

E 779
7/1/53

General Mills, Inc.

Mechanical Division

AD NO. 14116
ASTIA FILE COPY



ENGINEERING RESEARCH & DEVELOPMENT DEPARTMENT

2003 EAST HENNEPIN AVENUE
MINNEAPOLIS 13, MINN.

GENERAL MILLS, INC.
Mechanical Division
Engineering Research & Development Department
2003 E. Hennepin
Minneapolis 13, Minn.

FINAL REPORT

PROJECT 85012

REPORT NO. 1227

Prepared by:

Keith C. Giles
Keith C. Giles

DATE: 4 SEPTEMBER 1953

Approved by:

J. R. Smith
J. R. Smith

Balloon and Meteorological
Systems Group

I. INTRODUCTION

On 28 July 1952, Contract Nonr 875(00) between General Mills, Inc. and the Office of Naval Research was amended to provide for the execution of an experiment designed to carry scientific equipment to high altitudes. The scientific payload was supplied by the Naval Research Laboratory. General Mills supplied "Skyhook" balloons to carry aloft the scientific payload, the balloon controls, and recording and safety equipment. In addition, the flights were launched, tracked, and recovered by General Mills technical personnel.

II. PROJECT PROGRAM

This project followed the traditional "Skyhook" balloon flight pattern. The balloons were flown from the University of Minnesota Airport at New Brighton, Minnesota. A total of two flights were made in the program. Helium, provided by the Navy, was used for inflation. The inflations were made with a launching platform to keep the inflated "bubble" taut during the early stages. In-flight tracking was carried out with aircraft.

The first flight, 903, was on 16 September 1952. This flight used an 85 ft. balloon and carried the following items:

1. A 24-foot parachute on which the instruments and payload returned to earth.
2. The scientific payload supplied by the Naval Research Laboratory.
3. A barograph for recording the altitudes reached.
4. A timer set to release the equipment from the balloon at a predetermined time.

5. A safety device required by the C.A.A. consisting of a pressure switch to prevent the balloon from floating below 30,000 ft.

6. A radio transmitter whose signal was pressure-modulated. In addition to pressure telemetering, the radio signal provided a beacon on which the tracking aircraft could home.

The balloon was torn during inflation, contributing to a low rate of rise and a floating altitude lower than anticipated. The equipment was tracked with a Stinson aircraft and recovered in Wisconsin.

The second flight, 916, was launched on 20 October 1952. This flight used a balloon 116 feet in diameter and carried the following items:

1. A 28-foot parachute for the safe return of equipment.
2. Scientific payload supplied by the Naval Research Laboratory.
3. A small scientific payload supplied by the Health Physics Division, Oak Ridge National Laboratories, Oak Ridge, Tennessee.
4. A "single-shot" camera, pointing down, to be actuated at the termination of the flight.
5. A barograph to record the altitude reached.
6. A pressure modulated radio transmitter for both pressure telemetering and beacon homing by the tracking aircraft.
7. A radio control receiver to actuate the termination squibs releasing the equipment from the balloon. The portable audio frequency control unit was carried in the tracking aircraft.
8. A safety timer, in case of failure of the radio-controlled release, to release the equipment from the balloon.

9. A safety device required by the C.A.A., consisting of a pressure switch to prevent the balloon floating below 30,000 feet.

The balloon was successfully launched and reached the desired altitude. The balloon was tracked with the use of a Beechcraft aircraft and the release was successfully actuated with the radio command equipment. The equipment was recovered in a wilderness area of the Upper Peninsula of Michigan. The single shot camera was also successfully actuated with the radio commanded equipment. The accessory balloon equipment showed excellent results on both flights.

It is to be hoped that the scientific payload performed satisfactorily and that the entire operation met with success. General Mills, Inc. is happy to have had the opportunity of working with the Office of Naval Research and Naval Research Laboratory in carrying out these experiments.

The flight performance data are presented in the next section of this report.

GENERAL MILLS, INC.
Engineering Research and Development Department
Minneapolis, Minn.

FLIGHT SUMMARY

Flight No.: 903

Balloon Serial No.: 500

Date: 16 September 1952 Launching Time: 0644 Type: 851A Weight: 150#

Who: NRL - Johnson

What: Beacon, Timers, Barograph, Gondola

Duration: Sched. 10 hrs. from 0604
 Actual 9.15 hrs. from 0644

Load on Balloon: 157#

Gross Load: 307#

Free Lift: 39# 12.7%

Maximum Altitude: 90,600 ft.

Rate of Rise: 400 ft/min to 70,500 ft.

Theoretical Altitude: 99,200 ft.

Altitude Maintenance: Good

Recovery: where? 8 Mi. ESE LaCrosse, Wisconsin

Balloon Success: Fair

Critique: Balloon torn in top gore when it slipped in launching platform during inflation. Inflation hose leaking during inflation also. Both are factors contributing to low rate of rise from air pickup in cell.

Scientific Purpose: To Skyhook NRL proportional counter above 10CM HG for 8 hrs.

Scientific Success as known: Insufficient time at insufficient altitude though much valuable data gathered per Howard Caulk.

PHASE BAROGRAPH DATA
* MANUFACTURE DATA

SCHEDULED DURATION 12 HRS. FROM CEDT
ACTUAL DURATION 9.15 HRS. FROM 0644

NOTE: 2 FT. MOLE TERN BALLOON
IN LAUNCHING PLATFORM
WAS MATCHED WITH BODY AND TARE.

ALTITUDE IN THOUSANDS OF FEET

THEORETICAL CEILING

LOAD RELEASE
1554.8

RATE OF RISE
400 FT/MIN
FROM 33500 FT
TO 70500 FT

RATE OF RISE
400 FT/MIN
TO 33500 FT

BALLOON TARE AL. WT. # ARL NO.
B51A 510 157 # 297

FLIGHT NO. 303
FOR AIRL JONSON
FLOWN 13 SEPT. 1952
LOAD ON BALLOON 157 #
GRASS LARD 307 #
AFTER LIFT 39 # = 12.7 #

LAUNCH SITE
USFNMV AIRPORT
0644 10 SEPT. 1952

IMPACT 8 MI. ESE.
LA CROSSE, WIS.
1645 16 SEPT. 1952

ELAPSED TIME IN HOURS

CENTRAL STANDARD TIME

IN 3124-52
APPROVED: [Signature]

A20957A

OCT 12 1953

GENERAL MILLS, INC.
Mechanical Division
Engineering Research and Development Department
Minneapolis, Minnesota

FLIGHT SUMMARY

Flight No.: 916

Balloon Serial No.: 23

Date: 20 October 1952 Launching Time: 0807 Type: 1161A Weight: 225#

Who: NHL - Caulk

What: Proportional counter in gondola, Beacon, Baro., Camera, Plates, Timers & Release

Duration: 6 hrs. 17 min.

Load on Balloon: 184#

Gross Load: 409#

Free Lift: 61# 14.8%

Maximum Altitude: 108,000 ft.

Rate of Rise: 712 ft/min to 94,000 ft.

Theoretical Altitude: 108,600 ft.

Altitude Maintenance: Excellent

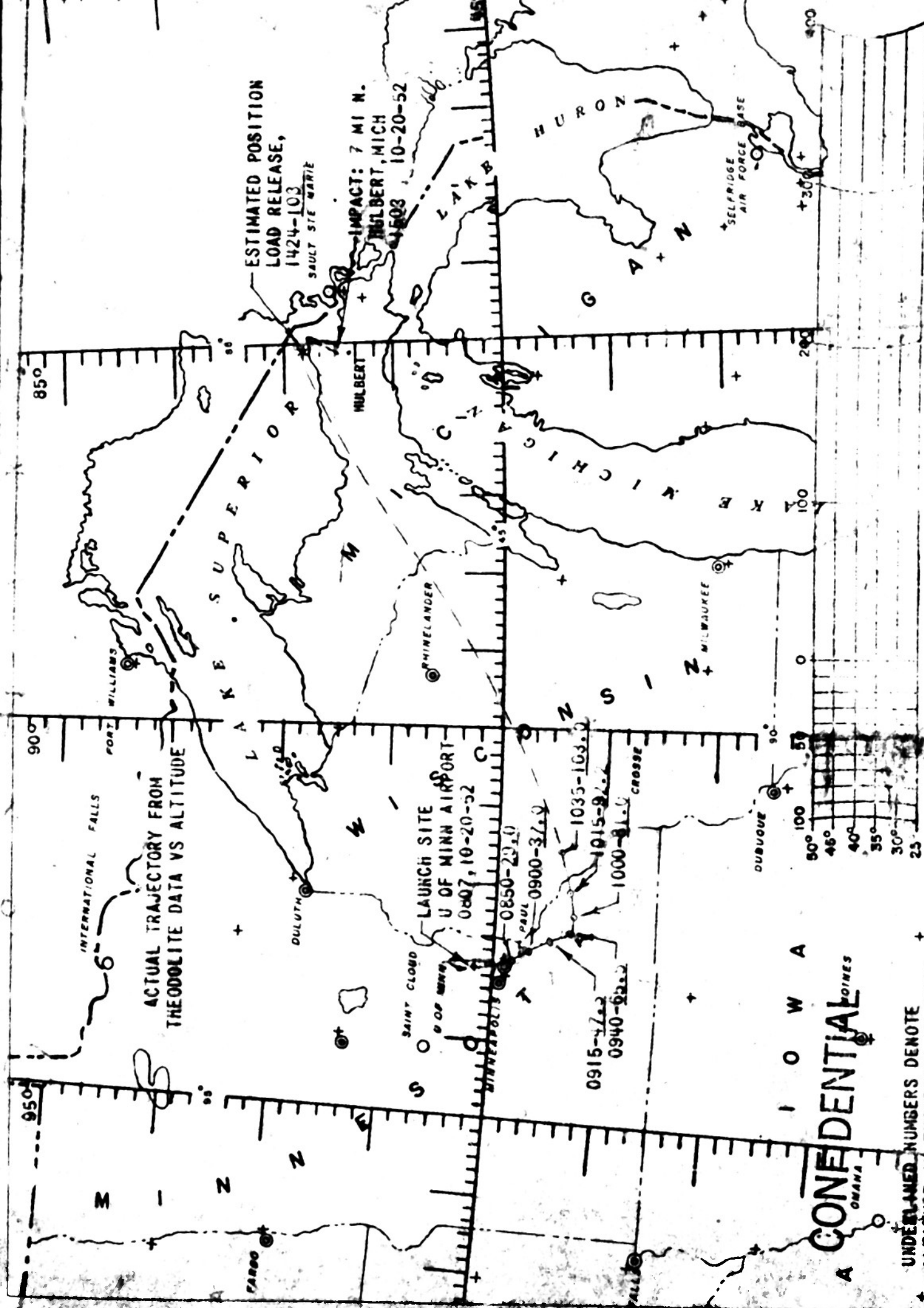
Recovery: where? 7 Mi. N. Hulbert, Mich.

Balloon Success: Excellent

Critique: Balloon left platform with low vertical velocity and did not pick up load for approximately 400 ft. horizontal travel. Altitude time curve indicates air pickup. Flight terminated by Church's radio load release at territorial limits.

Scientific Purpose: One proportional counter and 1 package hitch-hike plates from the Health Physics Division, C.R.N.C. Oak Ridge, Tenn. carried.

Scientific Success as known: Unknown



CONFIDENTIAL

UNEXPLAINED NUMBERS DENOTE ALTITUDE IN THOUSANDS OF FEET

CENTRAL STANDARD TIME

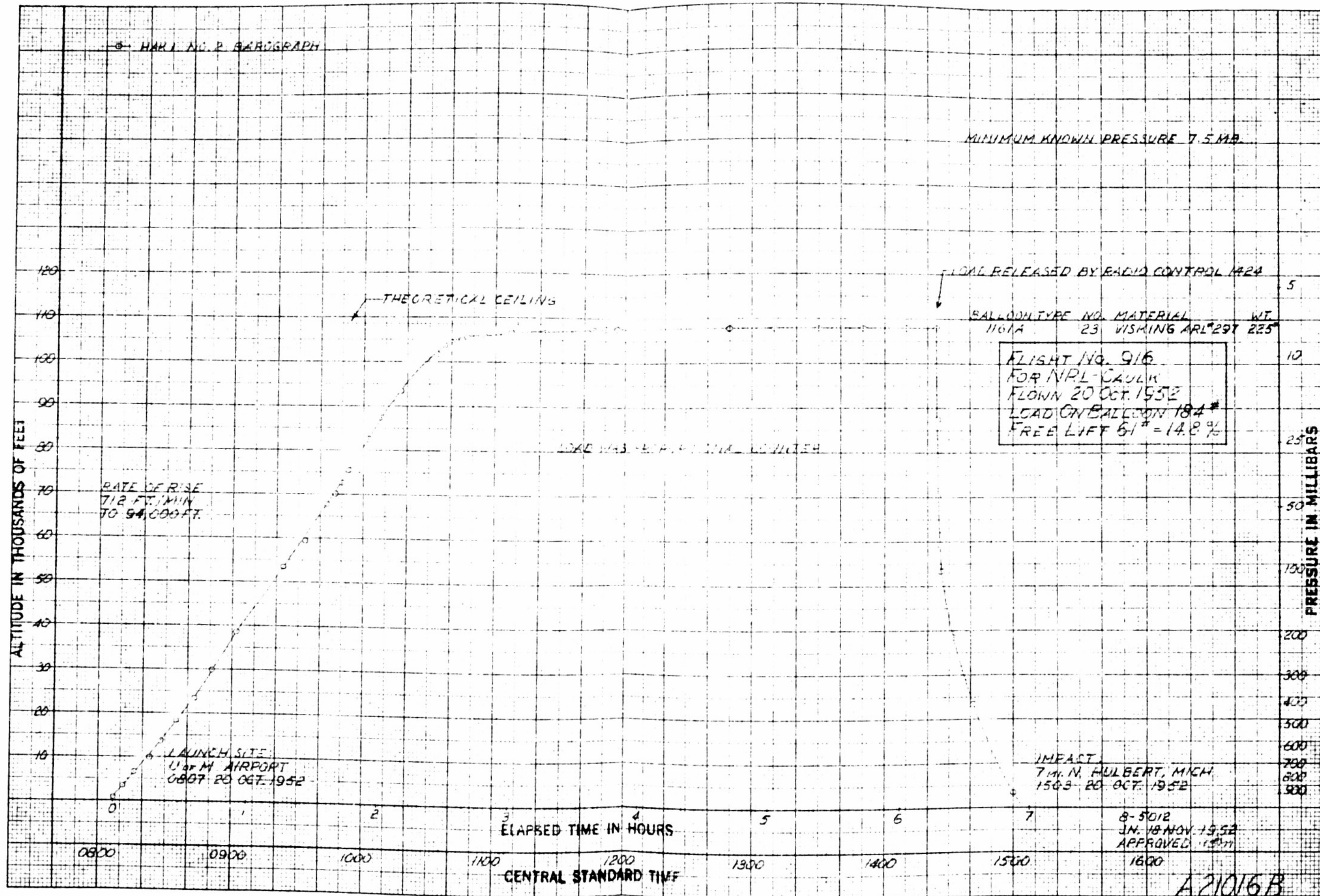
STATUTE MILES

OCT 12 1953

BALLOON TRAJECTORY, FLIGHT NO. 916, FOR NRL-CAULK FLOWN 20 OCTOBER 1952

DR	D.R.	APP	JUN.	SCALE
DATE	11-21-52	APP		1:5,000,000
				8 3012

A-21025-A



OCT 12 1953

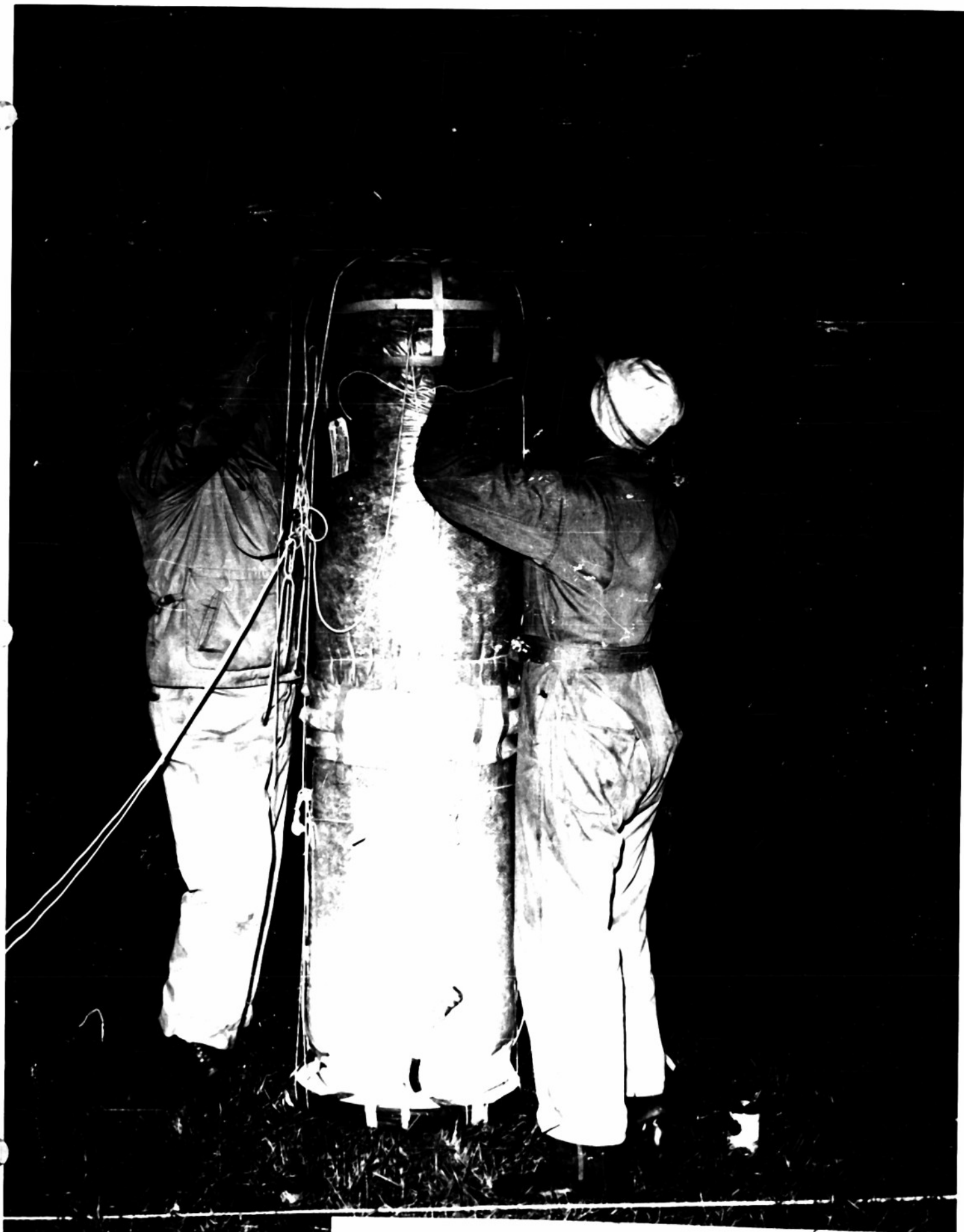


Photo #5309 - Scientific payload being prepared
for attachment to balloon train.



Photo #5305 - Balloon being inflated in platform.
Scientific payload in foreground.

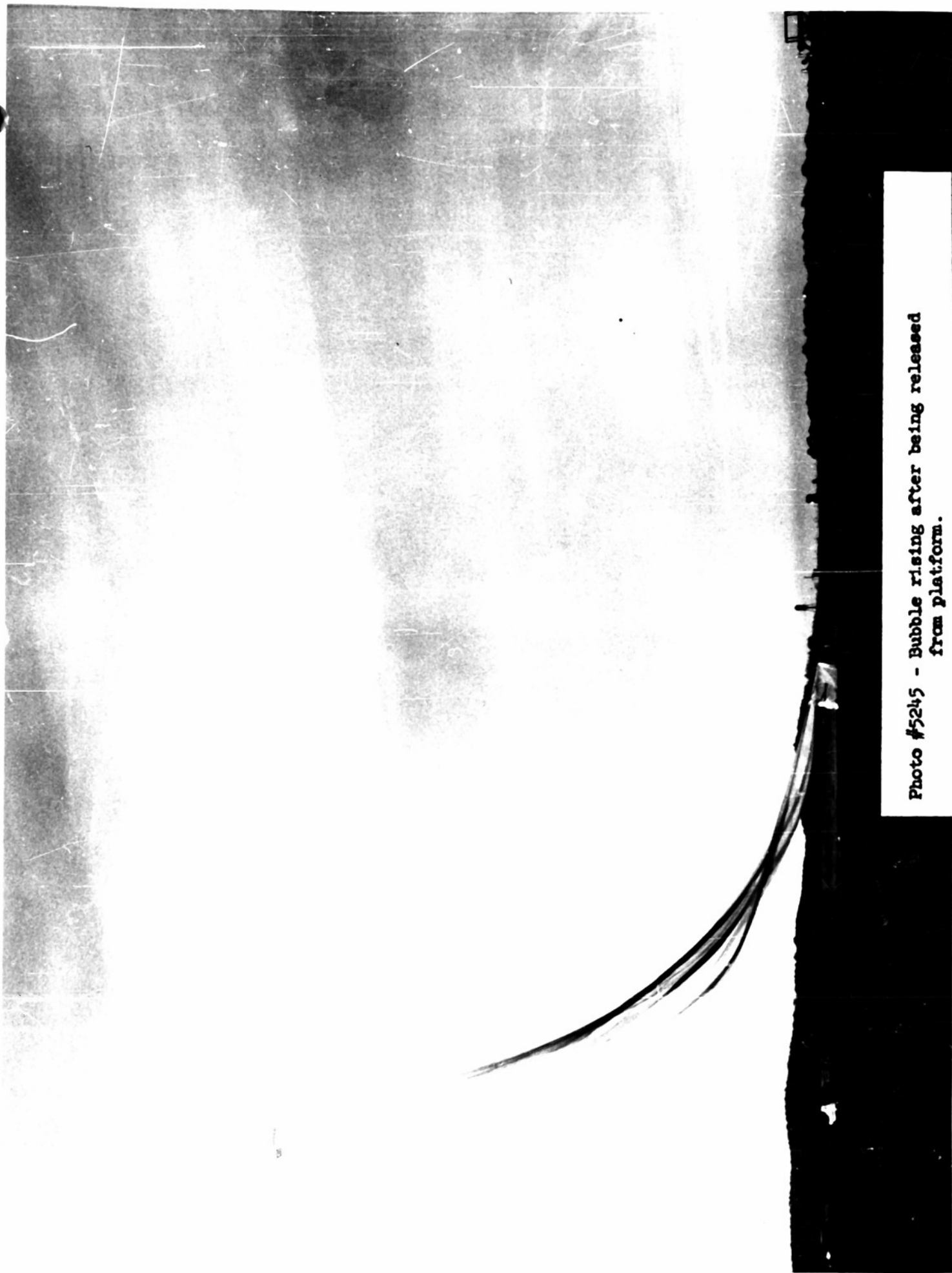


Photo #5245 - Bubble rising after being released
from platform.



Photo #5304 - Balloon carrying instruments and scientific payload immediately after launch.



Photo #5312 - Scientific payload and instruments descending
by parachute after release from the balloon.