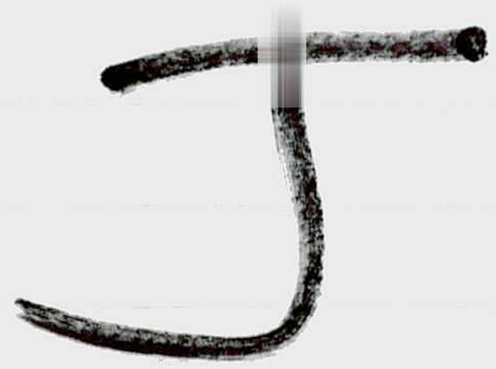

– New York University Papers

PROGRESS REPORT #2

Covering Period from July 1, 1947
to July 31, 1947

CONSTANT LEVEL BALLOONS

Section II

Research Division, Project No. 93

Prepared in Accordance with Provisions of Contract
W28-099-ac-241, between
Watson Laboratories, Red Bank, New Jersey
and
New York University

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Approved by

Prof. Athelstan F. Spilhaus
Director of Research

Research Division
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II. ABSTRACT

The first flights, using large single cell polyethylene balloons were made in a series of launchings from Alamogordo, New Mexico. The inherent stability and general superiority of this type of balloon, as compared with meteorological balloons, was clearly demonstrated. Laboratory tests were run and modifications were made on control and flight apparatus. A minimum pressure switch was designed to actuate the automatic ballast valve, replacing the switch actuating at a predetermined pressure. Equipment was prepared for a single flight from Lakehurst in August, designed to test the minimum pressure switch and the large balloons supplied by General Mills.

III. GENERAL REPORT

A. Personnel:

No change

B. Administrative Action:

A bid was obtained from General Mills, Inc., for the febrication of 20-ft., .001" polyethylene balloons. Delivery was made of two cells of this size in addition to the remainder of the 7-ft. balloons which had been contracted for in June.

C. Communications:

(1) Correspondence during this period was as follows:

Date of Correspondence	Address	Abstract	Answer
7/22/47	Chief, U. S. Weather Bureau, Washington, D.C. Att: Mr. B.C.Haynes	Report on trip to Alamogordo with thanks for cooperation of Big Springs, Tex. Station.	None required.

Date of Correspondence	Address	Abstract	Answer
7/22/47	Director of Special Devices Center, Office of Naval Research Sands Point, Port Wash., L.I., N.Y. Att: Lt. Comdr. G. W. Hoover.	Suggest cooperative flight program using Navy balloons and N.Y. University men and flight control.	Net yet received
7/22/47	Kollsman Instrument Div. Square D Company, Elmhurst, N. Y. Att: Mr. Paul Goudy	Request for quotation on modified automatic ballast valves and minimum pressure switches	Not yet furnished
7/29/47	Office of the Secretary, Ft. Worth Sub-Committee on Air Space, Civil Aeronautics Auth., (4th Region) Ft. Worth, Texas	Request permission to continue balloon releases from White Sands area.	Not yet received
7/29/47	Chief, U.S. Weather Bureau, Washington 25, D. C., Att: Mr. B. C. Haynes	Request for Big Springs, Texas Station to monitor radiosonde signals from Alamogordo flights.	Not yet received
7/29/47	Dewy & Almy Chem. Co. Cambridge, Mass. Att: Mr. Langley Ison	Suggest a conference to discuss results of recent flights with plastic balloons in attempt to interest Dewey & Almy in fabrication.	Not yet received
7/30/47	Belmar Wheel & Machine Co., 1707 F Street, Belmar, New Jersey	Request quotation on aluminum ballast reservoirs.	Not yet received

Date of Correspondence	Address	Abstract	Answer
7/30/47	New York Sub-Committee on Air Space, Civil Aeronautics Authority, 385 Madison Avenue, New York 17, N. Y. Att: Mr. C. J. Stock	Request permission to fly a single balloon from Lakehurst, N. J., in first week of August.	Not yet received

(a) Conferences:

The following conferences were held during the month of July:

Date	People Present	Where Held	Discussed	Conclusions
7/11/47	Lt. H. F. Smith, USNRS Prof. A. F. Spilhaus Mr. C. B. Moore Mr. C. S. Schneider	New York University	Cooperative flight program	Should be presented in writing to the Navy Dept.
7/22/47	Mr. Paul Goudy Mr. Martin Pepper of Kollsman Instr. Messrs. Moore, Hackman and Smith	Kollsman Instrument Division, Square D Company, Elmhurst, L. I., N. Y.	Modification of ballast reservoirs and design of minimum pressure switch	Bid will be submitted by Kollsman
7/24/47	Dr. Peoples Mr. Ireland Mr. Johnstone Mr. Mears Mr. Alden and Capt. Trakowski of Watson Labs. Messrs. Moore, Schneider and Hackman	Watson Laboratories, Red Bank, N. J.	Analysis of second Alamogordo field trip. Preparations for next launching from Lakehurst, N. J.	Lakehurst flight date set: 5 August 1947
7/28/47	Mr. Seyfang Mr. Schneider Mr. Moore	Seyfang Labs., Atlantic City, N. J.	Plastic and man-carrying fabric balloons	Bid on manufacture of plastic balloon will be submitted by Mr. Seyfang.
7/30/47	Dr. Peoples Capt. Trakowski Mr. Schneider	Watson Laboratories, Red Bank, N. J.	Detail of Lakehurst flight	Watson Lab. would request work space equipment, etc. from the Navy.

D. Work Accomplished:

(1) General

Field tests were conducted at the Alamogordo Army Air Base during the period from July 1 to July 9, using a three station network for tracking and recovery purposes. Three full scale flights used plastic balloons and afforded an opportunity to evaluate their characteristics. The inherent stability of these balloons was demonstrated. Although the flights were not generally of unusual duration, one flight passed out of range of the tracking net, still under ballast control influences, and was reported over Pueblo, Colorado on the following day. The technical reports will be prepared to cover the details of these flights.

After the return from Alamogordo, the remainder of the month was spent in analysis of flight data, development of new equipment, looking for office and work space, ordering supplies, and preparing for a launching to be made early in August from the Lakehurst Naval Air Station.

Cold tests were made on battery packs and explosives. It was found that the batteries successfully fired squibs when both batteries and caps had been held at -50°C. for over an hour.

(2) Specific Problems

The flights made with plastic balloons from Alamogordo gave rise to several special problems.

a. The loss of lift due to mixing and escape of gas through the open balloon appendix caused flights to go to a lower ceiling than was expected. To counteract this, a minimum pressure switch was devised as a means of activating the ballast release even though the desired hight was not obtained. Seal-off methods for the appendix are essential.

b. The problem of very slow descent through air-traffic lanes was increased with the use of plastic balloons. To speed up descent when the balloons begin to fall, a pressure activated squib was designed to rupture the cell below the equator and thus permit a high rate of gas leak, whenever a balloon descends below 20,000 ft.

c. When plastic balloons were flown in a cluster, it was found that those individual cells with a relatively slow rate of rise and an open appendix were deflated as they were towed upward. Individually, such balloons

spilled most of their gas and some even turned upside-down, scooping up air and acting as a drag on the others. This is a point against plastic clusters.

d. Visual tracking plastic cells proved to be more difficult than the tracking of meteorological balloons. During the July field trip, the proper location for down-wind stations proved to be difficult to forecast as were the winds at a given proposed flight level. To further accentuate this problem, the wind direction at different elevations was observed to vary markedly, thus making a good trajectory forecast dependent on a correct flight altitude prediction.

e. The action of the automatic pressure switch was not entirely satisfactory. It seems likely that the changing temperature of air trapped in the aneroid at the time of seal-off is responsible for considerable delay in the action of the valve.

(3) Limitations

The lack of workshop, laboratory, storage, and office space at New York University greatly hampers the operations of this project, and markedly reduces the efficiency of the staff.

E. Methods of Attack

The results of the Alamogordo II tests indicate that plastic balloons can be used for constant altitude flights. The development of the specific controls and experimentation to determine optimum size, shape, and design of the balloons are the major problems to be attacked.

F. Apparatus and Equipment

A minimum pressure switch was designed and tested. This switch will replace the pressure regulated switch which was previously used to actuate the automatic ballast valve.

In addition to the automatic ballast valve, a manual ballast valve has been developed. This valve is designed to permit a constant ballast loss which will slight over-compensate for loss of buoyancy through diffusion and mixing.

G. Conclusions and Recommendations

The Alamogordo II field trip confirmed earlier opinion that non-extensible balloons have great inherent stability. One

flight maintained its altitude at 16,000 feet ± 700 feet for seven hours. Also the importance of down-wind tracking and recovery stations was re-affirmed.

It is strongly recommended that suitable electromagnetic tracking equipment be provided to replace ground visual observation, but not to exclude aerial observation whenever possible.

Longer and more powerful radiosonde transmission is desirable with the prospect of increasing flight time resulting from the use of large plastic balloons.

IV. FUTURE WORK

Apparatus is being designed and built to provide suitable control over the flight of large plastic balloons. More of these balloons are expected from the manufacturers, and field trips will be planned as flight equipment is made available for testing. It is expected that a large number of flights will be made starting in September, 1947.