General Mills, Inc.
Mechanical Division

ENGINEERING RESEARCH & DEVELOPMENT DEPARTMENT

2003 EAST HENNEPIN AVENUE
MINNEAPOLIS 13, MINN.

FINAL REPORT

CONTRACT NO. Nonr 875(00)

ANNEX II

Prepared for

The Office of Naval Research
Washington 25, D. C.

This document has been reviewed in accordance with OPNAVINST 5510.17, paragraph 5. The security classification assigned to it is correct.

Date: 9/9/54 K. E. Wright
By direction of
Chief of Naval Research (Code 442)

Report No. 1308

10 June 1954

Prepared by: Keith C. Giles

Approved by:

Cledo Brunetti

Cledo Brunetti, Director

GENERAL MILLS, INC.
Mechanical Division
ENGINEERING RESEARCH AND DEVELOPMENT
2003 E. Hennepin Ave.
Minneapolis 13, Minn.

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FINAL REPORT CONTRACT Nonr 875(00)

ANNEX II

I. AIMS

On 29 May 1952, Contract Nonr 875(00) between General Mills, Inc. and the Office of Naval Research was amended to provide for the launching of "Skyhook" plastic balloons to carry scientific instruments to high altitudes. Scientific payloads were supplied by the Evans Signal Corps Engineering Laboratories. General Mills, Inc. supplied "Skyhook" balloons, balloon controls and safety equipment. Engineering services for launching and telemetering altitude information were also supplied by General Mills technical personnel.

II. WORK ACCOMPLISHED

Flight work on this project was carried out in July and August of 1953 and in May of 1954.

Six flights were made in the Summer of 1953, flights number 1000, 1038, 1042, 1045, 1047 and 1048. In all cases, 85-foot "Skyhook" balloons were used to carry the following equipment to high altitudes.

1. The scientific payload, an ozone counter, supplied by the Evans Signal Corps Engineering Laboratories.
2. Release timer, a clock mechanism set to fire a squib, severing the instruments from the balloon at a predetermined time.
3. Parachute, to return the instruments safely to earth after being released from the balloon.
4. Radio transmitter, pressure actuated to transmit pressure altitude data.

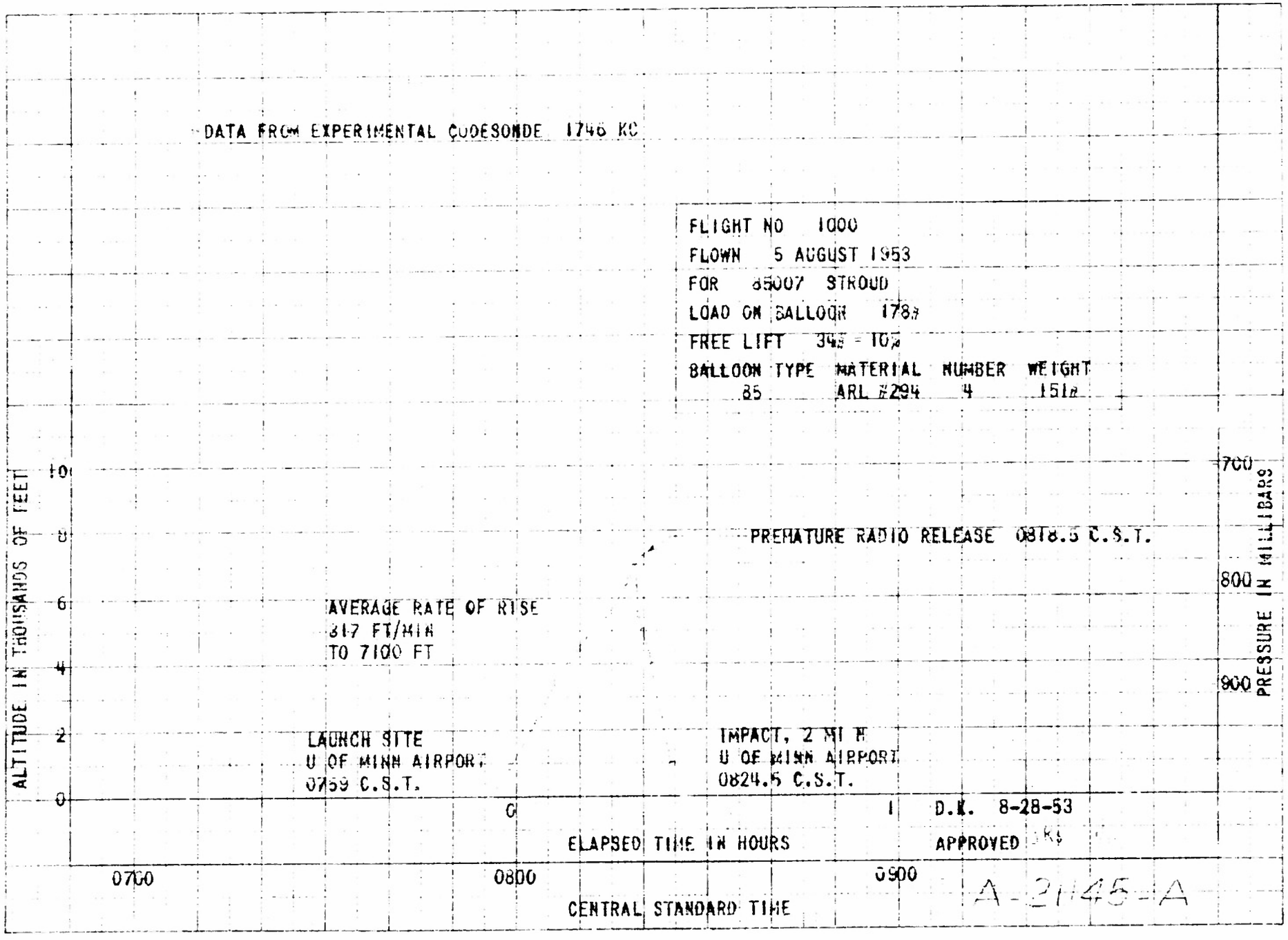
5. Cameras facing both up and down.
6. Safety switch, set to release the payload if balloon should float below 30,000 ft.

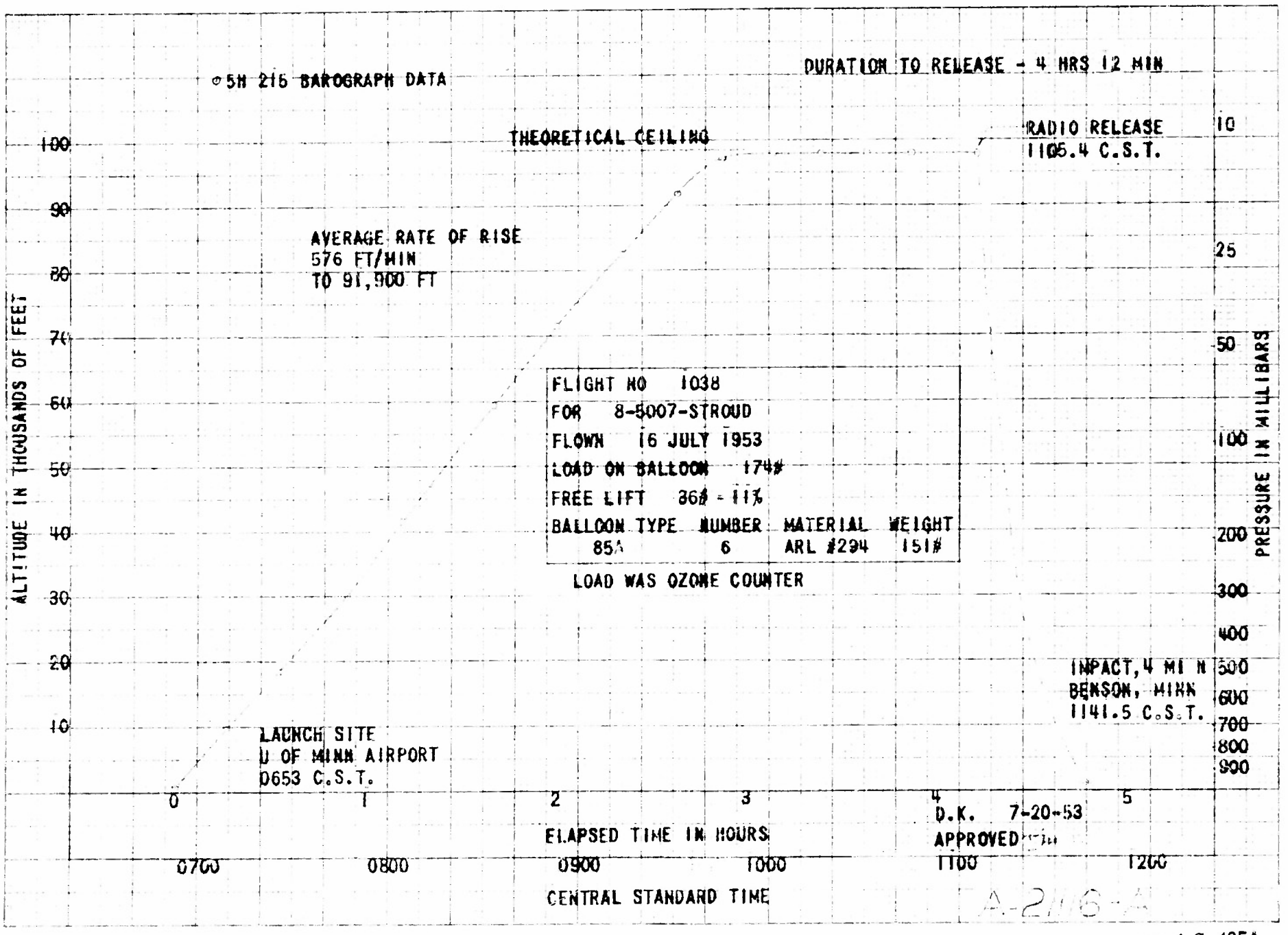
In addition to these standard items, two flights, number 1000 and 1038, carried a radio release, a device designed to separate the load from the balloon on radio command actuated from the ground or from an aircraft. Two flights, 1000 and 1045, failed prematurely; flight 1000 from premature radio release (improperly assembled by field technicians), and flight 1045 from balloon failure while rising. One flight, 1042, failed on reaching ceiling due to a restricted appendix. The remaining three flights performed successfully.

Two flights were made in May of 1954, flights number 1138 and 1139. These two flights were similar to those made in 1953 in that they utilized 85-foot "Skyhook" balloons and carried release timers, safety timers, pressure-sensitive radio transmitters, and parachutes, all of which are standard balloon flight accessories. Rather than carrying an ozone counter as the main load, the primary objective was to obtain meteorological trajectory data for analysis by the Meteorological Branch of the Evans Signal Corps Engineering Laboratories. Down cameras were used for trajectory and altitude purposes. Additional altitude information was derived from barographs and altitude telemeters. A secondary load was provided on each flight. Flight 1138 carried a dew point hygrometer for New York University, and on 1139 a cosmic ray counter for the University of Minnesota was flown. In addition, several "hitch-hike" payloads were carried aloft. Both flights performed successfully.

Flight data on all flights are presented in the next section.

General Mills, Inc. is happy to have been able to work with the personnel of Evans Signal Corps Engineering Laboratories and the Office of Naval Research in carrying out these high altitude scientific experiments and hopes all payloads performed satisfactorily and met with success.





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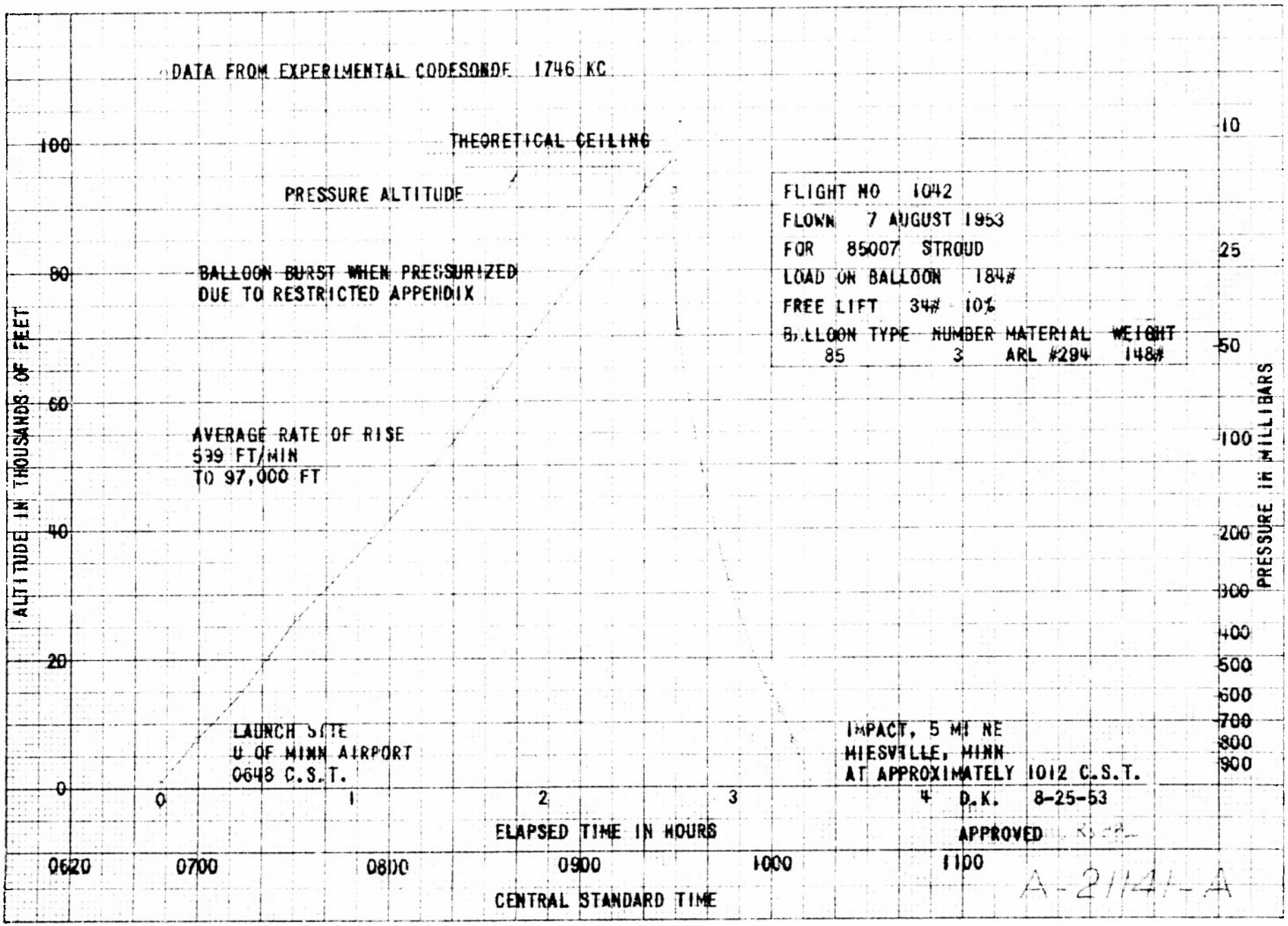
DATA FROM EXPERIMENTAL CODESONDE 1746 KC
THEORETICAL CEILING
PRESSURE ALTITUDE
BALLOON BURST WHEN PRESSURIZED
DUE TO RESTRICTED APPENDIX
AVERAGE RATE OF RISE
539 FT/MIN
TO 97,000 FT
FLIGHT NO 1042
FLOWN 7 AUGUST 1953
FOR 85007 STROUD
LOAD ON BALLOON 184#
FREE LIFT 34# 10%
BALLOON TYPE NUMBER MATERIAL WEIGHT
85 3 ARL #294 148#
LAUNCH SITE
U OF MINN AIRPORT
0648 C.S.T.
IMPACT, 5 MI NE
MIESVILLE, MINN
AT APPROXIMATELY 1012 C.S.T.
D.K. 8-25-53
APPROVED
ALTITUDE IN THOUSANDS OF FEET
PRESSURE IN MILLIBARS
ELAPSED TIME IN HOURS
CENTRAL STANDARD TIME
0620
0700
0800
0900
1000
1100
0
1
2
3
4
0
20
40
60
80
100
10
25
50
100
200
300
400
500
600
700
800
900

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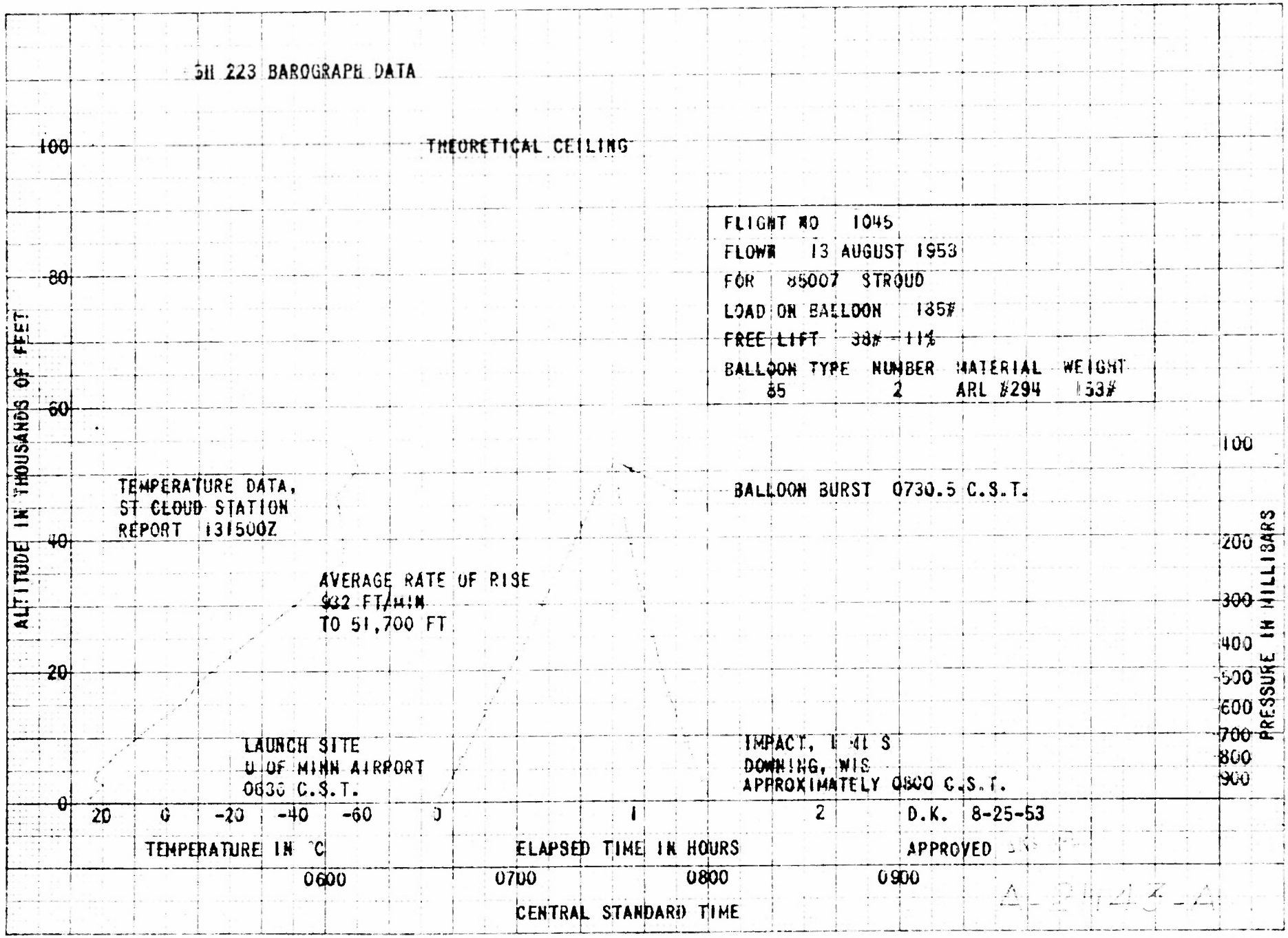
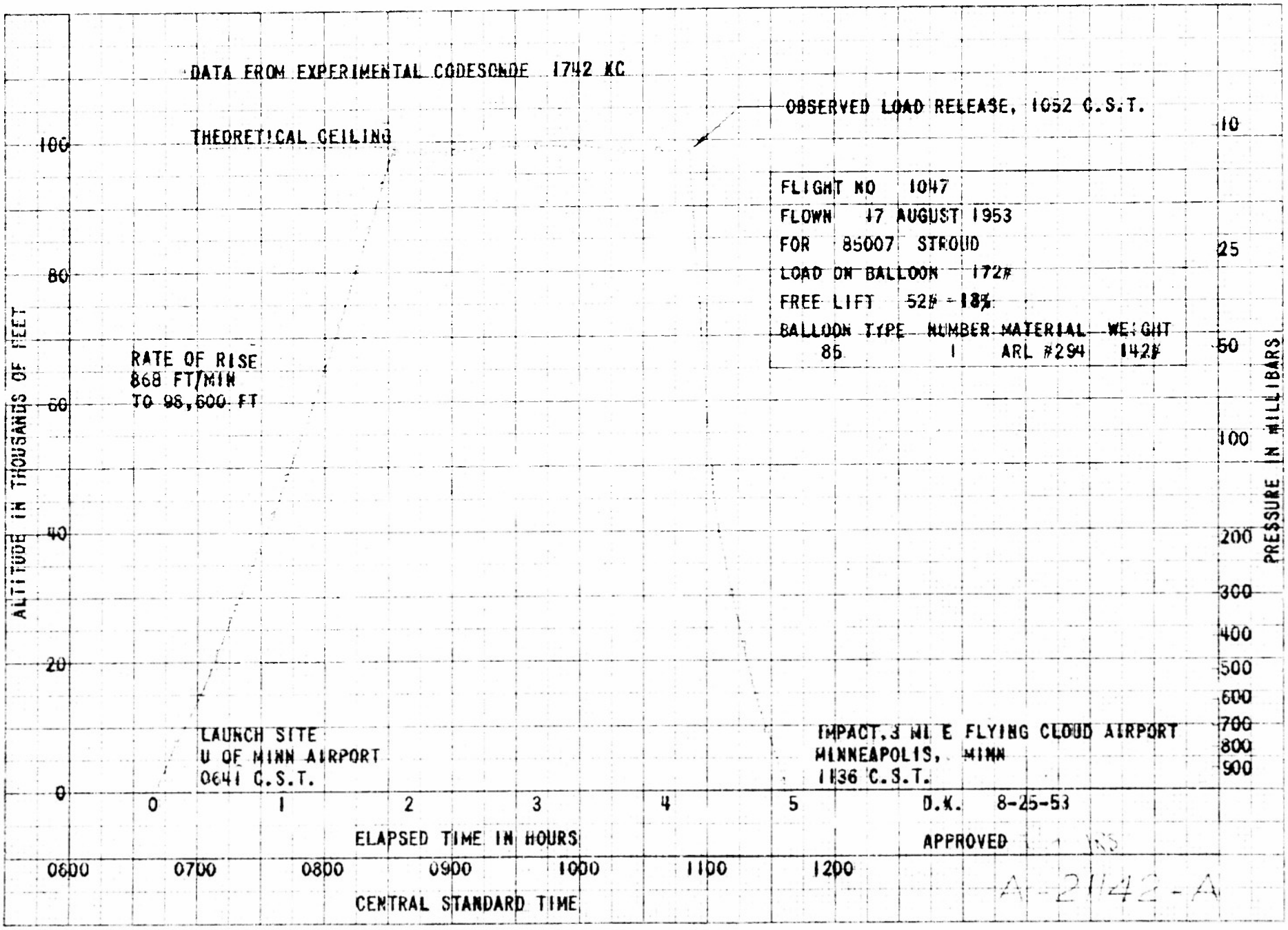
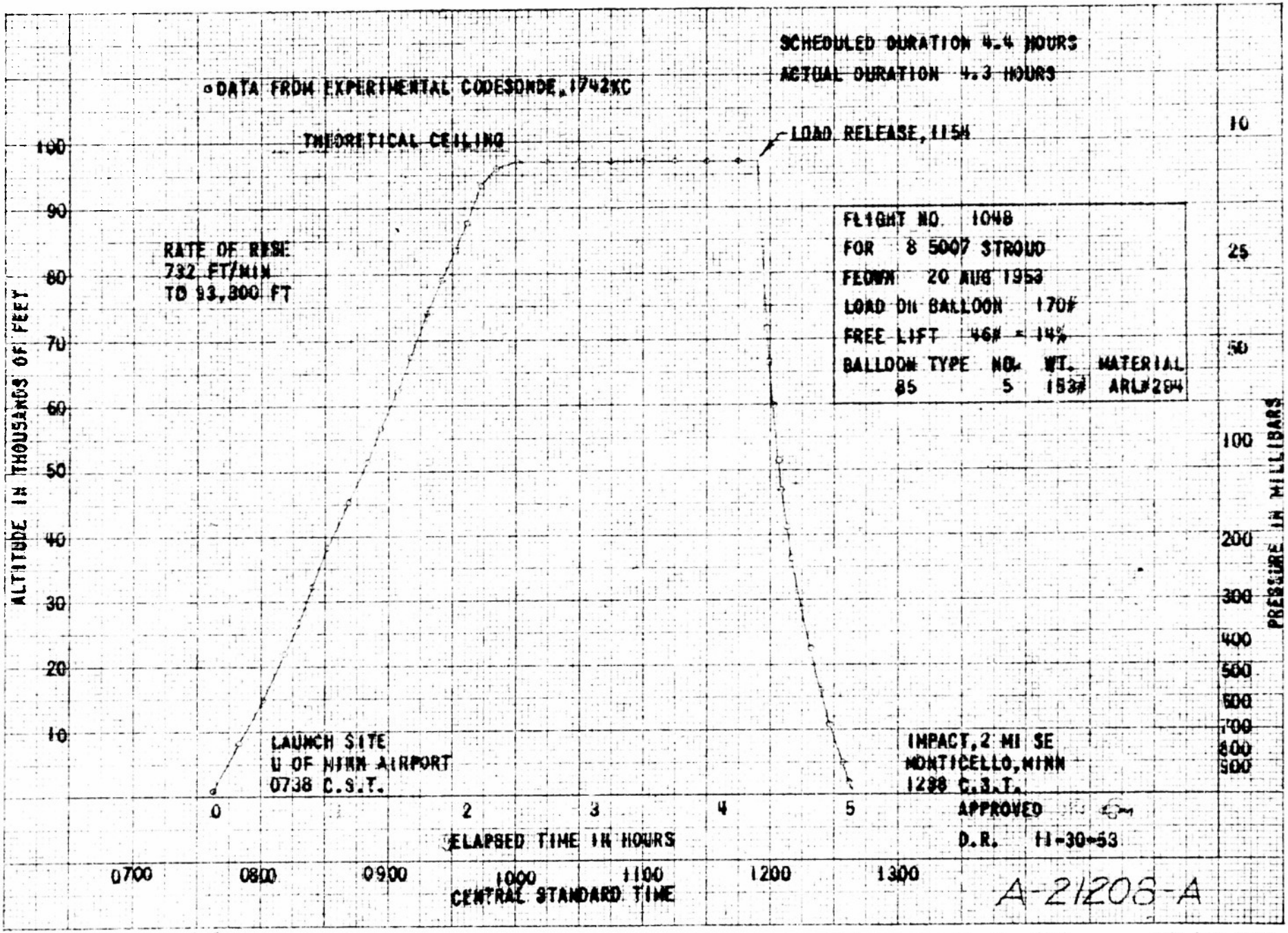

SH 223 BAROGRAPH DATA
THEORETICAL CEILING
FLIGHT NO 1045
FLOWN 13 AUGUST 1953
FOR 85007 STROUD
LOAD ON BALLOON 185#
FREE LIFT 38# - 11%
BALLOON TYPE NUMBER MATERIAL WEIGHT
85 2 ARL #294 153#
TEMPERATURE DATA,
ST CLOUD STATION
REPORT 131500Z
AVERAGE RATE OF RISE
932 FT/MIN
TO 51,700 FT
BALLOON BURST 0730.5 C.S.T.
LAUNCH SITE
U OF MINN AIRPORT
0630 C.S.T.
IMPACT, 1 MI S
DOWNING, WIS
APPROXIMATELY 0800 C.S.T.
D.K. 8-25-53
APPROVED
ALTITUDE IN THOUSANDS OF FEET
PRESSURE IN MILLIBARS
100
80
60
40
20
0
100
200
300
400
500
600
700
800
900
20 0 -20 -40 -60
TEMPERATURE IN °C
0 1 2
ELAPSED TIME IN HOURS
0600 0700 0800 0900
CENTRAL STANDARD TIME

JUN 17 1954



GENERAL MILLS, INC., ENGINEERING RESEARCH AND DEVELOPMENT DEPARTMENT, MINNEAPOLIS, MINN.

JUN 17 1954


SCHEDULED DURATION 4.4 HOURS
ACTUAL DURATION 4.3 HOURS
DATA FROM EXPERIMENTAL CODESONDE, 1742KC
THEORETICAL CEILING
LOAD RELEASE, 115M
FLIGHT NO. 1048
FOR S 5007 STROUD
FLOWN 20 AUG 1953
LOAD ON BALLOON 170#
FREE LIFT 46# = 14%
BALLOON TYPE NO. WT. MATERIAL
85 5 153# ARL#284
RATE OF RISE
732 FT/MIN
TO 93,300 FT
LAUNCH SITE
U OF MINN AIRPORT
0738 C.S.T.
IMPACT, 2 MI SE
MONTICELLO, MINN
1238 C.S.T.
APPROVED
D.R. 11-30-53
ALTITUDE IN THOUSANDS OF FEET
PRESSURE IN MILLIBARS
ELAPSED TIME IN HOURS
CENTRAL STANDARD TIME
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ALTITUDE DATA
△GMI DBD CODE DRUM BEACON
○ BAROGRAPH KO 6RZ19

SCHEDULED DURATION: 10 HOURS
ACTUAL DURATION: 9 HRS. 43 MIN.

THEORETICAL CEILING

LOAD RELEASE,
1621, C.S.T.

RATE OF RISE
885 FT/MIN
TO 93,300 FT

FLIGHT NO 1138
FLOWN 25 MAY 54
FOR S S007
LOAD ON BALLOON 110#
FREE LIFT 65# =17%

BALLOON TYPE	NUMBER	MATERIAL	WEIGHT
851E	445	ARL #222	265#

FREE AIR TEMPERATURE DATA
ST CLOUD 251500Z

DEW POINT

LAUNCH SITE
U OF M AIRPORT
0657 CST

IMPACT 12 MI W
ST CLOUD, MINN.
1640 CST

ALTITUDE IN THOUSANDS OF FEET

100
90
80
70
60
50
40
30
20
10

-60 -50 -20 0
TEMPERATURE IN °C

0 1 2 3 4 5 6 7 8 9 10
ELAPSED TIME IN HOURS

0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700
CENTRAL STANDARD TIME

Mn 2 JUNE 54 APPROVED

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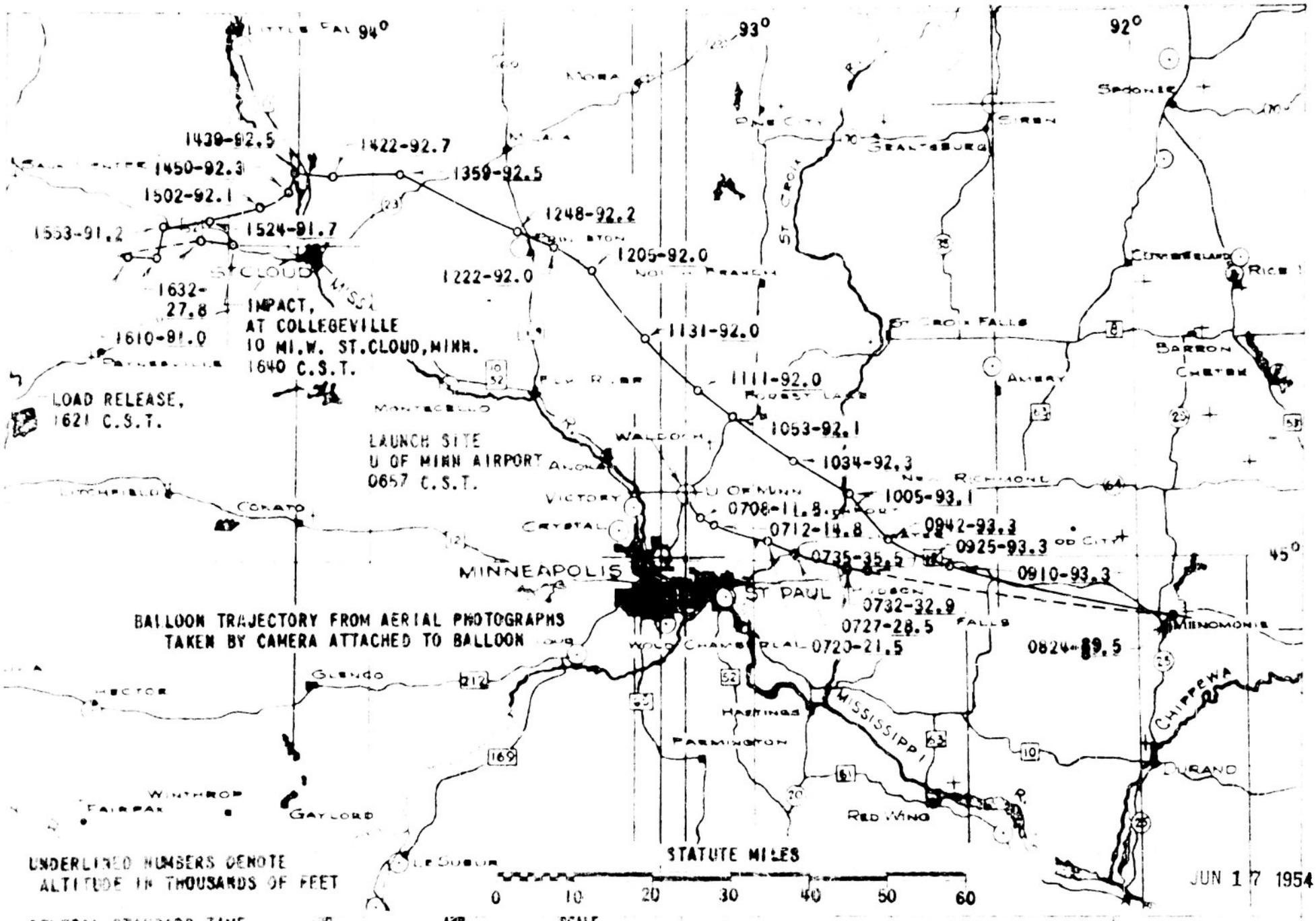
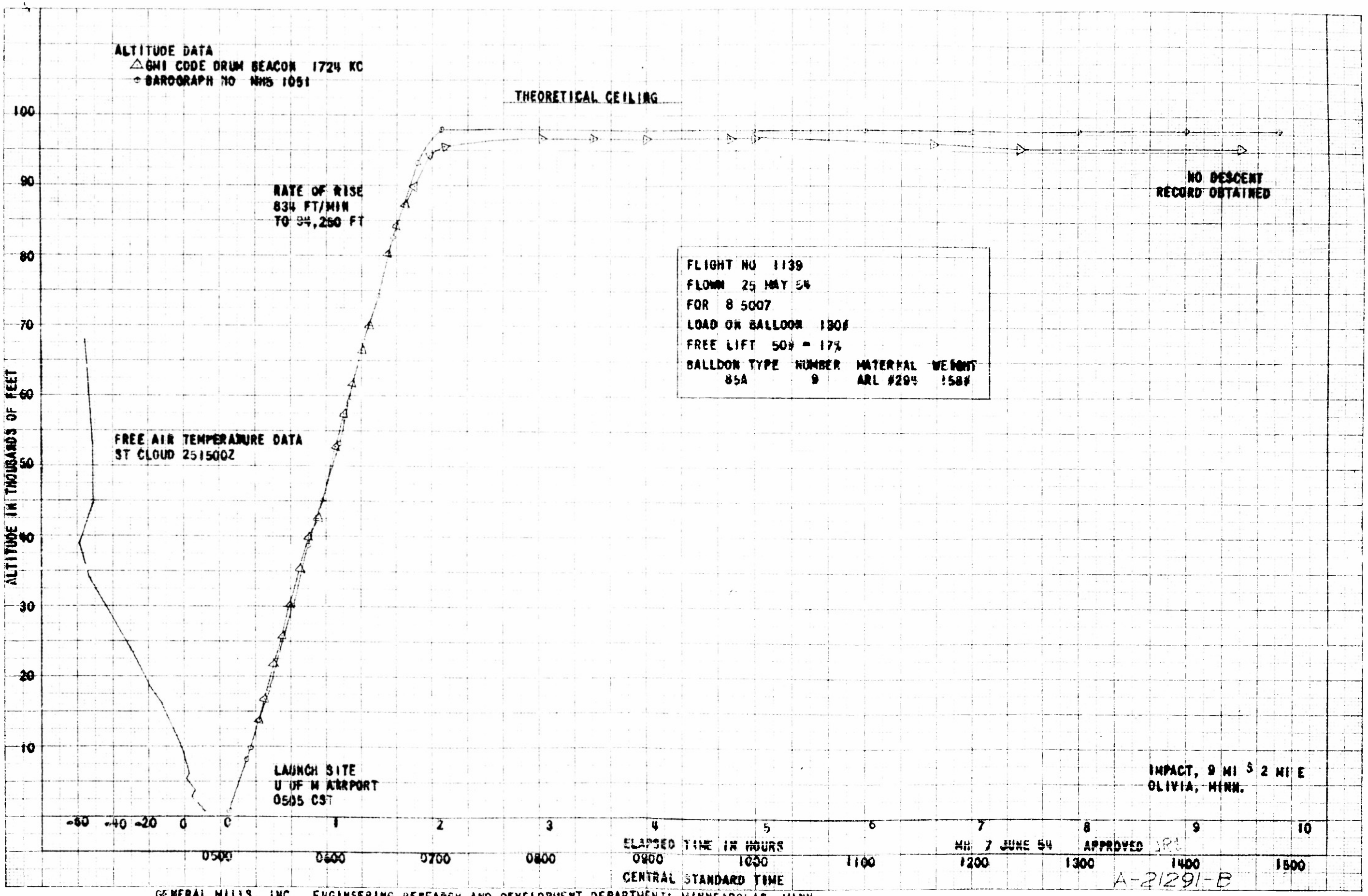
GENERAL MILLS, INC., ENGINEERING RESEARCH AND DEVELOPMENT DEPARTMENT, MINNEAPOLIS, MINN.

JUN 17 1954


94°
93°
92°
45°
1439-92.5
1422-92.7
1450-92.3
1359-92.5
1502-92.1
1248-92.2
1553-91.2
1524-91.7
1205-92.0
1222-92.0
1632-
27.8
IMPACT,
AT COLLEGEVILLE
10 MI.W. ST.CLOUD,MINN.
1640 C.S.T.
1610-81.0
1131-92.0
LOAD RELEASE,
1621 C.S.T.
1111-92.0
1053-92.1
LAUNCH SITE
U OF MINN AIRPORT
0657 C.S.T.
1034-92.3
1005-93.1
0708-11.8
0712-14.8
0842-93.3
0925-93.3
0735-35.5
0910-93.3
0732-32.9
0727-28.5
0720-21.5
0824-89.5
MINNEAPOLIS
ST PAUL
BALLOON TRAJECTORY FROM AERIAL PHOTOGRAPHS
TAKEN BY CAMERA ATTACHED TO BALLOON
UNDERLINED NUMBERS DENOTE
ALTITUDE IN THOUSANDS OF FEET
CENTRAL STANDARD TIME
STATUTE MILES
0 10 20 30 40 50 60
JUN 17 1954
DR D.R.
APP
DATE 15 JUN 54
APP
SCALE 1:1,000,000
PROJ 8 5007
BALLOON TRAJECTORY, FLIGHT NO. 1139,
FLOWN 25 MAY 1954, FOR 8 5007
GENERAL MILLS INC., ENGINEERING RESEARCH AND DEVELOPMENT DEPT., MINNEAPOLIS, MINNESOTA



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GENERAL MILLS, INC., ENGINEERING RESEARCH AND DEVELOPMENT DEPARTMENT: MINNEAPOLIS, MINN.

JUN 17 1954