. (MB)	FLIGHT SUCCESS
440-P B-76	Nov. 19	K. O. Kiepenheuer Fraunhofer Inst.	Photograph portions of the sun	0.1345-launch 3.050-main	GT-11, Mylar-scrim	Schjeldahl	4,906	3.0	28.0	Operational success, scientific equipment malfunction
441-P B-77	Nov. 20	K. J. Frost GSFC	Gamma ray spectrometer to observe 50-400 KeV gamma radiation from celestial X ray source	10.6	0.5 mil poly 0.5 mil cap	Winzen	926	3.5	2.94	Success
442-P B-78	Nov. 24	F. W. Floyd MIT	High angular resolution X ray telescope	10.6	0.7 mil poly 0.7 mil cap	Winzen	1,131	1.5	3.05	Electronic failure
443-P B-79	Dec. 4	P. Serlemitsos GSFC	Study X ray emission from M-87	10.6	0.7 mil poly 0.7 mil cap	Winzen	1,000	2.8	2.82	Success
444-P B-80	Dec. 11	R. C. Haymes Rice Univ.	Measure X and gamma rays from M-87	10.6	0.7 mil poly 0.7 mil cap	Winzen	1,243	5.2	3.14	Success

SUMMARY—1968 FLIGHTS

FLIGHT & PAGE NUMBER	DATE	EXPERIMENTER & ORGANIZATION	TYPE OF EXPERIMENT	BALLOON VOLUME $\times 10^6$ ft^3	GAUGE & MATERIAL	MANUFACTURER	PAYLOAD WEIGHT (LBS)	FLOAT TIME (HRS)	PRESSURE FLOAT ALT. (MB)	FLIGHT SUCCESS
46-N B-82	Dec. 15,'67	K. H. Stefan NCAR	Balloon Structural Measurements	3.50	0.5 mil poly	Raven	625	---	---	Sensor system failure
388-PT B-24	Apr. 10,'68	M. Schwarzschild Princeton Univ.	Check electronics and antenna system. Balloon not to be released.	0.0253	GT-12	Schjeldahl	N/A	N/A	N/A	Success
47-N B-83	Apr. 10	A. L. Morris R. L. Snyder NCAR	Operational test for NASA IRLS and OPLE flights	0.36	1.5 mil poly	Raven	1,095	8.5	44.0	Balloon failure
396-PT B-32	May 20	K. H. Stefan O. L. Cooper NCAR-Raven	Evaluation flight of Raven 9.0 x 10^6 capped balloon	9.0	0.75 mil poly 0.75 mil cap	Raven	1,035	1.7	3.4	Success
48-N B-84	Oct. 29	L. E. Colombe U/Calif, Berkeley	Test of LORAN System	0.0065	0.50 mil poly	Winzen	10.5	N/A	N/A	Operations failure
49-N B-85	Oct. 29	L. E. Colombe U/Calif, Berkeley	Test of LORAN System	0.08	0.75 mil poly	Winzen	10.6	unknown	8.75	Success
50-N B-86	Nov. 20	NCAR, SBF	Telemetry antenna test	0.0024	0.75 mil poly	Raven	6.0	6.0	49.0	Success
445-PT B-81	Dec. 14	O. L. Cooper A. Shipley NCAR	Telemetry and command systems test	0.450	0.5 mil poly	Winzen	434	3.8	14.6	Success

NOTE: All balloons manufactured by Winzen Research, Inc. were made of StratoFilm.

All balloons manufactured by Raven Industries, Inc. were made of Ethyl Visqueen X-124 film.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 372-PA PLACE: Page, Arizona DATE: 5 Jan 1968

NAME OF EXPERIMENTER: Dr. T. Gehrels LAUNCH TIME: ACTUAL: 1909 SCHED: 1900 MST

ORGANIZATION: U of Arizona SPONSOR: NASA-185

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Observe Venus in January 68 phase. Normal ascent to 118,000 feet - Float 14 hours-Cutdown

SUCCESS:
FAILURE: X
BALLOON:
OPERATIONS:
MECH:
WX: X
ELEC:

BALLOON DATA

MFG: Winzen Research SERIAL NO: 54 P.O.#: 14918-66

MATERIAL AND GAUGE: .9 mil poly TYPE: SF305.86-090-NSC-01 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 500 lb. load tapes - .9 mil cap extending 105 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 Truck CREW: NCAR

CLOUDS: Clear SFC WINDS: 1.5 mps CROSS WIND ANGLE: N/A °

SFC TEMP: -5 °C TROP HEIGHT: 18.2 Km TROP TEMP: -62 °C

WEIGHTS AND INFLATIONS

BALLOON 1748 LBS SCI LOAD 1225 LBS NCAR INST 58 LBS

BALLAST 400 LBS (11 % GL) GROSS LOAD 3631 LBS

FREE LIFT 363 LBS (10 % GL) GROSS LIFT 3994 LBS HE 70,288 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Barotransmitter, Photobarograph

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy-30" ring
DIAMETER: 100 FT
WEIGHT: 200 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.37 mps 9Km TO 18Km 3.92 mps

18 Km TO CLG: 3.12 mps FLIGHT AVG 3.49 mps

MAX (1500 METER LAYER) 5.86 mps @ ALT 9 Km

PRESS FLOAT ALT: THEORETICAL: 4.9 Mb ACTUAL 4.9 Mb

TIME AT ALT: PLANNED: 14.0 HRS ACTUAL 5.7 HRS

RECOVERY: DATE: 7 January 68 LOCATION: Hyanis, Nebraska COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

JTION:

Scientist	A. L. Morris (Circulating)
Balloon Mfg.	J. M. Shoemaker (2)
NASA, Holtz	K. Stefan (2)
	Operations

S: Flight was considered a scientific success.
Terminated early due to weather.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 373-PA PLACE: Page, Arizona DATE: 9 January 1968

NAME OF EXPERIMENTER: Dr. L. Peterson LAUNCH TIME: ACTUAL: 0330 SCHED: 0330 MST

ORGANIZATION: UCSD SPONSOR: NASA-185

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Search for gamma ray line emission from SCO X R-I - Normal ascent to 135,000 feet, float nine (9) hours - Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 191 P.O. #: 18317-68

MATERIAL AND GAUGE: .5 mil poly TYPE: SF-305.86-050-NSC-11 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes, .7 mil cap extending 90 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 3,000 broken SFC WINDS: Calm mps CROSS WIND ANGLE: 0 °

SFC TEMP: -8 °C TROP HEIGHT: 12.17 Km TROP TEMP: -64 °C

WEIGHTS AND INFLATIONS

BALLOON 983 LBS SCI LOAD 325 LBS NCAR INST 100 LBS

BALLAST 300 LBS (17 % GL) GROSS LOAD 1751 LBS

FREE LIFT 175 LBS (10 % GL) GROSS LIFT 1926 LBS HE 33,904 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Barotransmitter-Photobarograph

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat canopy
DIAMETER: 38 FT
WEIGHT: 43 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.72 mps 9Km TO 18Km 3.10 mps
18 Km TO CLG: 2.54 mps FLIGHT AVG 3.15 mps

MAX (1500 METER LAYER) 4.92 mps @ ALT 9.14 Km

PRESS FLOAT ALT: THEORETICAL: 2.46 Mb ACTUAL 2.4 Mb

TIME AT ALT: PLANNED: 9.0 HRS ACTUAL 7.0 * HRS

RECOVERY: DATE: 10 January 68 LOCATION: Pie Town, N. Mex. COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

JTION:

cientist	A. L. Morris (Circulating)
alloon Mfg.	Operations
ASA, Holtz	J. M. Shoemaker (2)
	K. Stefan (1)

S: Successful Flight

* All possible scientific data was gathered and scientist suggested termination to facilitate easy recovery of his detector.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 374-PA PLACE: Page, Arizona DATE: 12 January 1968

NAME OF EXPERIMENTER: Mr. Robert Lucas and George Hall

LAUNCH TIME: ACTUAL: 1515 SCHED: 1500 MST

ORGANIZATION: A. D. Little SPONSOR: ONR

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Measure internal gas and air temperature during launch, sunset, sunrise. Normal ascent to 82,000 feet - Float through sunset and sunrise - Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Raven Industries SERIAL NO: 219 P.O. #: 18320-68

MATERIAL AND GAUGE: 1.5 mil poly TYPE: 2333-565-386 VOLUME: .25 $\times 10^6 FT^3$

SPECIAL FEATURES: 500 lb. nylon line inside balloon - 10 ft. protruding on both ends, no lubrication on balloon, tapeless.

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Vertical VEHICLE: Power Wagon CREW: NCAR

CLOUDS: Clear SFC WINDS: 1 mps CROSS WIND ANGLE: N/A °

SFC TEMP: -3 °C TROP HEIGHT: 12.6 Km TROP TEMP: -68.5 °C

WEIGHTS AND INFLATIONS

BALLOON 189 LBS SCI LOAD 10 LBS NCAR INST 171 LBS

BALLAST 114 LBS (21 % GL) GROSS LOAD 520 LBS

FREE LIFT 52 LBS (10 % GL) GROSS LIFT 572 LBS HE 10,064 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Barotransmitter & Barograph

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 28 FT
WEIGHT: 36 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9 Km Beacon off during ascent mps 9 Km TO 18 Km ____ mps

18 Km TO CLG: ____ mps FLIGHT AVG 4.29 mps

MAX (1500 METER LAYER) N/A mps @ ALT ____ Km

PRESS FLOAT ALT: THEORETICAL: 24.9 Mb ACTUAL 24.3 Mb

TIME AT ALT: PLANNED: 15.5 HRS ACTUAL 16.0 HRS

RECOVERY: DATE: 13 January 68 LOCATION: Furnace Creek, Calif. COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

ION:

cientist	A. L. Morris (Circulating)
alloon Mfg.	J. M. Shoemaker (2)
	K. Stefan (1)
	Operations

Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 375-PA PLACE: Page, Arizona DATE: 13 January 1968

SUCCESS:
FAILURE: X
BALLOON: X
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. L. Peterson LAUNCH TIME: ACTUAL: 2145 SCHED: 2100 MST

ORGANIZATION: UCSD SPONSOR: NASA-185

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Measure x-ray spectrum of M-87 - Normal ascent to 132,000 feet, float eight (8) hours, Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 190 P.O. #: 18317-68

MATERIAL AND GAUGE: .5 mil poly TYPE: SF-305.86-050-NSC-11 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes - .7 mil cap extending 90 ft. from apex

CONDITION OF BALLOON: Poor PATCHES REQUIRED: Yes, but unable to accomplish

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 1,000 Scattered SFC WINDS: 1 mps CROSS WIND ANGLE: N/A °

SFC TEMP: -1 °C TROP HEIGHT: 16.7 Km TROP TEMP: -67 °C

WEIGHTS AND INFLATIONS

BALLOON 980 LBS SCI LOAD 440 LBS NCAR INST 91 LBS

BALLAST 225 LBS (12 % GL) GROSS LOAD 1792 LBS

FREE LIFT 179 LBS (10 % GL) GROSS LIFT 1971 LBS HE 34,688 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Barotransmitter-Photobarograph

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 56 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 3.12 mps 9Km TO 18Km 3.20 mps
18 Km TO CLG: 1.59 mps FLIGHT AVG 2.21 mps

MAX (1500 METER LAYER) 4.52 mps @ ALT 14.08 Km

PRESS FLOAT ALT: THEORETICAL: 2.78 Mb ACTUAL 5.35 Mb

TIME AT ALT: PLANNED: 8 HRS ACTUAL None * HRS

RECOVERY: DATE: 14 January 68 LOCATION: Pierce Ferry, Arizona COND: Fair **

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

ƆTION:

Ɛcientist	A. L. Morris (Circulating)
Ƀalloon Mfg.	J. M. Shoemaker (2)
ƝASA, Holtz	K. Stefan (2)
	Operations

Ƨ: A hole was found after inflation, but due to the height of the hole it could not be patched. The hole was approximately 30 ft. from apex; balloon rotated three (3) complete times after release. At approximately 1500 ft. balloon was buffeted forming a twist near the center, then formed a double bubble.

* The balloon was driven up by ballasting to an altitude of 116,450 feet. Balloon floated at 116,450 feet for three (3) hours, then descended over a five (5) hour period to 80,000 feet where the flight was terminated.

** The scientific package landed in Lake Mead causing some electrical damage.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 376-PA PLACE: Page, Arizona DATE: 15 January 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. A. Metzger LAUNCH TIME: ACTUAL: 0638 SCHED: 0630 MST

ORGANIZATION: JPL SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Measure x-ray source CYG XRI between 20 and 100 KEV - Normal ascent to 130,000 feet - Float seven (7) hours - Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 35 P.O. #: 18477-68

MATERIAL AND GAUGE: .7 mil poly TYPE: SF-242.17-070-NS-03 VOLUME: 5.25 $\times 10^6$ FT^3

SPECIAL FEATURES: 150 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 3,000 scattered SFC WINDS: 1.5 mps CROSS WIND ANGLE: N/A °

SFC TEMP: -5 °C TROP HEIGHT: 16.74 Km TROP TEMP: -64.3 °C

WEIGHTS AND INFLATIONS

BALLOON 697 LBS SCI LOAD 160 LBS NCAR INST 102 LBS

BALLAST 95 LBS (8.6 % GL) GROSS LOAD 1098 LBS

FREE LIFT 110 LBS (10 % GL) GROSS LIFT 1208 LBS HE 21,264 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Barotransmitter-Photobarograph

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat canopy
DIAMETER: 36 FT
WEIGHT: 44 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.08 mps 9Km TO 18Km 4.36 mps

18 Km TO CLG: 3.50 mps FLIGHT AVG 3.92 mps

MAX (1500 METER LAYER) 4.56 mps @ ALT 9 Km

PRESS FLOAT ALT: THEORETICAL: 2.95 Mb ACTUAL 2.83 Mb

TIME AT ALT: PLANNED: 7.0 HRS ACTUAL 6 HRS

RECOVERY: DATE: 16 January 68 LOCATION: Blanding, Utah COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-12a.

DISTRIBUTION:

Scientist	A. L. Morris (Circulating)
Balloon Mfg.	J. M. Shoemaker (2)
	K. Stefan (1)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 377-PA PLACE: Page, Arizona DATE: 17 January 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. L. Peterson LAUNCH TIME: ACTUAL: 0424 SCHED: 0400 MST

ORGANIZATION: UCSD SPONSOR: NASA-185

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Search for gamma ray line emission from CYG XRI - Normal ascent to 130,000 feet - Float six (6) hours - Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 18 P.O. #: 18317-68

MATERIAL AND GAUGE: .5 mil poly TYPE: SF 250.2-050-NSC-04 VOLUME: 6.0 $\times 10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes - .5 mil cap extending 80 ft. from apex

CONDITION OF BALLOON: Fair PATCHES REQUIRED: One

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: Clear SFC WINDS: 1.5 mps CROSS WIND ANGLE: N/A °

SFC TEMP: -5 °C TROP HEIGHT: 18.26 Km TROP TEMP: -61.5 °C

WEIGHTS AND INFLATIONS

BALLOON 667 LBS SCI LOAD 335 LBS NCAR INST 100 LBS

BALLAST 200 LBS (14 % GL) GROSS LOAD 1340 LBS

FREE LIFT 134 LBS (10 % GL) GROSS LIFT 1474 LBS HE 25,936 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Barotransmitter-Photobarograph

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat canopy
DIAMETER: 38 FT
WEIGHT: 38 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.03 mps 9Km TO 18Km 4.96 mps
18Km TO CLG: 4.40 mps FLIGHT AVG 4.29 mps

MAX (1500 METER LAYER) 5.19 mps @ ALT 6.7 Km

PRESS FLOAT ALT: THEORETICAL: 3.06 Mb ACTUAL 3.0 Mb

TIME AT ALT: PLANNED: 8 HRS ACTUAL 8.5 HRS

RECOVERY: DATE: 17 January 68 LOCATION: Amarillo, Texas COND: Fair *

REMARKS AND PROBLEMS: Use Reverse Side

UTION:

cientist	A. L. Morris (Circulating)
alloon Mfgr.	J. M. Shoemaker (2)
ASA, Holtz	K. Stefan (1)
	Operations

S: * Parachute did not collapse immediately and package dragged 3/4 mile causing some damage to the scientific gondola. However, the detector was not damaged.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 378-P PLACE: Palestine, Texas DATE: 3 Feb. 68

NAME OF EXPERIMENTER: Dr. A. Barrett LAUNCH TIME: ACTUAL: 0712 SCHED: 0710 CST

ORGANIZATION: MIT SPONSOR: NASA-185

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: To measure oxygen spectrum

Normal ascent to 100,000 feet - Float one (1) hour-800 feet per minute descent to 15,000 feet.-Cutdown

SUCCESS:
FAILURE: X
BALLOON: X
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Raven SERIAL NO: 113 P.O. #: 18553-68

MATERIAL AND GAUGE: .75 mil poly TYPE: 2323-545-6145 VOLUME: 1.11 $\times 10^6 FT^3$

SPECIAL FEATURES: 200 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 1,000 scattered SFC WINDS: 3 mps CROSS WIND ANGLE: 0 °

SFC TEMP: 2 °C TROP HEIGHT: 16.45 Km TROP TEMP: -71 °C

WEIGHTS AND INFLATIONS

BALLOON 286 LBS SCI LOAD 518 LBS NCAR INST 70 LBS

BALLAST 130 LBS (12 % GL) GROSS LOAD 1058 LBS

FREE LIFT 106 LBS (10 % GL) GROSS LIFT 1164 LBS HE 20,480 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 54 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km N/A mps 9Km TO 18Km N/A mps

18 Km TO CLG: N/A mps FLIGHT AVG N/A mps

MAX (1500 METER LAYER) 11.1 mps @ ALT N/A Km

PRESS FLOAT ALT: THEORETICAL: 11.1 Mb * ACTUAL None Mb

TIME AT ALT: PLANNED: One HRS * ACTUAL None HRS

RECOVERY: DATE: 3 Feb. 68 LOCATION: Palestine, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

TION:

cientist	A. L. Morris (Circulating)
alloon Mfg.	J. M. Shoemaker (2)
ASA, Holtz	K. Stefan (2)
	Operations

: *Balloon lifted off normally but at 500 feet the balloon ruptured and settled back to the ground. The payload came down in some large trees and was damaged slightly.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 379-P PLACE: Palestine, Texas DATE: 10 Feb. 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. P. W. Hodge LAUNCH TIME: ACTUAL: 0744 SCHED: 0700

ORGANIZATION: U of Washington SPONSOR: NASA-185

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Engineering evaluation of paddle reel and collect meteoric dust particles. Normal ascent to 118,000 feet - Float six (6) hours - Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 299 P.O. #: 17670-68

MATERIAL AND GAUGE: .7 mil poly TYPE: SF-199.78-070-NS-06 VOLUME: 2.94 $\times 10^6 FT^3$

SPECIAL FEATURES: 200 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: 12,000 Scattered SFC WINDS: 1 mps CROSS WIND ANGLE: None °

SFC TEMP: 3 °C TROP HEIGHT: 12.81 Km TROP TEMP: -70 °C

WEIGHTS AND INFLATIONS

BALLOON 487 LBS SCI LOAD 307 LBS NCAR INST 162 LBS + Reel

BALLAST None LBS (-- % GL) GROSS LOAD 1,006 LBS

FREE LIFT 101 LBS (10 % GL) GROSS LIFT 1,107 LBS HE 19,488 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph=Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: Paddle reel-2000 ft. line to lower collector box

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 24) Top FT
WEIGHT: 21) LBS
Diameter: 32) Bottom
Weight: 29)

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.17 mps 9Km TO 18Km 5.76 mps

18 Km TO CLG: 5.0 mps FLIGHT AVG 5.2 mps

MAX (1500 METER LAYER) 6.77 mps @ ALT 10.67 Km

PRESS FLOAT ALT: THEORETICAL: 4.8 Mb ACTUAL 4.9 Mb

TIME AT ALT: PLANNED: 6 HRS ACTUAL 4.9 HRS

RECOVERY: * DATE: 10 Feb. 68 LOCATION: Greenville, Ala. COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

ION:

ist	A. L. Morris (circulating copy)
n Mfr.	K. Stefan (1)
Holtz	J. M. Shoemaker (2)
	Operations

Only top load recovered. UHF stopped at termination and lower package could not be tracked down by aircraft and has not been found yet. Further explanation forthcoming with recovery of bottom load.

The bottom load was found by a hunter on 31 March 1968, five (5) miles south of Pine Hill, Alabama.

Examination of the remains indicated that the parachute (it was not recovered) opened and the opening shock was severe enough so that the U of Washingtons supplied cable suspension sheared off at the attachment points inside the gondola.

Post flight investigation revealed that the entire gondola weight of approximately 300 lbs. was suspended on 2 each 1/4 X 28 screws inside the gondola.

Scientific failure due to inadequate package design.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 380-P PLACE: Palestine, Texas DATE: 12 Feb. 68

NAME OF EXPERIMENTER: Dr. Alan Barrett LAUNCH TIME: ACTUAL: 0718 SCHED: 0700 CST

ORGANIZATION: MIT SPONSOR: NASA-185

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: To measure oxygen spectrum - Normal ascent 100,000 feet, float one (1) hour - Valve down to 15,000 feet - Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 98 P.O. #: 18954-68

MATERIAL AND GAUGE: 1 mil poly TYPE: SF-162.3-100-NS-02 VOLUME: 1.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 250 lb. load tapes, valve cable

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 Truck CREW: NCAR

CLOUDS: Clear SFC WINDS: 5.5 mps CROSS WIND ANGLE: None °

SFC TEMP: -1 °C TROP HEIGHT: 19.85 Km TROP TEMP: -69 °C

WEIGHTS AND INFLATIONS

BALLOON 444 LBS SCI LOAD 515 LBS NCAR INST 73 LBS

BALLAST 200 LBS (15 % GL) GROSS LOAD 1297 LBS

FREE LIFT 130 LBS (10 % GL) GROSS LIFT 1427 LBS HE 25,120 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Barotransmitter-Photobarograph

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 65 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.41 mps 9Km TO 18Km 4.54 mps

18Km TO CLG: 4.33 mps FLIGHT AVG 4.45 mps

MAX (1500 METER LAYER) 4.92 mps @ ALT 9.2 Km

PRESS FLOAT ALT: THEORETICAL: 10.6 Mb ACTUAL 10.85 Mb

TIME AT ALT: PLANNED: 1 HRS ACTUAL 1.1 HRS

RECOVERY: DATE: 12 Feb. 68 LOCATION: Magee, Mississippi COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

ITION:

ientist	A. L. Morris (Circulating)
lloon Mfg.	K. Stefan (1)
;A, Holtz	J. M. Shoemaker (2)
	Operations

;: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 381-P PLACE: Palestine, Texas DATE: 24 Feb. 1968

NAME OF EXPERIMENTER: Dr. A. Barrett LAUNCH TIME: ACTUAL: 0711 SCHED: 0700 CST

ORGANIZATION: MIT SPONSOR: NASA-185

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: To measure oxygen spectrum. Normal ascent to approximately 100,000 feet, float thirty (30) minutes, valve down to 15,000 feet - Termination

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 99 P.O. #: 18954-68

MATERIAL AND GAUGE: 1.0 mil Poly TYPE: SF-162.3-100-NS-02 VOLUME: 1.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 250 lb. load tapes, valve cable

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: Clear SFC WINDS: Calm mps CROSS WIND ANGLE: None °

SFC TEMP: -4 °C TROP HEIGHT: 19.85 Km TROP TEMP: -66 °C

WEIGHTS AND INFLATIONS

BALLOON 449 LBS SCI LOAD 514 LBS NCAR INST 86 LBS

BALLAST 200 LBS (15 % GL) GROSS LOAD 1311 LBS

FREE LIFT 131 LBS (10 % GL) GROSS LIFT 1442 LBS HE 25,376 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 62 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.68 mps 9Km TO 18Km 5.17 mps

18 Km TO CLG: 4.32 mps FLIGHT AVG 4.65 mps

MAX (1500 METER LAYER) 5.46 mps @ ALT 16.77 Km

PRESS FLOAT ALT: THEORETICAL: 10.6 Mb ACTUAL 11.6 Mb

TIME AT ALT: PLANNED: .5 HRS ACTUAL .7 HRS

RECOVERY: DATE: 24 Feb. '68 LOCATION: McComb, Miss. COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

ITION:

Scientist	A. L. Morris, Circulating
Balloon Mfgr.	K. Stefan (1)
NASA, Holtz	J. M. Shoemaker (2)
	Operations

: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 382-P PLACE: Palestine, Texas DATE: 27 Feb. 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: D.A. Kniffen-C.E. Fichtel LAUNCH TIME: ACTUAL: 1959.5 SCHED: 2000.0 CST

ORGANIZATION: GSFC SPONSOR: ONR

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Search for gamma rays from Crab Nebula and Cygnus regions. Normal ascent to 130,000 feet, float four (4) hours* - Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 188 P.O. #: ONR

MATERIAL AND GAUGE: .7 mil poly TYPE: SF-305.86-070-NSC-05 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 200 lb. load tapes .7 mil cap extending 90 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 12,000 scattered SFC WINDS: 4 mps CROSS WIND ANGLE: None °

SFC TEMP: 17 °C TROP HEIGHT: 16.77 Km TROP TEMP: -67 °C

WEIGHTS AND INFLATIONS

BALLOON 1285 LBS SCI LOAD 465 LBS NCAR INST 127 LBS

BALLAST 300 LBS (13 % GL) GROSS LOAD 2232 LBS

FREE LIFT 223 LBS (10 % GL) GROSS LIFT 2455 LBS HE 43,216 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: Separate termination instrument package

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 55 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.07 mps 9Km TO 18Km 4.28 mps

18 Km TO CLG: 2.86 mps FLIGHT AVG 3.47 mps

MAX (1500 METER LAYER) 5.16 mps @ ALT 1.8 Km

PRESS FLOAT ALT: THEORETICAL: 2.73 Mb ACTUAL 2.84 Mb

TIME AT ALT: PLANNED: 4.0* HRS ACTUAL 3.5 HRS

RECOVERY: DATE: 28 Feb. '68 LOCATION: Jasper, Florida COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

TION:

Scientist	A. L. Morris (Circulating)
Balloon Mfgr.	J. M. Shoemaker (2)
	K. Stefan (1)
	Operations

: *The 3-4 hour float was expected and was acceptable to the scientist.

Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 383-P PLACE: Palestine, Texas DATE: 4 March 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: D.A. Kniffen-CE. Fichtel LAUNCH TIME: ACTUAL: 0652.7 SCHED: 0700.0

ORGANIZATION: GSFC SPONSOR: ONR

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: An investigation of Albedo gamma rays produced in nuclear interactions of energetic charged particle cosmic rays with nuclei in the earth's atmosphere - Normal ascent - Float at approximately 120,000 feet for five (5) hours - Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 182 P.O. #: ONR

MATERIAL AND GAUGE: .75 mil poly TYPE: SF-199.78-075-NS-03 VOLUME: 2.94 $\times 10^6 FT^3$

SPECIAL FEATURES: 100 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 1000 Scattered SFC WINDS: 1 mps CROSS WIND ANGLE: None °

SFC TEMP: -4 °C TROP HEIGHT: 16.77 Km TROP TEMP: -65 °C

WEIGHTS AND INFLATIONS

BALLOON 499 LBS SCI LOAD 310 LBS NCAR INST 100 LBS

BALLAST 100 LBS (9 % GL) GROSS LOAD 1,062 LBS

FREE LIFT 106 LBS (10 % GL) GROSS LIFT 1168 LBS HE 20,560 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 53 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.56 mps 9Km TO 18Km 5.13 mps

18 Km TO CLG: 4.73 mps FLIGHT AVG 4.80 mps

MAX (1500 METER LAYER) 5.35 mps @ ALT 9.4 Km

PRESS FLOAT ALT: THEORETICAL: 4.76 Mb ACTUAL 4.63 Mb

TIME AT ALT: PLANNED: 5 HRS ACTUAL 5.2 HRS

RECOVERY: DATE: 4 March 1968 LOCATION: Marianna, Florida COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

MAR 14 1968

ION:

Scientist	A. L. Morris (Circulating)
Balloon Mfgr.	J. M. Shoemaker (2)
	K. H. Stefan (1)
	Operations

Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 384-P PLACE: Palestine, Texas DATE: 23 March 1968

NAME OF EXPERIMENTER: Dr. J. Strong LAUNCH TIME: ACTUAL: 0623.5 SCHED: 0630.0 CST

ORGANIZATION: U of Massachusetts SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: To measure far infrared from the sun - Normal ascent to 90,000 feet - Float six (6) hours- Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 304 P.O. #: 18319-68

MATERIAL AND GAUGE: 1.5 mil poly TYPE: SF-199.78-150-NS-13 VOLUME: 2.94 $\times 10^6 FT^3$

SPECIAL FEATURES: 650 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: Clear SFC WINDS: NW 2 mps CROSS WIND ANGLE: N/A °

SFC TEMP: -4 °C TROP HEIGHT: 18.62 Km TROP TEMP: -62 °C

WEIGHTS AND INFLATIONS

BALLOON 1132 LBS SCI LOAD 2370 LBS NCAR INST 122 LBS

BALLAST 200 LBS (4 % GL) GROSS LOAD 4014 LBS

FREE LIFT 321 LBS (8 % GL) GROSS LIFT 4335 LBS HE 76,304 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Barotransmitter-Photobarograph

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 100 FT
WEIGHT: 190 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 3.88 mps 9Km TO 18Km 3.97 mps
18 Km TO CLG: 5.34 mps FLIGHT AVG 3.64 mps

MAX (1500 METER LAYER) 5.38 mps @ ALT 10.66 Km

PRESS FLOAT ALT: THEORETICAL: 16.35 Mb ACTUAL 16.6 Mb

TIME AT ALT: PLANNED: 6 HRS ACTUAL 5.9 HRS

RECOVERY: DATE: 23 Mar. 68 LOCATION: Summit, Mississippi COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

TION:

:ientist	A. L. Morris (Circulating)
ılloon Mfgr.	J. M. Shoemaker (2)
	K. Stefan (1)
	Operations

: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 385-P PLACE: Palestine, Texas DATE: 14 March 1968

NAME OF EXPERIMENTER: Dr. J. J. Lord LAUNCH TIME: ACTUAL: 0650.9 SCHED: 0700.0 CST

ORGANIZATION: U of Washington SPONSOR: NSF

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Expose nuclear emulsion stack for A.L.A.P. at 100,000+ feet. Normal ascent - Float - Cutdown

SUCCESS:
FAILURE: X
BALLOON: X
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 224 P.O. #: Michigan

MATERIAL AND GAUGE: 1.0 mil poly TYPE: SF 199.78-100-NS-01 VOLUME: 2.94 $\times 10^6 FT^3$

SPECIAL FEATURES: 300 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 12,000 Scattered SFC WINDS: 4-6 mps CROSS WIND ANGLE: N/A °

SFC TEMP: 4 °C TROP HEIGHT: 17.1 Km TROP TEMP: -65 °C

WEIGHTS AND INFLATIONS

BALLOON 677 LBS SCI LOAD 680 LBS NCAR INST 80 LBS

BALLAST 100 LBS (6.1 % GL) GROSS LOAD 1622 LBS

FREE LIFT 162 LBS (10 % GL) GROSS LIFT 1784 LBS HE 31,392 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 85 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 2.79 mps 9Km TO 18Km 2.46 mps

18 Km TO CLG: 2.0 mps FLIGHT AVG 2.46 mps

MAX (1500 METER LAYER) 3.25 mps @ ALT 4.2 Km

PRESS FLOAT ALT: THEORETICAL: 7.1 Mb ACTUAL 7.1 Mb

TIME AT ALT: PLANNED: As long as possible HRS ACTUAL 3.71 (above 100,000 ft. HRS

RECOVERY: DATE: 14 March 1968 LOCATION: Selma, Alabama COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

MAR 22 1968

(Bal Ops 4 - 68)

ITION:

cientist	A. L. Morris (Circulating copy)
alloon Mfg.	J. M. Shoemaker (2)
	K. H. Stefan (2)
	Operations

S: Balloon ascended very slowly and then started a slow descent. Flight was terminated after balloon descended below 100,000 feet and all ballast had been expended.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 386-P PLACE: Palestine, Texas DATE: 24 March 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: D.A. Kniffen-C.E. Fichtel LAUNCH TIME: ACTUAL: 0128.8 SCHED: 0130.0 CST

ORGANIZATION: GSFC SPONSOR: ONR

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: A search for gamma-rays from Cygnus XR-1 - Normal ascent to 130,000 ft. +, float six (6) hours - Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 189 P.O. #: ONR

MATERIAL AND GAUGE: .7 mil poly TYPE: SF-305.86-070-NSC-05 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 200 lb. load tapes .7 mil cap extending 90 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: Clear SFC WINDS: SSE 5.5 mps CROSS WIND ANGLE: N/A °

SFC TEMP: 2 °C TROP HEIGHT: 16.18 Km TROP TEMP: -68 °C

WEIGHTS AND INFLATIONS

BALLOON 1277 LBS SCI LOAD 505 LBS NCAR INST 125 LBS

BALLAST 300 LBS (13 % GL) GROSS LOAD 2264 LBS

FREE LIFT 226 LBS (10 % GL) GROSS LIFT 2490 LBS HE 43,824 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Barotransmitter-Photobarograph

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 57 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.02 mps 9Km TO 18Km 5.14 mps

18 Km TO CLG: 3.49 mps FLIGHT AVG 4.06 mps

MAX (1500 METER LAYER) 5.84 mps @ ALT 10.97 Km

PRESS FLOAT ALT: THEORETICAL: 2.78 Mb ACTUAL 2.78 Mb

TIME AT ALT: PLANNED: 6 HRS ACTUAL 5.8 HRS

RECOVERY: DATE: 24 Mar. 68 LOCATION: Monroe, La. COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

ITION:

Scientist	A. L. Morris (Circulating)
Balloon Mfgr.	K. Stefan (1)
	J. M. Shoemaker (2)
	Operations

S: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 387-P PLACE: Palestine, Texas DATE: 5 April 1968

NAME OF EXPERIMENTER: D.A. Kniffen-C.E. Fichtel LAUNCH TIME: ACTUAL: 0059 SCHED: 0100 CST

ORGANIZATION: GSFC SPONSOR: ONR

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: A search for gamma-rays from Cygnus XR1 - Normal ascent to approximately 130,000 feet - Float six (6) hours - Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 187 P.O. #: ONR

MATERIAL AND GAUGE: .7 mil poly TYPE: SF-305.86-070-NSC-05 VOLUME: 10.6 $x10^6 FT^3$

SPECIAL FEATURES: 200 lb. load tapes .7 mil cap extending 90 ft. from apex.

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: Clear SFC WINDS: NE 2.5 mps CROSS WIND ANGLE: N/A °

SFC TEMP: 6 °C TROP HEIGHT: 18.26 Km TROP TEMP: -62 °C

WEIGHTS AND INFLATIONS

BALLOON 1287 LBS SCI LOAD 455 LBS NCAR INST 120 LBS

BALLAST 300 LBS (13 % GL) GROSS LOAD 2217 LBS

FREE LIFT 222 LBS (10 % GL) GROSS LIFT 2439 LBS HE 42928 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Barotransmitter-Photobarograph

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 55 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.92 mps 9Km TO 18Km 4.84 mps

18 Km TO CLG: 2.72 mps FLIGHT AVG 3.40 mps

MAX (1500 METER LAYER) 5.18 mps @ ALT 7 Km

PRESS FLOAT ALT: THEORETICAL: 2.75 Mb ACTUAL 3.1 Mb

TIME AT ALT: PLANNED: 6 HRS * ACTUAL 3.1 HRS

RECOVERY: DATE: 5 April 1968 LOCATION: Baton Rouge, La. COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

ION:

Scientists	A. L. Morris (circulating copy)
Balloon Mfr	K. Stefan (1)
	J. M. Shoemaker (2)
	Operations

*Flight terminated early after gondola failed.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 388-PT PLACE: Palestine, Texas DATE: 10 April 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. M. Schwarzschild LAUNCH TIME: ACTUAL: SCHED: Not Released

ORGANIZATION: Princeton University SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Check of electronics and antenna system-Balloon not to be released.

BALLOON DATA

MFG: GT. Schjeldahl Company SERIAL NO: N/A P.O. #: 13226-65

MATERIAL AND GAUGE: GT-12 TYPE: N/A VOLUME: .0253 $X10^6FT^3$

50 gauge laminated to Dacron scrim

SPECIAL FEATURES: No load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Static VEHICLE: Winch CREW: NCAR

CLOUDS: Clear SFC WINDS: 1.5 mps CROSS WIND ANGLE: N/A °

SFC TEMP: N/A °C TROP HEIGHT: N/A Km TROP TEMP: N/A °C

WEIGHTS AND INFLATIONS

BALLOON N/A LBS SCI LOAD N/A LBS NCAR INST N/A LBS

BALLAST N/A LBS (-- % GL) GROSS LOAD N/A LBS

FREE LIFT N/A LBS (-- % GL) GROSS LIFT 1500 LBS HE 26,400 FT^3 STP

SYSTEMS

ELECTRONICS: N/A

ALTITUDE SENSOR: N.A

SUSPENSION: N/A

SPECIAL RIGGING: N/A

PARACHUTE: None
TYPE:
DIAMETER: FT
WEIGHT: LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km N/A mps 9Km TO 18Km N/A mps

18 Km TO CLG: N/A mps FLIGHT AVG N/A mps

MAX (1500 METER LAYER) N/A mps @ ALT N/A Km

PRESS FLOAT ALT: THEORETICAL: N/A Mb ACTUAL N/A Mb

TIME AT ALT: PLANNED: N/A HRS ACTUAL N/A HRS

RECOVERY: DATE: 10 April 1968 LOCATION: NCAR Launch Pad COND: Good

REMARKS AND PROBLEMS: *Use Reverse Side*

(Bal Ops 4 - 68)

TION:

Scientist ✓	A.L.Morris (Circulating Copy) ✓
Balloon Mfr. ✓	K.Stefan (1) ✓
	J.M.Shoemaker (2) ✓
	Operations ✓

: Gas valved out and balloon recovered.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 389-P PLACE: Palestine, Texas DATE: 15 April 1968

NAME OF EXPERIMENTER: Dr. J. Lord & R. Gibbs LAUNCH TIME: ACTUAL: 1644 SCHED: 1630 CST

ORGANIZATION: U of Washington SPONSOR: NSF

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Expose nuclear emulsion stack for as long as possible at 100,000 + feet. Normal ascent, float-Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 305 P.O. #: 18319-68

MATERIAL AND GAUGE: 1.5 mil poly TYPE: SF 199.78-150-NS-13 VOLUME: 2.94 $\times 10^6 FT^3$

SPECIAL FEATURES: 650 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 1,000 Scattered SFC WINDS: 4.5 mps CROSS WIND ANGLE: N/A °

SFC TEMP: 25 °C TROP HEIGHT: 16.50 Km TROP TEMP: -68 °C

WEIGHTS AND INFLATIONS

BALLOON 1135 LBS SCI LOAD 755 LBS NCAR INST 74 LBS

BALLAST 300 LBS (12 % GL) GROSS LOAD 2356 LBS

FREE LIFT 235 LBS (10 % GL) GROSS LIFT 2591 LBS HE 45,600 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 92 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.50 mps 9Km TO 18Km 5.51 mps
18 Km TO CLG: 5.33 mps FLIGHT AVG 4.93 mps

MAX (1500 METER LAYER) 6.34 mps @ ALT 12.19 Km

PRESS FLOAT ALT: THEORETICAL: 10.6 Mb ACTUAL 10.6 Mb

TIME AT ALT: PLANNED: As long as possible HRS ACTUAL 18.8 HRS

RECOVERY: DATE: 16 April 1968 LOCATION: Jasper, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

Q.S.

TION:

Scientist	A.L.Morris (Circulating Copy)
Balloon Mfr.	K.Stefan (1)
	J.M.Shoemaker (2)
	Operations

: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 390-P PLACE: Palestine, Texas DATE: 24 April 1968

NAME OF EXPERIMENTER: Dr. W. Lewin LAUNCH TIME: ACTUAL: 1848.7 SCHED: 1900.0 CST

ORGANIZATION: MIT SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: To measure the x-ray flux from scorpio XR1 - Normal ascent to approximately 130,000 feet, float twelve (12) hours - Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 226 P.O. #: 19112-68

MATERIAL AND GAUGE: .7 mil poly TYPE: SF-305.86-070-NSC-02 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 200 lb. load tapes, 0.7 mil cap

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: Clear SFC WINDS: WNW-2 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +16 °C TROP HEIGHT: 18.26 Km TROP TEMP: -66 °C

WEIGHTS AND INFLATIONS

BALLOON 1200 LBS SCI LOAD 753 LBS NCAR INST 92 LBS

BALLAST 300 LBS (12 % GL) GROSS LOAD 2446 LBS

FREE LIFT 245 LBS (10 % GL) GROSS LIFT 2691 LBS HE 47,360 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 101 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 524 mps 9Km TO 18Km 4.35 mps

18 Km TO CLG: 3.04 mps FLIGHT AVG 3.66 mps

MAX (1500 METER LAYER) 6.25 mps @ ALT 10.67 Km

PRESS FLOAT ALT: THEORETICAL: 3.35 Mb ACTUAL 3.4 Mb

TIME AT ALT: PLANNED: 12 HRS ACTUAL 13.6 HRS

RECOVERY: DATE: 25 Apr. 1968 LOCATION: Mineola, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-26a.

DISTRIBUTION:

Scientist	A.L.Morris (circulating copy)
Balloon Mfr	K.Stefan (1)
NASA, Holtz	J.M.Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 391-P PLACE: Palestine, Texas DATE: 25 April 1968

NAME OF EXPERIMENTER: Dr. E.L. Chupp LAUNCH TIME: ACTUAL: 0157.0 SCHED: 0200.0 CST

ORGANIZATION: U of New Hampshire SPONSOR: NASA

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Monitoring high energy neutron spectrum >20 MEV - Normal ascent to approximately 125,000 feet- Float eight (8) hours - Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 36 P.O.#: 18477-68

MATERIAL AND GAUGE: .7 mil poly TYPE: SF-242.17-070-NS-03 VOLUME: 5.25 $x10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: Clear SFC WINDS: SW-4 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +9 °C TROP HEIGHT: 18.26 Km TROP TEMP: -68 °C

WEIGHTS AND INFLATIONS

BALLOON 686 LBS SCI LOAD 411 LBS NCAR INST 74 LBS

BALLAST 150 LBS (11 % GL) GROSS LOAD 1369 LBS

FREE LIFT 137 LBS (10 % GL) GROSS LIFT 1506 LBS HE 26,512 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 48 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.49 mps 9Km TO 18Km 5.49 mps
18 Km TO CLG: 3.75 mps FLIGHT AVG 4.39 mps

MAX (1500 METER LAYER) 6.06 mps @ ALT 1.5 Km

PRESS FLOAT ALT: THEORETICAL: ~~3.35~~ Mb ACTUAL ~~3.35~~ Mb

TIME AT ALT: PLANNED: 10 HRS ACTUAL 9.7 HRS

RECOVERY: DATE: 25 Apr. 1968 LOCATION: Cedar Hill, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

TION:

st	A.L.Morris (circulating copy)
Mfr.	K. Stefan (1)
oltz	J.M.Shoemaker (2)
	Operations

Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 392-P PLACE: Palestine, Texas DATE: 30 April 1968

NAME OF EXPERIMENTER: Dr. W.R. Webber LAUNCH TIME: ACTUAL: 0251 SCHED: 0300 CDT

ORGANIZATION: U of Minnesota SPONSOR: ONR-NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Normal ascent to approximately 125,000 feet - Float at altitude eight (8) hours - Cutdown. Study of x-rays from cygnus region of sky

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 18 P.O. #: 17672-68

MATERIAL AND GAUGE: .7 mil poly TYPE: SF-235.9-070-NS-01 VOLUME: 4.85 $\times 10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: Clear SFC WINDS: NNW-3 mps CROSS WIND ANGLE: N/a °

SFC TEMP: +8 °C TROP HEIGHT: 17.75 Km TROP TEMP: -66 °C

WEIGHTS AND INFLATIONS

BALLOON 685 LBS SCI LOAD 198 LBS NCAR INST 128 LBS

BALLAST 104 LBS (9 % GL) GROSS LOAD 1156 LBS

FREE LIFT 116 LBS (10 % GL) GROSS LIFT 1272 LBS HE 20,352 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 38 FT
WEIGHT: 41 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.11 mps 9Km TO 18Km 5.37 mps

18 Km TO CLG: 2.79 mps FLIGHT AVG 3.55 mps

MAX (1500 METER LAYER) 5.66 mps @ ALT 10.67 Km

PRESS FLOAT ALT: THEORETICAL: 3.22 Mb ACTUAL 3.55 Mb

TIME AT ALT: PLANNED: 8 HRS ACTUAL 11.7 HRS

RECOVERY: DATE: 30 April 1968 LOCATION: Okmulgee, Okla. COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

TION:

Scientist	A. L. Morris (circulating copy)
Balloon Mfr	K. Stefan
NASA, Holtz	J. M. Shoemaker (2)
	Operations

Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 393-P PLACE: Palestine, Texas DATE: 1 May 1968

NAME OF EXPERIMENTER: Dr. Overbeck LAUNCH TIME: ACTUAL: 0731 SCHED: 0730 CDT

ORGANIZATION: MIT SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Search for gamma rays from the reactions of nuclei on the sun and in stars - Normal ascent to approximately 120,000 feet - Float ten (10) hours - Cutdown

SUCCESS:
FAILURE: X
BALLOON: X
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Raven SERIAL NO: 145 P.O.#: 18752-68

MATERIAL AND GAUGE: .75 mil poly TYPE: 2323-545-8239 VOLUME: 5.0 $\times 10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: one

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: Clear SFC WINDS: SSW-3 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +11 °C TROP HEIGHT: 15.29 Km TROP TEMP: -58 °C

WEIGHTS AND INFLATIONS

BALLOON 648 LBS SCI LOAD 650 LBS NCAR INST 75 LBS

BALLAST 150 LBS (9 % GL) GROSS LOAD 1618 LBS

FREE LIFT 162 LBS (10 % GL) GROSS LIFT 1780 LBS HE 31,328 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 95 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.58 mps 9Km TO 18Km 6.06 mps

18 Km TO CLG: N/A mps FLIGHT AVG 5.82 mps (to 19.41 Km)

MAX (1500 METER LAYER) 6.27 mps @ ALT 7.75 Km

PRESS FLOAT ALT: THEORETICAL: 4.55 Mb ACTUAL None Mb

TIME AT ALT: PLANNED: 10 HRS ACTUAL *None HRS

RECOVERY: DATE: 1 May 1968 LOCATION: Mt. Enterprize, Tex. COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

TION:

Scientist	A. L. Morris (circulating copy)
Balloon Mfr	K. Stefan (2)
NASA, Holtz	J. M. Shoemaker (2)
	Operations

: Balloon burst at 63,800 feet.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 394-P PLACE: Palestine, Texas DATE: 5 May 1968

NAME OF EXPERIMENTER: Dr. Overbeck LAUNCH TIME: ACTUAL: 0641.0 SCHED: 0700.0 CDT

ORGANIZATION: MIT SPONSOR: NASA-185

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Search for gamma rays from the reactions of nuclei on the sun and stars - Normal ascent to approximately 120,000 feet - Float eight (8) hours - Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 13 P.O.#: 17502-68

MATERIAL AND GAUGE: .5 mil poly TYPE: SF 250.2-050-NSC-04 VOLUME: 6.0 $\times 10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: Clear SFC WINDS: SSE-4 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +13 °C TROP HEIGHT: 18.91 Km TROP TEMP: -67 °C

WEIGHTS AND INFLATIONS

BALLOON 674 LBS SCI LOAD 630 LBS NCAR INST 109 LBS

BALLAST 150 LBS (9 % GL) GROSS LOAD 1649 LBS

FREE LIFT 165 LBS (10 % GL) GROSS LIFT 1814 LBS HE 31,920 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 86 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.75 mps 9Km TO 18Km 4.65 mps

18Km TO CLG: 3.36 mps FLIGHT AVG 3.90 mps

MAX (1500 METER LAYER) 5.46 mps @ ALT 9.76 Km

PRESS FLOAT ALT: THEORETICAL: 3.8 Mb ACTUAL 4.2 Mb

TIME AT ALT: PLANNED: 8 HRS ACTUAL 8.3 HRS

RECOVERY: DATE: 5 May 1968 LOCATION: Arkadelphia, Ark. COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

TION:

Scientist	A. L. Morris (circulating copy)
Balloon Mfr.	K. Stefan
NASA, Holtz	J. M. Shoemaker (2)
	Operations

Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 395-P PLACE: Palestine, Texas DATE: 19 May 1968

NAME OF EXPERIMENTER: Dr. K. Anderson LAUNCH TIME: ACTUAL: 2052.8 SCHED: 2100.0 CDT

ORGANIZATION: U of California SPONSOR: NSF

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Engineering evaluation of stabilized platform, cosmic ray background counter. Normal ascent to approximately 125,000 feet - Float ten (10) hours - Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 207 P.O. #: 18530-68

MATERIAL AND GAUGE: .7 mil poly TYPE: SF 305.86-070-NSC-02 VOLUME: 10.6 $\times 10^6$ FT^3

SPECIAL FEATURES: .7 mil cap extending 90 ft. from apex - 200 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: 8,000 scattered SFC WINDS: ENE-5 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +18 °C TROP HEIGHT: 15.23 Km TROP TEMP: -66 °C

WEIGHTS AND INFLATIONS

BALLOON 1196 LBS SCI LOAD 738 LBS NCAR INST 95 LBS

BALLAST 200 LBS (8 % GL) GROSS LOAD 2322 LBS

FREE LIFT 232 LBS (10 % GL) GROSS LIFT 2554 LBS HE 44,944 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 93 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.81 mps 9Km TO 18Km 4.58 mps

18 Km TO CLG: 3.07 mps FLIGHT AVG 3.66 mps

MAX (1500 METER LAYER) 5.07 mps @ ALT 9.76 Km

PRESS FLOAT ALT: THEORETICAL: 3.25 Mb ACTUAL 3.55 Mb

TIME AT ALT: PLANNED: 10 HRS ACTUAL 11.6 HRS

RECOVERY: DATE: 20 May 1968 LOCATION: San Angelo, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

ION:

cientist	A. L. Morris (circulating copy)
alloon Mfr.	K. Stefan
	J. M. Shoemaker (2)
	Operations

Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 396-PT PLACE: Palestine, Texas DATE: 20 May 1968

NAME OF EXPERIMENTER: Karl Stefan-Dr. Cooper LAUNCH TIME: ACTUAL: 0735.6 SCHED: 0730.0 CDT

ORGANIZATION: NCAR-Raven SPONSOR: NCAR

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Evaluation flight of Raven 9.0×10^6 capped balloon. Normal ascent-float at approximately 128,000 feet for two (2) hours - Cutdown

BALLOON DATA

MFG: Raven SERIAL NO: 165 P.O. #: 18552

MATERIAL AND GAUGE: .75 mil poly TYPE: 2323C-545-8291 VOLUME: 9.0 $\times 10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes - .75 mil cap extending 90 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: Clear SFC WINDS: ESE-4 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +14 °C TROP HEIGHT: 15.23 Km TROP TEMP: -66 °C

WEIGHTS AND INFLATIONS

BALLOON 1150 LBS SCI LOAD 575 LBS NCAR INST 75 LBS

BALLAST 300 LBS (13 % GL) GROSS LOAD 2185 LBS

FREE LIFT 218 LBS (10 % GL) GROSS LIFT 2403 LBS HE 42,288 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter-Rosemount

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 85 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.68 mps 9Km TO 18Km 5.84 mps
18 Km TO CLG: 4.23 mps FLIGHT AVG 4.83 mps

MAX (1500 METER LAYER) 6.23 mps @ ALT 7.94 Km

PRESS FLOAT ALT: THEORETICAL: 3.4 Mb ACTUAL 3.4 Mb

TIME AT ALT: PLANNED: 2 HRS ACTUAL 1.7 HRS

RECOVERY: DATE: 20 May 1968 LOCATION: Neches, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

TION:

Scientist	A. L. Morris (circulating copy)
Balloon Mfr.	K. Stefan
	J. M. Shoemaker (2)
	Operations

: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 397-P PLACE: Palestine, Texas DATE: 21 May 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. L. Peterson LAUNCH TIME: ACTUAL: 2020.5 SCHED: 2000.0 CDT

ORGANIZATION: UCSD SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: X-ray telescope to measure energy spectrum of Scorpius XR1 - Normal launch and ascent to approximately 130,000 feet - Float ten (10) hours - Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 184 P.O. #: 17807-68

MATERIAL AND GAUGE: .5 mil poly TYPE: SF-305.86-050-NSC-11 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes - .7 mil cap extending 90 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: One*

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: 1,000 Scattered SFC WINDS: SSW3.5mps CROSS WIND ANGLE: N/A °

SFC TEMP: +22 °C TROP HEIGHT: 15.23 Km TROP TEMP: -67 °C

WEIGHTS AND INFLATIONS

BALLOON 986 LBS SCI LOAD 495 LBS NCAR INST 95 LBS

BALLAST 300 LBS (15 % GL) GROSS LOAD 1942 LBS

FREE LIFT 194 LBS (10 % GL) GROSS LIFT 2136 LBS HE 37,600 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 66 LBS

FLIGHT CONDUCT

ASCENT RATE: * SFC TO 9Km N/A mps 9Km TO 18Km N/A mps
18 Km TO CLG: N/A mps FLIGHT AVG 3.88 mps

MAX (1500 METER LAYER) 5.46 mps @ ALT 10.65 Km

PRESS FLOAT ALT: THEORETICAL: 2.65 Mb ACTUAL 2.55 Mb

TIME AT ALT: PLANNED: 10 HRS ACTUAL 11.8 HRS

RECOVERY: DATE: 22 May 1968 LOCATION: Eden, Texas COND: Fair

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

ION:

Scientist	A. L. Morris (circulating copy)
Balloon Mfg.	K. Stefan
NASA (Holtz)	J. M. Shoemaker (2)
	Operations

*1. A patch put on at the factory stuck to another gore and when separated made another hole which was patched before launch. Balloon performed satisfactorily.

*2. Beacon stopped seconds before launch.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 398-P PLACE: Palestine, Texas DATE: 24 May 1968

NAME OF EXPERIMENTER: Dr. J. Klarmann LAUNCH TIME: ACTUAL: 2008.3 SCHED: 2000.0 CDT

ORGANIZATION: Washington University SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Investigation of trans-iron elements in the cosmic radiation-Normal ascent to 120,000 feet-Float as long as possible-Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 235 P.O. #: 19119-68

MATERIAL AND GAUGE: .7 mil poly TYPE: SF-305.86-070-NSC-09 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 300 lb. load tapes - .7 mil cap extending 100 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: 5,000 scattered SFC WINDS: SSE-3 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +26 °C TROP HEIGHT: 15.23 Km TROP TEMP: -64 °C

WEIGHTS AND INFLATIONS

BALLOON 1227 LBS SCI LOAD 610 LBS NCAR INST 142 LBS

BALLAST 300 LBS (12 % GL) GROSS LOAD 2384 LBS

FREE LIFT 238 LBS (10 % GL) GROSS LIFT 2622 LBS HE 46,144 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 105 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.55 mps 9Km TO 18Km 4.23 mps
18 Km TO CLG: 2.82 mps FLIGHT AVG 3.38 mps

MAX (1500 METER LAYER) 5.07 mps @ ALT 9.76 Km

PRESS FLOAT ALT: THEORETICAL: 3.3 Mb ACTUAL 3.36 Mb

TIME AT ALT: * PLANNED: 40 HRS ACTUAL 14.2 HRS

RECOVERY: DATE: 25 May 1968 LOCATION: Fabens, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

TION:

:ientist	A. L. Morris (circulating copy)
ılloon Mfg.	K. Stefan
ıSA (Holtz)	J. M. Shoemaker (2)
	Operations

: *Forty (40) hours desirable, but fourteen (14) hours considered a successful flight.

Early termination due to trajectory toward Mexico. Parachute did not immediately collapse and package dragged causing damage to gondola framework.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 399-P PLACE: Palestine, Texas DATE: 29 May 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Mr. George Chapman LAUNCH TIME: ACTUAL: 0022.8 SCHED: 2400.0 CDT

ORGANIZATION: Oak Ridge National Lab. SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: To measure gamma rays at altitudes above 115,000 feet. Normal ascent to 120,000 feet-Float ten (10) hours - Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 227 P.O. #: 19112-68

MATERIAL AND GAUGE: .7 mil poly TYPE: SF305.86-070-NSC-02 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 200 lb. load tapes - .7 mil cap extending90feet from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: Clear SFC WINDS: Calm mps CROSS WIND ANGLE: N/A °

SFC TEMP: +15 °C TROP HEIGHT: 15.29 Km TROP TEMP: -63 °C

WEIGHTS AND INFLATIONS

BALLOON 1206 LBS SCI LOAD 1015 LBS NCAR INST 95 LBS

BALLAST 200 LBS (8 % GL) GROSS LOAD 2600 LBS

FREE LIFT 260 LBS (10 % GL) GROSS LIFT 2860 LBS HE 50,336 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 84 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.77 mps 9Km TO 18Km 4.47 mps

18 Km TO CLG: 2.70 mps FLIGHT AVG 3.53 mps

MAX (1500 METER LAYER) 5.07 mps @ ALT 9.76 Km

PRESS FLOAT ALT: THEORETICAL: 3.56 Mb ACTUAL 3.65 Mb

TIME AT ALT: PLANNED: 10 HRS ACTUAL 9.4 HRS

RECOVERY: DATE: 29 May 1968 LOCATION: Midland, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

0.5

TION:

ientist	A. L. Morris (circulating copy)
lloon Mfg.	K. Stefan
SA (J. Holtz)	J. M. Shoemaker (2)
	Operations

Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 400-P PLACE: Palestine, Texas DATE: 29 May 1968

NAME OF EXPERIMENTER: Dr. J. Lord LAUNCH TIME: ACTUAL: 1949 SCHED: 2000 CDT

ORGANIZATION: U of Washington SPONSOR: NSF

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Expose nuclear emulsion stack for as long as possible at 100,000 + feet. Normal ascent, float as long as possible - Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 37 P.O. #: 19352-68

MATERIAL AND GAUGE: 1.5 mil poly TYPE: SF 192.4-150-NS-01 VOLUME: 2.90 $\times 10^6 FT^3$

SPECIAL FEATURES: 300 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: Clear SFC WINDS: SSW-6 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +27 °C TROP HEIGHT: 15.23 Km TROP TEMP: -67 °C

WEIGHTS AND INFLATIONS

BALLOON 908 LBS SCI LOAD 775 LBS NCAR INST 95 LBS

BALLAST 250 LBS (11 % GL) GROSS LOAD 2108 LBS

FREE LIFT 210 LBS (10 % GL) GROSS LIFT 2318 LBS HE 40,784 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 80 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.13 mps 9Km TO 18Km 4.63 mps

18 Km TO CLG: 3.09 mps FLIGHT AVG 3.90 mps

MAX (1500 METER LAYER) 5.18 mps @ ALT 1.52 Km

PRESS FLOAT ALT: THEORETICAL: 9.1 Mb ACTUAL 9.4 Mb

TIME AT ALT: PLANNED: ALAP HRS ACTUAL 16.6 HRS

RECOVERY: DATE: 30 May 1968 LOCATION: Sierra Blance, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

TION:

Scientist	A. L. Morris (Circulating Copy)
Balloon Mfg.	K. Stefan
	J. Shoemaker (2)
	Operations

: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 401-P PLACE: Palestine, Texas DATE: 4 June 1968

SUCCESS:
FAILURE: X
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC: X

NAME OF EXPERIMENTER: Dr. J. W. Overbeck LAUNCH TIME: ACTUAL: 1907.3 SCHED: 1900.0 CDT

ORGANIZATION: MIT SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Sodium iodide crystal detector -Normal launch and ascent to approximately 125,000 feet-Float ten (10) hours-Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 232 P.O. #: 19119-68

MATERIAL AND GAUGE: .7 mil poly TYPE: SF 305.86-070-NSC-09 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 300 lbs. load tapes - .7 mil cap extending 100 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 4,000 scattered SFC WINDS: SSW-2 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +25 °C TROP HEIGHT: 15.23 Km TROP TEMP: -61 °C

WEIGHTS AND INFLATIONS

BALLOON 1215 LBS SCI LOAD 630 LBS NCAR INST 90 LBS

BALLAST 300 LBS (12 % GL) GROSS LOAD 2327 LBS

FREE LIFT 233 LBS (10 % GL) GROSS LIFT 2560 LBS HE 45,056 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 92 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.13 mps 9Km TO 18Km 4.99 mps

18 Km TO CLG: 2.54 mps FLIGHT AVG 3.31 mps

MAX (1500 METER LAYER) 5.63 mps @ ALT 10.67 Km

PRESS FLOAT ALT: THEORETICAL: 3.2 Mb ACTUAL 3.3 Mb

TIME AT ALT: PLANNED: 10 HRS * ACTUAL 6.8 HRS

RECOVERY: DATE: 5 June 1968 LOCATION: Rankin, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

ION:

Scientist	A. L. Morris (circulating copy)
Balloon Mfg.	K. Stefan (2)
NASA (Holtz)	J. M. Shoemaker (2)
	Operations

*Premature cutdown (due to safety timer set improperly) gave scientist approximately seven (7) hours at altitude of a possible nine (9) hour hour float. (Trajectory and velocity would have necessitated early termination near Mexican border.)

Excellent scientific data recorded during flight and all major objectives achieved. Scientifically the flight was a success.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 402-P PLACE: Palestine, Texas DATE: 6 June 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. J. Lord LAUNCH TIME: ACTUAL: 2041.5 SCHED: 2030.0 CDT

ORGANIZATION: U of Washington SPONSOR: NSF

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Expose nuclear emulsion stack for as long as possible at 100,000 + feet - Normal ascent- Float as long as possible - Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 38 P.O.#: 19352-68

MATERIAL AND GAUGE: 1.5 mil poly TYPE: SF-192.4-150-NS-01 VOLUME: 2.90 $\times 10^6 FT^3$

SPECIAL FEATURES: 300 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 1,000 Scattered SFC WINDS: SSE-4 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +25 °C TROP HEIGHT: 15.87 Km TROP TEMP: -68 °C

WEIGHTS AND INFLATIONS

BALLOON 881 LBS SCI LOAD 780 LBS NCAR INST 77 LBS

BALLAST 200 LBS (10 % GL) GROSS LOAD 2038 LBS

FREE LIFT 203 LBS (10 % GL) GROSS LIFT 2241 LBS HE 39,440 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 100 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.04 mps 9Km TO 18Km 4.79 mps

18 Km TO CLG: 3.77 mps FLIGHT AVG 4.04 mps

MAX (1500 METER LAYER) 5.51 mps @ ALT 9.76 Km

PRESS FLOAT ALT: THEORETICAL: 8.85 Mb ACTUAL 8.95 Mb

TIME AT ALT: PLANNED: ALAP HRS ACTUAL 16.9 HRS

RECOVERY: DATE: 7 June 1968 LOCATION: Artesia, New Mexico COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

ION:

Scientist	A. L. Morris (circulating copy)
Balloon Mfg.	K. Stefan
	J. M. Shoemaker (2)
	Operations

Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 403-P PLACE: Palestine, Texas DATE: 9 June 1968

NAME OF EXPERIMENTER: Dr. C.L. Hemenway LAUNCH TIME: ACTUAL: 0645.0 SCHED: 0700.0 CDT

ORGANIZATION: Dudley Observatory SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Test dust collector with aluminum pellets. Launch, collect particles on ascent to float altitude. No float-cutdown

SUCCESS:
FAILURE: X
BALLOON:
OPERATIONS: X
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 75 P.O.#: 18533-68

MATERIAL AND GAUGE: 1 mil poly TYPE: SF-150-100-NS-06 VOLUME: 1.25 $\times 10^6$ FT^3

SPECIAL FEATURES: 100 lb. load tapes - No lubricants on balloon

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 3,000 scattered SFC WINDS: S-3 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +26 °C TROP HEIGHT: 15.4 Km TROP TEMP: -71 °C

WEIGHTS AND INFLATIONS

BALLOON 414 LBS SCI LOAD 50 LBS NCAR INST 88 LBS

BALLAST 80 LBS (12 % GL) GROSS LOAD 664 LBS

FREE LIFT 66 LBS (10 % GL) GROSS LIFT 730 LBS HE 12,848 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat canopy
DIAMETER: 24 FT
WEIGHT: 32 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km N/A mps 9Km TO 18Km N/A mps

18 Km TO CLG: N/A mps FLIGHT AVG N/A mps

MAX (1500 METER LAYER) N/A mps @ ALT N/A Km

PRESS FLOAT ALT: THEORETICAL: 7.1 Mb *ACTUAL None Mb

TIME AT ALT: PLANNED: None HRS ACTUAL None HRS

RECOVERY: DATE: 9 June 1968 LOCATION: Palestine Airport COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

ION:

Scientist	Alvin L. Morris (Circulating copy)
Balloon Mfg.	Karl H. Stefan (2)
NASA (Holtz)	James Shoemaker (2)
	Operations

The instrument load on top of the balloon caught in the cleft of the balloon during erection of the bubble. The instrument load popped back into position during inflation. After release the balloon rose only a few feet and drifted into nearby trees. The top payload was released and recovered without damage. Inspection of the balloon revealed some V shaped tears in the vicinity of the top payload position.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 404-P PLACE: Palestine, Texas DATE: 9 June 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. L. Peterson LAUNCH TIME: ACTUAL: 1847.3 SCHED: 1830.0 CDT

ORGANIZATION: UCSD SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: High energy resolution X-ray telescope to observe Cygnus X-1 and Crab nebula. Normal launch- Float at approximately 127,000 feet for ten (10) hours - Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 17 P.O. #: 18317-68

MATERIAL AND GAUGE: .5 mil poly TYPE: SF-250.2-050-NSC-04 VOLUME: 6.0 $\times 10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: Clear SFC WINDS S-3-4 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +31 °C TROP HEIGHT: 15.4 Km TROP TEMP: -70 °C

WEIGHTS AND INFLATIONS

BALLOON 665 LBS SCI LOAD 500 LBS NCAR INST 111 LBS

BALLAST 200 LBS (13 % GL) GROSS LOAD 1536 LBS

FREE LIFT 153 LBS (10 % GL) GROSS LIFT 1689 LBS HE 29,728 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 60 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.32 mps 9Km TO 18Km 5.55 mps
18Km TO CLG: 5.41 mps FLIGHT AVG 5.44 mps

MAX (1500 METER LAYER) 6.11 mps @ ALT 14.04 Km

PRESS FLOAT ALT: THEORETICAL: 3.42 Mb ACTUAL 3.23 Mb

TIME AT ALT: PLANNED: 10 HRS ACTUAL 10.7 HRS

RECOVERY: DATE 10 June 1968 LOCATION: Marfa, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

ION:

Scientist	Alvin L. Morris (Circulating copy)
Balloon Mfg.	Karl H. Stefan
NASA (Holtz)	James Shoemaker (2)
	Operations

Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

- FLIGHT NO: 405-P
- PLACE: Palestine, Texas
- DATE: 11 June 1968
- SUCCESS: X
- FAILURE:
- BALLOON:
- OPERATIONS:
- MECH:
- WX:
- ELEC:
- NAME OF EXPERIMENTER: Dr. C.L. Hemenway
- LAUNCH TIME: ACTUAL: 0626.4 SCHED: 0630.0 CDT
- ORGANIZATION: Dudley Observatory
- SPONSOR: NASA
- DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Test of meteoric dust collector, Normal ascent to 110,000 feet, open collector box on ascent, close at ceiling and cutdown

BALLOON DATA

- MFG: Winzen
- SERIAL NO: 74
- P.O. #: 18533-68
- MATERIAL AND GAUGE: 1 mil poly
- TYPE: SF-150-100-NS-06
- VOLUME: 1.25 $\times 10^6 FT^3$
- SPECIAL FEATURES: 100 lb. load tapes - No lubricants on balloon
- CONDITION OF BALLOON: Good
- PATCHES REQUIRED: None

LAUNCH DATA

- METHOD: Dynamic
- VEHICLE: M-54 truck
- CREW: NCAR
- CLOUDS: 1000 Scattered
- SFC WINDS: SW-3 mps
- CROSS WIND ANGLE: N/A °
- SFC TEMP: +23 °C
- TROP HEIGHT: 15.3 Km
- TROP TEMP: -68 °C

WEIGHTS AND INFLATIONS

- BALLOON 414 LBS
- SCI LOAD 50 LBS
- NCAR INST 86 LBS
- BALLAST 85 LBS (12 % GL)
- GROSS LOAD 667 LBS
- FREE LIFT 66 LBS (10 % GL)
- GROSS LIFT 733 LBS
- HE 12,896 FT^3 STP

SYSTEMS

- ELECTRONICS: Primary
- ALTITUDE SENSOR: Photobarograph-Barotransmitter
- SUSPENSION: Rigid
- SPECIAL RIGGING: None
- PARACHUTE:
  - TYPE: Flat Canopy
  - DIAMETER: 24 FT
  - WEIGHT: 32 LBS

FLIGHT CONDUCT

- ASCENT RATE: SFC TO 9Km 4.44 mps; 9Km TO 18Km 5.34 mps
- 18 Km TO CLG: 5.15 mps; FLIGHT AVG 4.97 mps
- MAX (1500 METER LAYER) 5.88 mps @ ALT 23.04 Km
- PRESS FLOAT ALT: THEORETICAL: 7.4 Mb; ACTUAL 7.3 Mb
- TIME AT ALT: PLANNED: .5 HRS; ACTUAL .7 HRS
- RECOVERY: DATE: 11 June 1968 LOCATION: Poynor, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

'ION:

Scientist	A.L.Morris (Circulating Copy)
Balloon Mfr.	K.Stefan (1)
NASA, Holtz	J.M.Shoemaker (2)
	Operations

Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 406-P PLACE: Palestine, Texas DATE: 27 June 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. A. Barrett LAUNCH TIME: ACTUAL: 0617.8 SCHED: 0630.0

ORGANIZATION: MIT SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Measure micro-wave emission of molecular oxygen in the earth's atmosphere.
Normal launch, ascent to 118,000 feet, float six (6) hours - Cutdown

BALLOON DATA

MFG: Raven SERIAL NO: 143 P.O. #: 18752-68

MATERIAL AND GAUGE: .75 mil poly TYPE: 2323-545-8239 VOLUME: 5.0 $\times 10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 1,000 scattered SFC WINDS: SE-3 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +14 °C TROP HEIGHT: 15.75 Km TROP TEMP: -69 °C

WEIGHTS AND INFLATIONS

BALLOON 653 LBS SCI LOAD 450 LBS NCAR INST 68 LBS

BALLAST 142 LBS (10 % GL) GROSS LOAD 1371 LBS

FREE LIFT 137 LBS (10 % GL) GROSS LIFT 1508 LBS HE 26,554 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter-Rosemount

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 58 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.99 mps 9Km TO 18Km 5.53 mps
18 Km TO CLG: 4.95 mps FLIGHT AVG 5.10 mps

MAX (1500 METER LAYER) 5.93 mps @ ALT 10.67 Km

PRESS FLOAT ALT: THEORETICAL: 4.05 Mb ACTUAL 4.4 Mb

TIME AT ALT: PLANNED: 6 HRS ACTUAL 6.9 HRS

RECOVERY: DATE: 27 June 1968 LOCATION: Ozona, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

TION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Mfg.	Karl Stefan
NASA (Holtz)	James Shoemaker (2)
	Operations

: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 407-P PLACE: Palestine, Texas DATE: 27 June 1968

NAME OF EXPERIMENTER: Dr. L. Peterson LAUNCH TIME: ACTUAL: 1829.1 SCHED: 1830.0

ORGANIZATION: UCSD SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: High energy resolution X-ray telescope to observe cygnus XR1, serpent, cygnus- Normal launch-float as long as possible - Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 185 P.O. #: 17807-68

MATERIAL AND GAUGE: .5 mil poly TYPE: SF-305.86-050-NSC-11 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes - .7 mil cap extending 90 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: Clear SFC WINDS: SSW-2 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +29 °C TROP HEIGHT: 15.57 Km TROP TEMP: -68 °C

WEIGHTS AND INFLATIONS

BALLOON 994 LBS SCI LOAD 498 LBS NCAR INST 107 LBS

BALLAST 300 LBS (15 % GL) GROSS LOAD 1962 LBS

FREE LIFT 196 LBS (10 % GL) GROSS LIFT 2158 LBS HE 37,984 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Rosemount-Baro-transmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 63 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.85 mps 9Km TO 18Km 5.43 mps
18 Km TO CLG: 4.54 mps FLIGHT AVG 4.78 mps

MAX (1500 METER LAYER) 5.80 mps @ ALT 13.86 Km

PRESS FLOAT ALT: THEORETICAL: 2.73 Mb ACTUAL 2.8 Mb

TIME AT ALT: PLANNED: 8+ HRS ACTUAL 8 HRS

RECOVERY: DATE: 28 June 1968 LOCATION: Van Horn, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

'ION:

Scientist	Alvin L. Morris (Circulating copy)
Balloon Mfg.	Karl Stefan
NASA (Holtz)	James Shoemaker (2)
	Operations

Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 408-P PLACE: Palestine, Texas DATE: 5 July 1968

NAME OF EXPERIMENTER: Dr. A. Barrett LAUNCH TIME: ACTUAL: 0638 SCHED: 0630

ORGANIZATION: MIT SPONSOR: NASA

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Measure micro-wave emission of moelcular oxygen in the earth's atmosphere. Normal launch, ascent to approximately 118,000 feet, float five (5) hours - Cutdown

BALLOON DATA

MFG: Raven SERIAL NO: 144 P.O. #: 18752-68

MATERIAL AND GAUGE: .75 mil poly TYPE: 2323-545-8239 VOLUME: 5.0 $\times 10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 1,000 scattered SFC WINDS: E-3 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +15 °C TROP HEIGHT: 15.23 Km TROP TEMP: -71 °C

WEIGHTS AND INFLATIONS

BALLOON 643 LBS SCI LOAD 453 LBS NCAR INST 75 LBS

BALLAST 452 LBS (25 % GL) GROSS LOAD 1711 LBS

FREE LIFT 171 LBS (10 % GL) GROSS LIFT 1882 LBS HE 33,120 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 88 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.16 mps 9Km TO 18Km 5.53 mps

18 Km TO CLG: 4.47 mps FLIGHT AVG 4.90 mps

MAX (1500 METER LAYER) 5.72 mps @ ALT 10.87 Km

PRESS FLOAT ALT: THEORETICAL: 5.0 Mb ACTUAL 5.2 Mb

TIME AT ALT: PLANNED: 5 HRS ACTUAL 5.4 HRS

RECOVERY: DATE: 5 July 1968 LOCATION: Big Lake, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-44a.

DISTRIBUTION:

Scientist	Alvin L. Morris (Circulating copy)
Balloon Mfg.	Karl Stefan
NASA (Holtz)	Jim Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 409-P PLACE: Palestine, Texas DATE: 11 July 1968

NAME OF EXPERIMENTER: Shaw-Riccio LAUNCH TIME: ACTUAL: 0152 SCHED: 0130

ORGANIZATION: JPL SPONSOR: JPL

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: To determine temperature profile from cloud tops to 4 mb. - Normal launch and ascent to 125,000+ feet - Float six (6) hours - Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 208 P.O.#: 18535-68

MATERIAL AND GAUGE: .7 mil poly TYPE: SF305.86-070-NSC-02 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 200 lb. load tapes - .7 mil cap extending 90 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: Clear SFC WINDS: SSW 1.5 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +21 °C TROP HEIGHT: 15.29 Km TROP TEMP: -67 °C

WEIGHTS AND INFLATIONS

BALLOON 1207 LBS SCI LOAD 970 LBS NCAR INST 82 LBS

BALLAST 300 LBS (11 % GL) GROSS LOAD 2651 LBS

FREE LIFT 265 LBS (10 % GL) GROSS LIFT 2916 LBS HE 51,328 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-barotransmitter-Rosemount

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 92 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.99 mps 9Km TO 18Km 4.66 mps

18 Km TO CLG: 3.62 mps FLIGHT AVG 4.08 mps

MAX (1500 METER LAYER) 5.67 mps @ ALT 10.14 Km

PRESS FLOAT ALT: THEORETICAL: 3.55 Mb ACTUAL 3.6 Mb

TIME AT ALT: PLANNED: 6 HRS ACTUAL 6 HRS

RECOVERY: DATE: 11 July 68 LOCATION: Marfa, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-45a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Mfg.	Karl Stefan
	James Shoemaker (2)
	Operations

REMARKS:

Successful Flight
Terminated early to avoid Mexico

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 410-P. PLACE: Palestine, Texas DATE: 16 July 1968

NAME OF EXPERIMENTER: Mr. Frank Floyd LAUNCH TIME: ACTUAL: 1934 SCHED: 1930

ORGANIZATION: MIT SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: High angular resolution X-ray telescope-Normal launch, ascent to 125,000 feet - Float ten (10) hours - Cutdown

SUCCESS:
FAILURE: X
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC: X

BALLOON DATA

MFG: Winzen SERIAL NO: 230 P.O.#: 19119-68

MATERIAL AND GAUGE: .7 mil poly TYPE: SF305.86-070-NSC-09 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 300 lb. load tapes - .7 mil cap extending 90 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: 1000 scattered SFC WINDS: S-2 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +29 °C TROP HEIGHT: 13.44 Km TROP TEMP: -68 °C

WEIGHTS AND INFLATIONS

BALLOON 1219 LBS SCI LOAD 755 LBS NCAR INST 116 LBS

BALLAST 300 LBS (12 % GL) GROSS LOAD 2485 LBS

FREE LIFT 248 LBS (10 % GL) GROSS LIFT 2733 LBS HE 48,096 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 95 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.13 mps 9Km TO 18Km 5.02 mps

18 Km TO CLG: 3.46 mps FLIGHT AVG 4.10 mps

MAX (1500 METER LAYER) 6.01 mps @ ALT 10.54 Km

PRESS FLOAT ALT: THEORETICAL: 3.34 Mb ACTUAL 3.33 Mb

TIME AT ALT: PLANNED: 10 HRS ACTUAL 6.9 HRS

RECOVERY: DATE: 17 July 1968 LOCATION: Sierra Blanca, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-46a.

DISTRIBUTION:

Scientist	A. L. Morris (Circulating copy)
Balloon Mfg.	Karl Stefan (2)
NASA (Holtz)	Jim Shoemaker (2)
	Operations

REMARKS: PCM command failure precluded completion of scientific experiment. Trajectory towards Mexico also cut flight short.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 411-P PLACE: Palestine, Texas DATE: 18 July 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. G. Frye LAUNCH TIME: ACTUAL: 0614 SCHED: 0600

ORGANIZATION: Case Institute of Tech. SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Measure high energy neutrons produced during solar flares at the sun. Normal launch and ascent to 110,000 feet - Float eight (8) hours - Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 218 P.O. #: Case

MATERIAL AND GAUGE: .7 mil poly TYPE: SF 199.78-070-NS-04 VOLUME: 2.94 $\times 10^6 FT^3$

SPECIAL FEATURES: 200 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 1,000 scattered SFC WINDS: S-2 mps CROSS WIND ANGLE: N/A °

SFC TEMP: ±22 °C TROP HEIGHT: 15.42 Km TROP TEMP: -70 °C

WEIGHTS AND INFLATIONS

BALLOON 443 LBS SCI LOAD 470 LBS NCAR INST 126 LBS

BALLAST 150 LBS (12 % GL) GROSS LOAD 1249 LBS

FREE LIFT 125 LBS (10 % GL) GROSS LIFT 1374 LBS HE 24,176 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter-Rosemount

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 60 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 3.75 mps 9Km TO 18Km 4.0 mps

18 Km TO CLG: 3.75 mps FLIGHT AVG 3.72 mps

MAX (1500 METER LAYER) 5.07 mps @ ALT 13.44 Km

PRESS FLOAT ALT: THEORETICAL: 5.7 Mb ACTUAL 5.8 Mb

TIME AT ALT: PLANNED: 8 HRS ACTUAL 7.2 HRS

RECOVERY: DATE: 18 July 1968 LOCATION: Van Horn, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-47a.

DISTRIBUTION:

Scientist	Alvin L. Morris (Circulating Copy)
Balloon Mfg.	Karl Stefan
NASA (Holtz)	Jim Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 412-P PLACE: Palestine, Texas DATE: 19 July 1968

NAME OF EXPERIMENTER: Dr. Fred Mainschein LAUNCH TIME: ACTUAL: 0629 SCHED: 0630

ORGANIZATION: Oak Ridge Natl. Lab. SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Neutron spectrometer - Normal launch and float 100,000 feet + for eight (8) hours - Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 48 P.O. #: 19518-68

MATERIAL AND GAUGE: 1.5 mil poly TYPE: SF-192.4-150-NS-01 VOLUME: 2.90 $\times 10^6 FT^3$

SPECIAL FEATURES: 300 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 10,000 scattered SFC WINDS: S-1 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +22 °C TROP HEIGHT: 48 Km TROP TEMP: -72 °C

WEIGHTS AND INFLATIONS

BALLOON 899 LBS SCI LOAD 720 LBS NCAR INST 101 LBS

BALLAST 150 LBS (7 % GL) GROSS LOAD 1960 LBS

FREE LIFT 196 LBS (10 % GL) GROSS LIFT 2156 LBS HE 37,952 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: rigid

SPECIAL RIGGING: none

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 90 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.86 mps 9Km TO 18Km 5.22 mps

18 Km TO CLG: 4.60 mps FLIGHT AVG 4.84 mps

MAX (1500 METER LAYER) 6.11 mps @ ALT 13.44 Km

PRESS FLOAT ALT: THEORETICAL: 8.55 Mb ACTUAL 8.35 Mb

TIME AT ALT: PLANNED: 8 HRS *ACTUAL 3.1 HRS

RECOVERY: DATE: 19 July 1968 LOCATION: Bronte, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-48a.

DISTRIBUTION:

Scientist	Alvin L. Morris (Circulating Copy)
Balloon Mfg.	Karl Stefan
NASA (Holtz)	Jim Shoemaker (2)
	Operations

REMARKS: *Scientist asked to terminate flight early due to excessive heat build-up in his gondola.

Operationally successful and considerable scientific and engineering data was obtained.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 413-P PLACE: Palestine, Texas DATE: 22 July 1968

NAME OF EXPERIMENTER: Dr. Wm. Hoffmann LAUNCH TIME: ACTUAL: 2147 SCHED: 2000

ORGANIZATION: Institute for Space Studies SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Sky survey at 300 microns and 80 microns - Normal launch and ascent to 90,000 feet-Float ten (10) hours - Cutdown

SUCCESS:
FAILURE: X
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC: X

BALLOON DATA

MFG: Raven SERIAL NO: 175 P.O. #: 19416-68

MATERIAL AND GAUGE: .75 mil poly TYPE: 2323-545-397 VOLUME: .36 $\times 10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: none

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 8000 scattered SFC WINDS: SE-4 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +25 °C TROP HEIGHT: 14.81 Km TROP TEMP: -70 °C

WEIGHTS AND INFLATIONS

BALLOON 129 LBS SCI LOAD 169 LBS NCAR INST 80 LBS

BALLAST 75 LBS (15 % GL) GROSS LOAD 499 LBS

FREE LIFT 50 LBS (10 % GL) GROSS LIFT 549 LBS HE 9,664 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 38 FT
WEIGHT: 46 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.28 mps 9Km TO 18Km 5.04 mps

18 Km TO CLG: 3.95 mps FLIGHT AVG 4.37 mps

MAX (1500 METER LAYER) 5.10 mps @ ALT 10.67 Km

PRESS FLOAT ALT: THEORETICAL: 16.8 Mb ACTUAL 17.35 Mb

TIME AT ALT: PLANNED: 10 HRS * ACTUAL 2.3 HRS

RECOVERY: DATE: 23 July 1968 LOCATION: Hamilton, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

B-49a.

DISTRIBUTION:

Scientist	A. L. Morris (Circulating copy)
Balloon Mfg.	Karl Stefan (2)
NASA (Holtz)	Jim Shoemaker (2)
	Operations

REMARKS: *Bad reed in command receiver inadvertently terminated flight early.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 414-P PLACE: Palestine, Texas DATE: 24 July 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. G. Frye LAUNCH TIME: ACTUAL: 0656 SCHED: 0700

ORGANIZATION: Case Institute SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: To measure high energy neutron albedo flux from 130,000 feet in the atmosphere to 50,000 feet. Normal launch and ascent to approximately 130,000 feet, float one (1) hour, valve down to 50,000 feet, cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 271 P.O. #: Frye

MATERIAL AND GAUGE: .7 mil poly TYPE: SF305.86-070-NSC-10 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes - .7 mil cap extending 90 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 6000 scattered SFC WINDS: SSW-2 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +22 °C TROP HEIGHT: 15.29 Km TROP TEMP: -72 °C

WEIGHTS AND INFLATIONS

BALLOON 1213 LBS SCI LOAD 495 LBS NCAR INST 166 LBS

BALLAST 350 LBS (15 % GL) GROSS LOAD 2286 LBS

FREE LIFT 228 LBS (10 % GL) GROSS LIFT 2514 LBS HE 44,240 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter-Rosemount

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 62 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.94 mps 9Km TO 18Km 5.39 mps

18 Km TO CLG: 4.02 mps FLIGHT AVG 3.72 mps

MAX (1500 METER LAYER) 6.03 mps @ ALT 13.73 Km

PRESS FLOAT ALT: THEORETICAL: 3.06 Mb ACTUAL 3.12 Mb

TIME AT ALT: PLANNED: 1 HRS ACTUAL 1.4 HRS

RECOVERY: DATE: 24 July 1968 LOCATION: Kermit, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-50a.

DISTRIBUTION:

Scientist	A. L. Morris (Circulating Copy)
Balloon Mfg.	Karl Stefan
NASA (Holtz)	Jim Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 415-P PLACE: Palestine, Texas DATE: 25 July 1968

NAME OF EXPERIMENTER: Dr. Wm. Hoffmann LAUNCH TIME: ACTUAL: 2218 SCHED: 2230

ORGANIZATION: Institute for Space Studies SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Sky survey at 300 microns and 80 microns - Normal launch and float approximately 90,000 feet for eight (8) hours - Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Raven SERIAL NO: 170 P.O. #: --

MATERIAL AND GAUGE: .75 mil Poly TYPE: 2333-545-397 VOLUME: .360 $\times 10^6 FT^3$

SPECIAL FEATURES: None

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 1,000 scattered SFC WINDS: S-5 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +26 °C TROP HEIGHT: 15.29 Km TROP TEMP: -70 °C

WEIGHTS AND INFLATIONS

BALLOON 108 LBS SCI LOAD 200 LBS NCAR INST 71 LBS

BALLAST 70 LBS (14 % GL) GROSS LOAD 497 LBS

FREE LIFT 50 LBS (10 % GL) GROSS LIFT 547 LBS HE 9,632 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 38 FT
WEIGHT: 48 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.71 mps 9Km TO 18Km 5.91 mps

18 Km TO CLG: 5.27 mps FLIGHT AVG 5.23 mps

MAX (1500 METER LAYER) 6.04 mps @ ALT 13.73 Km

PRESS FLOAT ALT: THEORETICAL: 17.5 Mb ACTUAL 17.5 Mb

TIME AT ALT: PLANNED: 8 HRS ACTUAL 10.5 HRS

RECOVERY: DATE: 26 July 1968 LOCATION: Kermit, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-51a.

DISTRIBUTION:

Scientist	Alvin L. Morris (Circulating Copy)
Balloon Mfg.	Karl Stefan
NASA (Holtz)	Jim Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 416-P PLACE: Palestine, Texas DATE: 29 July 1968

NAME OF EXPERIMENTER: Dr. J. Lord LAUNCH TIME: ACTUAL: 2006 SCHED: 2000

ORGANIZATION: U of Washington SPONSOR: NSF

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Nuclear emulsion stack- Normal launch and ascent to 100,000 feet + - Float ten (10) hours- Cutdown

SUCCESS:
FAILURE: X
BALLOON:
OPERATIONS:
MECH:
WX: X
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 47 P.O. #: 19518-68

MATERIAL AND GAUGE: 1.5 mil poly TYPE: SF192.4-150-NS-01 VOLUME: 2.90 $\times 10^6$ FT^3

SPECIAL FEATURES: 300 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 12,000 scattered SFC WINDS: SSE-2 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +26 °C TROP HEIGHT: 15.30 Km TROP TEMP: -70.7 °C

WEIGHTS AND INFLATIONS

BALLOON 892 LBS SCI LOAD 780 LBS NCAR INST 105 LBS

BALLAST 150 LBS (7 % GL) GROSS LOAD 2017 LBS

FREE LIFT 202 LBS (10 % GL) GROSS LIFT 2219 LBS HE 39,056 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 90 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.13 mps 9Km TO 18Km 4.87 mps

18 Km TO CLG: 3.23 mps FLIGHT AVG 3.97 mps

MAX (1500 METER LAYER) 5.92 mps @ ALT 11.59 Km

PRESS FLOAT ALT: THEORETICAL: 8.85 Mb ACTUAL 9.0 Mb

TIME AT ALT: PLANNED: 10 HRS * ACTUAL 5.1 HRS

RECOVERY: DATE: 30 July 1968 LOCATION: Ft. Stockton, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-52a.

DISTRIBUTION:

Scientist	Alvin L. Morris (Circulating Copy)
Balloon Mfg.	Karl Stefan (2)
	Jim Shoemaker (2)
	Operations

REMARKS: *Flight terminated early to avoid Mexico

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 417-P PLACE: Palestine, Texas DATE: 30 July 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. Wm. Hoffmann LAUNCH TIME: ACTUAL: 2024.8 SCHED: 2030.0

ORGANIZATION: Institute for Space Studies SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Measure extended emission from inter-stellar material in spectral region 60-150 microns- Normal launch and ascent to 90,000 feet - Float ten (10) hours - Cutdown

BALLOON DATA

MFG: Raven SERIAL NO: 176 P.O. #: 19416-68

MATERIAL AND GAUGE: .75 mil poly TYPE: 2323-545-397 VOLUME: .360 $\times 10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 3,000 scattered SFC WINDS: SSE-4-5 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +29 °C TROP HEIGHT: 16.1 Km TROP TEMP: -69 °C

WEIGHTS AND INFLATIONS

BALLOON 126 LBS SCI LOAD 130 LBS NCAR INST 120 LBS

BALLAST 70 LBS (14 % GL) GROSS LOAD 491 LBS

FREE LIFT 49 LBS (10 % GL) GROSS LIFT 540 LBS HE 9,504 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 38 FT
WEIGHT: 45 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.59 mps 9Km TO 18Km 5.45 mps
18 Km TO CLG: 4.86 mps FLIGHT AVG 4.96 mps

MAX (1500 METER LAYER) 5.84 mps @ ALT 10.67 Km

PRESS FLOAT ALT: THEORETICAL: 17.2 Mb ACTUAL 17.35 Mb

TIME AT ALT: PLANNED: 10 HRS ACTUAL 11.3 HRS

RECOVERY: DATE: 31 July 1968 LOCATION: Van Horn, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-53a.

DISTRIBUTION:

Scientist	Alvin L. Morris (Circulating Copy)
Balloon Mfg.	Karl Stefan
NASA (Holtz)	Jim Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 418-P PLACE: Palestine, Texas DATE: 2 August 1968

NAME OF EXPERIMENTER: Dr. J. Lord LAUNCH TIME: ACTUAL: 1938 SCHED: 1930

ORGANIZATION: U of Washington SPONSOR: NSF

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Nuclear emulsion stack- Normal launch and ascent to 100,000 + feet, float 15 hours- Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 49 P.O. #: 19788-68

MATERIAL AND GAUGE: 1.5 mil poly TYPE: SF-192.4-150-NS-01 VOLUME: 2.90 $\times 10^6 FT^3$

SPECIAL FEATURES: 300 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: Clear SFC WINDS: S-3 mps CROSS WIND ANGLE: N/A °

SFC TEMP: ±30 °C TROP HEIGHT: 15.29 Km TROP TEMP: -70 °C

WEIGHTS AND INFLATIONS

BALLOON 871 LBS SCI LOAD 780 LBS NCAR INST 85 LBS

BALLAST 150 LBS (7 % GL) GROSS LOAD 1978 LBS

FREE LIFT 198 LBS (10 % GL) GROSS LIFT 2176 LBS HE 38,304 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 92 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.80 mps 9Km TO 18Km 4.42 mps
18 Km TO CLG: 3.23 mps FLIGHT AVG 3.93 mps

MAX (1500 METER LAYER) 5.15 mps @ ALT 13.73 Km

PRESS FLOAT ALT: THEORETICAL: 8.85 Mb ACTUAL 9.0 Mb

TIME AT ALT: PLANNED: 15 HRS ACTUAL 16.7 HRS

RECOVERY: DATE: 3 Aug. 1968 LOCATION: Tucson, Arizona COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-54a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Mfg.	Karl H. Stefan
	Jim Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 419-P PLACE: Palestine, Texas DATE: 3 August 1968

NAME OF EXPERIMENTER: Dr. J. Klarmann LAUNCH TIME: ACTUAL: 0628 SCHED: 0630

ORGANIZATION: Washington University SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Measure cosmic radiation-Normal ascent and float 120,000 + feet-Float eight (8) hours - Cutdown

SUCCESS: X

FAILURE:

BALLOON:

OPERATIONS:

MECH:

WX:

ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 6 P.O.#: 12327-65

MATERIAL AND GAUGE: .7 mil poly TYPE: SF-217.5-070-NS-01 VOLUME: 4.0 $\times 10^6 FT^3$

SPECIAL FEATURES: 100 lbs. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: Clear SFC WINDS: SSW-2 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +21 °C TROP HEIGHT: 15.29 Km TROP TEMP: -69 °C

WEIGHTS AND INFLATIONS

BALLOON 592 LBS SCI LOAD 227 LBS NCAR INST 132 LBS

BALLAST 100 LBS (9 % GL) GROSS LOAD 1088 LBS

FREE LIFT 109 LBS (10 % GL) GROSS LIFT 1197 LBS HE 21,072 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-barotransmitter-Rosemount

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 38 FT
WEIGHT: 37 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.76 mps 9Km TO 18Km 5.18 mps

18 Km TO CLG: 4.83 mps FLIGHT AVG 4.87 mps

MAX (1500 METER LAYER) 5.50 mps @ ALT 13.73 Km

PRESS FLOAT ALT: THEORETICAL: 3.27 Mb ACTUAL 3.30 Mb

TIME AT ALT: PLANNED: 7 HRS ACTUAL 7.7 HRS

RECOVERY: DATE: 3 Aug. 1968 LOCATION: Fabens, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-55a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Mfg.	Karl H. Stefan
NASA (Holtz)	Jim Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 420-P PLACE: Palestine, Texas DATE: 6 August 1968

NAME OF EXPERIMENTER: Dr. G. Frye LAUNCH TIME: ACTUAL: 0558 SCHED: 0600

ORGANIZATION: Case Western Reserve U SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: To measure direction and intensity of cosmic gamma radiation-Normal ascent-Float approximately 125,000 feet for eight (8) hours-Cutdown

SUCCESS:
FAILURE: X
BALLOON: X
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 177 P.O. #: 17503-68

MATERIAL AND GAUGE: .5 mil poly TYPE: SF-305.86-050-NSC-11 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: Clear SFC WINDS: S-2 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +21 °C TROP HEIGHT: 15.43 Km TROP TEMP: -69 °C

WEIGHTS AND INFLATIONS

BALLOON 1013 LBS SCI LOAD 435 LBS NCAR INST 135 LBS

BALLAST 300 LBS (15 % GL) GROSS LOAD 1941 LBS

FREE LIFT 194 LBS (10 % GL) GROSS LIFT 2135 LBS HE 37,584 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter-Rosemount

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 58 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.62 mps 9Km TO 18Km 4.89 mps

18 Km TO CLG: 1.85 mps FLIGHT AVG 2.95 mps

MAX (1500 METER LAYER) 6.29 mps @ ALT 13.73 Km

PRESS FLOAT ALT: THEORETICAL: 3.0 Mb ACTUAL 12.75 Mb

TIME AT ALT: PLANNED: 8 HRS *ACTUAL 4.3 HRS

RECOVERY: DATE: 6 Aug. 1968 LOCATION: Roscoe, Texas COND: Good

REMARKS AND PROBLEMS: *Use Reverse Side*

(Bal Ops 4 - 68)

B-56a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Mfg.	Karl H. Stefan (2)
NASA (Holtz)	Jim Shoemaker (2)
	Operations

REMARKS: Balloon ascended at 906 feet per minute to 60,000 feet from 60,000 to 97,000 was 363 feet per minute. (All ballast was used driving balloon to 97,000 feet) Balloon descended to 85,000 feet where the flight was terminated.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 421-P PLACE: Palestine, Texas DATE: 13 August 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. Hemenway LAUNCH TIME: ACTUAL: 0544 SCHED: 0600

ORGANIZATION: Dudley Observatory SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Collect micro-meteoric dust particles-Normal launch and ascent to 100,000 + feet-Float one (1) hour-cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 77 P.O. #: 19998-69

MATERIAL AND GAUGE: 1.0 mil poly TYPE: SF-150-100-NS-06 VOLUME: 1.25 $\times 10^6$ FT^3

SPECIAL FEATURES: 100 lb. load tapes - No lubricants on balloon

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 10,000 scattered SFC WINDS: SSW-4 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +25 °C TROP HEIGHT: 15.29 Km TROP TEMP: -70 °C

WEIGHTS AND INFLATIONS

BALLOON 415 LBS SCI LOAD 64 LBS NCAR INST 95 LBS

BALLAST 100 LBS (14 % GL) GROSS LOAD 710 LBS

FREE LIFT 71 LBS (10 % GL) GROSS LIFT 781 LBS HE 13,744 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: Scientific pkg. on top of balloon

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 24 FT
WEIGHT: 36 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.38 mps 9Km TO 18Km 5.28 mps
18 Km TO CLG: 4.94 mps FLIGHT AVG 4.84 mps

MAX (1500 METER LAYER) 5.77 mps @ ALT 26.16 Km

PRESS FLOAT ALT: THEORETICAL: 7.6 Mb ACTUAL 7.4 Mb

TIME AT ALT: PLANNED: .5 HRS ACTUAL .5 HRS

RECOVERY: DATE: 13 Aug. 1968 LOCATION: Corsicana, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-57a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Mfg.	Karl H. Stefan
NASA (Holtz)	Jim Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 422-P PLACE: Palestine, Texas DATE: 17 August 1968

NAME OF EXPERIMENTER: Dr. G. Frye LAUNCH TIME: ACTUAL: 0649 SCHED: 0700

ORGANIZATION: Case Western Reserve U SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: To measure low energy gamma rays with spark chamber-Normal launch and ascent to 130,000 feet, float eight (8) hours-Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 231 P.O. #: 19119-68

MATERIAL AND GAUGE: .7 mil poly TYPE: SF-305.86-070-NSC-09 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 300 lb. load tapes - .7 mil cap extending 100 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: Clear SFC WINDS: S-3 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +22 °C TROP HEIGHT: 17.75 Km TROP TEMP: -70 °C

WEIGHTS AND INFLATIONS

BALLOON 1199 LBS SCI LOAD 460 LBS NCAR INST 138 LBS

BALLAST 200 LBS (9 % GL) GROSS LOAD 2057 LBS

FREE LIFT 206 LBS (10 % GL) GROSS LIFT 2263 LBS HE 39,824 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter-Rosemount

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 60 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9 Km 5.22 mps 9 Km TO 18 Km 5.84 mps

18 Km TO CLG: 4.52 mps FLIGHT AVG 4.90 mps

MAX (1500 METER LAYER) 5.95 mps @ ALT 10.73 Km

PRESS FLOAT ALT: THEORETICAL: 2.78 Mb ACTUAL 2.82 Mb

TIME AT ALT: PLANNED: 8 HRS * ACTUAL 5 HRS

RECOVERY: DATE: 17 Aug. 1968 LOCATION: Hobbs, New Mexico COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-58a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Mfg.	K.H. Stefan
NASA (Holtz)	J. M. Shoemaker (2)
	Operations

REMARKS: *Scientist requested termination as his film had been expended early due to higher than expected counting rate.

Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 423-P PLACE: Palestine, Texas DATE: 17 August 1968

SUCCESS: X

FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Mr. D. Pierson LAUNCH TIME: ACTUAL: 2237 SCHED:

ORGANIZATION Manned Space Flight Center SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Test launch method and system function

BALLOON DATA

MFG: SERIAL NO: P.O. #:

MATERIAL AND GAUGE: TYPE: VOLUME: $X10^6FT^3$

SPECIAL FEATURES: No balloon data

CONDITION OF BALLOON: PATCHES REQUIRED:

LAUNCH DATA

METHOD: N/A VEHICLE: N/A CREW: NASA

CLOUDS: N/A SFC WINDS: N/A mps CROSS WIND ANGLE: N/A °

SFC TEMP: N/A °C TROP HEIGHT: 17.75 Km TROP TEMP: -70 °C

WEIGHTS AND INFLATIONS

BALLOON N/A LBS SCI LOAD N/A LBS NCAR INST 37 LBS

BALLAST N/A LBS (% GL) GROSS LOAD 140 LBS

FREE LIFT 14 LBS (10 % GL) GROSS LIFT 154 LBS HE 2,704 FT^3 STP

SYSTEMS

ELECTRONICS: N/A

ALTITUDE SENSOR: N/A

SUSPENSION:

SPECIAL RIGGING: N/A

PARACHUTE:
TYPE:
DIAMETER: N/A FT
WEIGHT: LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9 Km N/A mps 9 Km TO 18 Km N/A mps

18 Km TO CLG: N/A mps FLIGHT AVG mps

MAX (1500 METER LAYER) N/A mps @ ALT N/A Km

PRESS FLOAT ALT: THEORETICAL: N/A Mb ACTUAL 13.1 Mb

TIME AT ALT: PLANNED: 1+ HRS ACTUAL 1.5 HRS

RECOVERY: DATE: 17 Aug 1968 LOCATION: Corsicana, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

B-59a.

DISTRIBUTION:

Alvin L. Morris (circulating copy)

Karl Stefan

James M. Shoemaker (2)

Operations

REMARKS: They provided launch crew and balloon and back-up timer - we contributed command term and helium.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 424-P PLACE: Palestine, Texas DATE: 21 August 1968

NAME OF EXPERIMENTER: Dr. J. Lord LAUNCH TIME: ACTUAL: 2004 SCHED: 2000

ORGANIZATION: U of Washington SPONSOR: NSF

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Nuclear emulsion stack-Normal launch and float 100,000 + feet, as long as possible-Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 50 P.O.#: 19788-68

MATERIAL AND GAUGE: 1.5 mil poly TYPE: SF-192.4-150-NS-01 VOLUME: 2.90 $\times 10^6 FT^3$

SPECIAL FEATURES: 300 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 3,000 scattered SFC WINDS: SSE-3 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +27 °C TROP HEIGHT: 15.23 Km TROP TEMP: -73 °C

WEIGHTS AND INFLATIONS

BALLOON 870 LBS SCI LOAD 780 LBS NCAR INST 127 LBS

BALLAST 200 LBS (9 % GL) GROSS LOAD 2072 LBS

FREE LIFT 207 LBS (10 % GL) GROSS LIFT 2279 LBS HE 40,112 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 95 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.96 mps 9Km TO 18Km 4.82 mps

18 Km TO CLG: 3.42 mps FLIGHT AVG 4.11 mps

MAX (1500 METER LAYER) 6.16 mps @ ALT 14.7 Km

PRESS FLOAT ALT: THEORETICAL: 9.1 Mb ACTUAL 9.2 Mb

TIME AT ALT: PLANNED: 20 HRS ACTUAL 20.6 HRS

RECOVERY: DATE: 22 Aug. 68 LOCATION: Prescott, Arizona COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

B-60a.

DISTRIBUTION:

Scientist	Alvin L. Morris (Circulating copy)
Balloon Mfg.	K. Stefan
	J. Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 425-P PLACE: Palestine, Texas DATE: 26 August 1968

NAME OF EXPERIMENTER: G. Hilton-A.L. Morris LAUNCH TIME: ACTUAL: 0711 SCHED: 0700

ORGANIZATION: GSFC-NCAR SPONSOR: GSFC and NCAR

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: OPLE position and location experiment with the ATS-3 satellite-Normal launch and ascent to approximately 70,000 feet-Float ten (10) hours - Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Raven SERIAL NO: 171 P.O. #: Nimbus B

MATERIAL AND GAUGE: 1.5 mil poly TYPE: 2323-356-397 VOLUME: .36 $\times 10^6 FT^3$

SPECIAL FEATURES: 300 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: Clear SFC WINDS: SE-2 mps CROSS WIND ANGLE: N/a °

SFC TEMP: +22 °C TROP HEIGHT: 14.66 Km TROP TEMP: -66.4 °C

WEIGHTS AND INFLATIONS

BALLOON 242 LBS SCI LOAD 865 LBS NCAR INST 53 LBS

BALLAST 75 LBS (5 % GL) GROSS LOAD 1337 LBS

FREE LIFT 134 LBS (10 % GL) GROSS LIFT 1471 LBS HE 25,888 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 102 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 3.97 mps 9Km TO 18Km 5.71 mps
18 Km TO CLG: 2.58 mps FLIGHT AVG 4.27 mps

MAX (1500 METER LAYER) 5.92 mps @ ALT 10.05 Km

PRESS FLOAT ALT: THEORETICAL: 44.8 Mb ACTUAL 45.0 Mb

TIME AT ALT: PLANNED: 10 HRS ACTUAL 8.9 HRS

RECOVERY: DATE: 26 August 68 LOCATION: Coleman, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-61a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Mfg.	Karl Stefan
	Jim Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 426-P PLACE: Palestine, Texas DATE: 29 August 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. J. Lord LAUNCH TIME: ACTUAL: 1958 SCHED: 2000

ORGANIZATION: University of Washington SPONSOR: NSF

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Expose neclear emulsion stack-Normal launch and ascent to 100,000+feet-Float twenty (20) hours-Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 52 P.O. #: 19788-68

MATERIAL AND GAUGE: 1.5 mil poly TYPE: SF-192.4-150-NS-01 VOLUME: 2.90 $\times 10^6 FT^3$

SPECIAL FEATURES: 300 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 1,000 scattered SFC WINDS: E-3 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +25 °C TROP HEIGHT: 15.35 Km TROP TEMP: -72 °C

WEIGHTS AND INFLATIONS

BALLOON 897 LBS SCI LOAD 780 LBS NCAR INST 89 LBS

BALLAST 200 LBS (9 % GL) GROSS LOAD 2056 LBS

FREE LIFT 205 LBS (10 % GL) GROSS LIFT 2261 LBS HE 39,792 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 90 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.31 mps 9Km TO 18Km 5.13 mps

18 Km TO CLG: 2.81 mps FLIGHT AVG 4.09 mps

MAX (1500 METER LAYER) 6.46 mps @ ALT 11.2 Km

PRESS FLOAT ALT: THEORETICAL: 9.2 Mb ACTUAL 9.3 Mb

TIME AT ALT: PLANNED: 20 HRS ACTUAL 19.33 HRS

RECOVERY: DATE: 30 August 68 LOCATION: Truth or Consequences, New Mexico COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

B-62a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Mfg.	Karl Stefan
	Jim Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 427-P PLACE: Palestine, Texas DATE: 4 September 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. R. Haymes LAUNCH TIME: ACTUAL: 0711 SCHED: 0700

ORGANIZATION: Rice University SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Engineering evaluation of gamma-ray monitoring equipment-Normal launch and ascent to 75,000 + feet-Float four (4) hours-Cutdown

BALLOON DATA

MFG: Raven SERIAL NO: 342 P.O. #: 17052-67

MATERIAL AND GAUGE: 1.0 mil poly TYPE: 2323-356-258 VOLUME: .080 $\times 10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 1000 Scattered SFC WINDS: S-4.5 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +24 °C TROP HEIGHT: 14.76 Km TROP TEMP: -72 °C

WEIGHTS AND INFLATIONS

BALLOON 65 LBS SCI LOAD 7 LBS NCAR INST 82 LBS

BALLAST 50 LBS (22 % GL) GROSS LOAD 227 LBS

FREE LIFT 28 LBS (12 % GL) GROSS LIFT 255 LBS HE 4,496 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: ~~Photobarograph-~~ Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 24 FT
WEIGHT: 23 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.52 mps 9Km TO 18Km 5.71 mps
18 Km TO CLG: 2.87 mps FLIGHT AVG 4.25 mps

MAX (1500 METER LAYER) 6.07 mps @ ALT 9.96 Km

PRESS FLOAT ALT: THEORETICAL: 30.5 Mb ACTUAL 31.3 Mb

TIME AT ALT: PLANNED: 4 HRS ACTUAL 5.6 HRS

RECOVERY: DATE: 4 Sept. 68 LOCATION: Midlothian, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

94

B-63a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Mfg.	Karl Stefan
NASA (Holtz)	Jim Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 428-P PLACE: Palestine, Texas DATE: 7 September 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. J. Lockwood LAUNCH TIME: ACTUAL: 0518 SCHED: 0500

ORGANIZATION: U of New Hampshire SPONSOR: NASA-185

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: To measure gamma rays and neutrons. Normal launch and ascent to approximately 115,000 feet- Float eight (8) hours - Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 306 P.O. #: 18318-68

MATERIAL AND GAUGE: .7 mil poly TYPE: SF-199.78-070-NS-07 VOLUME: 2.94 $\times 10^6 FT^3$

SPECIAL FEATURES: 200 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: 10,000 Scattered SFC WINDS: SE-2 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +16 °C TROP HEIGHT: 14.66 Km TROP TEMP: -69 °C

WEIGHTS AND INFLATIONS

BALLOON 492 LBS SCI LOAD 377 LBS NCAR INST 96 LBS

BALLAST 150 LBS (12 % GL) GROSS LOAD 1173 LBS

FREE LIFT 117 LBS (10 % GL) GROSS LIFT 1290 LBS HE 22,704 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 58 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.63 mps 9Km TO 18Km 4.79 mps
18 Km TO CLG: 4.58 mps FLIGHT AVG 4.64 mps

MAX (1500 METER LAYER) 5.07 mps @ ALT 10.67 Km

PRESS FLOAT ALT: THEORETICAL: 5.6 Mb ACTUAL 5.6 Mb

TIME AT ALT: PLANNED: 8 HRS ACTUAL 8.6 HRS

RECOVERY: DATE: 7 Sept. 1968 LOCATION: Big Springs, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-64a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Mfg.	Karl Stefan
NASA (Holtz)	Jim Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 429-P PLACE: Palestine, TExas DATE: 17 Sept. 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. David Ramsden LAUNCH TIME: ACTUAL: 2030 SCHED: 2000

ORGANIZATION: U of Southampton, England SPONSOR: Science Research Council

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Search for gamma rays with sensitive telescope using spark chamber-Normal launch and ascent to approximately 115,000 feet - Float eight (8) hours - Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 234 P.O.#: 19119-68

MATERIAL AND GAUGE: .7 mil poly TYPE: SF-305.86-070-NSC-09 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 300 lb. load tapes - .7 mil cap extending 100 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: Clear SFC WINDS: NW-1 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +15 °C TROP HEIGHT: 15.87 Km TROP TEMP: -70 °C

WEIGHTS AND INFLATIONS

BALLOON 1219 LBS SCI LOAD 1760 LBS NCAR INST 100 LBS

BALLAST 300 LBS (9 % GL) GROSS LOAD 3574 LBS

FREE LIFT 357 LBS (10 % GL) GROSS LIFT 3931 LBS HE 69,184 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter-Rosemount

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 100 FT
WEIGHT: 195 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.63 mps 9Km TO 18Km 3.37 mps

18Km TO CLG: 3.00 mps FLIGHT AVG 3.35 mps

MAX (1500 METER LAYER) 4.71 mps @ ALT 7.62 Km

PRESS FLOAT ALT: THEORETICAL: 4.49 Mb ACTUAL 4.69 Mb

TIME AT ALT: PLANNED: 8 HRS ACTUAL 7.8 HRS

RECOVERY: DATE: 18 Sept. 68 LOCATION: San Angelo, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-65a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Mfg.	Karl Stefan
NASA (Holtz)	Jim Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 430-P PLACE: Palestine, Texas DATE: 18 Sept. 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. Albert Gaide LAUNCH TIME: ACTUAL: 2311 SCHED: 2300

ORGANIZATION: Observatory of Geneva SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Observe Orion and Gemini in low resolution photographic spectro-photometry-Normal launch and ascent to 130,000 feet - Float Five (5) hours - Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 206 P.O. #: 18530-68

MATERIAL AND GAUGE: .7 mil poly TYPE: SF305.86-070-NSC-02 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 200 lb. load tapes - .7 mil cap extending 90 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: Clear SFC WINDS: S-2 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +17 °C TROP HEIGHT: 15.57 Km TROP TEMP: -66 °C

WEIGHTS AND INFLATIONS

BALLOON 1206 LBS SCI LOAD 498 LBS NCAR INST 75 LBS

BALLAST 200 LBS (10 % GL) GROSS LOAD 2047 LBS

FREE LIFT 205 LBS (10 % GL) GROSS LIFT 2252 LBS HE 39,632 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 68 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.11 mps 9Km TO 18Km 4.92 mps

18 Km TO CLG: 3.23 mps FLIGHT AVG 3.86 mps

MAX (1500 METER LAYER) 5.63 mps @ ALT 10.41 Km

PRESS FLOAT ALT: THEORETICAL: 2.78 Mb ACTUAL 2.80 Mb

TIME AT ALT: PLANNED: 5 HRS ACTUAL 5.5 HRS

RECOVERY: DATE: 19 Sept. 68 LOCATION: Frankston, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-66a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Mfg.	Karl Stefan
NASA (Holtz)	Jim Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 431-P PLACE: Palestine, Texas DATE: 19 Sept. 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. Klarmann-Walker LAUNCH TIME: ACTUAL: 1952 SCHED: 2000

ORGANIZATION: Washington University SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Expose nuclear emulsions and plastics in search for cosmic rays-Normal ascent to approximately 125,000 feet-Float forty (40) hours-Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 228 P.O. #: 19112-68

MATERIAL AND GAUGE: .7 mil poly TYPE: SF305.86-070-NSC-02 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 200 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: Clear SFC WINDS: S-3 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +21 °C TROP HEIGHT: 15.29 Km TROP TEMP: -67 °C

WEIGHTS AND INFLATIONS

BALLOON 1190 LBS SCI LOAD 935 LBS NCAR INST 180 LBS

BALLAST 400 LBS (14 % GL) GROSS LOAD 2810 LBS

FREE LIFT 280 LBS (10 % GL) GROSS LIFT 3090 LBS HE 54,384 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 105 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.24 mps 9Km TO 18Km 4.06 mps
18Km TO CLG: 3.27 mps FLIGHT AVG 3.62 mps

MAX (1500 METER LAYER) 4.76 mps @ ALT 6.1 Km

PRESS FLOAT ALT: THEORETICAL: 3.27 Mb ACTUAL 3.16 Mb

TIME AT ALT: PLANNED: 40 HRS ACTUAL 39.7 HRS

RECOVERY: DATE: 21 Sept. 68 LOCATION: Tucumcari, New Mexico COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

B-67a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Mfg.	K. Stefan
NASA (Holtz)	J. Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 432-P PLACE: Palestine, Texas DATE: 22 Sept. 1968

NAME OF EXPERIMENTER: Dr. P. Fowler LAUNCH TIME: ACTUAL: 1921 SCHED: 1930

ORGANIZATION: U of Bristol SPONSOR: NASA-Bristol

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Nuclear emulsion + plastics in search for cosmic rays heavier than iron-Normal launch and ascent to 130,000 feet (+)-Float forty (40) hours - Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 1 P.O. #: 20093-69

MATERIAL AND GAUGE: .6 mil poly TYPE: SF-334.85-060-NSC-01 VOLUME: 15.0 $x10^6 FT^3$

SPECIAL FEATURES: 200 lb. load tapes-.8 mil cap extending 120 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: 5000 Scattered SFC WINDS: SSE-3 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +25 °C TROP HEIGHT: 15.47 Km TROP TEMP: -69 °C

WEIGHTS AND INFLATIONS

BALLOON 1409 LBS SCI LOAD 810 LBS NCAR INST 185 LBS

BALLAST 450 LBS (15 % GL) GROSS LOAD 2945 LBS

FREE LIFT 353.0 LBS (12 % GL) GROSS LIFT 3298 LBS HE 58,048 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter-Rosemount

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 91 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.76 mps 9Km TO 18Km 4.96 mps
18 Km TO CLG: 3.01 mps FLIGHT AVG 3.62 mps

MAX (1500 METER LAYER) 6.38 mps @ ALT 13.73 Km

PRESS FLOAT ALT: THEORETICAL: 2.75 Mb ACTUAL 2.85 Mb

TIME AT ALT: PLANNED: 40 HRS ACTUAL 39.7 HRS

RECOVERY: DATE: 24 Sept. 68 LOCATION: Truth or Consequences, New Mexico COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-68a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Mfg.	Karl Stefan
NASA (Holtz)	James Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 433-P PLACE: Palestine, Texas DATE: 25 Sept. 1968

NAME OF EXPERIMENTER: Dr. Peter Fowler LAUNCH TIME: ACTUAL: 1933 SCHED: 1930

ORGANIZATION: U of Bristol-England SPONSOR: NASA-Bristol

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Nuclear emulsions and plastics in search for cosmic rays heavier than iron-Normal launch and ascent to 130,000 feet-Float at altitude forty (40) hours-Terminate

SUCCESS:
FAILURE: X
BALLOON: X
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Raven SERIAL NO: 101 P.O. #: 20092-69

MATERIAL AND GAUGE: .75 mil poly TYPE: 2363-S-545-8342 VOLUME: 15.4 $\times 10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes-Vista Dome II construction with mylar scrim dome

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: Clear SFC WINDS: E-4 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +20 °C TROP HEIGHT: 15.7 Km TROP TEMP: -69 °C

WEIGHTS AND INFLATIONS

BALLOON 1442 LBS SCI LOAD 810 LBS NCAR INST 210 LBS

BALLAST 400 LBS (11 % GL) GROSS LOAD 2938 LBS

FREE LIFT 294 LBS (10 % GL) GROSS LIFT 3232 LBS HE 56,880 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 76 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km N/A mps 9Km TO 18Km N/A mps
18 Km TO CLG: N/A mps FLIGHT AVG N/A mps

MAX (1500 METER LAYER) N/A mps @ ALT N/A Km

PRESS FLOAT ALT: THEORETICAL: N/A Mb ACTUAL N/A Mb

TIME AT ALT: PLANNED: 40 HRS ACTUAL 0 HRS

RECOVERY: DATE: 25 Sept. 68 LOCATION: Oakwood, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-69a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Manufacturer	Karl H. Stefan (2)
NASA (Holtz)	James M. Shoemaker (2)
	Operations

REMARKS: Balloon rose very slowly. 280 lbs. of ballast was expended driving balloon to 10,000 feet. After 12 minutes at 10,000 feet, the flight was terminated.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 434-P PLACE: Palestine, Texas DATE: 26 Sept. 68

NAME OF EXPERIMENTER: Dr. P. Fowler LAUNCH TIME: ACTUAL: 1933 SCHED: 1930

ORGANIZATION: U of Bristol SPONSOR: NASA-Bristol

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Expose nuclear emulsions + plastics in search for cosmic rays heavier than iron-Normal launch-Ascent to approximately 125,000 feet-Float forty (40) hours-Cutdown

SUCCESS: X

FAILURE:

BALLOON:

OPERATIONS:

MECH:

WX:

ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 276 P.O. #: 20093-69

MATERIAL AND GAUGE: .7 mil poly TYPE: SF-305.86-070-NSC-09 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 300 lb. load tapes-.7 mil cap extending 100 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: none

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: Clear SFC WINDS ENE-3 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +18 °C TROP HEIGHT: 15.47 Km TROP TEMP: -69 °C

WEIGHTS AND INFLATIONS

BALLOON 1227 LBS SCI LOAD 800 LBS NCAR INST 206 LBS

BALLAST 400 LBS (14 % GL) GROSS LOAD 2713 LBS

FREE LIFT 271 LBS (10 % GL) GROSS LIFT 2984 LBS HE 52,512 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter-Rosemount

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 80 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.56 mps 9Km TO 18Km 4.17 mps

18 Km TO CLG: 2.97 mps FLIGHT AVG 3.54 mps

MAX (1500 METER LAYER) 4.64 mps @ ALT 6.12 Km

PRESS FLOAT ALT: THEORETICAL: 3.13 Mb ACTUAL 3.10 Mb

TIME AT ALT: PLANNED: 40 HRS ACTUAL 42.1 HRS

RECOVERY: DATE: 28 Sept. 68 LOCATION: Big Springs, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-70a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Mfg.	Karl Stefan
NASA (Holtz)	James Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 435-P PLACE: Palestine, Texas DATE: 30 Sept. 1968

NAME OF EXPERIMENTER: Dr. G. Frye LAUNCH TIME: ACTUAL: 0657 SCHED: 0630

ORGANIZATION: Case Western Reserve SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Neutron detector to measure high energy neutrons during solar flares-Normal ascent to 110,000 ft.(+) Float thirty-six (36) hours, terminate

SUCCESS:
FAILURE: X
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC: X

BALLOON DATA

MFG: Winzen SERIAL NO: 318 P.O. #: Case

MATERIAL AND GAUGE: .7 mil poly TYPE: SF-199.78-070-NS-07 VOLUME: 2.94 $\times 10^6 FT^3$

SPECIAL FEATURES: 200 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: Clear SFC WINDS: SE-3 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +14 °C TROP HEIGHT: 15.47 Km TROP TEMP: -68 °C

WEIGHTS AND INFLATIONS

BALLOON 498 LBS SCI LOAD 480 LBS NCAR INST 145 LBS

BALLAST 200 LBS (14 % GL) GROSS LOAD 1387 LBS

FREE LIFT 139 LBS (10 % GL) GROSS LIFT 1526 LBS HE 26,864 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter-Rosemount

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 64 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.02 mps 9Km TO 18Km 4.99 mps

18 Km TO CLG: 4.37 mps FLIGHT AVG 4.70 mps

MAX (1500 METER LAYER) 5.52 mps @ ALT 10.98 Km

PRESS FLOAT ALT: THEORETICAL: 6.55 Mb ACTUAL 6.65 Mb

TIME AT ALT: PLANNED: 36 HRS ACTUAL 11.4 HRS

RECOVERY: DATE: 30 Sept. 68 LOCATION: Athens, Texas COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

Rk/

(Bal Ops 4 - 68)

B-71a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Mfg.	Karl Stefan (2)
NASA (Holtz)	James Shoemaker (2)
	Operations

REMARKS: Command receiver failed after five (5) hours of float. Since ballast could not be dropped near sunset, the balloon continued to descend and FAA (minimum altitude) safety timer terminated flight after 11 hr. and 24 min. of float.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 436-P PLACE: Palestine, Texas DATE: 10 October 1968

NAME OF EXPERIMENTER: Dr. George Chapman LAUNCH TIME: ACTUAL: 2331 SCHED: 2330

ORGANIZATION: OakRidge Natl. Lab. SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Search for gamma rays - Normal launch and ascent to approximately 116,000 feet-Float ten (10) hours - Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 21 P.O. #: 19647-68

MATERIAL AND GAUGE: .7 mil poly TYPE: SF250.2-070-NSC-01 VOLUME: 6.0 $\times 10^6 FT^3$

SPECIAL FEATURES: 200 lb. load tapes - .7 mil cap extending 50 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: 5000 scattered SFC WINDS: ESE-3-5 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +17 °C TROP HEIGHT: 15.23 Km TROP TEMP: -72 °C

WEIGHTS AND INFLATIONS

BALLOON 872 LBS SCI LOAD 940 LBS NCAR INST 105 LBS

BALLAST 200 LBS (9 % GL) GROSS LOAD 2212 LBS

FREE LIFT 221 LBS (10 % GL) GROSS LIFT 2433 LBS HE 42,816 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter-Rosemount

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 95 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.47 mps 9Km TO 18Km 4.77 mps

18 Km TO CLG: 3.21 mps FLIGHT AVG 3.77 mps

MAX (1500 METER LAYER) 5.78 mps @ ALT 12.81 Km

PRESS FLOAT ALT: THEORETICAL: 4.95 Mb ACTUAL 5.05 Mb

TIME AT ALT: PLANNED: 10 HRS ACTUAL 10 HRS

RECOVERY: DATE: 11 Oct. 1968 LOCATION: Oxford, Miss. COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-72a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Manufacturer	Karl H. Stefan
NASA (Holtz)	James M. Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 437-P PLACE: Palestine, Texas DATE: 11 October 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. R. T. Bettinger LAUNCH TIME: ACTUAL: 0719 SCHED: 0700

ORGANIZATION: U of Maryland SPONSOR: U of Maryland

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: To determine the vertical ozone distribution and total ozone content from atmospheric albedo in the ultra-violet. Normal launch and ascent to approximately 116,000 feet-Float six (6) hours - Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 19 P.O. #: 19647-68

MATERIAL AND GAUGE: .7 mil poly TYPE: SF-250.2-070-NSC-01 VOLUME: 6.0 $\times 10^6 FT^3$

SPECIAL FEATURES: 200 lb. load tapes - .7 mil cap extending 50 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: 5000 scattered SFC WINDS: ESE-3 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +16 °C TROP HEIGHT: 15.37 Km TROP TEMP: -69 °C

WEIGHTS AND INFLATIONS

BALLOON 889 LBS SCI LOAD 1000 LBS NCAR INST 124 LBS

BALLAST 150 LBS (7 % GL) GROSS LOAD 2295 LBS

FREE LIFT 229 LBS (10 % GL) GROSS LIFT 2524 LBS HE 44,416 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 132 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.01 mps 9Km TO 18Km 5.48 mps

18 Km TO CLG: 4.28 mps FLIGHT AVG 4.72 mps

MAX (1500 METER LAYER) 5.56 mps @ ALT 13.73 Km

PRESS FLOAT ALT: THEORETICAL: 5.0 Mb ACTUAL 5.1 Mb

TIME AT ALT: PLANNED: 6 HRS ACTUAL 6.4 HRS

RECOVERY: DATE: 11 Oct. 1968 LOCATION: Yazoo City, Miss. COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-73a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Manufacturer	Karl H. Stefan
	James M. Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 438-P PLACE: Palestine, Texas DATE: 25 October 1968

NAME OF EXPERIMENTER: Lewin-McClintock

LAUNCH TIME: ACTUAL: 0712 SCHED: 0700

ORGANIZATION: MIT SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: X-ray observation of M87 and scorpio X-1 - Normal launch and ascent to 125,000 feet-Float eight (8) hours-Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 233 P.O. #: 19119-68

MATERIAL AND GAUGE: .7 mil poly TYPE: SF305.86-070-NSC-09 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 300 lb. load tapes-.7 mil cap extending 100 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: Clear SFC WINDS: N-1 mps CROSS WIND ANGLE: N/A °

SFC TEMP: 3 °C TROP HEIGHT: 15.31 Km TROP TEMP: -68 °C

WEIGHTS AND INFLATIONS

BALLOON 1229 LBS SCI LOAD 975 LBS NCAR INST 120 LBS

BALLAST 200 LBS (9 % GL) GROSS LOAD 2614 LBS

FREE LIFT 261 LBS (10 % GL) GROSS LIFT 2875 LBS HE 50,592 FT^3 STP

SYSTEMS

ELECTRONICS Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 90 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.86 mps 9Km TO 18Km 5.06 mps

18 Km TO CLG: 5.21 mps FLIGHT AVG 5.07 mps

MAX (1500 METER LAYER) 6.13 mps @ ALT 10.98 Km

PRESS FLOAT ALT: THEORETICAL: 3.27 Mb ACTUAL 3.45 Mb

TIME AT ALT: PLANNED: 8 HRS ACTUAL 7.4 HRS

RECOVERY: DATE: 25 October 68 LOCATION: Valdosta, Ga. COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-74a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Mfg.	Karl Stefan
NASA (Holtz)	Jim Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 439-P PLACE: Palestine, Texas DATE: 28 October 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Mr. Kenneth Frost LAUNCH TIME: ACTUAL: 2033 SCHED: 2030

ORGANIZATION: GSFC SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Gamma ray spectrometer to observe 50-400 KeV gamma radiation from celestial X-ray source- Normal launch and ascent to approximately 130,000 feet-Float five (5) hours-Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 213 P.O. #: 18557-68

MATERIAL AND GAUGE: .7 mil poly TYPE: SF305.86-070-NSC-07 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes-.7 mil cap extending 90 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: Clear SFC WINDS: E-2 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +9.1°C TROP HEIGHT: 15.13 Km TROP TEMP: -68 °C

WEIGHTS AND INFLATIONS

BALLOON 1216 LBS SCI LOAD 490 LBS NCAR INST 126 LBS

BALLAST 300 LBS (13 % GL) GROSS LOAD 2242 LBS

FREE LIFT 224 LBS (10 % GL) GROSS LIFT 2466 LBS HE 43,408 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 110 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.69 mps 9Km TO 18Km 4.51 mps

18 Km TO CLG: 3.66 mps FLIGHT AVG 4.02 mps

MAX (1500 METER LAYER) 5.40 mps @ ALT 11.12 Km

PRESS FLOAT ALT: THEORETICAL: 2.68 Mb ACTUAL 2.95 Mb

TIME AT ALT: PLANNED: 5+ HRS ACTUAL 4.6 HRS

RECOVERY: DATE: 29 Oct. 68 LOCATION: Ft. Gordon, Ga. COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-75a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Mfg.	Karl Stefan
NASA (Holtz)	Jim Shoemaker (2)
	Operations

REMARKS: Successful Flight

During impact of the gondola, the trailing beacon antenna touched 2 power lines causing activation of a 30 sec circuit breaker system and the blowing of a 350 amp fuse. This 30 sec power loss affected only a small portion of the military installation and no damage was incurred.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 440-P PLACE: Palestine, Texas DATE: 19 November 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Dr. K.O. Kiepenheuer LAUNCH TIME: ACTUAL: 0458 SCHED: 0430

ORGANIZATION: Fraunhofer Institute- Germany SPONSOR: NSF-NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Photograph portions of the sun. Static launch, normal ascent to 80,000 feet, float eight (8) hours, parachute descent.

BALLOON DATA

MFG: G.T. Schjeldahl SERIAL NO: 1158-1 1201-1 P.O. #: 20242-69 20091-69

MATERIAL AND GAUGE: GT-11 / GT-11 TYPE: Mylar Scrim / Mylar Scrim VOLUME: .1345 / 3.050 $\times 10^6 FT^3$

SPECIAL FEATURES: Tandem Balloon System

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Static VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: Clear SFC WINDS: SW-2 mps CROSS WIND ANGLE: N/A °

SFC TEMP: -4 °C TROP HEIGHT: 16.18 Km TROP TEMP: -69 °C

WEIGHTS AND INFLATIONS

BALLOON 1823 LBS SCI LOAD 3810 LBS NCAR INST 201 LBS

BALLAST 550 LBS (8 % GL) GROSS LOAD 6729 LBS

FREE LIFT 807 LBS (12 % GL) GROSS LIFT 7536 LBS HE 132,640 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 100 FT
WEIGHT: 345 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.18 mps 9Km TO 18Km 4.76 mps

18 Km TO CLG: 3.51 mps FLIGHT AVG 4.18 mps

MAX (1500 METER LAYER) 5.07 mps @ ALT 9.16 Km

PRESS FLOAT ALT: THEORETICAL: 28 Mb ACTUAL 28 Mb

TIME AT ALT: PLANNED: 8 HRS ACTUAL 3 HRS

RECOVERY: DATE: 19 Nov. 1968 LOCATION: Oakdale, La. COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

B-76a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Manufacturer	Karl Stefan
NASA (Holtz)	James M. Shoemaker (2)
	Operations

REMARKS: Scientific instrument failed to unlatch and flight was terminated early at scientist's request.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 441-P PLACE: Palestine, Texas DATE: 20 Nov. 1968

NAME OF EXPERIMENTER: Mr. K. Frost LAUNCH TIME: ACTUAL: 0435 SCHED: 0430

ORGANIZATION: GSF C SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Gamma ray spectrometer gamma radiation from celestial X-ray source-Normal launch and ascent to 130,000 feet, float 3+ hours-Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 214 P.O.#: 18557-68

MATERIAL AND GAUGE: .5 mil poly TYPE: SF305.86-050-NSC-12 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 200 lb. load tapes - .7 mil cap extending 90 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 truck CREW: NCAR

CLOUDS: Clear SFC WINDS: Calm mps CROSS WIND ANGLE: N/A °

SFC TEMP: +2 °C TROP HEIGHT: 17.75 Km TROP TEMP: -71 °C

WEIGHTS AND INFLATIONS

BALLOON 958 LBS SCI LOAD 485 LBS NCAR INST 105 LBS

BALLAST 200 LBS (10 % GL) GROSS LOAD 1884 LBS

FREE LIFT 188 LBS (10 % GL) GROSS LIFT 2072 LBS HE 36,464 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 136 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.82 mps 9Km TO 18Km 4.85 mps

18 Km TO CLG: 3.69 mps FLIGHT AVG 4.14 mps

MAX (1500 METER LAYER) 4.99 mps @ ALT 7.63 Km

PRESS FLOAT ALT: THEORETICAL: 2.95 Mb ACTUAL 2.94 Mb

TIME AT ALT: PLANNED: 3+ HRS ACTUAL 3.5 HRS

RECOVERY: DATE: 20 Nov. 68 LOCATION: Tifton, Ga. COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

B-77a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Manufacturer	Karl Stefan
	James M. Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 442-P PLACE: Palestine, Texas DATE: 24 Nov. 1968

NAME OF EXPERIMENTER: Mr. F. Floyd LAUNCH TIME: ACTUAL: 2005 SCHED: 2000

ORGANIZATION: MIT SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: High angular resolution X-ray telescope-Normal launch and ascent to 130,000 feet-Float ALAP, Cutdown

SUCCESS:
FAILURE: X
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC: X

BALLOON DATA

MFG: Winzen SERIAL NO: 275 P.O.#: 20093-69

MATERIAL AND GAUGE: .7 mil poly TYPE: SF305.86-070-NSC-09 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 300 lb. load tapes - .7 mil cap extending 100 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: Clear SFC WINDS: NNW-3 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +8 °C TROP HEIGHT: 18.35 Km TROP TEMP: -70 °C

WEIGHTS AND INFLATIONS

BALLOON 1232 LBS SCI LOAD 730 LBS NCAR INST 109 LBS

BALLAST 200 LBS (9 % GL) GROSS LOAD 2363 LBS

FREE LIFT 236 LBS (10 % GL) GROSS LIFT 2599 LBS HE 45,744 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 92 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.25 mps 9Km TO 18Km 4.48 mps

18 Km TO CLG: 3.28 mps FLIGHT AVG 3.71 mps

MAX (1500 METER LAYER) 4.64 mps @ ALT 11.32 Km

PRESS FLOAT ALT: THEORETICAL: 2.95 Mb ACTUAL 3.05 Mb

TIME AT ALT: PLANNED: ALAP HRS ACTUAL 1.5 HRS

RECOVERY: DATE: 25 Nov. 1968 LOCATION: Kentwood, Miss. COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

B-78a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Manufacturer	Karl Stefan (2)
NASA (Holtz)	James M. Shoemaker (2)
	Operations

REMARKS: Flight terminated early after PCM and telemetry failed.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 443-P PLACE: Palestine, Texas DATE: 4 December 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Mr. Peter Serlemitsos LAUNCH TIME: ACTUAL: 0247 SCHED: 0215

ORGANIZATION: GSFC SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: To study X-ray emission from M-87-Normal launch and ascent to 130,000 + feet- Float three (3) hours - Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 281 P.O. #: 20257-69

MATERIAL AND GAUGE: .7 mil poly TYPE: SF305.86-070-NSC-09 VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 300 lb. load tapes - .7 mil cap extending 90 ft. from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 Truck CREW: NCAR

CLOUDS: Clear SFC WINDS: SSE-2 mps CROSS WIND ANGLE: N/A °

SFC TEMP: -1 °C TROP HEIGHT: 13.48 Km TROP TEMP: -66 °C

WEIGHTS AND INFLATIONS

BALLOON 1215 LBS SCI LOAD 600 LBS NCAR INST 140 LBS

BALLAST 200 LBS (9 % GL) GROSS LOAD 2215 LBS

FREE LIFT 221 LBS (10 % GL) GROSS LIFT 2436 LBS HE 42,880 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 46 FT
WEIGHT: 60 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.66 mps 9Km TO 18Km 4.59 mps

18Km TO CLG: 3.16 mps FLIGHT AVG 3.71 mps

MAX (1500 METER LAYER) 5.31 mps @ ALT 9.81 Km

PRESS FLOAT ALT: THEORETICAL: 2.73 Mb ACTUAL 2.82 Mb

TIME AT ALT: PLANNED: 3 HRS ACTUAL 2.8 HRS

RECOVERY: DATE: 4 Dec. 1968 LOCATION: Columbus, Ga. COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

B-79a.

DISTRIBUTION:

Scientist	A. L. Morris (Circulation Copy)
J. R. Holtz, NASA	K. Stefan (1)
Balloon Mfr.	J. M. Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 444-P PLACE: Palestine, Texas DATE: 11 December 1968

NAME OF EXPERIMENTER: Dr. R. Haymes LAUNCH TIME: ACTUAL: 0305 SCHED: 0230

ORGANIZATION: Rice University SPONSOR: AFOSR

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Measure X and gamma rays from M-87 - Normal launch and ascent to approximately 130,000 feet - Float 4.5 hours - Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 211 P.O. #: Rice University

MATERIAL AND GAUGE: .7 mil poly TYPE: SF305.80-070-NSC VOLUME: 10.6 $\times 10^6 FT^3$

SPECIAL FEATURES: 150 lb. load tapes-.7 mil cap extending 90' from apex

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Tiny Tim CREW: NCAR

CLOUDS: 5000 scattered SFC WINDS: S-4-5 mps CROSS WIND ANGLE: N/A °

SFC TEMP: +13 °C TROP HEIGHT: 16.18 Km TROP TEMP: -70 °C

WEIGHTS AND INFLATIONS

BALLOON 1211 LBS SCI LOAD 705 LBS NCAR INST 150 LBS

BALLAST 300 LBS (12 % GL) GROSS LOAD 2454 LBS

FREE LIFT 245 LBS (10 % GL) GROSS LIFT 2699 LBS HE 47,504 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter-Rosemount

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 64 FT
WEIGHT: 88 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 5.14 mps 9Km TO 18Km 4.53 mps
18Km TO CLG: 3.51 mps FLIGHT AVG 3.95 mps

MAX (1500 METER LAYER) 6.18 mps @ ALT 10.89 Km

PRESS FLOAT ALT: THEORETICAL: 3.06 Mb ACTUAL 3.14 Mb

TIME AT ALT: PLANNED: 4.5 HRS ACTUAL 5.2 HRS

RECOVERY: DATE: 11 Dec. 1968 LOCATION: Lenox, Ga. COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

B-80a.

DISTRIBUTION:

Scientist	A. L. Morris (circulating copy)
Balloon Mfr.	K. Stefan (1)
	J. M. Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: 445-PT PLACE: Palestine, Texas DATE: 14 December 1968

NAME OF EXPERIMENTER: O. L. Cooper, A. Shipley LAUNCH TIME: ACTUAL: 0033 SCHED: 0030

ORGANIZATION: NCAR SPONSOR: NCAR

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS: Test of telemetry and command systems-Normal launch and ascent to 90,000 feet-Float as long as possible to 300 miles - Cutdown

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Winzen SERIAL NO: 172 P.O.#: 18079-67

MATERIAL AND GAUGE: .5 mil poly TYPE: SF 104.8-050-NS-01 VOLUME: .45 $\times 10^6 FT^3$

SPECIAL FEATURES: 100 lb. load tapes

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: M-54 Truck CREW: NCAR

CLOUDS: Clear SFC WINDS: N-4-5 mps CROSS WIND ANGLE: N/A °

SFC TEMP: -1 °C TROP HEIGHT: 16.18 Km TROP TEMP: -70 °C

WEIGHTS AND INFLATIONS

BALLOON 116 LBS SCI LOAD 264 LBS NCAR INST 25 LBS

BALLAST 100 LBS (18 % GL) GROSS LOAD 550 LBS

FREE LIFT 55 LBS (10 % GL) GROSS LIFT 605 LBS HE 10,656 FT^3 STP

SYSTEMS

ELECTRONICS: Primary

ALTITUDE SENSOR: Photobarograph-Barotransmitter

SUSPENSION: Rigid

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Flat Canopy
DIAMETER: 38 FT
WEIGHT: 45 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 4.80 mps 9Km TO 18Km 5.70 mps

18 Km TO CLG: 5.53 mps FLIGHT AVG 5.25 mps

MAX (1500 METER LAYER) 5.86 mps @ ALT 9.81 Km

PRESS FLOAT ALT: THEORETICAL: 12.2 Mb ACTUAL 14.6 Mb

TIME AT ALT: PLANNED: 4 HRS ACTUAL 3.8 HRS

RECOVERY: DATE: 14 December 68 LOCATION: Krotz Springs, La. COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

0.3.

B-81a.

DISTRIBUTION:

Balloon Mfr.	A. L. Morris (circulating copy)
	K. Stefan (1)
	J. M. Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: N-46 PLACE: Sioux Falls, S.D. DATE: 15 December 1967

NAME OF EXPERIMENTER: Karl Stefan LAUNCH TIME: ACTUAL: 0900 SCHED: CST

ORGANIZATION: NCAR SPONSOR: NCAR

SUCCESS:
FAILURE: X
BALLOON:
OPERATIONS: X
MECH:
WX:
ELEC: X

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS:

Joint NCAR-Raven project to measure balloon structural parameters during flight of a balloon design with a poor flight history.

BALLOON DATA

MFG: Raven SERIAL NO: 116 P.O. #: --

MATERIAL AND GAUGE: 0.5 mil poly TYPE: StratoFilm VOLUME: 3.5 $\times 10^6 FT^3$

SPECIAL FEATURES: Several balloons of this type had failed due to gas leakages on previous flight attempts

CONDITION OF BALLOON: Excellent PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Dynamic VEHICLE: Truck CREW: Raven

CLOUDS: Clear SFC WINDS: 10 mps CROSS WIND ANGLE: 30 °

SFC TEMP: -20 °C TROP HEIGHT: -- Km TROP TEMP: -- °C

WEIGHTS AND INFLATIONS

BALLOON 528 LBS SCI LOAD 616 LBS ~~NCAR~~ Raven INST 54 LBS

BALLAST -- LBS (-- % GL) GROSS LOAD 1198 LBS

FREE LIFT 120 LBS (10 % GL) GROSS LIFT 1318 LBS HE -- FT^3 STP

SYSTEMS

ELECTRONICS: Raven

ALTITUDE SENSOR: Raven

SUSPENSION: (See reverse side for special rigging)

SPECIAL RIGGING:

PARACHUTE:
TYPE: Flat circular
DIAMETER: 38 FT
WEIGHT: 37 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km 3.5 mps 9Km TO 18Km -- mps

18 Km TO CLG: -- mps FLIGHT AVG 3.0 mps

MAX (1500 METER LAYER) -- mps @ ALT -- Km

PRESS FLOAT ALT: THEORETICAL: 4.4 Mb Max. ACTUAL 92.0 Mb

TIME AT ALT: PLANNED: -- HRS ACTUAL 0 HRS

RECOVERY: DATE: 15 Dec 1967 LOCATION: 100 mi E of Sioux Falls COND: Good

REMARKS AND PROBLEMS: Use Reverse Side

B-83a.

DISTRIBUTION:

Alvin L. Morris (circulating copy)	NASA (Holtz)
Jim Shoemaker	
Karl Stefan (2)	
Operations	

REMARKS: The principal purpose of this particular flight was to test the complete flight system in an operational mode which let us launch from the most promising site in the United States. We prepared the equipment for flight at Sioux Falls, South Dakota. We then determined from the weather charts that New Mexico offered the best prospects for both surface conditions and trajectory for a flight of long duration. The equipment and flight crew were flown from Sioux Falls to Albuquerque and the balloon system was launched. The crew in the aircraft tracked the balloon, received telemetered data, sent commands, etc. Unfortunately the balloon leaked and descended during the first afternoon of flight. The ballast command did not function properly and the flight was terminated. Although the flight was drastically shortened due to a leaking balloon and ballast command failure, the exercise did prove the feasibility of the chosen mode of operating and point up some deficiencies which were corrected prior to the first scientific data flight.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: N-48 PLACE: Marshall, Colo. DATE: 29 October 1968

NAME OF EXPERIMENTER: Mr. Roy Colombe LAUNCH TIME: ACTUAL: None SCHED: 0345 MST

ORGANIZATION: U of Calif., Berkeley SPONSOR: NASA

SUCCESS:
FAILURE: X
BALLOON:
OPERATIONS: X
MECH:
WX:
ELEC:

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS:
Test of Loran System
0345 launch - Float four (4) hours - Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 1 P.O. #: 20433-69

MATERIAL AND GAUGE: 0.50 mil poly TYPE: SF-25.96-050-TT-01 VOLUME: 6500 FT^3

SPECIAL FEATURES: Huch Clutch

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Anchor VEHICLE: -- CREW: NCAR

CLOUDS: None SFC WINDS: 6-8 mps CROSS WIND ANGLE: 0 °

SFC TEMP: -- °C TROP HEIGHT: -- Km TROP TEMP: -- °C

WEIGHTS AND INFLATIONS

BALLOON 5.5 LBS SCI LOAD 6.0 LBS NCAR INST 3.5 LBS

BALLAST 0 LBS (-- % GL) GROSS LOAD 16.0 LBS

FREE LIFT 3.8 LBS (24 % GL) GROSS LIFT 19.8 LBS HE 352 FT^3 STP

SYSTEMS

ELECTRONICS: Dual timer

ALTITUDE SENSOR: None

SUSPENSION: Soft

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Conical
DIAMETER: 12 FT
WEIGHT: 1.0 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km N/A mps 9Km TO 18Km N/A mps
18 Km TO CLG: N/A mps FLIGHT AVG N/A mps

MAX (1500 METER LAYER) N/A mps @ ALT N/A Km

PRESS FLOAT ALT: THEORETICAL: N/A Mb ACTUAL N/A Mb

TIME AT ALT: PLANNED: N/A HRS ACTUAL N/A HRS

RECOVERY: DATE: N/A LOCATION: N/A COND: N/A

REMARKS AND PROBLEMS: Use Reverse Side

(Bal Ops 4 - 68)

B-84a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Manufacturer	Karl H. Stefan (2)
NASA (Holtz)	James M. Shoemaker (2)
	Operations

REMARKS: Ground abort. Mishandling by crew resulted in tears in balloon.

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: N-49 PLACE: Marshall, Colo. DATE: 29 October 1968

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

NAME OF EXPERIMENTER: Mr. Roy Colombe LAUNCH TIME: ACTUAL: 1332 SCHED: 1330

ORGANIZATION: U of Calif., Berkeley SPONSOR: NASA

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS:

Test of Loran System
Afternoon launch - Float four (4) hours - Cutdown

BALLOON DATA

MFG: Winzen SERIAL NO: 16 P.O. #: U of California

MATERIAL AND GAUGE: 0.75 mil poly TYPE: SF-59.8-075-TT-01 VOLUME: 0.08 $\times 10^6 FT^3$

SPECIAL FEATURES: Huch Clutch

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Anchor VEHICLE: NA CREW: NCAR

CLOUDS: None SFC WINDS: 4-5 mps CROSS WIND ANGLE: 15 °

SFC TEMP: 22 °C TROP HEIGHT: -- Km TROP TEMP: -- °C

WEIGHTS AND INFLATIONS

BALLOON 41.4 LBS SCI LOAD 6.0 LBS NCAR INST 3.5 LBS

BALLAST None LBS (-- % GL) GROSS LOAD 52.0 LBS

FREE LIFT 12.4 LBS (24 % GL) GROSS LIFT 64.4 LBS HE 1136 FT^3 STP

SYSTEMS

ELECTRONICS: Dual timer

ALTITUDE SENSOR: None

SUSPENSION: Soft

SPECIAL RIGGING: None

PARACHUTE:
TYPE: Conical
DIAMETER: 12 FT
WEIGHT: 1.1 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9 Km NM mps 9 Km TO 18 Km NM mps
18 Km TO CLG: NM mps FLIGHT AVG 4.0 mps

MAX (1500 METER LAYER) NM mps @ ALT -- Km

PRESS FLOAT ALT: THEORETICAL: 8.75 Mb ACTUAL 8.75 Mb

TIME AT ALT: PLANNED: 6.5 HRS ACTUAL unknown HRS

RECOVERY: DATE: Not recovered LOCATION: -- COND: --

REMARKS AND PROBLEMS: Use Reverse Side

B-85a.

DISTRIBUTION:

Scientist	Alvin L. Morris (circulating copy)
Balloon Manufacturer	Karl H. Stefan
NASA (Holtz)	James M. Shoemaker (2)
	Operations

REMARKS: Successful Flight

NCAR BALLOON FLIGHT SUMMARY

GENERAL INFORMATION

FLIGHT NO: N-50 PLACE: Boulder, Colo. DATE: 20 Nov. 1968

NAME OF EXPERIMENTER: SBF, NCAR LAUNCH TIME: ACTUAL: 0842 SCHED:

ORGANIZATION: NCAR SPONSOR: NCAR

DESCRIPTION OF EXPERIMENT AND FLIGHT REQUIREMENTS:
Test of telemetry transmitter and ability of FAA radar to track a chaff-covered balloon.

SUCCESS: X
FAILURE:
BALLOON:
OPERATIONS:
MECH:
WX:
ELEC:

BALLOON DATA

MFG: Raven SERIAL NO: P.O. #: Surplus balloon

MATERIAL AND GAUGE: 0.75 mil poly TYPE: Tailored Tapeless VOLUME: 0.0024 $\times 10^6 FT^3$

SPECIAL FEATURES: None

CONDITION OF BALLOON: Good PATCHES REQUIRED: None

LAUNCH DATA

METHOD: Static VEHICLE: N/A CREW: NCAR

CLOUDS: 3 AC SFC WINDS: 2.1 mps CROSS WIND ANGLE: °

SFC TEMP: unk °C TROP HEIGHT: unk Km TROP TEMP: unk °C SFC PRESS: unk mb

WEIGHTS AND INFLATIONS

BALLOON 4.1 LBS SCI LOAD 6.0 LBS NCAR INST LBS

BALLAST 0 LBS (%GL) GROSS LOAD 10.1 LBS

FREE LIFT 3 LBS (30 %GL) GROSS LIFT 13.1 LBS HE 1991 FT^3 STP

SYSTEMS

ELECTRONICS: Timer Cutdown

ALTITUDE SENSOR: Radar (ground)

SUSPENSION: Soft

SPECIAL RIGGING: None

PARACHUTE:
TYPE:
DIAMETER: 12 FT
WEIGHT: 0.8 LBS

FLIGHT CONDUCT

ASCENT RATE: SFC TO 9Km mps 9Km TO 18Km mps

18 Km TO CLG: mps FLIGHT AVG mps

MAX (1500 METER LAYER) mps @ ALT Km

PRESS FLOAT ALT: THEORETICAL: 49.0 Mb ACTUAL 49.0 Mb

TIME AT ALT: PLANNED: 6.0 HRS ACTUAL 6.0 HRS

RECOVERY: DATE: LOCATION: COND:

REMARKS AND PROBLEMS: Use Reverse Side

'RIBUTION:

IARKS:

Success. Throwaway package. Recovery not attempted.

APPENDIX C

EVALUATIONS BY SCIENTISTS OF BALLOON-BORNE EXPERIMENTS

ATMOSPHERIC SCIENCES

TEMPERATURE

Dr. John H. Shaw, Ohio State University

Flight 409-P, 11 July 1968

Purpose: To determine the accuracy to which the vertical profiles of temperature and water vapor in the atmosphere can be measured by using the 4.3 μ CO_2 and 6 μ H_2O to obtain thermal radiance data.

Result: Successful. Six hours of data were collected most of which has been reduced and is now being analyzed.

MICROMETEORITES

Dr. Paul W. Hodge and Mr. Donald E. Brownlee, University of Washington

Flight 379-P, 10 February 1968

Purpose: Flight 379-P flown on February 10, 1968 was a micrometeorite collection using 2 settling plate collectors suspended 2000 feet below the balloon. The primary goals of the flight were the following:

1. To evaluate the effectiveness of using wind shear to isolate a balloon payload from dust emitted from the balloon.
2. To test a line reeling device, built by Mack Gore of NCAR, for payloads as heavy as 300 pounds.
3. To determine the flux and composition of extraterrestrial matter in the size range 5μ to 100μ.

Result: Telemetry, a sequence camera on the balloon and visual monitoring from the ground indicated the reel worked smoothly and without the heating problems that had plagued previous designs. We thus feel safe in using this technique for similar experiments in the future.

On termination of the flight the payload free fell and was totally destroyed. One collector was broken in half and the other was jarred sufficiently to break its seal. The only information retrieved from the collectors was that there was no thermal degradation of the collection surfaces.

ATMOSPHERIC MOTION

Messrs. Alvin L. Morris and Gay Hilton, National Center for Atmospheric Research, NASA Goddard Space Flight Center

Flight 425-P, 26 August 1968

Purpose: The purpose of flight 425-P from Palestine, Texas on 26 August 1968 was to test several methods of determining the position of a balloon system during flight. A down looking camera which photographed a plumb bob hanging 35 feet below the center of the lens against the earth below served as the primary standard. An optical theodolite, radar, and aircraft visual fixes were also used, but the principal system to be tested was the NASA OPLE system. This system makes use of the Department of Defense OMEGA navigation system and the ATS III satellite.

Result: The balloon-borne equipment was interrogated via the satellite and OMEGA data were relayed back to the NASA Goddard Space Flight Center via the satellite. A more detailed report of the flight and the results is provided in Appendix A. The data will be used in a NASA report on its OPLE system and in an NCAR Tech Note which will summarize the results from the OPLE system and several other systems of locating a balloon system in flight.

COSMIC RAY

HIGH ENERGY PARTICLES AND INTERACTIONS

Dr. J. J. Lord and Mr. Robert E. Gibbs, University of Washington

Flights 385-P, 14 March 1968; 389-P, 15 April 1968; 400-P, 29 May 1968; 402-P, 6 June 1968; 416-P, 29 July 1968; 418-P, 2 August 1968; 424-P, 21 August 1968; 426-P, 29 August 1968

Summary: The Cosmic Ray Laboratory at the University of Washington, under sponsorship by the National Science Foundation, has undertaken a study of high energy nuclear interactions of primary cosmic rays in the 10^4 - 10^5 Bev energy range, using sandwich stack detectors of emulsion, lead, and plastic. Specifically, we plan to measure the momentum of the created secondary particles in these interactions using the multiple coulomb scattering technique. Our apparatus is designed to allow momentum measurements up to values of secondary momentum of 500 Bev/c with errors typically 15-30%.

To achieve these goals we desired our emulsion stacks flown at altitudes in excess of 100,000 feet for periods up to 40 hours with minimum delay (to reduce background). Five emulsion stacks, which were essentially identical, were flown between March 14, 1968, and August 29, 1968. The last three stacks were each flown twice, making a total of eight flights in the series. The emulsion packages were assembled in Seattle and shipped to Palestine by air express. They were flown by balloon and returned, air express, to Seattle. All of the flights reached the planned altitude, and the average float time of 14.7 hours was very good in spite of two extremely short flights. All of the packages were recovered in good order.

Taking data from emulsions is a long and tedious procedure. However, this work is well under way, and preliminary results indicate that we will be able to achieve our stated scientific goals.

NEUTRON SPECTROSCOPY

Drs. Fred Maienschein, W. Zobel and Mr. T. A. Love, Oak Ridge National Laboratory

Flight 412-P, 19 July 1968

Purpose: Flight 412-P was designed as an engineering flight to determine the feasibility of obtaining neutron spectra in the energy range from ~1 MeV to ~40 MeV at high altitudes. Such spectra are of interest because albedo neutrons, produced by cosmic ray interactions, constitute a source for high-energy protons in the Van Allen belt. Since there appears to be a discrepancy of a factor of ~50 between the calculated and measured high-energy (>20 MeV) proton flux, the result of measurements of the albedo neutrons is, therefore, of considerable interest to the scientific community. Knowledge of neutron spectra in the atmosphere is also of practical interest since the dose due to neutrons received by the crew and passengers of the proposed supersonic transport plane can be calculated from these spectra.

Results: During the flight of July 19 all systems operated successfully with the exception that the temperature did not level out as predicted but continued to rise with the following results:

a. There was about a 5 to 10% gain drift which would have been tolerable since there was a gain check provided once every hour.

b. The delay lines in the linear amplifier changed electrical length. Since the separation of the gamma-ray spectra from the neutron spectra is dependent on the stability of the timing set by these delay lines, the data obtained after about one and one-half hours at float altitude will be extremely difficult to unscramble. Therefore, the flight was terminated 3.1 hours after reaching altitude.

Very preliminary examination of the data taken during ascent and the first hour at float indicates about one or two counts per second in the 2-inch-diameter by 2-inch-high neutron detector due to neutrons in this energy range. Installation of delay lines with smaller temperature coefficients, a more accurate prediction of the temperature excursion, and installation of a simple temperature control, we believe, will result in successful operation during the next flight.

ASTRONOMY

GAMMA AND X-RAY EXPERIMENTS

Dr. A. E. Metzger, Jet Propulsion Laboratory

Flight 376-PA, 15 January 1968

Purpose: The objectives of our flight No. 376-PA were to gain experience in balloon operations, to make observations of one or more of the x-ray sources reported in Cygnus, to test the effectiveness of a background-reducing shield and to establish the practicality of flying as thin a window as one mil beryllium in spacecraft experiments. The experimental package included a xenon-filled proportional counter with an effective window area of 14 cm^2. A scintillating plastic anti-coincidence shield surrounded the proportional counter and was observed by a 3" diameter photo-multiplier tube. Signals from the proportional counter were amplified and passed to a 128 channel pulse height analyzer to be digitized, and from there to telemetry. A three position trolley mechanism mounted above the plastic shield provided a ground command capability for in-flight calibration, and also for covering the collimated aperture with an anti-coincidence plastic scintillator, thereby completely shielding the proportional counter.

Results: Readings were taken of the cosmic x-ray background between 20 and 120 keV, of the efficiency of anti-coincidence shielding between 3 and 12 keV and between 20 and 120 keV, and of the spectrum of the discrete x-ray source Cygnus XR-1 above 20 keV. The transit of Cygnus XR-1 was seen from 20 keV to about 60 keV. The atmospheric background between 20 and 120 keV was monitored during ascent. The particle flux observed by the anti-coincidence shield was monitored continuously.

Dr. Donald A. Kniffen, NASA Goddard Space Flight Center

Flights 382-P, 27 February 1968; 383-P, 4 March 1968; 386-P, 24 March 1968; 387-P, 5 April 1968

Summary: The objective of flight 382-P was to search for a possible point source of gamma-rays eminating from the radio galaxy M-87. A digitized spark chamber sensitive to the detection of gamma-rays with energies above about 20 MeV was pointed in the direction of M-87 for 1.5 hours and it was determined that no source of gamma-rays existed in this direction within the sensitivity of the detector. An upper limit of $2 \times 10^{-4}/cm^2 sec$ was set on gamma-rays with energies greater than 100 MeV from this source. Also a study was made of the intensity and energy spectrum of gamma-rays produced by the collision of energetic charged particle gamma-rays with the matter in the atmosphere above the detector.

Flight 383-P: The spark chamber gamma-ray detector was flown in a horizontal pointing direction on this flight to investigate the intense source of gamma-rays coming from the earth's horizon. During the flight, the detector axis was dropped to look downward in order to study the character of the gamma-rays produced in the atmosphere beneath the detector which diffuse upwards. This data is useful as a relatively constant gamma-ray source for calibration of satellite gamma-ray detectors.

Flight 386-P: On this flight an attempt was made to investigate gamma-rays eminating from the x-ray source Cynus XR-1. The same detector was used as before, but a malfunction in the detector prevented the collection of useful data.

Flight 387-P: A second attempt was made to investigate the Cygnus region and again a malfunction in the orientation system and the detector precluded the acquisition of useful data.

The results of the first two flights will be combined with previous data and presented in a paper entitled "Results of Recent Cosmic Gamma-Ray Measurements and a Comparison with the OSO-3 Results" by D. Kniffen, C. Fichtel, and H. Ogelman, to be presented at the 25-27 November 1968 meeting of the American Physical Society in Miami. These results will be published in the literature in the near future.

Dr. W. R. Webber, University of Minnesota

Flight 392-P, 30 April 1968

Purpose: To detect and study discrete sources of cosmic x-rays. Instrument: a 4 foot diameter focusing x-ray telescope (the first focusing telescope flown on balloons to our knowledge).

Results: Very successful from both the balloon performance and instrument performance point of view. The data is still being reduced, however we have seen at least one known source (the Crab Nebula) and one source apparently not observed before. Only about 10% of the data has been scanned so far. First reports of the results are expected to be in the spring of 1969.

Dr. James W. Overbeck and Mr. E. Allen Womack, Massachusetts Institute of Technology

Flight 393-P, 1 May 1968

Purpose: A search for gamma rays from the reactions of nuclei on the sun and in the stars using a semi-conductor gamma ray spectrometer.

Result: This flight ended with a balloon burst on ascent. Fortunately, we collected data during ascent that enabled us to make many checks on the performance of a new instrument and to find one or two minor bugs. The 500-pound payload, which included 92 pounds of NaI (Tℓ) scintillator, 9 photomultipliers, a Ge (Li) crystal, and its liquid nitrogen cryostat, was recovered undamaged, and was ready for another flight three days later.

Flight 394-P, 5 May 1968

Purpose: This was an attempt to detect extraterrestrial gamma ray lines. The gamma ray detector was a cooled Ge (Li) crystal with an area of 15.3 cm^2 and an active volume of 22 cm^3. Its resolution was 5 keV FWHM. A 4096 channel pulse height analyzer allowed us to study the energy range from 30 keV to 6.3 MeV. The 92 pounds of NaI (Tℓ) was used as an anticoincidence shield to reduce the counting rate background.

Result: The gamma ray detector was pointed at the sun for 3½ hours in order to detect gamma ray lines from solar activity. Solar activity was minimal so only upper limits to gamma ray fluxes have been gotten from the data so far. The instrument worked extremely well as evidenced by sharp lines due to positron annihilation, and to neutron interactions in germanium.

A sudden failure of the command radio link prevented observation of the Crab Nebula, but allowed collection of several hours of background data for comparison with the solar data.

Flight 401-P, 4 June 1968

Purpose: The objective of this flight was to study the 20 - 200 keV x-rays from such celestial objects as Scorpius X-1, Cygnus XR-1, Nova Vulpecula 1968, M-87, and the x-ray sources near the galactic center.

The equipment used was the same as that used in flights 393-P and 394-P with the following exceptions:

1. The Ge (Li) crystal and its cryostat were replaced with a 3" diameter, 2 mm. thick NaI (Tℓ) scintillation crystal and its photomultiplier.
2. An 8 by 8 degree tungsten collimator was added. We also added a separate 1 degree fan beam collimator which was moved in and out of the x-ray path by radio command.
3. A star camera was added for precise verification of the pointing information normally provided by magnetometers and shaft encoders.

Results: Most of the flight was spent looking at Scorpius X-1 while astronomers in Virginia and British Columbia looked at its optical counterpart. While the data are still being analyzed, the following qualitative results are apparent:

1. A fairly low background of 4×10^{-4} counts/cm^2 sec keV at 30 keV was achieved.
2. The intensity of Scorpius X-1 was about the same as we found it in May 1967. No marked changes in x-ray intensity occurred.
3. Cygnus XR-1 was about one-tenth as intense as we found it in May 1967.

In order to investigate problems with the command system, we telemetered the command receiver's audio output back to the ground. However, the difficulties in command reception were very minor in this flight. We found that with this scheme we had created an excellent communications channel between Palestine and Midland, so we intend to continue the practice of telemetering the command receiver's audio output.

While the flight was cut short by a premature timer cutdown, the limitations set by the winds and the time southern celestial objects are high in the sky would not have allowed the collection of very much more data.

Publications

High Resolution Search for Solar Gamma Ray Lines*

E. Allen Womack+ and James W. Overbeck
Massachusetts Institute of Technology

The sun was observed from 4.7 gm./$cm.^2$ on May 5, 1968 (flight 394-P) with a 15.3 $cm.^2$ Ge(Li) detector (22 $cm.^3$ active volume). A shield of NaI(Tℓ) with 2.25 inch minimum thickness was operated in anticoincidence to form a directional spectrometer for energies from 30 keV to 6.3 MeV. Data include three and one-half hours of solar observation and two hours away from the sun. Detector resolution was 6 keV. Eight lines have been observed in the background spectrum, most of which are attributed to neutron interactions in the detector. The observed continuum background below one MeV is approximately 2.9 $E^{-1.3}$ counts/keV - sec. Annihilation radiation at 511 keV is shown to originate predominately in the mass surrounding the detector. Upper limits for interesting gamma ray line energies during the period of observation and periods of minor solar activity will be given.

*Research supported by National Aeronautics and Space Administration and U. S. Atomic Energy Commission

+Now at U. S. Atomic Energy Commission, Washington, D.C.

1968 publications resulting from 1967 flights 296-P, 303-P and 318-P were:

"Twofold Increase of the High-Energy X-ray Flux from Cygnus XR-1" by James W. Overbeck and Harvey D. Tananbaum. Physical Review Letters 20, 24 (1968).

"Time Variations in Scorpius X-1 and Cygnus XR-1" by James W. Overbeck and Harvey D. Tananbaum. The Astrophysical Journal 153, 899 (1968).

In addition, Harvey Tananbaum's Ph.D. thesis was based on the results of these flights.

Dr. George W. Clark and Mr. Frank Floyd, Massachusetts Institute of Technology

Flight 410-P, 16 July 1968

Purpose: This work includes the design and construction of a high angular resolution, balloon borne, x-ray telescope and its application to the determination of an upper limit on the angular size of the x-ray source Cyg X-1.

A nominal angular resolution of one arc minute was achieved by use of a grid modulation collimator which was held stable in inertial space by a gyroscopic feedback control system. The stabilized collimator was mounted in front of a 500 cm^2 x-ray detector which could be oriented from the ground via radio command link.

Results: Cyg X-1 was observed with this instrument on the night of 16, 17 July 1968. Its intensity was .056 photons/cm^2 sec at an atmospheric depth of 3.74 gm/cm^2 (127,000 ft) over the energy range of 25-100 keV.

An upper limit of 1.4 arc minutes was placed on its angular diameter along an axis which is at 27 degrees with the lines of right ascension.

Dr. Robert C. Haymes, Rice University

Flight 427-P, 4 September 1968

Purpose: The flight served as a final test of an instrument we designed for use with the GHOST system. It monitors the flux of low-energy gamma radiation in the atmosphere. The purpose of the GHOST experiment is to measure the atmospheric flux and its variations at high altitudes over an extended period of time. Should any fluctuations occur, we intend to attempt to correlate them with solar and geophysical phenomena, in an attempt to increase our understanding of the cause(s) of such variations. It is at that point that student involvement, with resulting theses, will become heavy.

Results: I am happy to say that the test was successful and the instrument appears to be suitable for use with the GHOST system.

Thus, 427-P was different from our other flights, in that the latter are conducted in order to carry our experiments; 427-P consisted of a flight test.

Dr. John A. Lockwood, University of New Hampshire

Flight 428-P, 7 September 1968

Purpose: The detecting system flown measured the gamma and energy spectra and fluxes in the atmosphere. The detecting system used has been described in Nuclear Instruments and Methods to be published in 1968. The neutron energy spectrum in the range 3-20 Mev has been determined, as well as the gamma-ray spectrum in the range of 1-10 Mev. We will make a detailed comparison of these measured spectra with the theoretical calibrations of Lingenfelter and others.

Flight 428-P carrying the University of New Hampshire fast-neutron detecting system was successful to the extent that a reasonable quantity of good data were obtained.

Publications

"A Fast Neutron Detector System for Space Research," R.N. St. Onge and J.A. Lockwood

Presented at the 14th Nuclear Science Symposium, Los Angeles, California and published by the Institute of Electrical and Electronics Engineers, Inc. (IEEE).

"A Simple High Resolution Pulse Shape Discriminator," R.N. St. Onge and J.A. Lockwood

Submitted to and accepted for publication by Nuclear Instruments and Methods, 1968.

"A Total Enclosing Active Charged Particle Shield," R.N. St. Onge and J.A. Lockwood

Submitted to Nuclear Instruments and Methods for publication in 1968-69.

"The Energy Spectrum and Flux of Fast Neutrons in the Atmosphere," R.N. St. Onge, University of New Hampshire Thesis, 1968.

Dr. David Ramsden, University of Southampton

Flight 429-P, 17 September 1968

Purpose: A sensitive telescope suitable for gamma ray astronomy at balloon altitudes had been developed in Southampton having a prediction sensitivity for discrete sources of 5×10^{-7} photons cm^{-2} sec^{-1}. The object of the flight was to steer the telescope axis towards the plane of the galaxy for the first half of the flight in a search for point sources of radiation and any possible anisotropy associated with the structure of the galaxy. It was also planned to maintain the Crab Nebula within its field of view for a further four to five hours later in the flight to improve the limits on the emission from this possible source.

Result: While it appeared from the telemetry that the system generally continued to function during the flight, and although some experience was gained in the problem of steering the payload, no scientific data was obtained from the first flight due to a failure in the data recording camera close to the instant of launch.

Publications

A paper describing the instrument launched from Palestine has been accepted for publication later this year in Nuclear Instruments and Methods. A copy of the preprint is attached. This was submitted prior to our trip to Palestine and there is a serious discrepancy between the weight quoted in the paper and our final overall weight. The discrepancy was largely accounted for by problems which arose in the manufacture of our thermally insulated pressure vessel and the landing frame. We have redesigned this part of the payload and hope to achieve a figure more consistent with the published weight.

A thesis written by Mr. S.J. Board to be submitted soon discusses the problems associated with the design and construction of the telescope flown on Flight No. 429-P and presents some non-flight results.

SOLAR

Dr. John D. Strong, University of Massachusetts

Flight 384-P, 23 March 1968

Purpose: The purpose of the flight was to measure the variation in the radiance of the sun as a function of distance from the center of the disk (the "limb darkening") at six infrared wavelengths from 11μ to 115μ. From this we deduce the far infrared continuous spectrum of the sun (11μ to 150μ) and hence the variation of temperature with height in the lowest part of the solar chromosphere.

We used a 16-inch telescope automatically pointed with an accuracy of about 10 arcsec to feed an infrared filter radiometer which scanned from the center to the edge of the image at each of the six wavelengths.

Results: Except for some small and scientifically unimportant difficulties with the tracking system, the flight was completely successful. We obtained the data which we wanted. The analysis is not complete.

Drs. Glenn Frye and A. D. Zych, Case Western Reserve University

Flights 411-P, 18 July 1968; 414-P, 24 July 1968; 420-P, 6 August 1968; 422-P, 17 August 1968; 435-P, 30 September 1968

Summary: Flight 411-P was essentially a repeat of 331-P made last summer by Dr. A.D. Zych to investigate the possibility of a solar neutron flux. During this particular flight there was no unusual solar activity.

Flight 414-P: The same spark chamber that was used on the previous flight was mounted in a different geometry to investigate atmospheric albedo neutrons from the nadir direction and from the horizon.

Flight 420-P: This flight was made with a gamma ray spark chamber whose counter triggering system had been modified to include time-of-flight discrimination.

Flight 422-P: This was another gamma ray spark chamber designed especially to detect low energy gamma rays with a threshold of about 10 MeV.

Flight 435-P: This flight was made with the same equipment as used on 411-P. On the previous two days there had been several large solar flares and the ESSA prediction was 60% for a large flare on this date. Unfortunately, one did not occur during the flight.

Results: Usable data was obtained on all of these flights although not always under optimum conditions. Flight 420-P only reached 96,000 feet instead of the theoretical ceiling of 135,000 feet. On 435-P the radio command system failed during the flight so that we could not switch our apparatus between the various operating modes. Unfortunately, our recording camera jammed so we could not obtain worthwhile data after the first hour.

ULTRAVIOLET AND INFRARED MEASUREMENTS OF CELESTIAL BODIES

Drs. William F. Hoffmann and C. L. Frederick, Institute for Space Studies

Flights 413-P, 22 July 1968; 415-P, 25 July 1968; 417-P, 30 July 1968

Summary: During a recent balloon flight (30 July 1968), we detected an intense far infrared source in the direction of the galactic center. The observation was made with a germanium bolometer at the focus of a 1 inch aperture f/1.2 crystal quartz lens. The bolometer, lens, and associated 100μ filter system were cooled to liquid helium temperature. The beam width was 2.3°. The spectral sensitivity was centered at 100μ with an effective bandwidth of 40μ. The balloon gondola was stabilized and controlled to provide an overlapping raster scan in the region of the galactic center approximately 2 hours in right ascension by 5° in declination. This yielded 40 scans across the source in a period of one hour.

The source coincides in direction with that of the galactic center to within the uncertainty of the direction determination. It appears to extend along the direction of the galactic plane at least three times the beam width and perpendicular to the galactic plane by less than a beam width. From laboratory calibration and from a direct in-flight comparison with the moon, we have determined the power detected from this source to be $4 \pm 2 \times 10^{-11}$ watts. This implies a flux density from the observed extent of the source of $1.8 \pm .8 \times 10^{-19}$ watts m^{-2} Hz^{-1} and a 100μ brightness temperature averaged over our beam width of 16°K. If the source is at the distance of the galactic center, the flux we detect corresponds to an emission of 2.7×10^{42} ergs sec^{-1} ($7 \times 10^{8} L_{\odot}$) within our spectral bandwidth.

This emission is comparable to the total luminosity believed to be associated with the galactic nucleus. A possible mechanism for this infrared luminosity is thermal emission from interstellar grains heated by the absorption of starlight. If this is the case, the dust grains must absorb the bulk of stellar energy produced in the galactic nucleus and re-emit it largely in the spectral range 80μ to 120μ. The grain temperature would have to be greater than 16°K.

Publications

"Far Infrared Observation of the Galactic Center Region at 100 Microns," by William F. Hoffmann, Institute for Space Studies, and Carl L. Frederick, Physics Department, Yeshiva University.

Dr. M. Golay, Geneva Observatory

Flight 430-P, 18 September 1968

Purpose: The purpose of the experiment is to extend a low resolution spectro-photography to the near ultra-violet region and to provide information about the Ozone absorption at balloon altitude.

A small, entirely automatic observatory has been developed at Geneva Observatory. It is equipped with a F:1, 160 mm Schmidt telescope using a Quartz prism to produce low dispersion spectra. A coarse attitude control system, using a flux gate magnetometer, generates a slow scanning of the sky.

580 spectro-photographs of Gemini and Orion were taken during their ascent between 67° and 23° zenith-distance.

Results: Scientific publications concerning this flight will be issued in September 1969.

Publications

M. Golay, A. Gaide, D. Huguenin: Stellar Observations from Balloons.

IAU Colloq. on Space Spectroscopy, Chicago, 3-5 May 1967.