NATIONAL SCIENTIFIC BALLOON FACILITY

ANNUAL REPORT

FY 1974

National Center for Atmospheric Research

The National Center for Atmospheric Research is operated by the nonprofit University Corporation for Atmospheric Research under the sponsorship of the National Science Foundation.

CONTENTS

		Page
I.	Summary	1 - 2
II.	Base Development	3 - 4A
	Facilities	
	Major Equipment	
III.	Engineering Development	5 - 11
	Long Duration Program	
	Extreme Altitude Program	
	Balloon Materials & Quality Control	
	Ballooning Systems and Test Flights	
IV.	Electronic Development	12 - 13
	Consolidated Instrument Package	
	Computer	
	Aircraft Tracking	
	Termination Package	
	Weather Radar	
V.	Operations	14 - 21
	Flight Services by the NSBF Crew	
VI.	Administration	22 - 29
	Personnel	
	Funding	
	Committee Meetings	
	Safety	
	Malfunction Investigations	
	Other Meetings	
VII.	Plans for FY 1975	30 - 31
Appendices		
	A. Flight Summaries	
	B. Evaluations by Scientists of Balloon-Borne Experiments	

NATIONAL SCIENTIFIC BALLOON FACILITY

ANNUAL REPORT - 1 JULY 1973 - 30 JUNE 1974

I. SUMMARY

During FY 1974, the National Scientific Balloon Facility flew a total of 86 flights, of which 82 were in direct support of scientific research and 4 in support of our test and evaluation effort. These flights were flown for 44 scientific groups from 34 institutions and 7 countries.

Of interest was the rise in demand for remote flights. During the year we flew 16 flights from locations other than Palestine. Eight of these were from Parana, Argentina, 3 from Rio Cuarto, Argentina, 3 from Sioux City, Iowa, and one each from Midland, Texas and Hope, Arkansas.

The overall success rate decreased slightly from 84% last year to 82% this year. Balloon failures remained constant at 12%. One cause for the increased operational failures was the lack of funds for engineering flights, resulting in experimental designs being flown on operational flights. An example of this was the series of failures on the top-load Jet Propulsion Laboratories (JPL) flights.

We are quite pleased that we had no electronic failures during the year.

The trend to larger, heavier and more complex scientific experiments has leveled off during the year, although this is masked in the statistics by an increased number of small flights during the year. For example, the average balloon size decreased but 25% of the balloons we

flew were greater than 15 MCF.

The most significant trend in operation is the demand for remote site launches. We expect this requirement to continue and have already received a significant number of such requests for next year. We anticipate the demand to level off at approximately 15 remote flights and 70 Palestine flights per year.

The primary emphasis in development has been on long duration ballooning. We met with a cross section of the scientific community to determine the scientific requirements. Following this, we prepared a detailed proposal (with the assistance and advice of our advisory committee) for submittal to the National Science Foundation. We have been advised that this effort will be funded in FY 1975.

II. BASE DEVELOPMENT

FACILITIES

Construction of a new 305 M diameter launch pad was completed in June 1974. The new pad was constructed by E. W. Hable and Sons, Inc., on the 119 hectare site west of the present building complex at Palestine. (Figure 1).

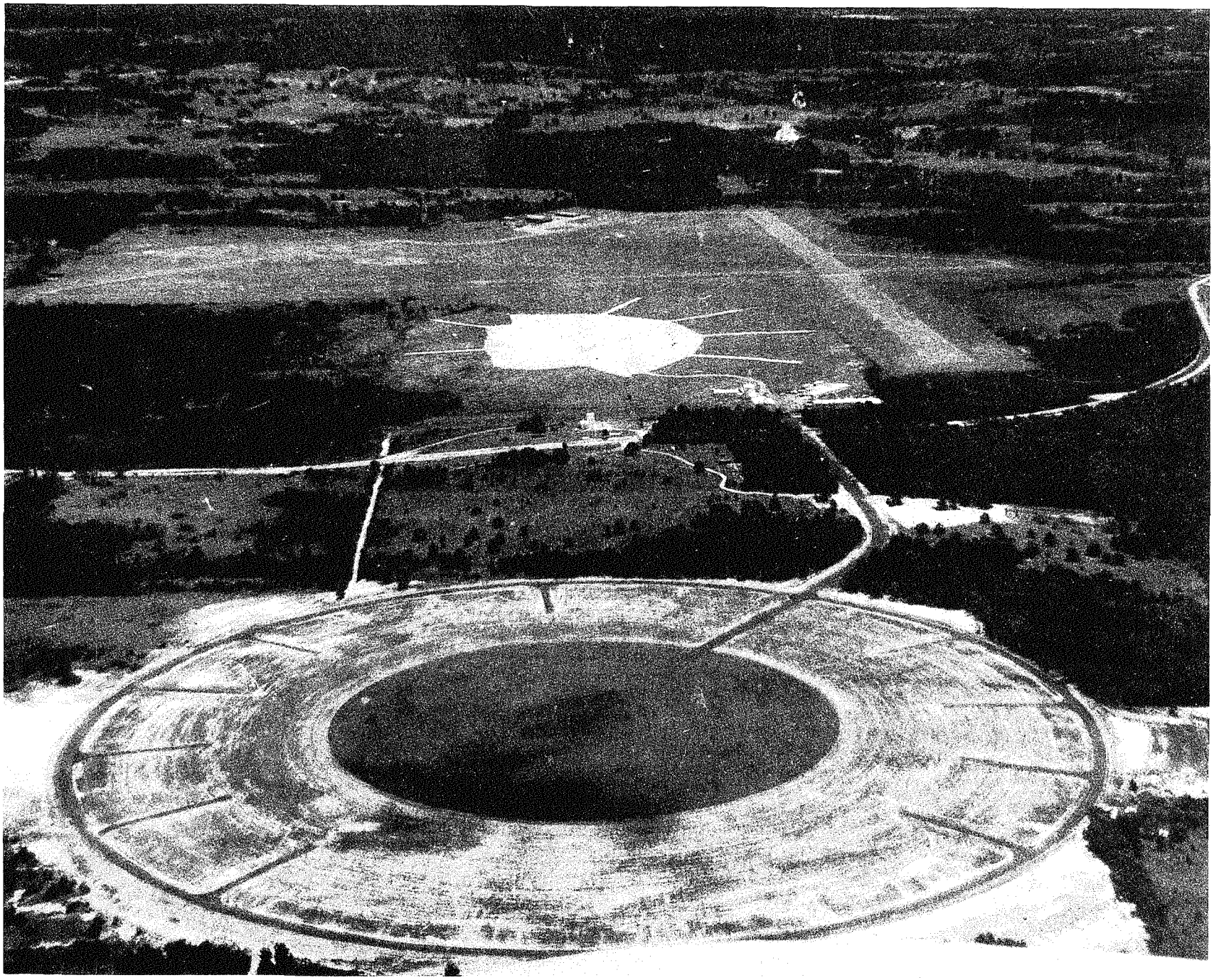
Construction of a new state access road to the NSBF was completed in June 1974.

MAJOR EQUIPMENT

A 50 KVA standby power generator has been installed to provide emergency power for the telemetry and control tower.

A 5 ton wrecker with hydraulic operated boom was obtained from surplus for use as a balloon launch vehicle and mobile crane.

Two 4,540 Kg capacity, one 2,724 Kg capacity and one 1,816 Kg capacity forklifts were obtained off surplus for use at the NSBF.



New Launch Area

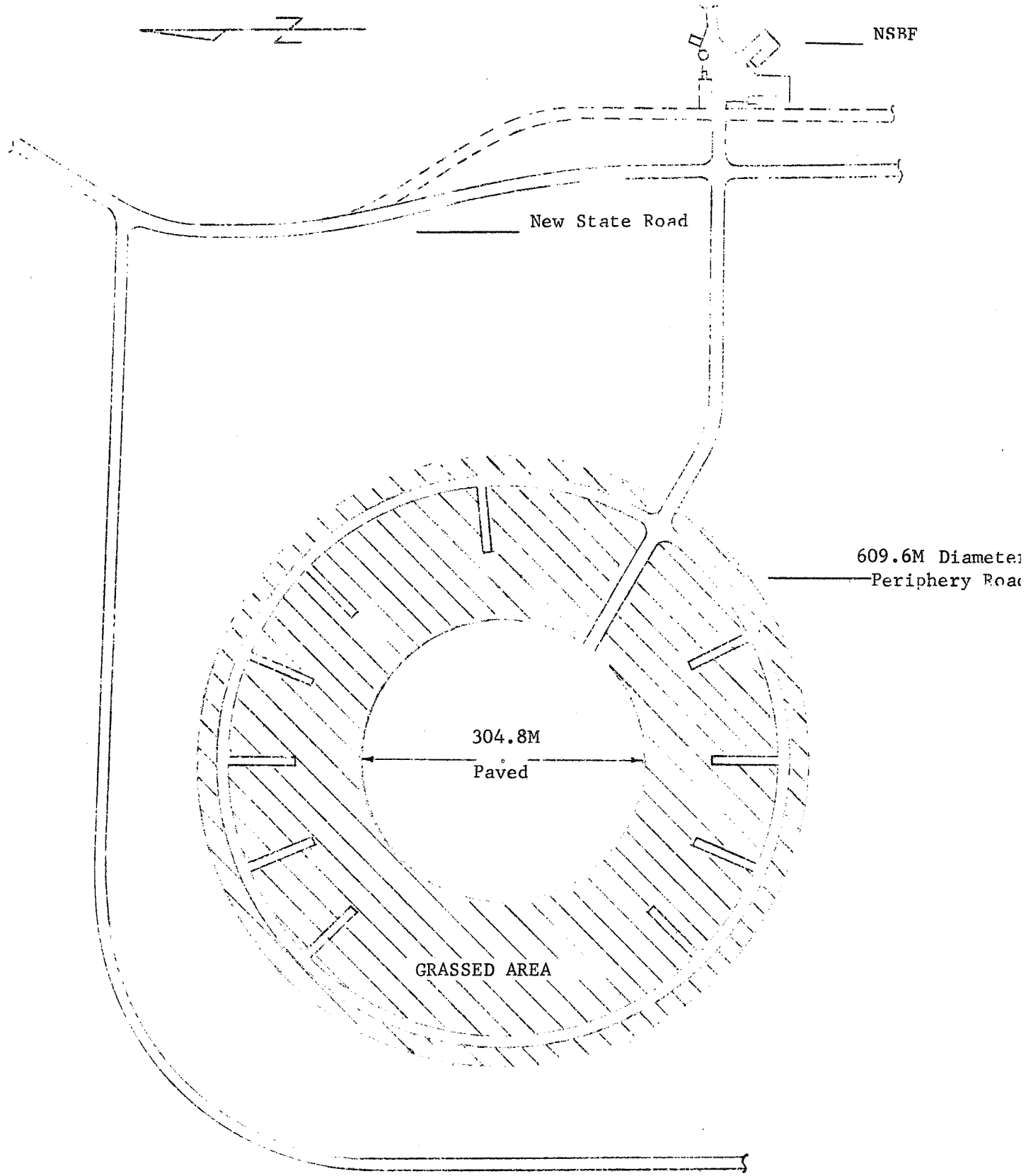

NSBF
New State Road
609.6M Diameter
Periphery Road
304.8M
Paved
GRASSED AREA

Figure 1.

III. ENGINEERING DEVELOPMENT

The primary goal of the engineering development program at the NSBF is to advance the state-of-the-art of scientific ballooning, both in the design of the balloon vehicle and/or associated systems and in refinements in operational techniques. The major ballooning development programs were established in FY 1972, consisting of long duration, extreme altitude, and economical heavy load. These have been continued during FY 1974 with primary emphasis on the long duration program.

Extensive design and development work has been performed at Texas A & M University in support of these goals. Additionally, other programs, both in-house and sub-contracted, have been conducted to help achieve our design objectives.

These programs and associated efforts are discussed in the following sections.

LONG DURATION PROGRAM

The development of long duration ballooning was established as our top priority program early in CY 1972 by a survey of the scientific ballooning community. The goal was set at 227 Kg payload at 36.6 Km for duration of several weeks to months. A meeting was held in September 1973, (Reference Section VI), at which time the goals were changed to 227 Kg at 39.6 Km with continuous tracking, data acquisition and payload recovery.

1) Program Development

At the B & P Meeting in October 1973 the staff of the NSBF was directed to prepare a proposal for submission to the NSF to develop long duration ballooning. Development of both the air-

borne/ground station electronics and the balloon vehicle were proposed for a two year period. During the preparation of this proposal, in-house studies were conducted on the various areas involved to develop feasible approaches to solving both the electronics and balloon development problems. As a result of this proposal, funding from the NSF for this development will begin in FY 1975.

2) Significant Accomplishments

During FY 1974 two superpressure balloon test flights were conducted and a new film development test and analysis program was undertaken. Details are described below:

a. In May of 1973, a 59.2 M superpressure balloon with a 227 Kg payload was flown from Palestine. A probable small leak in the balloon necessitated an early termination. As a result, in early FY 1974, a post-flight analysis was undertaken to determine the cause of the presumed leak. The available evidence pointed to the load attachment design as the likely cause. In March of 1974, a 19.5 M sphere was flown from Palestine with a newly designed load attachment configuration. The flight was successful in all respects. The 19.5 M sphere also utilized a new tube type inflation system to replace the previously used hard fittings. This proved to be an excellent improvement. Some refinement of the design is planned prior to its usage in future larger balloons. Changes were also made in the techniques utilized to collect the data from the balloon (temperature and strain). Good data was received throughout the flight.

b. On 23 May 1974, Flight 102-N was successfully launched from Hope, Arkansas. The balloon was a 60.1 M (approximately 113,000 M^3) designed to support a 148 Kg payload at 36.6 Km (4.45 Mbs). A load attachment design nearly identical to that successfully flown on the 19.5 M sphere was incorporated into the balloon. However, during ascent an unexpected "inflation" of the conical enclosed attachment apparently caused unusual angular stresses at the attachment to the balloon, and possible minor holes and/or tears. After reaching float, only a minimal superpressure caused catastrophic failure of the balloon. This indicates that a tear or hole was probably present which propagated causing balloon rupture. Texas A & M University, under contract to the NSBF, is currently evaluating this problem both from a stress analysis and materials viewpoint.

c. In addition to work on balloons built from polyester film, a program was undertaken to thoroughly evaluate a biaxially oriented nylon film. Certain characteristics of this material appear superior to polyester, such as 1) higher strength, 2) lighter weight, and 3) less pin-holing from handling. It is the latter characteristic which is most important since it should eliminate the need for lamination; hence, considerable cost savings because smaller balloons will be required and lamination costs eliminated. Extensive laboratory tests are currently underway. Favorable results from these tests will then result in balloon design criteria being established and flight tests attempted.

In FY 1975, with the advent of the additional NSF funding for long

duration, an extensive program will be undertaken. A very detailed stress and design analysis will be conducted; extensive material tests using both old and newly devised techniques will be performed; a number of fully instrumented flight tests will be made; new designs and materials evaluated; all of this pointing towards our goal of 227 Kg at 39,650 M for several months.

The electronics portion of the long duration ballooning program consists of the major components of: Tracking System, Data Acquisition, Long Range Command and Power System. All of these are planned for completion through study and design phases during FY 1975. Some prototype component fabrication is also contemplated during the year. The electronics goal is the achievement of nearly continuous global tracking, data acquisition and command capability throughout the anticipated flight durations of 1-3 months.

EXTREME ALTITUDE PROGRAM

A test flight of a nylon-12 film 86,932 M^3 balloon was attempted on 31 January 1974 (Flight 807-PT). This was the first full scale flight balloon to be fabricated from this film. After release from the spool and prior to the balloon taking the full weight of the payload, a split occurred in the bubble resulting in failure. The payload was never released. Post examination revealed three (3) gores with extensive stretch marks. These marks were compared to similar stretches in the film seen in lab tests and in an earlier ground inflation test. Fairly high stresses are necessary to create these marks; hence, isolated areas in the top region of the balloon had to be highly stressed. This was undoubtedly a result of the loading caused by a dynamic launch; therefore, it appears that some form of vertical launch should be utilized for these ultra-thin films.

In FY 1975 further evaluation of the ultra-thin nylons will be undertaken as part of Phase I of our program to achieve the desired goal of a 227 Kg payload at 55 Kms. A parallel effort will be the mating of thin film balloons to a vertical and/or reefed launch technique.

BALLOON MATERIALS & QUALITY CONTROL

The majority of the materials research undertaken in FY 1974 by the NSBF has been conducted by the Texas A & M Mechanics and Materials Laboratory. The majority of this work has been concerned with balloon grade poly and the development of new testing techniques which will discriminate between superior and inferior films. The major developments utilized the adaptation of the "race track" biax tester. Cold brittle points of various films and seals were defined using this technique. This was the first time a diaphragm biaxial test has defined a brittleness temperature of a balloon film and shown a discrimination between films. In addition, a heat-seal configuration of unusual appearance, tested by the race track method, was found to be inferior to normal appearing seals. Normal test techniques had been unable to show this seal to be inferior. These tests resulted in a change in sealing technique by the manufacturer to correct the problem.

Three materials meetings were held during FY 1974, (Reference Section VI). The goal of these meetings was the development of a new balloon-grade material specification. All tests have been agreed upon by ONR, AFCRL, manufacturers and the NSBF, except for the cold brittle test. Further testing is now being carried out at Texas A & M to resolve this one remaining test.

The Sheldahl Poly + Program was continued on a joint effort with

ONR. Further seals and tubes were made by Zodiac/CNES in France. These were tested by Sheldahl and a seal configuration chosen. This lamination of polyethylene and thread laid scrim will be fabricated into a small balloon for hangar inflation and pressurization in FY 1975. The application of this material to the long duration program is becoming more appealing and a trade-off study will also be conducted in FY 1975 along with a possible free-flight balloon.

BALLOONING SYSTEMS AND TEST FLIGHTS

1. Let-Down Reel - A new paddle wheel let-down reel was designed, built and tested in-house. This reel is designed for a 726 Kg payload and 610 M of line. It was successfully used on two flights in FY 1974.

2. Thermal Program - Texas A & M has completed development of a computer program to design proper scientific package insulation to maintain desired temperatures. A thorough sensitivity study was also made of the input parameters of this program. It has been successfully used on approximately 10-12 packages and has been extrapolated to investigate long duration flight package insulation.

3. Dynamics - The balloon dynamics program was continued under the direction of Drs. Frank Kreith and Jan Kreider of the University of Colorado. A number of flight simulations were made to prove the accuracy of the computer program and is now considered in an operational status. In FY 1975 it will be revised to simulate polyester superpressure flights.

4. Top Payload Mount - A new mounting for a package designed to fly on the top of a balloon was designed, built and tested during FY 1974. A full scale test was flown on an operational

flight in January 1974 to prove out the system. An additional flight on a revised configuration was successfully made later in the year. This top mount is designed for approximately a 36.3 Kg load. In addition, in conjunction with the operations, rigging and launch crew, a tow balloon launch technique was developed and successfully used on four (4) flights in FY 1974.

IV. ELECTRONIC DEVELOPMENT

CONSOLIDATED INSTRUMENT PACKAGE

A redesign of the prototype CIP was completed and contract let for the construction of the frames and printed circuit cards. These are due for delivery in August 1974 and will be placed into operation as soon after as testing can be completed.

A total of 10 units are being purchased, however this does not include some of the more expensive components such as PCM data encoders which must be purchased as funds become available. At the present time enough components are on hand to complete 6 units with full capability of data handling and command functions.

COMPUTER

The PDP-11 computer has been upgraded with the addition of 8 K of core for a total of 24 K. A 1.2 megaword disk was added with a changeable disk pack capability. This disk and the paper tape software now enable Fortran to be used for programming.

AIRCRAFT TRACKING

The VHF "P" band direction finder equipment in the tracking aircraft is being modified for tracking of the UHF "L" band telemetry signal. The antennas for both aircraft have been modified and reinstalled with the receivers due for delivery in late August.

An altitude read out will be added to this system with a goal of elimination of the HF Barocoder Beacon from the flight instrument package.

TERMINATION PACKAGE

An in-house design of a new termination PCM Command Decoder has

been completed with a prototype unit now being assembled for testing.

This package will be self-contained with a 10 function PCM Command and battery for firing squibs, control of parachute release and operation of helium valves. Also, to be included and now under design is an electronic back-up timer that can have the pre-set time extended to enable longer float times when the flight trajectory allows.

WEATHER RADAR

Installation has been completed on a CPS-9 weather radar. This will give observations of weather conditions which may effect launching of flights as an aid in deciding a GO - NO GO decision. This radar will also be used for tracking of balloon flights, however, the effectiveness of this has not been determined as yet. Tests will be conducted to determine the distance and accuracy of the system as related to balloon tracking.

V. OPERATIONS

FLIGHT SERVICES BY THE NSBF CREW

Seventy (70) flights were flown from Palestine, Texas, eight (8) from Paranà, Argentina, three (3) from Rio Cuarto, Argentina, three (3) from Sioux City, Iowa, one (1) from Midland, Texas and one (1) from Hope, Arkansas for a total of 86 flights. There were eighty-two (82) operational flights and four (4) engineering flights.

We had a total of fifteen (15) failures, the nature of which were as follows:

Balloons - 10

Operations - 5

Balloons again accounted for the majority of the failures. There was no consistent pattern that could be detected except that two out of three 314,314 M^3 balloons failed. One of the failures was a 860,824 M^3 balloon and the others varied in size from 7,164 M^3 to 152,060 M^3 in volume.

Of the operational failures, one occurred on a top mounted scientific package. At launch the upward and forward movement of the balloon bubble caused the top mounted package to move in the opposite direction, which caused the balloon to fail prior to release from the launch vehicle. This failure mode was corrected in subsequent flights by the use of a tow balloon to overcome the inertia of the top mounted package.

Two operation failures were concerned with the paddle wheel let-down reel operation. The first failure occurred after successful deployment of the let down device and the conclusion of the scientific experiment. The top parachute of a two parachute system was separated from the balloon.

It quickly overtook the bottom parachute and caused fouling of the bottom package. The bottom package separated from the parachute and free fell to the ground, destroying the package.

The other failure was on the maiden flight of a newly designed let-down reel. An inadequate winding technique allowed the 2000 foot nylon let-down line to deploy faster than planned. As a result the nylon line melted due to frictional heating. The scientific payloads were safely parachuted to earth and were not damaged at impact. A new winding system has been established and the system has been flown successfully twice since the failure.

A malfunction of the release mechanism on the launch vehicle caused one failure at Paraná, Argentina. The top came out of the balloon while the launch director was trying to release the gondola from the launch vehicle.

One other operational failure was due to a frozen discharge valve on the large Kelly trailer thus causing an under inflated balloon at launch. Corrective action has been to check the pressure on each tube on the Kelly trailers prior to tying off the inflation tubes.

A very significant change in the operation was the increased number of balloon launches from remote locations. A total of sixteen (16) balloons were launched from five (5) different locations.

Of particular note were two long duration flights on zero pressure balloons. One flight with a payload of 878.8 Kg floated at the 2.65 millibar pressure level for 63.1 hours. The other flight with a payload of 1,175 Kg floated at the 3.45 millibar level for 61.9 hours. These are the longest completely successful flights flown by the NSBF.

The average payload weight has decreased over the past two years from 797 Kg to 654 Kg. However, out of eight payloads, three were over 1,453 Kg, four were over 2,043 Kg and one weighed 2,869 Kg. This 2,869 Kg payload is the heaviest payload ever launched dynamically.

The average balloon volume for 1974 shows a decrease over last year. However, eleven flights were flown on balloons 424,749 M^3 or larger and eleven more flights were flown on balloons 566,332 M^3 or larger.

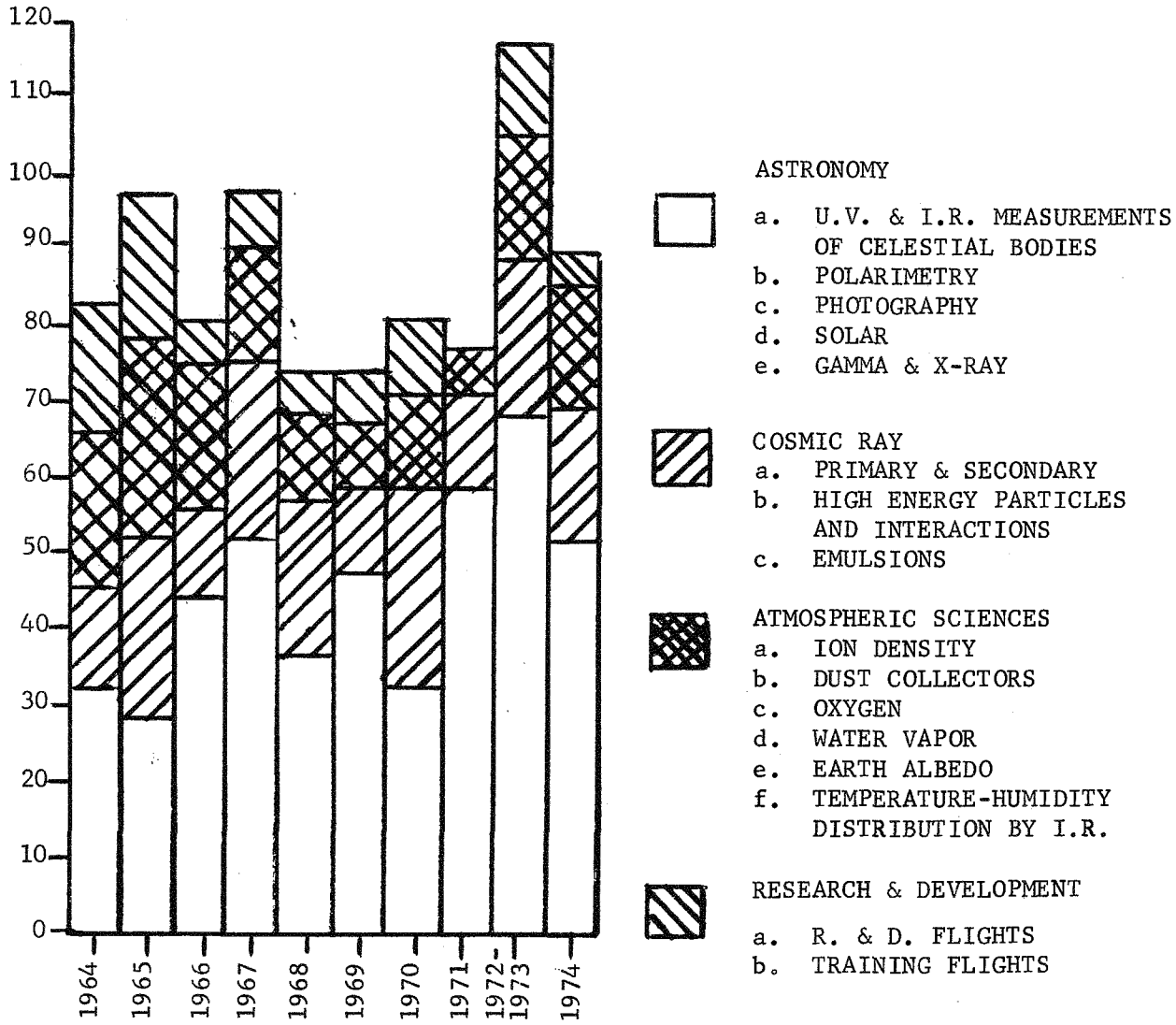


Figure 2. This chart shows how the NSBF balloon flight support has been distributed among the broad scientific disciplines.

YEAR	'64	'65	'66	'67	'68	'69	'70	'71	'72 '73	'74
NUMBER OF FLIGHTS	83	97	81	98	74	74	81	77	118	86
FAILURES	29%	28%	30%	26%	19%	16%	15%	19%	16%	17.4%
BALLOON	19%	16%	6%	16%	8%	9%	6%	14%	12%	11.6%
ELECTRONICS	6%	3%	10%	2%	7%	3%	3%	3%	2%	0%
OPERATIONAL	3%	5%	9%	3%	1%	1%	4%	3%	2%	5.8%
WEATHER	1%	4%	5%	5%	3%	3%	2%	0%	0%	0%

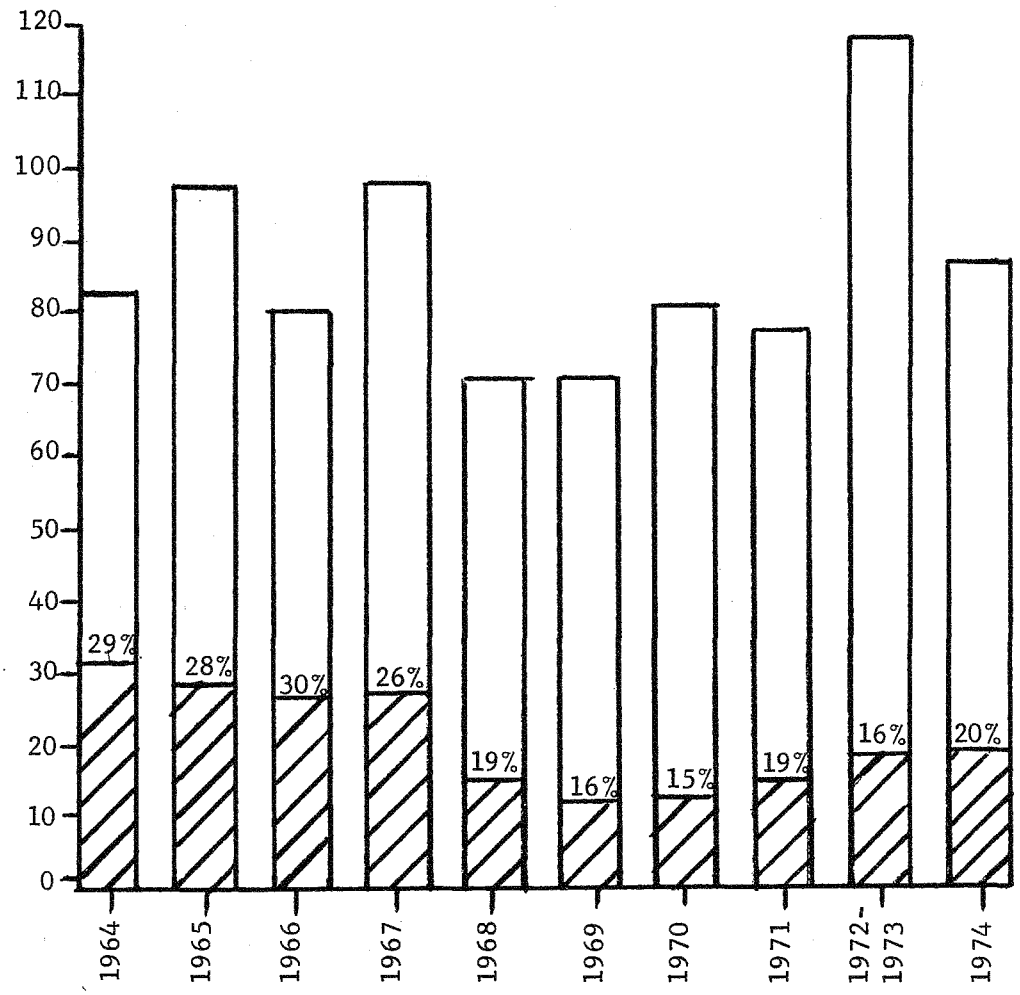


Figure 3. The number of flights attempted by the NSBF operations crew from all locations and the percentage frequency of failures are shown by years in both the graph and the table. The table also provides a breakdown by failure type.

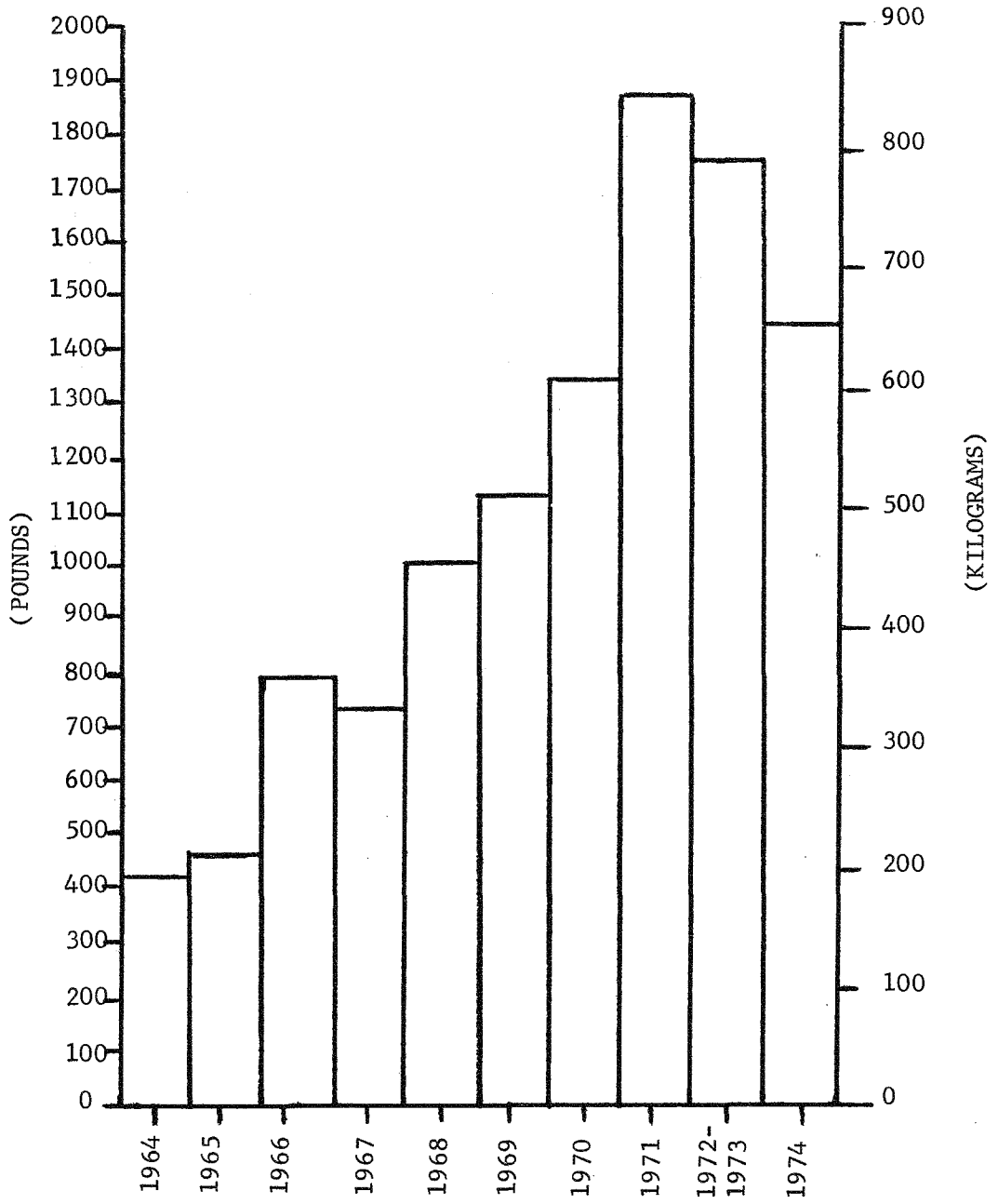


Figure 4. This graph shows the trend in average payload weight over the years.

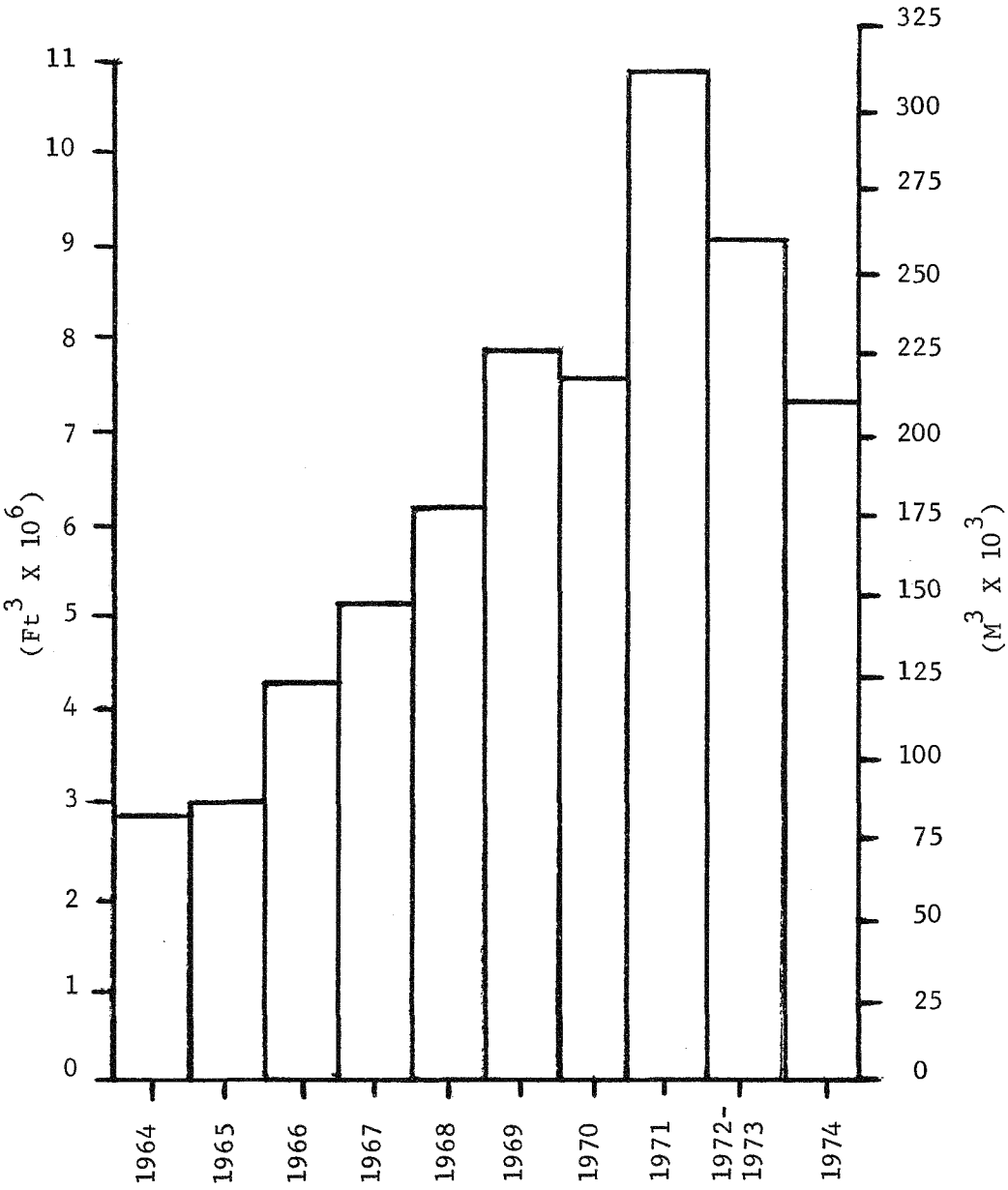


Figure 5. This graph shows the average balloon volume flown over the years.

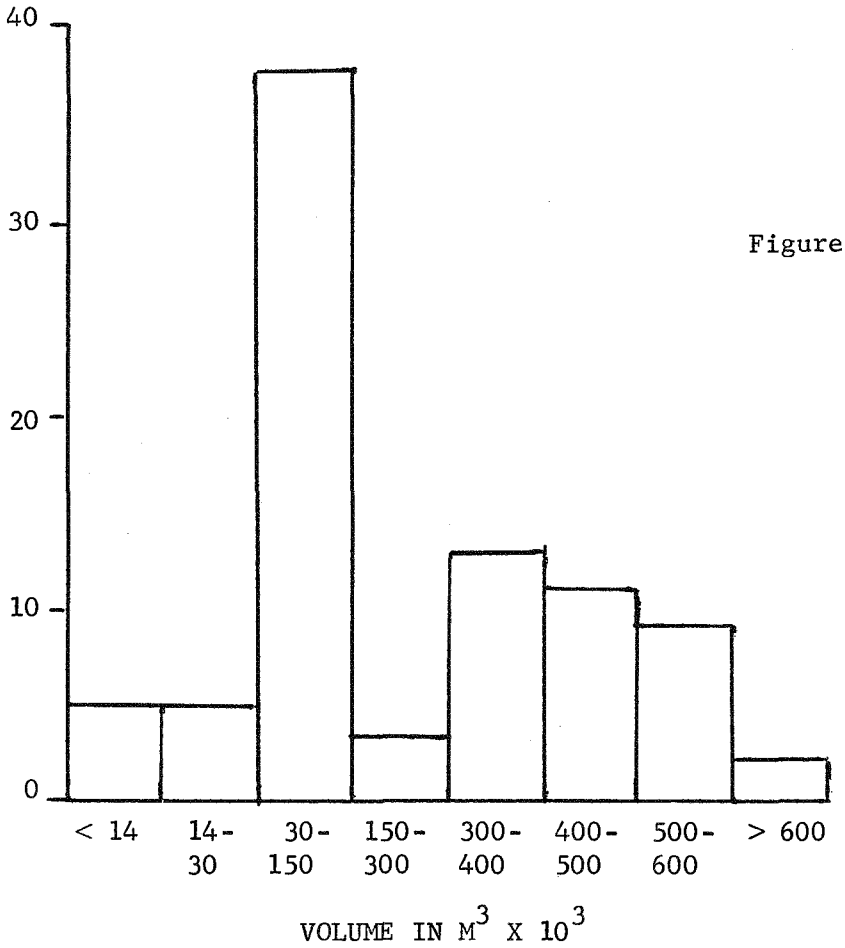


Figure 6. Balloon Volume Distribution for FY 1974 Flights

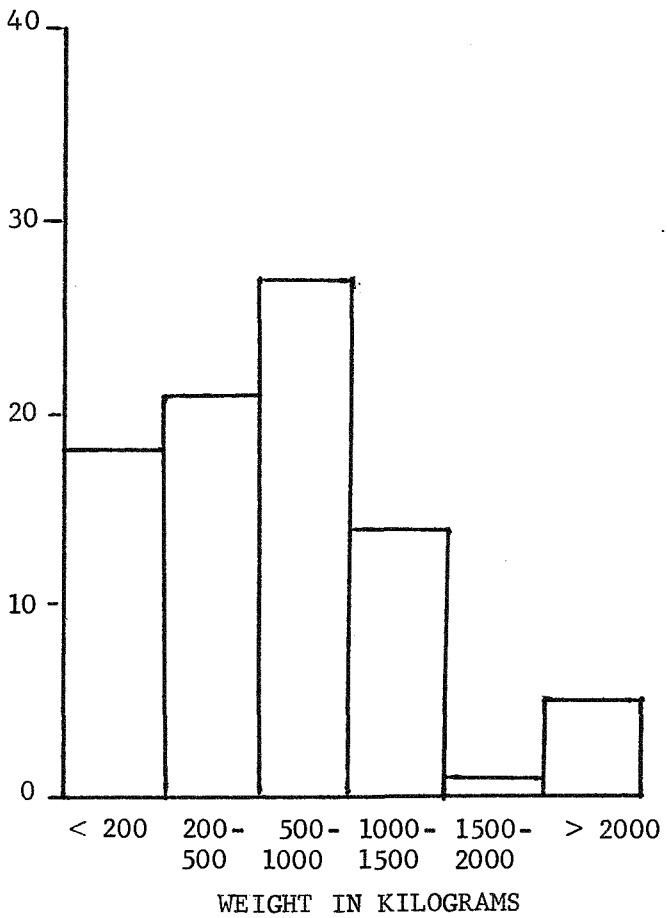


Figure 7. Payload Weight Distribution for FY 1974 Flights

VI. ADMINISTRATION

PERSONNEL

The staff of the National Scientific Balloon Facility on 30 June 1974 consisted of forty-four (44) full-time employees and three (3) trainees working under a Minority Technician Training Program. The full-time staff allowance is classified as follows:

Administration	6
Clerical	5
Engineers	4
Guards	3
Machinist	1
Maintenance	1
Mechanic	1
Meteorologists	2
Pilots	2
Technicians	19
TOTAL	44

In connection with NCAR's Affirmative Action Program, a Minority Technician Training Program was established at the National Scientific Balloon Facility on 3 September 1973. John M. Jackson, Jr. was hired as a Weather Observer/Rawinsonde Operator Trainee on that date. A second trainee Herman R. Bell, Jr., was hired on 10 September 1973 as an Electronic Technician Trainee. A third trainee, Norman J. Lincoln, Jr., was hired as an Engineering Technician Trainee on 3 December 1973. All three of the young men are Black and from the Palestine area. They were originally hired for one year training periods under NCAR's Personnel Development Program. Funds were made available, however, on 1 June 1974, by the Atmospheric Technology Division, to continue the training programs through June 1975. The National Scientific Balloon Facility will make every effort to bring the trainees on as regular full-time

employees on 1 July 1975.

Two (2) temporary Balloon Technicians, Randy Brown and Mark Hamilton were hired in early March to work through June 1974. They were needed to assist our regular crew in balloon launching, tracking and recovery during the busy Spring turn-around period.

Three (3) temporary employees were hired in June 1974 to work in a Summer Youth Training Program at the NSBF. Messrs. Jay Hatler and Andy Flores were chosen to work with the Mechanic and Machinist, respectively; and Miss Theresa Smith was selected for the clerical training position.

Purchasing authority at the NSBF was raised from $2500 to $5000 in March 1974. At about the same time, the NSBF was given authority to process excess property orders direct to the National Science Foundation in Washington, D. C., without going through the NCAR Administration Division in Boulder. Also, beginning in March 1974, payroll checks are prepared, signed and distributed by the Administration Department at the NSBF, using a local bank, with the NCAR Finance Office handling the actual computations.

Staff changes, for full-time positions, for the period 1 July 1973 through 30 June 1974 were as follows:

1. 16 July 1973 - Don Gage was hired to fill one of our two pilot positions to replace the contract pilots provided under Subcontract No. NCAR 154-70 with Modern Aero, Inc., which terminated on 30 June 1973. The other pilot position was filled by Michael Rayburne on 4 June 1973.

2. 1 September 1973 - Billy Blevins was promoted to Master Balloon Technician.

3. 1 September 1973 - Robert Collett was promoted to Electronics Technician III.

4. 1 September 1973 - J. O. Hollingsworth was promoted to Balloon Technician II.

5. 1 September 1973 - Johnny Ingram was promoted to Balloon Technician II.

6. 1 September 1973 - Marvin Riley was promoted to Balloon Technician II.

7. 1 September 1973 - Homer Woody was promoted to Balloon Technician II.

8. 14 September 1973 - Michael Rayburne resigned as a pilot.

9. 17 September 1973 - Danny Masur was hired as a pilot.

10. 1 October 1973 - Michael Pavey was named as the Head of the Engineering Department. He had served as Acting Head of the department from 1 January 1973.

11. 30 October 1973 - Frank McCreary began his disability leave.

12. 1 December 1973 - Tommie Lumpkin was promoted to Shipping and Receiving Clerk.

13. 1 January 1974 - Charles Burris was promoted to Balloon Technician II.

14. 1 January 1974 - William Landsperger's job was changed from Chief Meteorologist to Safety and Standards Administrator.

15. 1 January 1974 - Dan Christianson was promoted to Chief Meteorologist.

16. 1 January 1974 - Ralph Harju's job was changed from Quality Assurance Specialist to Administrative Assistant to the Head of the Operations Department.

17. 7 January 1974 - Gerald Hooks was hired as a Plant Maintenance Engineer.

18. 11 January 1974 - William Wilson resigned as Programmer.

19. 4 February 1974 - Charles Palmer moved from the position of Acting Head of the Atmospheric Technology Division to Deputy Manager of the National Scientific Balloon Facility.

20. 18 February 1974 - Oscar Cooper transferred from NCAR/Boulder, as an Electronics Engineer.

21. 1 June 1974 - Gerald Hooks was transferred from the Administration Department to the Operations Department.

FUNDING

Funding during FY 1974 was below optimum but it did permit the NSBF to honor all authorized requests for flight support. The Foundation allowed the NCAR Divisions to carry-over all funds from FY 1973 provided they were able to present a clear picture of explaining how these funds could be used in relieving the tight budget situation of FY 1974. As a result, the NSBF was able to carry-over $39,145 from FY 1973 available funds.

Funds in the amount of $550,000 were received from NASA Headquarters, Washington, D. C., $400,000 of this was for Balloons and Helium in support of NASA Grantees to fly experiments from the NSBF and the remaining $150,000 was for Research and Development work to be conducted by the NSBF Engineering Staff.

NSBF Management also learned in June, 1974, that $600,000 would be made available to support a new Long Duration Balloon Development Plan. Steps will be taken in early FY 1975 to hire two (2) new Engineers in support of this activity and begin to develop concepts and systems.

The FY 1974 Budget Program for the NSBF is broken down as follows:

		SALARIES, BENEFITS & TRAVEL	SUPPLIES SERVICES & EQUIPMENT	TOTALS
1.	Administration	$149,344	$ 95,301	$ 244,645
2.	Engineering	81,352	3,500	84,852
3.	Operations	419,299	231,126	650,425
4.	Safety & Standards	21,078	1,000	22,078
	TOTALS	$671,073	$330,927	$1,002,000

COMMITTEE MEETINGS

Three meetings of the UCAR Committee on the NSBF Budget and Program were held during the year. In addition, there was one meeting of the Operation and Development Sub-Committee.

The Sub-Committee met in Palestine on 19 July 1973. The findings of this meeting were reported by the Chairman, Dr. R. Haymes, by letter to Dr. David Atlas on 24 July 1973. They praised both the management and the engineering-development program of the NSBF.

The meetings of the full Committee were held on October 2, 3, and 4, 1973 in Boulder, 5 November 1973 at Goddard Space Flight Center and 23 April 1974 in Washington, D. C. These meetings were primarily concerned with budget examination and defense and discussions of the proper administration setting for the NSBF.

Membership on the Committee during the past year were as follows:

Robert C. Haymes	Rice University, Chairman
Rainer Weiss	Massachusetts Institute of Technology, Vice Chairman
Robert L. Chasson	University of Denver
Edward L. Chupp	University of New Hampshire
Giovanni Fazio	Smithsonian Astrophysical Observatory
Curtis L. Hemenway	Dudley Observatory
Donald Kniffen	Goddard Space Flight Center
Homer T. Mantis	University of Minnesota
Elmar Reiter	Colorado State University

We continue to be impressed with the enthusiasm and order of the Committee. Their guidance and support has been invaluable and is deeply appreciated.

SAFETY

In January 1974, W. J. Landsperger was named Safety Coordinator for the Facility. A vigorous safety campaign has been instituted and a large number of potential hazards have been corrected. There have been no accidents resulting in loss of work time during the year.

MALFUNCTION INVESTIGATIONS

The Facility has long had a policy of investigating all flight failures. This has recently been enlarged to formal investigation of all flight malfunctions and has already resulted in several procedural modifications that should increase reliability.

OTHER MEETINGS

The Symposium on Telescope Systems for Balloon-Borne Research was co-sponsored by the National Scientific Balloon Facility and NASA-Ames Research Center. It was held at the Ames Research Center, Moffett Field, California, on 21 and 22 February 1974. The meetings were co-chaired by Alfred Shipley, NSBF and Charles Swift, Ames.

There were 24 invited papers, including 2 by NSBF personnel. The attendance was above expectation with over 90 people participating in the symposium. The proceedings are being edited and should be published in the next six months.

A Long Duration Balloon Meeting was held in Dallas on 29 September 1973. The purpose of this meeting was to present the possibilities of long duration ballooning to the scientific community and to determine their requirements. There were 35 attendees representing 20 different institutions. The meeting was quite successful in finalizing the requirements as a first step to writing a proposal.

Three Balloon Materials Meetings were held during the year, co-sponsored by the NSBF and AFCRL. These meetings were attended by NSBF, AFCRL, Texas A & M University, Stevens Institute and representatives of the balloon manufacturers.

A new specification (mil-spec) was agreed upon except for the section on cold brittleness testing. Further work is required before an agreeable test can be accepted.

A meeting on Trans-Atlantic Balloon Flights was held in March 1973, in Rome, Italy. This meeting was called by the U. K., SRC, and the Italian C.N.R. to discuss the feasibility of a Trans-Atlantic Balloon Facility.

It was attended by representatives from the NSBF, Italy, the U.K. and France. It has resulted in a proposal from the University of Southampton to the S.R.C. for funding.

VII. PLANS FOR FY 1975

The NSBF will continue to offer year-round scientific ballooning operations and engineering support to authorized scientific research groups. The total number of flights is expected to remain constant at about 90. The trend in payloads appears to be toward the extremes, with the increase in large complicated experiments being matched by a new group of small, but equally sophisticated payloads.

We will continue to maintain a remote operations capability for any valid request and suitable location. These remote flights are expected to average around 15 per year over the next few years.

Of operational significance is the coming lunar occultation of the Crab Nebula. We have a request to fly in Canada in August and three requests for Palestine in December for this event.

A Southern Hemisphere expedition is also under consideration. Argentina, Australia, and Brazil are presently being evaluated as possible sites of the next expedition.

Our engineering effort will be concentrated on long duration super-pressure ballooning. This will be a two year effort and will not be described in detail here. The complete plan is described in our document "Technical Proposal, Long Duration Ballooning" revised 24 January 1974.

The Texas A & M sub-contract has proven most useful and will be continued. Again, the emphasis will be on long duration ballooning.

Space will continue to be a problem during the next year, especially space for staging of the scientific experiments. We see no solution to this problem with the anticipated budget.

We plan a minor modification of the Control Tower to increase the space in the telemetry room. This will take away one bay from scientific staging, but will be compensated by the addition of a bay on the end of the building.

Staff level will be increased by two engineers (two year term appointments) and one electronics technician.

APPENDIX A

SUMMARY OF FLIGHTS

FLIGHT NUMBER	DATE	EXPERIMENTER & ORGANIZATION	TYPE OF EXPERIMENT	BALLOON VOLUME (M^3)	GAUGE & MATERIAL	MANUFACTURER	PAYLOAD WEIGHT (KGS)	FLOAT TIME (HRS)	PRESSURE FLOAT ALT. (MB)	FLIGHT SUCCESS
	1973									
765-P	July 10	J. Benbrook and W. Sheldon Univ. of Houston	Monitor time dependence of x ray flux, using a low energy x ray detector	56,634	17.78 μ Poly	Winzen	124.8	4.1	4.5	Success
766-P	July 10	D. Ramsden U/Southampton	High energy gamma ray astronomy to observe the Cygnus Region of the sky	441,745	15.24 μ Poly	Winzen	1135.0	8.7	4.1	Success
767-P	July 23	K. Greisen Cornell Univ.	High energy gamma ray telescope to record gamma rays above 200 MeV and to pinpoint sources to angular resolution better than one degree	588,994	20.32 μ Poly	Winzen	2160.5	8.7	4.5	Success
768-P	July 27	F. Low U/Arizona	Infrared telescope to study powerful infrared sources near their peak energy output at a wavelength of 100 microns	7171.3	17.78 μ Poly	Winzen	176.0	N/A	N/A	Balloon Failure
769-P	July 27	F. Low U/Arizona	Infrared telescope to study powerful infrared sources near their peak energy output at a wavelength of 100 microns	42,476	17.78 μ Poly	Winzen	176.0	6.5	6.0	Success
770-P	Aug. 6	R. Staubert Astronomisches Institute Tubingen, Germany	A magnetometer-stabilized gondola carries an x ray spectrometer employing a NAl-detector and CSl guard counters to observe in 20-200 KeV energy range	436,082	12.70 μ Poly	Winzen	517.1	5.0	2.3	Success
771-P	Aug. 9	G. Fishman NASA/MSFC	A study of high energy radiation properties from the Crab Nebula and the sun will be made in the energy region from 50 KeV-5 MeV	300,160	17.78 μ Poly	Winzen	879.6	9.0	4.0	Success
772-P	Aug. 20	G. Sironi U/of Milan	Gamma ray telescope to study celestial objects in the energy region 500 KeV - 20 MeV	314,319	25.40 μ Poly	Raven	1610.7	N/A	N/A	Balloon Failure
773-P	Aug. 22	T. Pepin U/Wyoming	Vertical profile of sub-micron aerosols, 0_3 and H_20	2010.0	12.70 μ Poly	Winzen	12.1	N/A	13.5	Success

SUMMARY OF FLIGHTS

FLIGHT NUMBER	DATE	EXPERIMENTER & ORGANIZATION	TYPE OF EXPERIMENT	BALLOON VOLUME (M^3)	GAUGE & MATERIAL	MANUFACTURER	PAYLOAD WEIGHT (KGS)	FLOAT TIME (HRS)	PRESSURE FLOAT ALT. (MB)	FLIGHT SUCCESS
774-P	Aug. 28	R. Staubert Astronomisches Institute Tubingen, Germany	A magnetometer-stabilized gondola carries an x ray spectrometer employing a NAl-detector and CSl guard counters to observe in 20-200 KeV energy range	436,082	12.70 μ Poly	Winzen	547.5	6.5	2.5	Success
775-P	Sept. 8	E. Tanzi Univ. of Milan	X ray telescope to study selected celestial objects in the energy region 20 KeV - 400 KeV	84,951	19.05 μ Poly	Raven	457.3	13.8	7.2	Success
776-P	Sept. 8	M. Friedlander Washington Univ.	Far infrared sky survey	42,951	25.40 μ Poly	Raven	436.4	8.9	11.3	Success
777-P	Sept. 9	D. Ehhalt NCAR	Atmospheric composition study, collect vertical profile at selected altitudes on balloon descent	42,476	17.78 μ Poly	Winzen	394.2	2.0	10.0	Success
778-P	Sept. 20	M. Friedlander Washington Univ.	Far infrared sky survey	42,951	25.40 μ Poly	Raven	415.0	10.7	11.2	Success
779-P	Sept. 26	J. Lord U/Washington	Emulsion stack to measure ultra-high energy and cosmic ray interactions	112,162	25.40 μ Poly	Winzen	627.4	N/A	N/A	Balloon Failure
780-P	Sept. 28	J. Lord U/Washington	Emulsion stack to measure ultra-high energy and cosmic ray interactions	112,162	25.40 μ Poly	Winzen	630.0	25.4	7.2	Success
781-P	Sept. 28	M. Sommer Max-Planck Inst.	Gamma ray spark chamber detector and two x ray detectors to measure diffuse celestial background radiation and time structure of pulsed emissions from the Crab Nebula	863,102	15.24 μ Poly	Winzen	615.1	N/A	N/A	Balloon Failure
782-P	Sept. 29	P. Meyer U/Chicago	Cerenkov counter to obtain information on isotopic composition of heavy cosmic ray nuclei of the galactic region	591,825	17.78 μ Poly	Winzen	1459.2	40.2	3.9	Success
783-P	Oct. 1	J. Lord U/Washington	Emulsion stack to measure ultra-high energy and cosmic ray interactions	112,162	25.40 μ Poly	Winzen	626.4	45.4	7.1	Success

SUMMARY OF FLIGHTS

FLIGHT NUMBER	DATE	EXPERIMENTER & ORGANIZATION	TYPE OF EXPERIMENT	BALLOON VOLUME (M^3)	GAUGE & MATERIAL	MANUFACTURER	PAYLOAD WEIGHT (KGS)	FLOAT TIME (HRS)	PRESSURE FLOAT ALT. (MB)	FLIGHT SUCCESS
784-P	Oct. 1	L. Koch & B. Peters Danish Space Research Institute	Measurement of the isotopic composition of primary cosmic radiation using Cerenkov light detectors and the earth's magnetic field	441,745	15.24 μ Poly	Winzen	1117.6	30.0	3.55	Success
785-P	Oct. 3	M. Israel & J. Klarmann Washington Univ.	Measure the chemical and isotopic composition of heavy cosmic ray using 1 M^2 ionization chambers and Cerenkov counters	441,745	15.24 μ Poly	Winzen	1217.8	14.0	3.75	Success
786-P	Oct. 6	M. Sommer Max Planck Inst.	Gamma ray spark chamber detector and two x ray detectors to measure diffuse celestial background radiation and time structure of pulsed emissions from the Crab Nebula	576,534	15.24 μ Poly	Winzen	623.8	10.0	2.35	Success
787-P	Oct. 8	J. Kurfess NRL	Large area 20-200 KeV scintillation detectors to make transit observations of Hercules X-1 and the Cygnus Region	314,319	15.24 μ Poly	Raven	512.0	N/A	N/A	Balloon Failure
788-P	Oct. 8	J. Lord U/Washington	Emulsion stack to measure ultra-high energy and cosmic ray interactions	112,162	25.40 μ Poly	Winzen	533.0	21.2	8.2	Success
789-P	Oct. 12	T. Rygg NASA/MSFC	Cosmic ray measurements	300,160	17.78 μ Poly	Winzen	1020.6	11.6	4.3	Success
790-P	Oct. 17	J. Kurfess NRL	Large area 20-200 KeV scintillation detectors to make transit observations of Hercules X-1 and the Cygnus Region	329,044	12.70 μ Poly	Winzen	505.3	9.5	2.55	Success
791-P	Oct. 17	S. Tilford & B. Fox NRL - DOT	Uses white cell to measure ozone and an ionization chamber for measuring nitric oxide and smoke release mechanism	107,321	38.10 μ Poly	Winzen	1160.7	3.0	12.0 8.9	Success
792-P	Oct. 19	F. Hudson, L. Hale, H. Ballard, C. Patel, Sandia Labs and Bell Labs	A multiple group of experiments in atmospheric research	189,100	25.40 μ Poly	Winzen	2867.1	10.4	15.0	Success

SUMMARY OF FLIGHTS

FLIGHT NUMBER	DATE	EXPERIMENTER & ORGANIZATION	TYPE OF EXPERIMENT	BALLOON VOLUME (M^3)	GAUGE & MATERIAL	MANUFACTURER	PAYLOAD WEIGHT (KGS)	FLOAT TIME (HRS)	PRESSURE FLOAT ALT. (MB)	FLIGHT SUCCESS
793-P	Oct. 19	M. Israel and J. Klarmann Washington Univ.	Measure the chemical and isotopic composition of heavy cosmic ray using 1 M^2 ionization chambers and Cerenkov counters	424,755	17.78 μ Poly	Winzen	1030.1	9.5	3.9	Success
794-P	Oct. 26	P. Richards U/California Berkeley	Measure far infrared spectrum of the universe around 1.0 mm in wavelength	300,160	17.78 μ Poly	Winzen	504.8	4.3	3.25	Success
795-P	Oct. 29	J. Strong U/Massachusetts	Study solar corona in the near infrared from 3-13 solar radius	87,783	38.10 μ Poly	Winzen	811.9	4.8	12.5	Success
796-P	Nov. 11	P. Hodge and D. Brownlee U/Washington	Micro-meteorite collector	99,110	19.05 μ Poly	Raven	395.6	N/A	N/A	Balloon Failure
797-P	Nov. 15	P. Hodge and D. Brownlee U/Washington	Micro-meteorite collector	87,783	17.78 μ Poly	Winzen	391.1	4.8	5.9	Operations Failure
798-P	Nov. 16	R. Yasui JPL	Suntracker mounted on apex of balloon, automatically positions solar cells toward sun	58,301	17.78 μ Poly	Winzen	206.9	N/A	N/A	Operations Failure
799-P	Nov. 16	T. Pepin W/Wyoming	Vertical profile of sub-micron aerosols, O_3 and H_2O	2010.0	12.70 μ Poly	Winzen	24.3	N/A	N/A	Success
800-P	Dec. 10	G. Fazio and F. Low SAO - U/Arizona	High resolution mapping of infrared radiation sources with (1) meter telescope	151,943	25.40 μ Poly	Winzen	2184.5	N/A	N/A	Balloon Failure
	1974									
801-PT	Jan. 7	R. Yasui JPL	Suntracker mounted on apex of balloon, automatically positions solar cells toward sun	58,301	17.78 μ Poly	Winzen	250.4	.4	6.4	Success
802-P	Jan. 12	F. Low U/Arizona	Observe galaxies, nebulae and planets to determine their total far infrared emission	14,160	25.40 μPoly	Raven	214.6	4.7	18.0	Success
803-P	Jan. 20	R. Weiss M.I.T.	Measure large scale isotropy of the cosmic background radiation in the far infrared	329,213	17.78 μ Poly	Winzen	545.6	N/A	N/A	Operations Failure

SUMMARY OF FLIGHTS

FLIGHT NUMBER	DATE	EXPERIMENTER & ORGANIZATION	TYPE OF EXPERIMENT	BALLOON VOLUME (M^3)	GAUGE & MATERIAL	MANUFACTURER	PAYLOAD WEIGHT (KGS)	FLOAT TIME (HRS)	PRESSURE FLOAT ALT. (MB)	FLIGHT SUCCESS
804-PT	Jan. 21	NCAR	Test flight of balloon	56,630	19.05 μ Poly	Raven	340.2	1.1	8.1	Success
805-P	Jan. 21	F. Low U/Arizona	Observe galaxies, nebulae and planets to determine their total far infrared emission	14,160	25.40 μ Poly	Raven	203.3	11.7	16.1	Success
806-P	Jan. 28	R. Weiss MIT	Measure large scale isotropy of the cosmic background radiation in the far infrared	329,213	17.78 μ Poly	Winzen	440.1	2.9	3.1	Success
807-PT	Jan. 31	M. Pavey NSBF	Test flight of balloon made with very thin nylon film	87,037	7.62 Nylon	Winzen	226.8	N/A	N/A	Balloon Failure
808-P	Feb. 3	G. Fazio and F. Low SAO/U/Arizona	High resolution mapping of infrared radiation sources with (1) meter telescope	145,549	25.40 μ Poly	Winzen	2064.5	6.1	15.0	Success
809-P	Feb. 16	R. Yasui JPL	Suntracker mounted on apex of balloon, automatically positions solar cells toward sun	58,301	17.78 μ Poly	Winzen	142.2	4.4	4.95	Success
810-P	Feb. 16	R. Golden NASA/JSC	Balloon borne cosmic ray lab	588,994	20.32 μ Poly	Winzen	2243.4	8.1	4.85	Success
811-P	Feb. 25	D. Ehhalt NCAR/DOT	Atmospheric composition study, collect vertical profile on balloon valved descent	102,409	19.05 μ Poly	Winzen	385.6	3.7	4.85	Success
812-P	March 13	P. Clegg and J. Beckman Queen Mary College	Determine spectrum of cosmic ray background in the wavelength 3 MM to 0.3 MM	329,213	12.70 μ Poly	Winzen	523.5	4.8	2.70	Success
813-PT	March 29	M. Pavey NSBF	Test of superpressure balloon using a new load attachment technique	3881.0	46.23 Celanar Laminate	Raven	70.8	6.0	31.0	Success
814-P	April 5	R. Yasui JPL	Suntracker mounted on apex of balloon, automatically positions solar cells toward sun	58,301	17.78 μ Poly	Winzen	152.9	2.9	4.95	Success
815-P	April 5	L. Peterson U/California, San Diego	Measure spatial distribution of the x ray emission from the Crab Nebula	329,044	12.70 μ Poly	Winzen	981.6	5.4	4.4	Success

SUMMARY OF FLIGHTS

FLIGHT NUMBER	DATE	EXPERIMENTER & ORGANIZATION	TYPE OF EXPERIMENT	BALLOON VOLUME (M^3)	GAUGE & MATERIAL	MANUFACTURER	PAYLOAD WEIGHT (KGS)	FLOAT TIME (HRS)	PRESSURE FLOAT ALT. (MB)	FLIGHT SUCCESS
816-P	April 9	P. Fowler U/Bristol	Cosmic ray detector to measure abundance of elements in charge range of primary cosmic rays	314,319	19.05 μ Poly	Raven	893.2	N/A	N/A	Operations Failure
817-P	April 12	F. Low U/Arizona	Observe galaxies, nebulae and planets to determine their total far infrared emission	14,158.5	25.40 μ Poly	Raven	234.1	1.0	17.2	Success
818-PT	April 16	R. Yasui JPL	Suntracker mounted on apex of balloon, automatically positions solar cells toward sun	65,267	17.78 μ Poly	Winzen	150.7	1.4	4.3	Success
819-P	April 23	R. Yasui JPL	Suntracker mounted on apex of balloon, automatically positions solar cells toward sun	65,267	17.78 μ Poly	Winzen	151.8	4.3	4.4	Success
820-P	April 25	A. Boksenberg and B. Bates U/College London	High resolution UV interstellar and stellar spectra observations	569,455	12.70 μ Poly	Winzen	700.0	8.0	2.3	Success
821-P	May 3	J. Kurfess NRL	X ray telescope for transit observation of the x ray source Hercules X-1	169,920	12.70 μ Poly	Winzen	318.0	11.6	3.15	Success
822-P	May 4	T. Cline NASA-GSFC	Cosmic gamma ray burst detector to search for fast increases of photon intensity	329,044	12.70 μ Poly	Winzen	1038.6	29.6	4.05	Success
823-P	May 6	C. Hemenway Dudley Obs.	Test of new type micro-meteorite collector system	14,158	25.40 μ Poly	Raven	189.6	19.9	16.0	Success
824-P	May 7	P. Meyer U/Chicago	Determine nuclear composition of primary cosmic rays	591,825	17.78 μ Poly	Winzen	1458.0	35.5	3.51	Success
825-P	May 9	R. Yasui JPL	Suntracker mounted on apex of balloon, automatically positions solar cells toward sun	65,267	17.78 μ Poly	Winzen	157.8	4.7	4.4	Success
826-P	May 11	T. Rygg NASA-MSFC	Cosmic ray measurements	441,745	15.24 μ Poly	Winzen	1075.9	11.6	3.15	Success
827-P	May 17	A. Few Rice University	Measure the vector electric field strength in the atmosphere	3048.0	Mylar Scrim	Schjeldahl	2.3	N/A	N/A	Success

SUMMARY OF FLIGHTS

FLIGHT NUMBER	DATE	EXPERIMENTER & ORGANIZATION	TYPE OF EXPERIMENT	BALLOON VOLUME (M^3)	GAUGE & MATERIAL	MANUFACTURER	PAYLOAD WEIGHT (KGS)	FLOAT TIME (HRS)	PRESSURE FLOAT ALT. (MB)	FLIGHT SUCCESS
828-P	May 19	A. Boksenberg and B. Bates U/College London	High resolution UV interstellar and stellar spectra observations	569,455	12.70 μ Poly	Winzen	703.5	7.1	2.4	Success
829-P	June 2	F. Low U/Arizona	Observe galaxies, nebulae and planets to determine their total far infrared emission	56,630	19.05 μ Poly	Raven	260.8	11.2	7.0	Success
830-P	June 10	A. Jacobson JPL	Large volume, shielded solid state detector to search for gamma ray emissions	438,900	15.24 μ Poly	Raven	785.6	6.9	2.85	Success
831-P	June 10	F. Low U/Arizona	Observe galaxies, nebulae and planets to determine their total far infrared emission	14,160	25.40 μ Poly	Raven	217.0	5.7	17.4	Success
832-P	June 17	V. Schoenfelder Max Planck Inst.	Gamma ray telescope in 1-10 MeV energy range	569,580	12.70 μ Poly	Winzen	866.4	4.1	2.1	Success
833-P	June 17	R. Weiss MIT	Measure large scale isotropy of the cosmic background radiation in the far infrared	329,213	12.70 μ Poly	Winzen	575.2	8.5	3.2	Success
834-P	June 21	W. Lewin MIT	High energy x ray observations of the Perseus Cluster and the Coma Cluster	727,514	12.70 μ Poly	Winzen	1142.6	8.8	2.35	Success
87-N	Sept. 17 1973	Z. Osborne and P. Price NASA/JSC	Cosmic ray detector to provide data on the charge and energy spectra of transiron cosmic ray primaries	441,800	15.24 μ Poly	Winzen	787.8	63.1	2.65	Success
88-N	Sept. 25	Z. Osborne P. Price NASA/JSC	Cosmic ray detector to provide data on the charge and energy spectra of transiron cosmic ray primaries	587,882	20.32 μ Poly	Winzen	1175.2	61.9	3.45	Success
89-N	Oct. 13	B. Taylor and P. Coufleau ESRO-ESTEC-COS-B	Engineering flight of model to be flown on ESRO's COS-B satellite - study gamma rays	441,800	15.24 μ Poly	Winzen	1011.1	8.1	3.35	Success

SUMMARY OF FLIGHTS

FLIGHT NUMBER	DATE	EXPERIMENTER & ORGANIZATION	TYPE OF EXPERIMENT	BALLOON VOLUME (M^3)	GAUGE & MATERIAL	MANUFACTURER	PAYLOAD WEIGHT (KGS)	FLOAT TIME (HRS)	PRESSURE FLOAT ALT. (MB)	FLIGHT SUCCESS
90-N	Nov. 6	D. Ehhalt NCAR - DOT	Atmospheric composition study, collect vertical profile on balloon valved descent	42,476	17.78 μ Poly	Winzen	402.5	N/A	N/A	Balloon Failure
91-N	Nov. 14	D. Ehhalt NCAR - DOT	Atmospheric composition study, collect vertical profile on balloon valved descent	42,476	17.78 μ Poly	Winzen	421.0	2.1	10.5	Success
92-N	Nov. 15	R. Jennings U/College London	Observation of astronomical sources in the infrared using a 40 CM telescope	87,783	30.48 μ Poly	Winzen	616.8	10.4	9.25	Success
93-N	Nov. 18	H. Ghielmetti CONICET	X ray astronomy	83,252	17.78 μ Poly	Winzen	197.9	7.2	3.95	Success
94-N	Nov. 20	R. Jennings U/College London	Observation of astronomical sources in the infrared using a 40 CM telescope	87,783	30.48 μ Poly	Winzen	603.2	3.1	10.5	Balloon Failure
95-N	Nov. 25	H. Ghielmetti CONICET	X ray astronomy	84,951	25.40 μ Poly	Raven	179.2	7.6	4.75	Success
96-N	Dec. 1	R. Jennings U/College London	Observation of astronomical sources in the infrared using a 40 CM telescope	87,783	30.48 μ Poly	Winzen	619.6	N/A	N/A	Operations Failure
97-N	Dec. 8	R. Jennings U/College London	Observation of astronomical sources inthe infrared using a 40 CM telescope	56,634	25.40 μ Poly	Winzen	619.6	10.3	11.5	Success
98-N	April 1 1974	R. Haymes Rice University	Measurement of low energy gamma radiation	441,800	15.24 μ Poly	Winzen	1055.0	15.5	3.45	Success
99-N	April 6	H. Ghielmetti CONICET	X ray astronomy	56,640	19.05 μ Poly	French	109.3	N/A	N/A	Balloon Failure
100-N	April 6	V.C.R. Flores Argentine Air Force	N/A	35,400	N/A	French	54.5	3.7	16.0	Success
101-N	May 7	D. Ehhalt NCAR - DOT	Atmospheric composition study, collect vertical profile on balloon valved descent	104,384	12.70 μ Poly	Winzen	419.1	3.7	5.6	Success
102-N	May 23	M. Pavey and J. Kurfess NSBF - NRL	Test flight of 4.0 MCF super-pressure long duration balloon	113,268	Mylar	Schjeldahl	149.7	N/A	N/A	Success

APPENDIX B

GAMMA AND X RAY EXPERIMENTS

Dr. David Ramsden, University of Southampton

Flight 760-P, 19 June 1973

Purpose: The purpose of this flight was dedicated to the observation of the Crab Nebula using a spark chamber telescope sensitive to gamma rays having an energy of about 100 MEV.

Results: The raw data has been reduced and the data from this and earlier flights are being collated to produce a map of the Taurus Region.

Publications: The combined results from this and earlier flights will be published in the scientific literature in due course.

Flight 766-P, 10 July 1973

Purpose: The purpose of this flight was to repeat earlier observations of the Cygnus Region using a spark chamber telescope sensitive to gamma rays having an energy of about 100 MEV.

Results: The raw data has been reduced and the data from this and earlier flights are being collated to produce a map of the Cygnus Region.

Publications: The combined results from this and earlier flights will be published in the scientific literature in due course.

Drs. Kenneth Greisen and Brian McBreen, Cornell University

Flight 767-P, 23 July 1973

Purpose: The purpose of this flight was to study the high energy (E> 100 MeV) gamma radiation from the Crab Pulsar and Nebula. An earlier flight (639-P) had yielded the first observations of this radiation. We wished to refine the information about its pulse shape and the ratio of the DC to pulsed components. A secondary purpose was to search for similar radiation from the galaxy M-87.

Results: (1) To our surprise, the high energy radiation from the Crab Nebula and pulsar were much weaker than on Flight 639-P. After exhaustive study of the data from both flights, we believe we have discovered a strong variability in the source, increasing rapidly with energy in the range 0.1-1 GeV. (2) The flight was terminated too early to obtain the desired exposure on M-87.

Publications: A publication on the above mentioned results is in preparation and will probably be sent to the Astrophysical Journal later this summer.

Drs. R. Staubert and J. Trumper, Astronomisches Institut der Universitat Tubingen

Flight 770-P, 6 August 1973

Purpose: The purpose of this flight was to measure the hard x ray flux of the Crab with high statistical precision and time resolution.

Results: Because of a high voltage breakdown early in the flight no scientific results have been obtained. However, valuable engineering information has been gained on this detector system during its first flight.

Dr. G. J. Fishman, Teledyne Brown Engineering

Flight 771-P, 9 August 1973

Purpose: The purpose of this flight was to observe the Crab Nebula in the energy range from 50 keV to 5 MeV using a new type of actively shielded gamma ray telescope.

Results: All systems worked well and good telemetry was received for eight hours at float altitude. The Crab Nebula was observed at the lower energies. The background radiation was higher than expected, presumably due to an inefficient shield; no new information about the Crab Nebula could be obtained.

Publications: Data being analyzed, will be included in a report. No journal articles expected.

Drs. R. Staubert and J. Trumper, Astronomisches Institut der Universitat, Tubingen

Flight 774-P, 28 August 1973

Purpose: The purpose of this flight was to measure the hard x ray flux of the Crab with high statistical precision and time resolution.

Results: The x ray flux above 60 keV of the Crab Nebula and Pulsar as well as background has been recorded for four hours total. Preliminary analysis yielded the pulsar light curve and a value of the pulsar radiation as compared to total flux 32 ± 5 10% for energies above 60 keV.

Publications: The results will be published later this year after thorough analysis.

Dr. Michael Sommer, Max-Planck Institute

Flight 786-P, 6 October 1973

Purpose: The purpose of this flight was to measure the diffuse cosmic gamma radiation and to observe the emission of the pulsar NP-0532 in the x ray and gamma ray energy range simultaneously.

Results: The analysis of the x ray data showed that a 5 hour exposure of the Crab Nebula has been obtained. The light curve of the pulsar in the Crab Nebula was derived in the x ray band. The preliminary analysis of the gamma ray data showed no significant pulsed emission in the energy region above 30 MeV.

Dr. James D. Kurfess, Naval Research Laboratory

Flight 790-P, 17 October 1973

Purpose: This flight was conducted to test the performance of phoswich scintillation detector for hard x ray and γ ray observations. A large area detector (765 cm^2 area) and three small detectors were flown. The balloon was launched at a time which enabled the sources Hercules X-1 and Cygnus X-1 to be viewed by the vertically oriented detectors.

Results: The engineering tests on the phoswich detectors were very successful. The inherent detector backgrounds were found to be very low. The Hercules X-1 transit provided a nul result, although this was expected since the source was in an "off" state at this time. Cygnus X-1 was observed with a very good signal-to-noise ratio.

Publications: Preliminary results of this flight were presented at the HEAO - AAS Meeting in Tucson. Bull American Astronomical Society, Vol. 6, page 277. Abstracts J12 and J13 (1974).

Drs. M. R. Pelling and S. Miyamoto, University of California, San Diego and University of Tokyo, ISAS

Flight 815-P, 5 April 1974

Purpose: The purpose of this experiment was to measure the angular extent of the Crab Nebula in the energy band 15 to 75 keV. Since this was the initial flight of a highly complex new gondola, engineering evaluation was considered to be an important secondary objective.

Results: Due to unavoidable slippage of the launch time and date, night observation of the Crab was not possible so there was no scientific result from this flight. The secondary objective was attained though, allowing complete evaluation of the various gondola systems performance.

Dr.T. L. Cline, NASA - Goddard Space Flight Center

Flight 822-P, 5 May 1974

Purpose: The purpose of this experiment was to search for cosmic gamma ray bursts in the 75 to 1500 KEV energy interval with new instruments capable of detecting fast increases of time duration as short as hundreds of nanoseconds and as long as several seconds with a differential time interval analyzer. The large area detector makes possible sensitivity to small events.

Results: The flight lasted just over 24 hours at a typical altitude of 119,000 feet and was a success. The data have, by now, been scanned in a preliminary fashion and show that the instrument functioned perfectly for the duration of the flight. An NCAR provided battery failure caused the termination of the flight before the 48 hour maximum.

Publications: These results will be published when the data are analyzed. They will provide the first extensive measurement of the size spectrum, (or its upper limits) at small cosmic gamma ray burst event size.

Dr. B. G. Taylor, European Space Research Organization

Flight 89-N, 13 October 1973

Purpose: The engineering model of the COS-B experiment for gamma ray astronomy was flown from Sioux City as part of the

calibration program which included extensive accelerator testing. The object of the flight was to test the hardware in a realistic cosmic ray environment, to check the experiments performance and to provide typical data for the automatic data reduction and analysis procedures. Significant new data on the generation flux and energy spectrum of atmospheric gamma radiation were expected.

Results: The experiment performed faultlessly during the collection of six hours of data at float altitude. The gondola was reoriented in flight to measure downwards, sideways, and upwards. The data have been analyzed in preliminary form and the first results are very encouraging. Several more months work are required before definitive results can be published.

Dr. Robert C. Haymes, Rice University

Flight 98-N, 1 April 1974

Purpose: Measure gamma radiation in the nuclear band from southern hemisphere celestial objects. This was the first scientific balloon flight to be launched from Rio Cuarto, Argentina.

Results: Four hours of excellent quality data were obtained on Centaurus A/NGC 5128 and eight hours of excellent-quality data were obtained on GX 1+4 in the galactic-center region. Both sources revealed themselves to be bright sources, with the new, larger actively-collimated scintillation detector being used. (Our previous observations in 1968 with a smaller instrument over Mildura, Australia failed to detect Cen A at all.) The atmospheric γ ray background over northern Argentina is no more than half as intense, in the 0.03 MeV-12 MeV band, as that encountered over Texas or southern Australia.

Dr. Allan S. Jacobson, Jet Propulsion Laboratory/CALTECH

Flight 830-P, 10 June 1974

Purpose: The first flight for a new system incorporating a GE (Li) spectrometer for gamma ray astronomy. Objectives were (1) observe Crab Nebula and Pulsar, (2) determine the sensor characteristics in a radiation environment

Results: Flight was successful for all objectives. The data are now being analyzed.

Publications: Publications will be forthcoming upon completion of the analysis.

Dr. H. S. Ghielmetti, Instituto de Astronomia y Fisica del Espacio (IAFE)

Flight 93-N, 18 November 1973

Purpose: The final purpose for flying the detector utilized in this flight is to observe the solar emission of gamma ray lines during flares. This first flight was made, independently of solar activity, to know the detector background and to test a pointing system, first stage for a more elaborated version necessary for future experiments.

Results: The orientation system behaved correctly during the first two hours at floating altitude. Later on pointing was perturbed, due to undetermined causes. The detector itself behaved correctly along the ten hours flight duration. The data from this flight are begining to be analyzed in detail.

Publications: Solar activity was nil during the flight but preliminary data analysis indicates that energy spectra and fluxes of high energy atmospheric X-ray (0.3 to about 10 MeV) at different depths in the atmosphere, at high geomagnetic cut-off rigidity, will be obtained.

Flight 95-N, 25 November 1973

Purpose: The final purpose for flying the detector utilized in this flight is to detect the solar emission of fast neutrons during flares. This first flight was made, independently of solar activity, to know detector sensitivity and response to atmospheric background (neutron and gamma rays).

Results: First data inspection shows correct behavior of the whole system along the ten hours flight. Some portions of the data already sampled indicate that most of the detected pulses are due to high energy atmospheric gamma rays (the system responds to gamma rays within the range 5 to 80 MeV), the atmospheric fast neutron flux being too small to be distinguished. However, the detector shows reasonable sensitivity to observe a solar neutron flux if it would be produced coinciding with future experiments.

Publications: The data from this flight are being analyzed in detail. The detector behavior under laboratory tests will be published. Main results of the flight concerns the measurement of the spectrum of atmospheric gamma rays in a wide energy range.

INFRARED EXPERIMENTS

Dr. R. E. Jennings, University College London

Flight 97-N, 8 December 1973

Purpose: To observe the extreme southern sky in the wavelength band 40 - 350μm, in particular to obtain infrared contour maps of a number of major regions for comparison with corresponding radio maps and other infrared measurements.

Results: Flight 97-N was the last flight of the series and was an extremely successful one. On the previous flights it had only been possible to determine the correct levels etc., and no new data had been obtained. On flight 97-N five major regions, including the Carina Nebula, RCW 48 and 49, RCW 57, RCW 74 and 75 were scanned. In addition, a molecular cloud near NGC 2024 was detected. An attempt was made to observe the comet Kahoutek without success.

Publications: A preliminary announcement of the observation of the molecular cloud was made at the 8th Eslab Symposium in June 1974. The bulk of the data should be published shortly.

Dr. Frank J. Low, University of Arizona

Flight 769-P, 27 July 1973

Purpose: Far infrared astronomical observations.

Results: Sky background data at λ = 100 μ and useful engineering data were obtained.

Publications: Data are being reduced.

Flight 802-P, 12 January 1974

Purpose: Far infrared astronomical observations.

Results: 100 μ observation of Orion, NGC 2024, Mars, Saturn.

Publications: Data are being reduced.

Flight 805-P, 21 January 1974

Purpose: Far infrared astronomical observations.

Results: 100 μ observations of Mars, Saturn, M-82, Orion, NGC 2024 and W-3.

Publications: Data are being reduced.

Flight 817-P, 8 April 1974

Purpose: Engineering test of 3-axis pointing system.

Results: Improved pointing capability demonstrated.

Publications: Data are being reduced.

Flight 829-P, 2 June 1974

Purpose: Far infrared observations of galactic and extra-galactic infrared sources.

Results: Ophiucus dark cloud was scanned, showing strong emission. The galactic plane from declination -40° to -30° was scanned about 20° on either side. Numerous discrete and extended sources were mapped with 12 arc minute resolutions.

Flight 831-P, 10 June 1974

Purpose: Far infrared observations of galactic and extra-galactic infrared sources.

Results: Additional scans of the dark cloud in Ophiucus were obtained.

Dr. Giovanni Fazio, Harvard College Observatory, Smithsonian Astrophys. Observatory, University of Arizona

Flight 808-P, 3 February 1974

Purpose: The purpose of this flight was to make high resolution (1 arcmin) maps of regions of ionized hydrogen (H II regions) at far infrared wavelengths (>40 microns) and to accurately determine the positions of these sources to 0.5 arcmin. A one-meter telescope was used for these observations.

Results: The first successful flight of a balloon-borne 1-meter telescope for far infrared (>40 microns) astronomy occurred on 4 February 1974 (UT), from Palestine, Texas. During 6 hours at float altitude the gyro-stabilized telescope mapped the intensity of far infrared radiation from the H II regions, Orion A and W 3, with a resolution of one arcmin. Partial maps of these regions were made with a resolution of 0.5 arcmin. The results of these observations are the highest resolution maps ever made of Orion A

and W 3 at far infrared wavelengths. These sources were resolved into several components, some of which were previously unknown. Observations of Mars were used for calibration of angular resolution and sensitivity. Numerous weak sources were also observed.

Publications: "A High-Resolution Map of the Orion Nebula Region at Far-Infrared Wavelengths", G. G. Fazio, D. E. Kleinmann, R. W. Noyes, E. L. Wright, M. Zeilik II, and F. J. Low. Submitted to Astrophys. Journal Letters, May, 1974.

"High Resolution Maps of H II Regions at Far-Infrared Wavelengths", G. G. Fazio, D.E. Kleinmann, R. W. Noyes, E. L. Wright, M. Zeilik, II, and F. Low. Submitted to 8th ESLAB Symposium on H II Regions and the Galactic Center, Frascatti, Italy, June 1974.

"Proc. Symposium on Telescope Systems for Balloon-Borne Research, NASA Ames Research Center, California, 1974 (in press)., G. G. Fazio, D. E. Kleinmann, R. W. Noyes, E. L. Wright, M. Zeilik, II, and F. J. Low.

"Proc. Symposium on Telescope Systems for Balloon-Borne Research, NASA Ames Research Center, California, 1974 (in press). N. L. Hazen, L. M. Coyle and S. M. Diamond.

"Proc. SPIE Seminar-in-Depth on Instrumentation in Astronomy-II, Tucson, Arizona, 1974 (in press). N. L. Hazen.

Drs. P. E. Clegg and J. E. Beckman, Queen Mary College, University of London

Flight 812-P, 13 March 1974

Purpose: The experiment was designed to measure the spectrum of the cosmic background radiation in the wavelength range 300 μm using a liquid helium cooled polarizing Michelson interferometer.

Results: The apparatus operated successfully for ~ 4 hours at float, although an electronic fault prevented data collection for about half this period. Analysis of results has been delayed by a computer output fault. Preliminary analysis is in accord with expectations.

Publications: It is hoped that preliminary interpretation of the results will be published in the near future. Very much more detailed analysis is required before final conclusions are drawn.

COSMIC RAY EXPERIMENTS

Drs. Peter Meyer and Robert Dwyer, University of Chicago

Flight 782-P, 29 September 1973

Purpose: The purpose of this flight was to obtain a sample of a large number of primary cosmic ray nuclei in the charge range from helium through iron using a new counter telescope consisting of multiwire proportional chambers (MWPC's), scintillation counters and a liquid Cerenkov counter in order to obtain information on the isotopic composition of the more abundant cosmic ray nuclei. In addition the flight was to test the MWPC's in a balloon flight as this potentially useful type of detector has never been used before in our laboratory.

Results: The long duration of this flight (41 hours at float) enabled us to obtain a sample of 3/4 million events providing us with good statistical accuracy. In the first flight of this new instrument, we have selected over 100,000 good helium, carbon and oxygen events and have compared their isotopic compositions. The main result of the flight so far is a preliminary value for the He^3/He^4 ratio at a significantly higher energy than previously measured.

Publications: Preliminary results have been presented on the isotopic composition of helium nuclei at the Spring, 1974 American Physical Society meeting in Washington, D. C. Further publication awaits the more complete data analysis of this and a second also successful flight (824-P).

Drs. Thomas A. Rygg, Thomas A. Parnell and Thomas Wdowiak, NASA - Marshall Space Flight Center

Flight 789-P, 13 October 1973

Purpose: The purpose of this flight was to measure the charge composition of the cosmic ray nuclei over the interval Z = 1 to Z - 30. A small U.V. Telescope was flown as a hitchhike package to obtain UV pictures of Comet Kahoutek.

Results: Approximately 75,000 cosmic ray nuclei with Z = 3 were obtained during the 12 hour ceiling exposure. Computer analysis of this data is now underway. The film advance mechanism in the U. V. camera failed after taking the first frame. No useful scientific data was obtained from this experiment.

Drs. Martin H. Israel and Joseph Klarmann, Washington University

Flight 785-P, 3 October 1973 and Flight 793-P, 19 October 1973

Purpose: The purpose of these flights was to measure flux of cosmic ray nuclei heavier than nitrogen to determine their chemical and isotopic composition and energy spectra.

Results: Analysis is in progress. The instrument performed well and we expect to satisfy our objectives.

Publications: Analysis still in progress. Publications will follow completion of analysis.

Dr. R. L. Golden and G. D. Badhwar, NASA - Johnson Spacecraft Center

Flight 810-P, 16 February 1974

Purpose: Cosmic ray survey using a superconducting magnet. The flight was primarily to check out new detector techniques based on multiwire proportional counter techniques. Primary science objective was the electron and positron fluxes.

Results: Over one (1) million cosmic rays were digitized in 6 hours at float. The data is presently being analyzed.

Publications: In preparation.

Drs. Thomas A. Rygg and Thomas A. Parnell, NASA - Marshall Space Flight Center

Flight 826-P, 11 May 1974

Purpose: The purpose of this flight was to measure the charge composition of the cosmic ray nuclei over the interval Z = 1 to Z = 30. A second detector system monitored the gamma ray intensity in the interval 85 to 1950 keV in a search for gamma ray bursts.

Results: All detector systems functioned without fault. The cosmic ray data is now in preliminary computer analysis. No statistically significant gamma ray bursts have been found in the preliminary analysis of that data.

Drs. W. Z. Osborne and P. B. Price, University of Houston and University of California, Berkeley

Flight 87-N, 17 September 1973 and Flight 88-N, 25 September 1973.

Purpose: Experiment is latest in a continuing series to measure

the charge and energy spectra of transiron cosmic rays. The flights were highly successful -- the results should equal the current world supply of such data at low energies when analysis is completed.

Results: Scanning of the nuclear emulsions is now approximately 50% complete. We are finding useful tracks at the expected rate and expect to have finished the scanning task before the end of this calendar year. The analysis should be completed by July 1975.

Publications: We expect to present an initial report at the 14th Cosmic Ray Conference in August, 1975.

Dr. M. W. Friedlander, Washington University

Flight 776-P, 8 September 1973

Purpose: Far Infrared Sky Survey - to scan continuously during the flight, searching for point sources of far infrared radiation (wavelengths greater than 50 microns). Two liquid-helium-cooled silicon bolometers were used, with a Newtonian telescope with 40 cm mirror.

Results: Flight Successful, but post-flight analysis showed that a large DC offset was present. Small signals would be very hard to detect, if at all, and instead attention was concentrated on Flight 778-P. Before that flight, adjustments were made which largely eliminated this problem.

Flight 778-P, 20 September 1973

Purpose: Far Infrared Sky Survey - to scan continuously during the flight, searching for point sources of far infrared radiation (wavelengths greater than 50 microns). Two liquid-helium-cooled silicon bolometers were used, with a Newtonian telescope with 40 cm mirror.

Results: Twelve localized objects were found during the flight. About half the sky was scanned, and no well-known infrared sources were located. Using this to place a lower limit on the minimum detectable power, we estimate that the objects that were seen, had fluxes (at Earth) $\gtrsim 3 \times 10^{-12}$ W/cm^2. Each of objects was seen more than once, at the same celestial coordinates, thus eliminating the chance that these signals were simply noise in the system.

Publications: Manuscript being submitted (July 1974).

Drs. R. Weiss and D.J. Muehlner, Massachusetts Institute of Technology

Flight 806-P, 28 January 1974

Purpose: To measure the isotropy of $3^{\circ}K$ cosmic background radiation in the spectral region embracing the Black Body Peak.

Results: This was the first flight of the apparatus, the preliminary results are 1) the background radiation appears isotropic to 1×10^{-3} in a bandwidth extending from 3 cm^{-1}, 2) the atmosphere and thermal gradients in this apparatus do not contribute to the noise in the measurement which is dominated by detector noise, 3) with longer and more frequent flights made with this instrument, we should be able to determine the anisotropy in the background radiation due to the earth's motion relative to the co-moving frame determined by the expansion of the universe.

ATMOSPHERIC SCIENCES

Drs. J. R. Benbrook and W. R. Sheldon, University of Houston

Flight 765-P, 10 July 1973

Purpose: This flight was the third in a series of three flights conducted to provide engineering tests of sounding rocket instrumentation. DC electric field probes of three types were successfully tested. In addition, the low energy x ray flux was monitored during ascent and float as part of a continuing study of short-time fluctuations in the rate of precipitation of electrons into the atmosphere from the magnetosphere.

Results: Analysis of the engineering data from the electric field measurements has permitted the selection of a final design for the rocket instrumentation. The x-ray data will be analysed later this year.

Publications: A brief article on the electric field data obtained during this flight when the balloon was above a thunderstrom system has been submitted for publication in the Journal of Geophysical Research.

Dr. D. Ehhalt, National Center for Atmospheric Research

Flight 777-P, 9 September 1973

Purpose: The purpose of this flight was to fly a prototype cryogenic sampler and obtain vertical profile of N_2O, CO_2, CO and H_2, CH_4.

Results: The flight was successful, and demonstrated that the sampler worked. We also obtained profiles of H_2, CH_4, N_2O, CO_2 and CO. These measurements provided for the first time measurements of N_2O, CO_2, CO concentrations above 20 km altitude.

Publications: "Vertical Profiles of CH_4, H_2, CO, N_2O and CO_2 in the Stratosphere", D. H. Ehhalt, L. E. Heidt, R. H. Lueb and N. Roper. Proc. III CIAP Conference, Boston, Massachusetts, February, March.

Other publications based on these are earlier balloon flights:

"Vertical Profiles of Molecular H_2 and CH_4 in the Stratosphere", D. H. Ehhalt and L. E. Heidt. AIAA Paper # 73-518. Appears also in the AIAA Journal in 1974.

"Sampling of Stratospheric Trace Constituents", D. H. Ehhalt. Can. J. Chemistry, 1974.

Dr. D. H. Ehhalt, National Center for Atmospheric Research

Flight 91-N, 14 November 1973

Purpose: Obtain vertical profiles of CH_4, CO and H_2 in the stratosphere. These were the first measurements in the Southern Hemisphere.

Results: The flight was successful and we obtained vertical profiles of H_2 and CH_4 to 30 km altitude and a CO profile to 26 km.

Publications: "Vertical Profiles of CH_4, H_2, CO, N_2O and CO_2 in the Stratosphere", D. H. Ehhalt, L. E. Heidt, R. H. Lueb, and N. Roper. Proc. III CIAP Conference, Boston, Massachusetts, February-March 1974.

Dr. D. H. Ehhalt, National Center for Atmospheric Research

Flight 101-N, 7 May 1974

Purpose: To fly a newly developed cryogenic sampler. Obtain 16 samples and from them obtain vertical profiles of H_2, CH_4, CO, CO_2, N_2O and H_2O in the stratosphere. The experiment was part of NCAR's LACATE experiment.

Results: Due to a failure in telemetry the flight was only partially successful. We collected only the first 3 samples. However, the flight demonstrated that our instrument works satisfactorily.

Harold N. Ballard, Jagir Randhawa, Atmospheric Sciences Laboratory; Frank P. Hudson, Robert O. Woods, Ralph L. Schellenbaum, Sandia Laboratories; Leslie C. Hale, Pennsylvania State University; John D. Mitchell, Miguel Izquierdo, University of Texas-El Paso; and C.K.N. Patel, Bell Telephone Laboratories

Flight 792-P, 19 October 1973

Purpose: To make correlated multiple measurements of atmospheric parameters related to the aeronomy and meteorology of the middle stratosphere. The goals are both measurement of single parameters and determination of the relationships among co-measured parameters to help define the processes which establish stratospheric conditions and behavior. The instruments flown include:

(1) Mass Spectrometer, quadruple, cryo-pumped, for determination of neutral particle densities in the mass range 1-60

(2-3) Ozonesonde, chemilluminescent (2), for measurement of ozone particle density

(4) Atmospheric sampler; flight mass spectrometric analysis for O_2, N_2, CO_2 and H_2O

(5) Ultra-violet photometers, filter wheel, four-bands between 250 and 310 mm

(6) Blunt probe for measurement of positive and negative electrical conductivity. Lyman-α and lamp for NO/NO_2 ionization

(7) Optico-acoustic laser system for detection of NO and H_2O, Raman spin-flip laser

(8-10) Water vapor sensors (3); Al_2O_3

(11-13) Temperature sensors (3), bead thermistor

(14-16) Pressure sensors (3), thermal conductivity

(17) Cosmic ray detector, Geiger tube

Results: All instruments operated successfully and about 13 hours of night, sunrise and daytime data was obtained at 28 kilometers altitude. Planned lower altitude measurements (18 km) were not carried out. Preliminary analyses of the rough data indicates all experiments were satisfactorily completed.

Publications: It is expected that the results will be presented in a sequence of papers at a special session of a future AGU meeting. Publications will follow.

Dr. Arthur A. Few, Rice University

Flight 827-P, 17 May 1974

Purpose: The purpose of this flight was to measure the profile of the atmospheric vector electric field from the surface to the tropopause. Because this was the first flight of the Balloon Electric Field Sensor (BEFS) it was also an opportunity to perform a complete engineering test of the system.

Results: All systems on board performed as designed and the ground support tracking systems worked as planned. Data analysis is proceeding. In addition to the anticipated motions of the

balloon system we find in the data a high frequency forced oscillation of the system which must be removed from the data prior to detailed analysis.

Publications: No publications have resulted at this time. One abstract of a paper to the Fifth International Conference on Atmospheric Electricity authored by Hugh J. Christian and A. A. Few has been submitted and accepted. In addition, a patent application on the BEFS has been filed via the Office of Naval Research.

OTHER

Vicecomodoro Raul Pedro Flores, Argentine Air Force

Flight 100-N, 6 April 1974

Purpose: The purpose of this flight was to obtain pictures of the zone around Rio Cuarto for the Argentine Space Commision natural resource program. We are also using this opportunity to test a new distribution of cameras inside the gondola. Flight instrumentation was provided by N.C.A.R.

Results: Cameras and electronics triggers worked all right. More than 280 frames of 70 mm color film were developed and sent to Argentina Space Commision for evaluation. This zone was previously photographed from an altitude of 400 kilometers (Skylark rocket) and pictures from this balloon flight will be compared.

Publications: The data from this flight will be analyzed later this year and will provide the basis of reports of the National Space Commision.

Drs. John Strong and Raymond N. Smartt, University of Massachusetts

Flight 795-P, 29 October 1973

Purpose: To obtain radiometric measurements of the solar corona from 3.5 R to 13 R over a spectral range of 2μm to 4μm, using an improved coronagraph system. As well as the need for more data in general, this flight was designed as a corroborative test of some unexpected results obtained in a previous flight.

Results: Approximately four hours of data were obtained. Some differences from previous results are tentatively attributed both to a temporally varying corona, and to some minor instrumental artifacts.

Publications: The results will form a major part of the basis for a dissertation.

Dr. R. K. Yasui, Jet Propulsion Laboratory /California Institute of Technology

Flight 809-P, 16 February 1974, Flight 814-P, 5 April 1974, Flight 819-P, 23 April 1974 and Flight 825-P, 8 May 1974

Purpose: The purpose of these flight are to provide: 1) Earth-

space calibrated reference standard solar cells for use with artifical light sources and in terrestrial sunlight; 2) a means to evaluate the spectral quality of light sources through specially filtered photovoltaic devices or total energy measuring radiometers in conjunction with narrow band-pass filters; and 3) a cost effective means of evaluating new photovoltaic devices under research and development. As part of its solar power effort sponsored by the National Aeronautics and Space Administration (NASA), the Jet Propulsion Laboratory (JPL) of the California Institute of Technology (Caltech) has the prime responsibility to fill the need for standard solar cells which are a basic tool used to evaluate production solar cells and spacecraft solar arrays. The standard solar cells calibrated on high-altitude balloons have proven to be the most reliable and accurate method for solar cell and array evaluation.

Results: Several problems were encountered during these series of balloon flights. The results are still being evaluated and analyzed. However, preliminary results due indicate that solar cells calibrated on high altitude balloons still prove to be the most reliable and accurate method for solar cell and array evaluation. Continuation of the solar cell high altitude standardization program will be necessary to meet the needs of the photovoltaic community. Plans are currently in progress to resume flights later this year. It is hopeful that majority of problems encountered during these series of balloon flights have been resolved. It is also anticipated that minor modifications will be made to further improve system accuracy and reliability in future flights.

Publications: The data from these flights will be thoroughly analyzed later this year and will provide the basis of a final report which will be published in a form of a JPL technical report. Also, a paper entitled, "Status of the 1973 NASA/JPL Balloon Flight Solar Cell Standardization Program", authored by R. K. Yasui and R. F. Greenwood is being prepared for presentation at the 9th Intersociety Engineering Conference, August 26-30, 1974, Jack Tarr Hotel, San Francisco, California.