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K142.271-2

January 1966 - June 1967

K142.271-3

AFOAT Letter

~~SECRET~~

COMBAT SQUADRONS OF THE AIR FORCE WORLD WAR II



Edited by
MAURER MAURER

**Albert F. Simpson Historical Research Center
and
Office of Air Force History
Headquarters USAF
1982**



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1945; North Field,
Oct 1945; Roswell
1945; Pease AFB,

1944; B-29, 1944-
5; B-47, 1955-

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with black stripes,

gue and eyeball,
the blast

below the atomic cloud, disc, and tiger's head, an arrow of the second pointing to dexter, all outlines and details black throughout. (Approved 15 Jul 1957.)

393d FIGHTER

LINEAGE. Constituted 393d Fighter Squadron on 26 May 1943. Activated on 15 Jul 1943. Inactivated on 7 Nov 1945. Redesignated 179th Fighter Squadron, and allotted to ANG, on 24 May 1946.

ASSIGNMENTS. 367th Fighter Group, 15 Jul 1943-7 Nov 1945.

STATIONS. Hamilton Field, Calif, 15 Jul 1943; Santa Rosa AAFld, Calif, 11 Oct 1943; Oakland Mun Aprt, Calif, 6 Dec 1943-8 Mar 1944; Stony Cross, England, 4 Apr 1944; Ibsley, England, 6 Jul 1944; Cretteville, France, 27 Jul 1944; Cricqueville, France, 15 Aug 1944; Peray, France, 4 Sep 1944; Clastres, France, 12 Sep 1944; Juvincourt, France, 28 Oct 1944; St Dizier, France, 2 Feb 1945; Conflans, France, 15 Mar 1945; Frankfurt/Eschborn, Germany, 10 Apr 1945; Crepy-en-Laonois, France, 4 Jul-16 Aug 1945; Seymour Johnson Field, NC, 15 Sep-7 Nov 1945.

AIRCRAFT. P-39, 1943-1944; P-38, 1944-1945; P-47, 1945.

OPERATIONS. Combat in ETO, 9 May 1944-7 May 1945.

SERVICE STREAMERS. None.

CAMPAIGNS. Air Offensive, Europe; Normandy; Northern France; Rhineland; Ardennes-Alsace; Central Europe; Air Combat, EAME Theater.

DECORATIONS. Distinguished Unit Citations: France, 25 Aug 1944; Germany, 19 Mar 1945. Cited in the Order of the Day, Belgian Army: 6 Jun-30 Sep 1944; 16 Dec 1944-25 Jan 1945. Belgian Fourragere.

EMBLEM. None.

394th BOMBARDMENT



LINEAGE. Organized as 4th Aero Squadron on 5 May 1917. Redesignated Squadron B, Post Field, Okla, on 22 Jul 1918. Demobilized on 2 Jan 1919. Reconstituted and consolidated (1924) with the 4th Aero Squadron which was organized on 23 Jun 1919. Redesignated: 4th Squadron on 14 Mar 1921; 4th Observation Squadron on 25 Jan 1923; 4th Reconnaissance Squadron on 25 Jan 1938; 4th Reconnaissance Squadron (Medium Range) on 6 Dec 1939; 4th Reconnaissance Squadron (Heavy) on 20 Nov 1940; 394th Bombardment Squadron (Heavy) on 22 Apr 1942. Inactivated on 29 Apr 1946.

ASSIGNMENTS. Eastern Department, 23 Jun 1919; 2d (later 5th) Observation Group, 15 Dec 1919 (attached to Eastern Department until 8 Jan 1920); Hawaiian Department, 31 Jan 1922 (divisional aviation for Hawaiian Division, Feb 1922-Jan 1927); 5th Composite (later Bombardment) Group, assigned on 11 Jan 1927, attached on 12 Oct 1938, and assigned 25 Feb 1942-29 Apr 1946.

STATIONS. Ft Sam Houston, Tex, 5 May 1917; South San Antonio, Tex, May 1917; Ft Sill, Okla, 24 Sep 1917; Post Field, Okla, Nov 1917-2 Jan 1919. Hazelhurst Field, NY, 23 Jun 1919; Mitchel Field, NY, Nov 1919-8 Jan 1920; Luke Field, TH, 24 Jan 1920; Schofield Barracks, TH, 6 Feb 1922; Luke Field, TH, 11 Jan 1927; Hickam Field, TH, 1 Jan

STATIONS. Hamilton Field, Calif, 15 Jul 1943; Santa Rosa AAFld, Calif, 11 Oct 1943; Sacramento Mun Aprt, Calif, 10 Dec 1943–8 Mar 1944; Stony Cross, England, 5 Apr 1944; Ibsley, England, 7 Jul 1944; Carentan, France, 31 Jul 1944; Cricqueville, France, 15 Aug 1944; Peray, France, 7 Sep 1944; Clastres, France, 13 Sep 1944; Juvincourt, France, 28 Oct 1944; St Dizier, France, 6 Feb 1945; Conflans, France, 16 Mar 1945; Frankfurt/Eschborn, Germany, 11 Apr–Jul 1945; Seymour Johnson Field, NC, 9 Sep–7 Nov 1945.

AIRCRAFT. P-39, 1943–1944; P-38, 1944–1945; P-47, 1945.

OPERATIONS. Combat in ETO, 9 May 1944–8 May 1945.

SERVICE STREAMERS. None.

CAMPAIGNS. Air Offensive, Europe; Normandy; Northern France; Rhineland; Ardennes-Alsace; Central Europe; Air Combat, EAME Theater.

DECORATIONS. Distinguished Unit Citations: France, 25 Aug 1944; Germany, 19 Mar 1945. Cited in the Order of the Day, Belgian Army: 6 Jun–30 Sep 1944; 16 Dec 1944–25 Jan 1945. Belgian Fourragere.

EMBLEM. None.

393d BOMBARDMENT

LINEAGE. Constituted 393d Bombardment Squadron (Very Heavy) on 28 Feb 1944. Activated on 11 Mar 1944. Redesignated 393d Bombardment Squadron (Medium) on 2 Jul 1948.

ASSIGNMENTS. 504th Bombardment Group, 11 Mar 1944; Second Air Force, 25 Nov 1944; 509th Composite (later Bombardment) Group, 17 Dec 1944; 509th Bombardment Wing, 16 Jun 1952–.

STATIONS. Dalhart AAFld, Tex, 11 Mar 1944; Fairmont AAFld, Neb, 12

Mar 1944; Wendover Field, Utah, 14 Sep 1944–26 Apr 1945; North Field, Tinian, 30 May–17 Oct 1945; Roswell AAFld, NM, 6 Nov 1945; Pease AFB, NH, 1 Jul 1958–.

AIRCRAFT. B-17, 1944; B-29, 1944–1952; B-50, 1949–1955; B-47, 1955–.

OPERATIONS. Combat in Western Pacific, 1 Jul–14 Aug 1945. This squadron, the only unit trained for atomic warfare in World War II, dropped the first atomic bomb, on Hiroshima, Japan, 6 Aug 1945, from B-29, "Enola Gay", piloted by Col Paul W Tibbets Jr, and the second atomic bomb, on Nagasaki, Japan, 9 Aug 1945, from B-29 "Bock's Car", piloted by Maj Charles W Sweeney. Participated in atomic bomb tests on Bikini Atoll, Jul 1946, while temporarily stationed on Kwajalein.

SERVICE STREAMERS. American Theater.

CAMPAIGNS. Air Offensive, Japan; Eastern Mandates; Western Pacific.

DECORATIONS. None.

EMBLEM. Over a green disc edged Air Force golden yellow, a mushroom-shaped atomic cloud issuing from a blast, white; all surmounted by a snarling tiger's head in profile, proper (Air Force golden yellow with black stripes, white teeth, red tongue and eyeball, green iris and black pupil); on the blast



SQUAD

below the atom head, an arrow dexter, all out throughout. (A)

393

LINEAGE. Co Squadron on 26 15 Jul 1943. In Redesignated and allotted to

ASSIGNMENTS 15 Jul 1943–7 N

STATIONS. H Jul 1943; Sant Oct 1943; Oak Dec 1943–8 M England, 4 Apr Jul 1944; Cre 1944; Cricquev Peray, France

France, 28 Oct 2 Feb 1945; C 1945; Frankfu Apr 1945; Cre Jul–16 Aug Field, NC, 15 S

AIRCRAFT.

1944–1945; P–

OPERATIONS 1944–7 May 10

SERVICE STR

CAMPAIGNS. Normandy; I land; Ardenn Air Combat, I

DECORATION tations: Franc 19 Mar 1945. Day, Belgian 16 Dec 1944–ragere.

EMBLEM

AIR FORCE COMBAT UNITS OF WORLD WAR II



Edited by
Maurer Maurer

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Washington, D.C.
1983

SQUADRONS. 466th: 1944-1945. 467th: 1944-1945. 468th: 1944-1945.

INSIGNE. *Shield*: Per bend engrailed azure and gules, in bend a chain or and in chief an atomic cloud argent issuing from a base gray, over-all three figures representing the "Spirit of '76" sable fimbriated of the fourth. *Motto*: KNOWLEDGE AND COURAGE. (Approved 14 Sep 1953.)

Constituted as 509th Composite Group on 9 Dec 1944 and *activated* on 17 Dec. Became the first AAF group to be organized, equipped, and trained for atomic warfare. Moved to Tinian, Apr-Jun 1945. Assigned to Twentieth AF. Flew practice missions in Jun and Jul. On 6 Aug 1945 one of the group's B-29's, the "Enola Gay," piloted by the group commander, Col Paul W Tibbets Jr, dropped an atomic bomb on Hiroshima, Japan. Three days later a B-29, "Bock's Car," piloted by Maj Charles W Sweeney, dropped an atomic bomb on Nagasaki. These two bombs, the first atomic weapons ever employed,



quickly brought the war to an end. The group returned to the US, Oct–Nov 1945. Assigned to Strategic Air Command on 21 Mar 1946, providing the nucleus for the command's atomic striking force. *Redesignated* 509th Bombardment Group (Very Heavy) in Jul 1946. Participated in atomic tests (Operation CROSSROADS) in the Marshall Islands in 1946. *Redesignated* 509th Bombardment Group

(Medium) in Jul 1948. Converted from B-29 to B-50 aircraft, 1949–1950. *Inactivated* on 16 Jun 1952.

SQUADRONS. 320th Troop Carrier: 1944–1946. 393d Bombardment: 1944–1952. 715th: 1946–1952. 830th: 1946–1952.

STATIONS. Wendover Field, Utah, 17 Dec 1944–26 Apr 1945; North Field, Tinian, 29 May–17 Oct 1945; Roswell AAFld, NM, 6 Nov 1945–16 Jun 1952.

COMMANDERS. Col Paul W Tibbets Jr, 17 Dec 1944; Col William H Blanchard, 22 Jan 1946; Col John D Ryan, 15 Sep 1948; Col William H Blanchard, 21 Jul 1951–16 Jun 1952.

CAMPAIGNS. Air Offensive, Japan; Eastern Mandates; Western Pacific.

DECORATIONS. None.

INSIGNE. *Shield:* Or, in base a label of three points gules, surmounted by an atomic cloud proper, between a pair of wings conjoined in base azure. *Crest:* On a wreath of the colors, or and azure, an atomic cloud or, with broken pattern gules, between two lightning bolts gules. *Motto:* DEFENSOR VINDE—Defender Avenger. (Approved 10 Jul 1952.)

1st BOM

Organized on 6 Jul 1918. Operated near Tonnawagon offensive in September 1918. Protected oil fields from enemy observation balloons, flew bombing missions behind the Meuse-Argonne (Nov 1918). Continued their pursuit of the enemy in large-scale operations in France.

Reconstituted with 1st Wing of the US on 1 July 1919 in border patrol and advanced operations. *Inactivated* 1 July 1920.

Redesignated 1st Bombardment Wing in 1921. In 1940. Based at GHQAF of the Army.

DOCUMENT TO ROLL INDEX

Frame Number	Classification Number	Date Period	Vol	Pt	Title	Security Classification	Remarks
4	1013756	52/01-52/06			Quarterly Rpt.--Holloman AFB	U	
158	1013757	52/10-52/12			Monthly Rpt.--Holloman AFB	U	
269	1013758	53/01-53/03			"	U	
412	1013759	53/04-53/06			"	U	
583	1013760	53/07-53/09			"	U	
786	1013761	47/11-47/12			Progress Summary Rpt.	U	
875	1013762	48/08-48/09			"	U	
147	1013763	48/10-48/12			"	U	
394	1013764	49/01-49/01			"	U	
787	1013765	49/05-49/08			"	U	
2190	1013766	49/09-49/12			"	U	
3579					INDEX		

The plotting board was delivered about 20 February 1949. Work has been started in its calibration and adjustment. Design and fabrication of a remote data display panel for photography was initiated. This panel will display altitude and signal strength on meters, mountain time on a synchronous clock, and seconds after launching on a counter, the fast wheel of which makes one revolution in two seconds.

ATMOSPHERIC BRANCH

BRIEF HISTORY OF WORK DURING PRECEDING MONTHS: "V-2 Firing with Blossom IV-A," E. O. 116-11: V-2 Rocket No. 41 scheduled to be fired at White Sands Proving Ground on the night of 23 March 1949, has been assigned to the AMC with the General Electric Company participating. This rocket will be the first to carry the new elongated nose section called "Blossom IV" which increases the length of the rocket by one diameter, and makes 80 to 100 cubic feet available for instrumentation for upper air research. Blossom IV is the most ambitious of the experiments on recovery of equipment by parachute, as the entire redesigned and enlarged nose section is to be brought to earth by a canopy-type parachute, 100 feet in diameter. Separation and ejection of the nose section will be activated by radio signal at the zenith of the trajectory.

Previous work on "Physical and Chemical Atmospheric Constituents" Project E. O. 114-11, Test Directive No. 24A, consisted of parachute drop tests, static balloon tests, and balloon cluster flight tests. A balloon system was developed to practice flying balloon clusters and recovering instruments. This system includes two or three J-1400 gram balloons, an aneroid pressure element wired into a circuit which fires a squib inside a small aluminum cylinder or "cannon" at a predetermined pressure height, severing the main rigging and separating the balloon from the system; a parachute rigged into the line, which after separation of the balloon from the system, lowers the system to the ground; and a radar corner reflector, in order that the position and motion of the system may be tracked with a 584 radar set. Visual tracking of the balloon system has been accomplished by the use of a theodolite to determine the separation point of the balloon from the system and in following the descent of the system to the ground. A K-35 Signal Corps Trailer has been acquired for the purpose of remote launching away from home base.

New York University Balloon Flying Project, E. O. 188-11, Test Directive No. 16A: Previous work on this phase of the project included development of ballast control mechanisms to maintain constant level flights in plastic balloons over periods of time up to twelve or more hours. Trajectories, temperatures, pressures, and ballast release information is telemetered and analyzed from the standpoint of balloon performance.

"Upper Air Research Station" Project E. O. 116-11-10, Test Directive No. 27, dated 16 November 1948, was received in the Electronic and Atmospheric Projects Section office the first part of December 1948. The purpose of the contract with Harvard University is to initiate a program of basic research on solar and related problems on Sacramento Peak in New Mexico. The main investigation will be with the solar coronagraph, and there will be related

44-1278

Holloman

AIR FORCE BASE
ALAMOGORDO, NEW MEXICO

Progress Summary Report

ON

U.S.A.F. GUIDED MISSILE
TEST ACTIVITIES

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WARRANTED AT
ALAMOGORDO
NEW MEXICO

48

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49-1278

HOLLOMAN AIR FORCE BASE
Alamogordo, New Mexico

~~SECRET~~

PROGRESS SUMMARY REPORT
on
U. S. A. F.

GUIDED MISSILE TEST ACTIVITIES

Compiled by:

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Major, USAF,
Director of Technical
Information Division

Reviewed by:

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Actg. Deputy for Operations
and Projects

Approved by:

PAUL F. HELMICK,
Colonel, U S A F
Commanding

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Vol. 1

1 October 1948

No. 12

Copy # 52

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It is believed that selsyn drive will be satisfactory for this unit. However, if too much angular lag is encountered in operation, the dial will be servo-driven. It is expected that this unit will be completed and in operation by 10 October 1948.

UPPER AIR RESEARCH BRANCH

- a. Test Parachute: A parachute will be needed to lower the sampling bottles back to earth. The requirements of the chute are to carry a maximum load of 32 pounds and have a maximum terminal descent velocity of approximately 40 feet per second. Since light weight is an important factor and there is almost no opening shock, a six foot light parachute was fabricated at Holloman Air Force Base Parachute Shop.

On a test drop, the descent velocity was too high, and a ten foot chute is being fabricated for further tests.

- b. Static Balloon Test for Bursting Diameter: It is necessary to know the maximum bursting size of the atmospheric sounding balloon in order to calculate the maximum altitude which the balloon can reach, and to know how to rig a cluster of balloons. Several balloons were inflated slowly to simulate atmospheric ascension, and the bursting sizes were measured by triangulation.

- c. General: Two balloon clusters of three balloons each were flown with several corner reflectors for radar tracking; one cluster reached over 100,000 feet. Work on this project is hampered by lack of personnel. Additional personnel are being requested.

- d. AMC V-2 Firing Blossom IV A: Modified skin sections and the remodeled control compartment for the Blossom IV AMC V-2 arrived at White Sands Proving Ground on 27 September 1948.

Coordination with Cambridge Field Station and liaison with White Sands Proving Ground was effected on the NRL telemetering, special cast-off plug, special cable from cast-off plug to blockhouse, 60 inch reflecting searchlight mirror installation, and on many other special requirements of the Blossom IV missile. Through coordination with White Sands Proving Ground, special platforms are being constructed on the Gantry Crane at White Sands Proving Ground to permit work on the enlarged warhead of the Blossom IV missile.

The Blossom IV test has been postponed from the scheduled date of 28 October 1948, to the end of the year, or early spring.

range of about 22.5 miles at Azimuth of 241 degrees and Elevation of about 22.5 degrees. These echoes did not change appreciably in range nor azimuth, but descended slowly and persisted for some 10 minutes after impact. No logical reason can be given for loss of this target, but failure to get back on target was caused by the false target in the launching vicinity.

5. PROJECT JB-2 -- EO-727-12

PURPOSE

The JB-2 Project (EO-727-12) was activated by AMC, Test Directives No. 10 and 10A dated 23 April 1948, for the purpose of training Holloman Air Force Base personnel in assembly, adjustment, launching and flight characteristics of the JB-2 missile, and to train personnel in tracking and instrumentation techniques.

BRIEF HISTORY OF WORK DURING PRECEDING MONTHS

A four-hundred foot, two-rail launching ramp was constructed on a three degree earth-filled slope. The ramp was located three hundred feet west of the North American Blockhouse in order to utilize existing blockhouse facilities. Personnel have been undergoing training at Holloman Air Force Base to carry out AMC test directives.

REPORT FOR MONTH OF JULY: by N. LeBlanc, Captain, USAF

a. Missile Tests: Two JB-2 missiles were launched during the month of July as follows:

- (1) The first JB-2, No. 6, was launched 7 July 1948. Missile left ramp with right wing low, but recovered immediately climbing 1,000 feet per minute at a speed of 240 miles per hour. After two minutes of flight, missile was climbing 500 feet per minute at 280 miles per hour; at 3 1/2 minutes, airspeed was 320 miles per hour and flying on course of 320 degrees. At this point, the elevator started oscillating very fast but did not affect the missile's flight. After a five minute flight, airspeed was 360 miles per hour.

Approximately 33 miles from launching site, the pilots of the F-51 and F-80, escort aircraft, were given permission to shoot it down. The F-51 aircraft was not able to keep within firing range after four minutes of flight; however, the F-80 pilot fired one burst and

OQ-19 flying activities ceased at this Base 21 July 1948 to prepare for extended operations at Idelwild Airport, New York City. Departure date was 26 July 1948, and returning date was set for on or about 11 August 1948.

4. ELECTRONIC AND ATMOSPHERIC PROJECTS DIVISION

MISSION

The mission of the Electronic and Atmospheric Projects Division at Holloman Air Force Base is to provide and operate radar research and tracking equipment as tests to obtain data upon which to base developments of an improved air defense system; to cooperate in the instrumentation and test of upper air phenomena as a basis for improved missiles, pilotless aircraft, and control system designs; to insure the effective utilization by the Air Force of the guided missile facilities available at the White Sands Proving Ground, and the Holloman Air Force Base; to (1) develop an adequate defense against V-2 type missiles, and (2) advance the Air Force Guided Missile and Upper Air Research programs.

REPORT FOR MONTH OF JULY: by Lawrence H. Dyvad, Captain, USAF
and Max I. Rothman, Radio Engineer; content reviewed by
Charles F. Maas, Major, USAF, Electronic and Atmospheric Officer

a. Fixed Antenna Projects:

- (1) Early Warning Radar Fence Project E. O. No. 164-15 - Except for the procurement and installation of a suitable shutterless camera, the Long-Range SCR-270 is ready for deployment at Lubbock, Texas, in the first phase of Long-Range Detection Tests on V-2 firings. A letter, dated 22 July 1948, has been sent by this Station to Commanding General, Wright-Patterson Air Force Base requesting that coordination with the Air Training Command be effected in order to authorize installation of relevant Radar equipment at the Lubbock Air Force Base, Lubbock, Texas.

The Gated Video Circuits referenced in last month's report have been modified somewhat in order to achieve improved performance. An up-to-date schematic diagram of this unit is embodied in Figure No. 1.

The pulse-to-pulse film record presentation has also been modified in order to simplify circuitry. The photo-oscilloscope beam is normally off, and is turned on by an electronic gate the

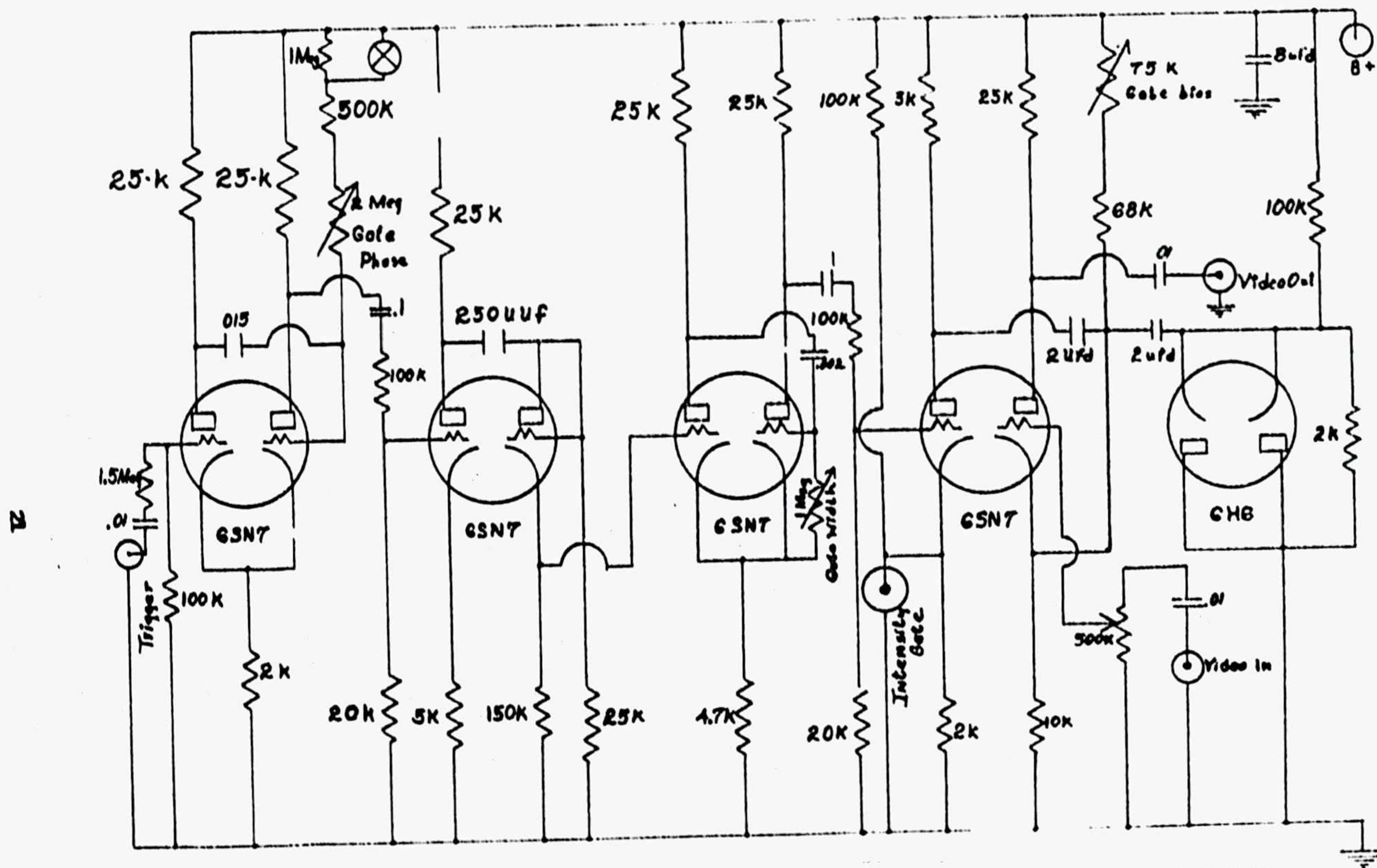


FIG.1. PHOTO-GATE GENERATOR AND VIDEO CIRCUIT LONG RANGE
SCR-270

time position of which is known and which straddles the range-excursion of the rocket. Rocket echo is used to provide vertical deflection of the oscilloscope spot. No oscilloscope horizontal sweep is used. Time-sweep is effected by the linear motion of the film in a 35mm shutterless camera. Figure No. 2 illustrates the resulting film presentation drawn to scale for a gate 100 miles in duration, and extending from 300 to 400 miles at a pulse recurrence frequency of 60 per second. One-second time-marks are recorded on the film through the accurate flashing of a ne-1 neon bulb. A satisfactory neon-flash circuit has been designed and fabricated at this station and installed in the radar equipment. A schematic diagram of this unit is embodied in Figure No. 3. A Dumont Model 241 oscilloscope modified for 6000 volts of accelerator potential and utilizing a 5Jp5 low-persistence cathode ray tube is in use as a pulse to pulse photo-oscilloscope.

Figure No. 4 is a photograph of the "A" scope in the equipment showing the echo received from a B-17 target at a range of 145 miles in a test run on 29 July 1948. The video gate, as shown, extends from 113 to 237 miles. Twenty-five mile range markers are shown disposed upon this gate. Data recorded on this flight is embodied in the chart of Figures No. 5a and No. 5b. Note that excellent detection was achieved to past the optical horizon which, in this case, was 180 miles. Elevation angle was limited to a minimum of 21 miles shooting over the Sacramento Mountains. The range and altitude of these mountains at the point of observation was 20 miles and 2,130 feet, respectively. Target altitude was 35,000 feet.

- (2) Radar Triangulation Tests Project E. O. No. 164-15 - Data was recorded from this set during the V-2 firing on 26 July 1948. Two stations were used; one SCR-270 radar at Hueco, New Mexico, and a synchronized radar receiving station located five miles east of the radar. Radio-link synchronization of radar indicators and cameras was satisfactorily accomplished. The stop-watches, however, did not photograph legibly at either station. The radar station detected the rocket and held it for the first 25 seconds of flight at an apparent signal strength approximately equal to 25 per cent of saturation level. Time estimate was made by counting photo-frames which were made at the rate of approximately one per second. The signal then disappeared completely and was not again detected until the rocket reached a slant range of 60 miles. At this time, it was held for about 30 seconds at the same signal strength, as previously.

The remote radar receiving station did not detect the rocket until it had reached an indicated transit-time range-equivalent of 60 miles, at which time the echo was held for 30 seconds at a signal strength equal to 50 per cent of saturation level. It is probable that the remote receiving station did not detect the rocket at the beginning of its flight due to the fact that this period was obscured by powerful permanent echoes at this station. The master

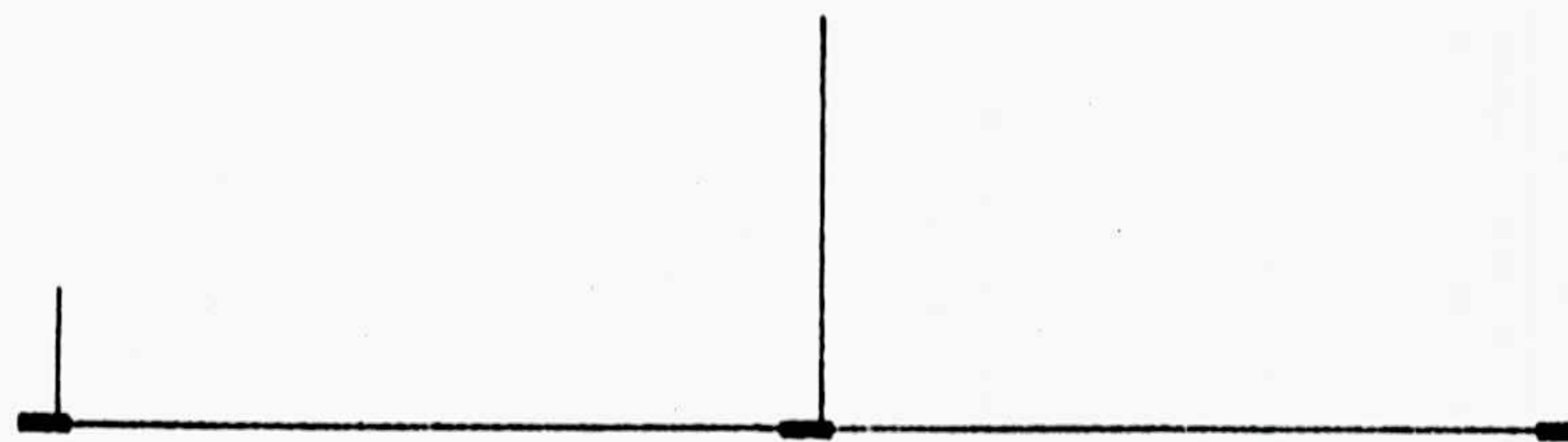


FIG-2. REVISED PRESENTATION OF PULSE TO
PULSE FILM-RECORD LONG RANGE SCR-270

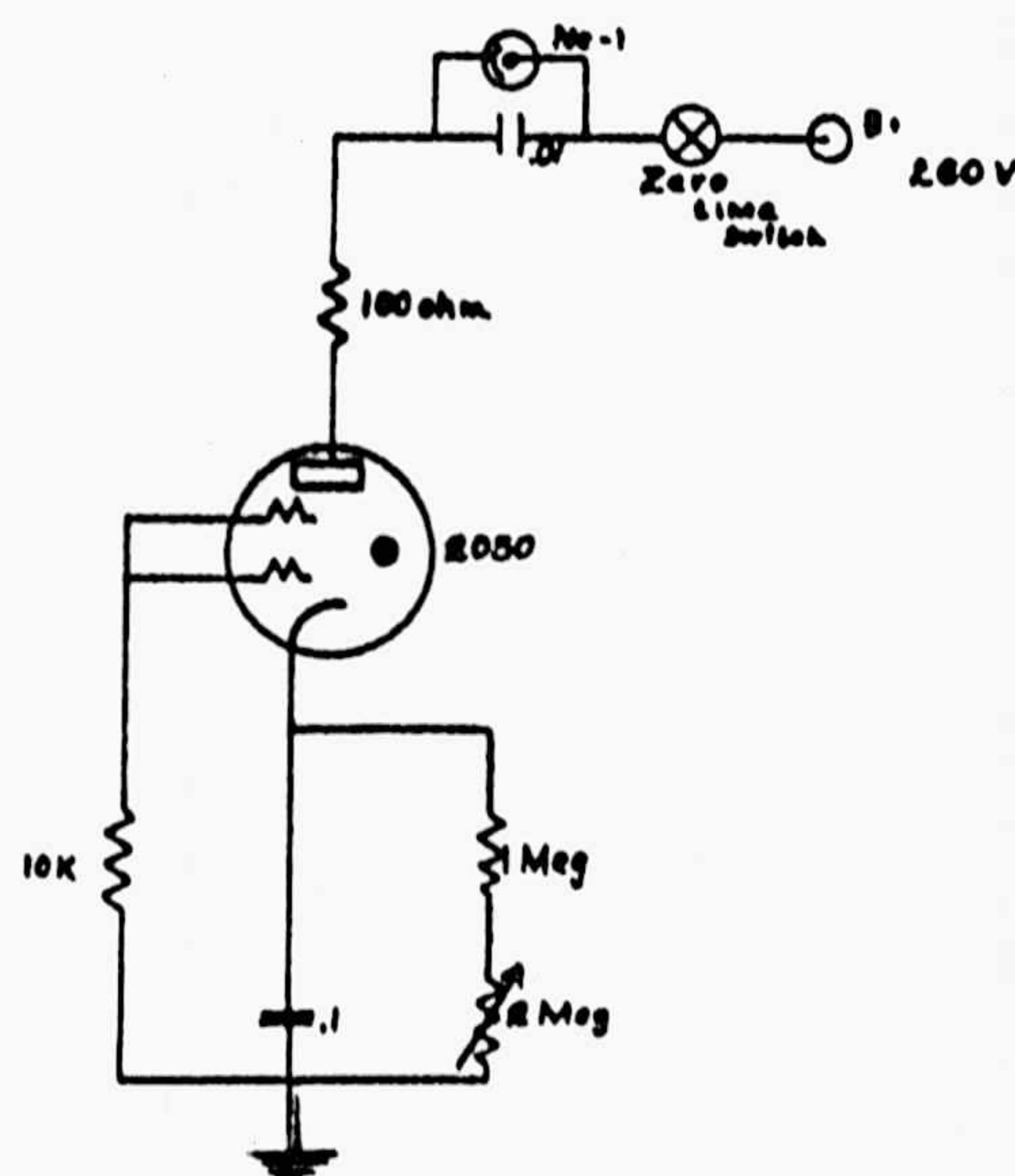


FIG-3. NEON FLASH TIMER
LONG RANGE S C R-270

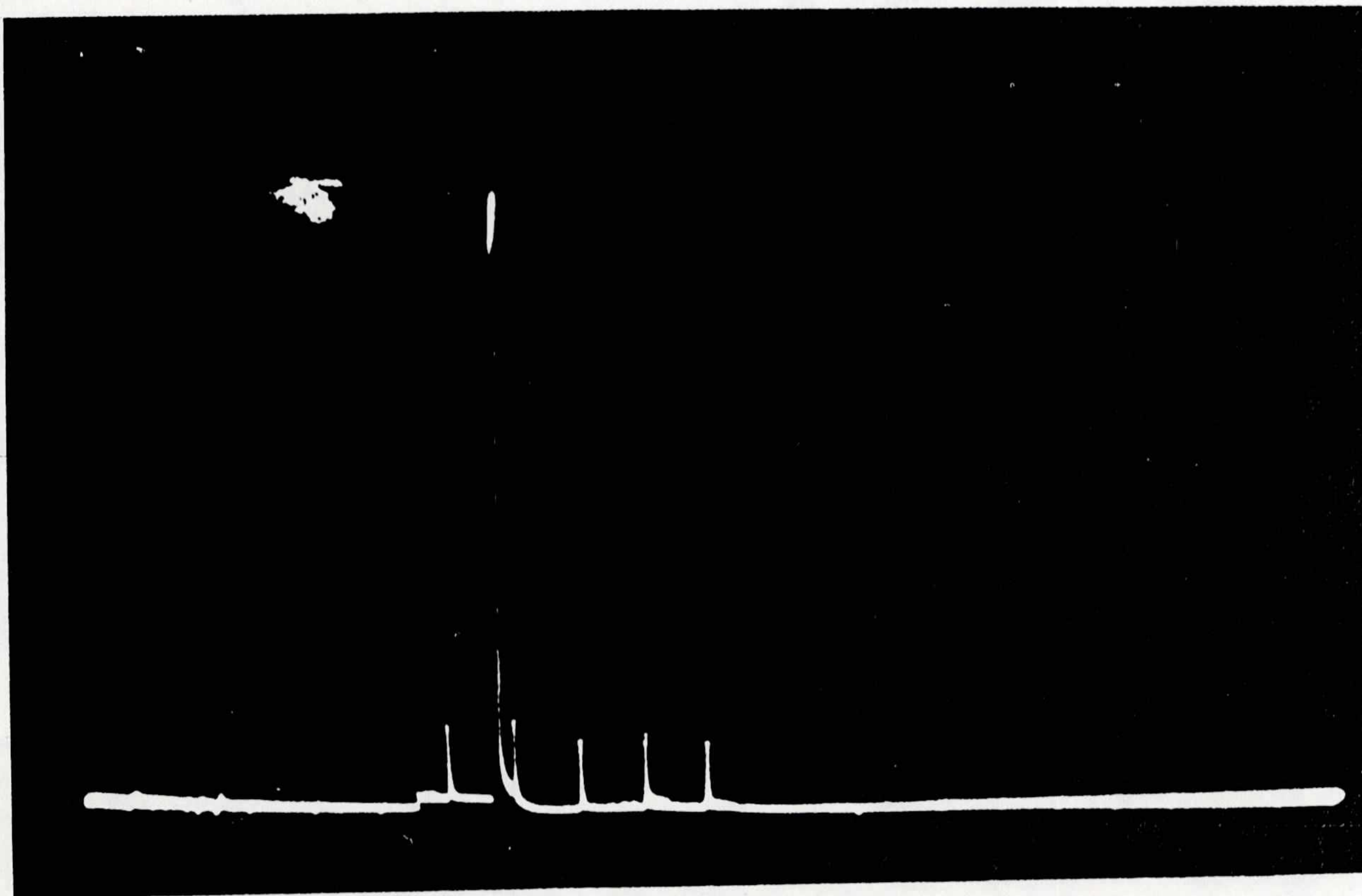
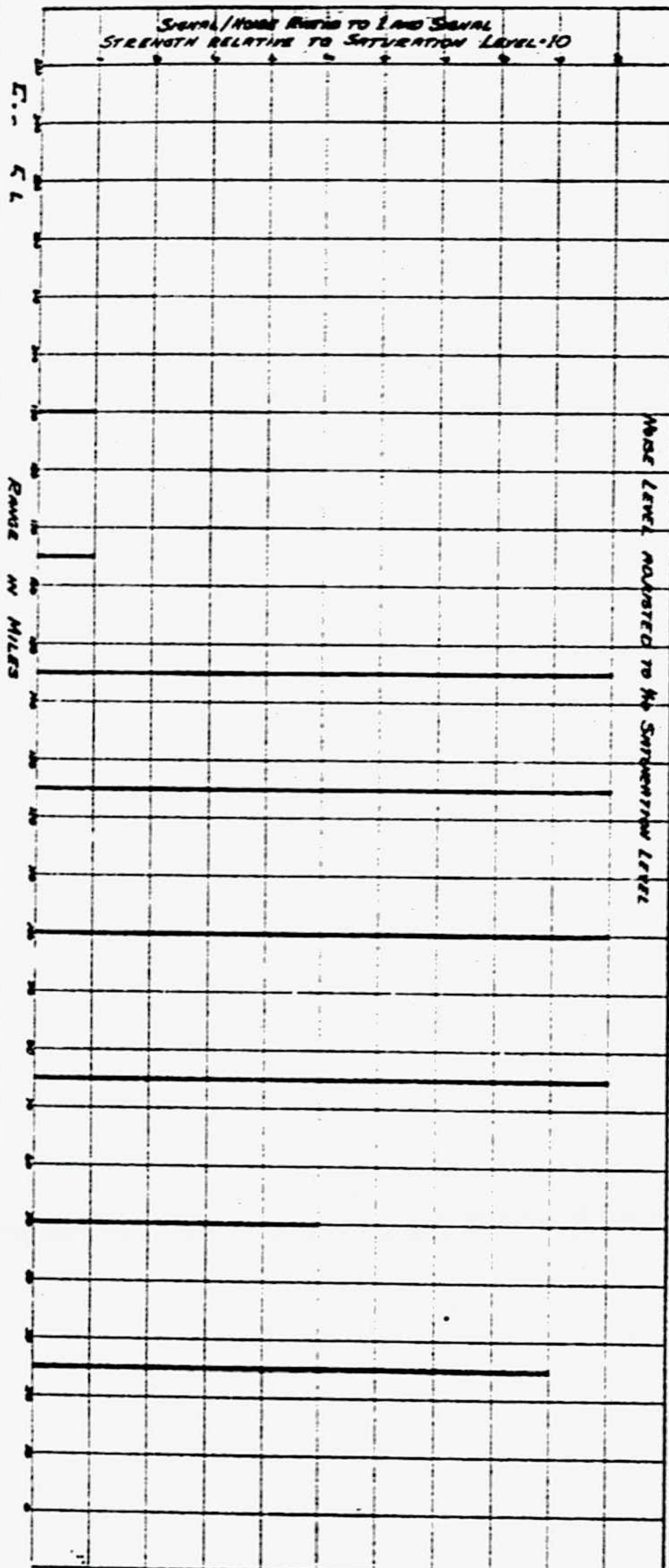
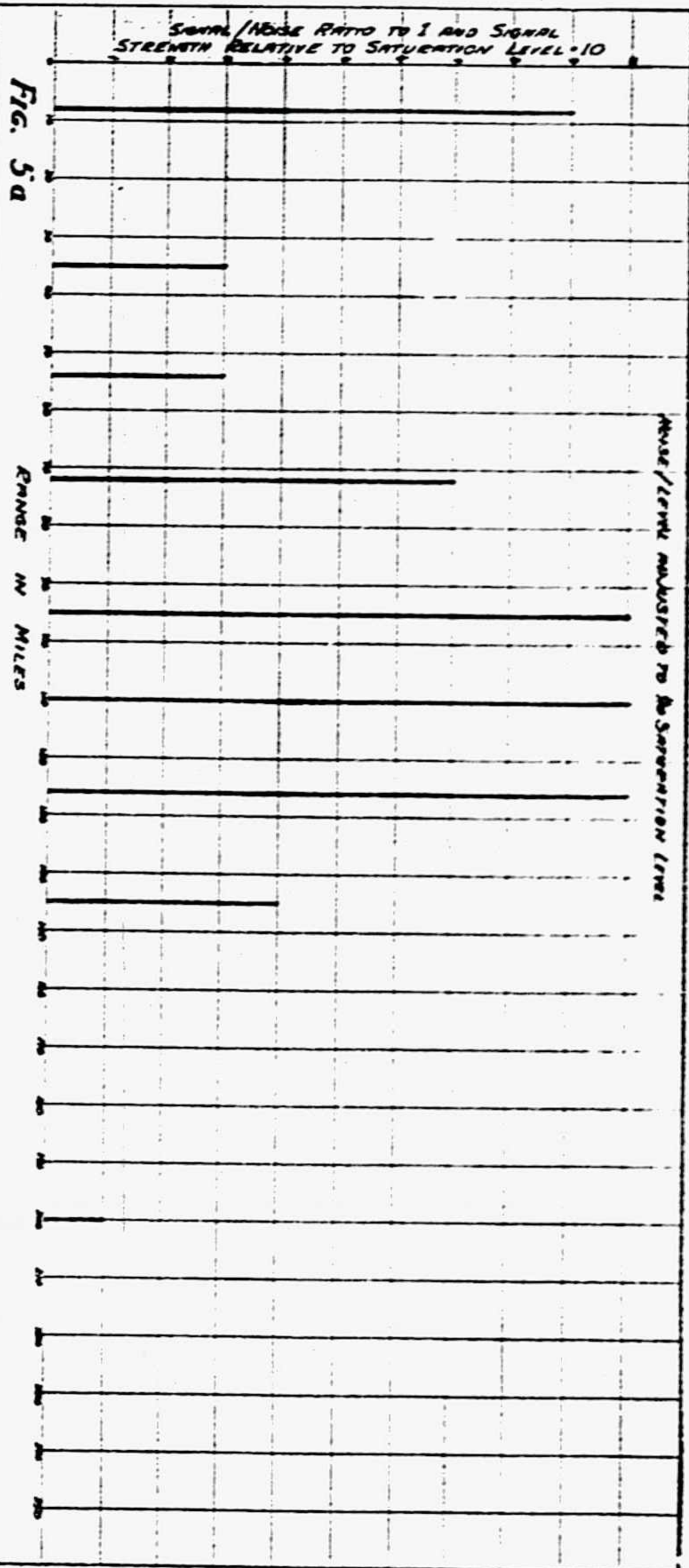


FIG-4. "A" SCOPE PHOTOGRAPH OF LONG RANGE SCR-270
TEST RUN 29 JULY, 1948 ON B-17 TARGET

Fig. 5a

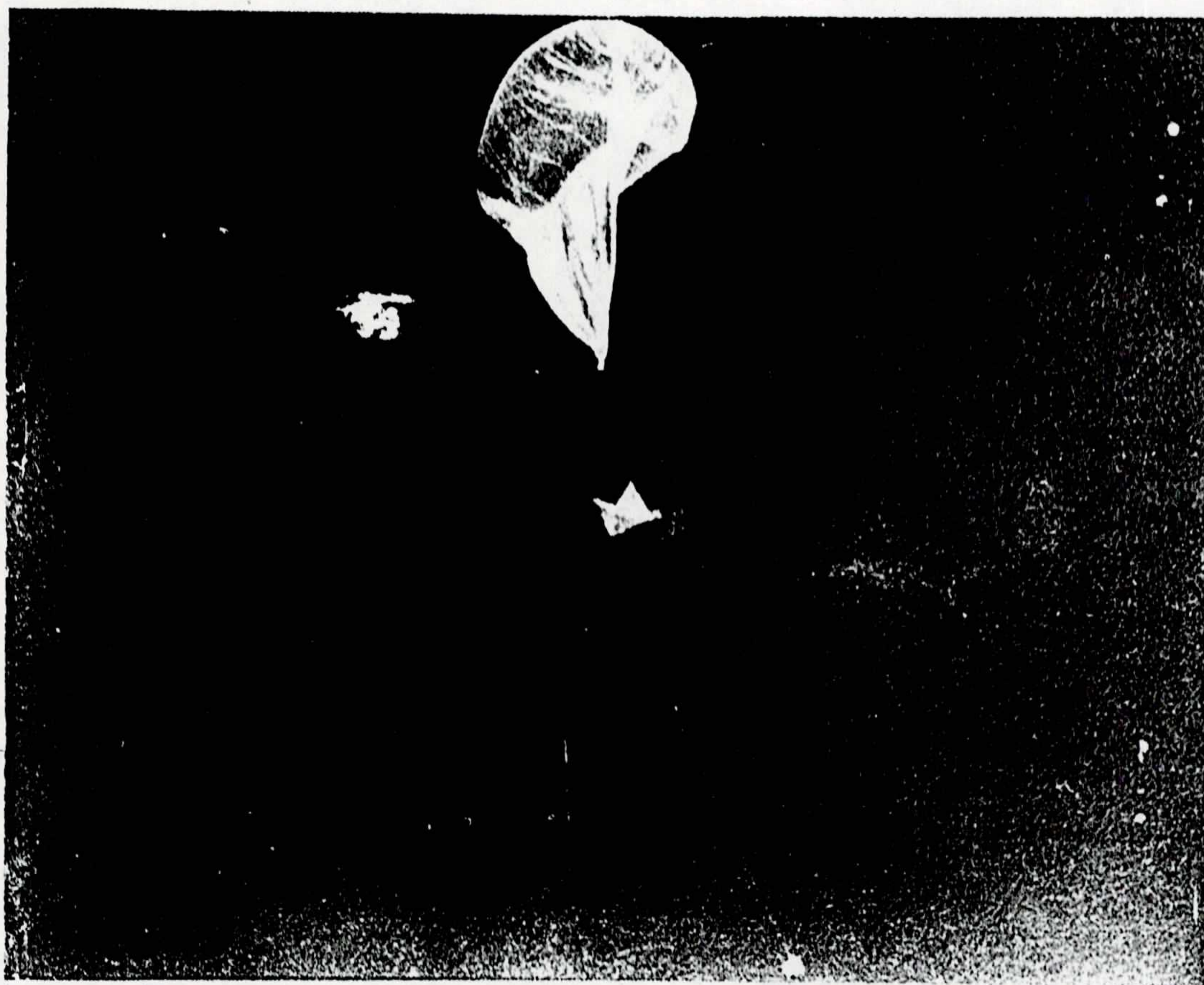


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*Air Force Base,
Alamogordo, New Mexico*



PROGRESS SUMMARY REPORT ON
U.S.A.F. GUIDED MISSILE TEST ACTIVITIES

VOL. II

20
1 December, 1948

NO. 2

The third flight failed to separate the two balloons from the flight gear, and the equipment was lost over the mountains. Two balloons were flown to test fly a total instrument load of twelve pounds.

The fourth flight was made to test the parachute descent rate and to check the best location in the instrument train for the radar target. With the radar target uppermost on the train, the target may fall into the parachute and foul the lines on a slow descent. However, with the target on the bottom of the train on a rapid descent, the instruments may fall into the target. (See Figure No. 3, Page 20) for a schematic diagram of the flight system.

On this flight, the radar target was placed on the bottom directly below the sand bag weighing 2330 gms. After separation, the equipment descended in almost a free-fall until the parachute fully opened. In this initial fall, the sand bag crashed through the radar target and fouled the parachute lines. Thus the descent figures were not representative.

The fifth flight was also made to test the two balloon systems with twelve pounds of flight gear. However, the squib again failed to fire and separation did not occur. Failure might possibly be due to the use of second hand instruments and batteries. New equipment is being requisitioned.

Future Plans: Emphasis during the month of December 1948, will be on readying a van for mobile launching facilities, improving radar tracking facilities, and on determination of parachute descent data.

5. PROJECT JB-2 -- EO-727-12

PURPOSE

The JB-2 Project (EO-727-12) was activated by AMC, Test Directives No. 10, 10A, and 10B dated 23 April 1948, for the purpose of training Holloman Air Force Base personnel in assembly, adjustment, launching, and flight characteristics of the JB-2 Missile; and to investigate the feasibility of guidance of the JB-2 Missile from a remote control station by radar, and radio control.

BRIEF HISTORY OF WORK DURING PRECEDING MONTHS

A four-hundred foot, two-rail launching ramp was constructed on a three degree earth-filled slope. The ramp is located three-hundred feet west of the North American Blockhouse and utilizes existing blockhouse facilities.

The first phase of training personnel in launching techniques has been

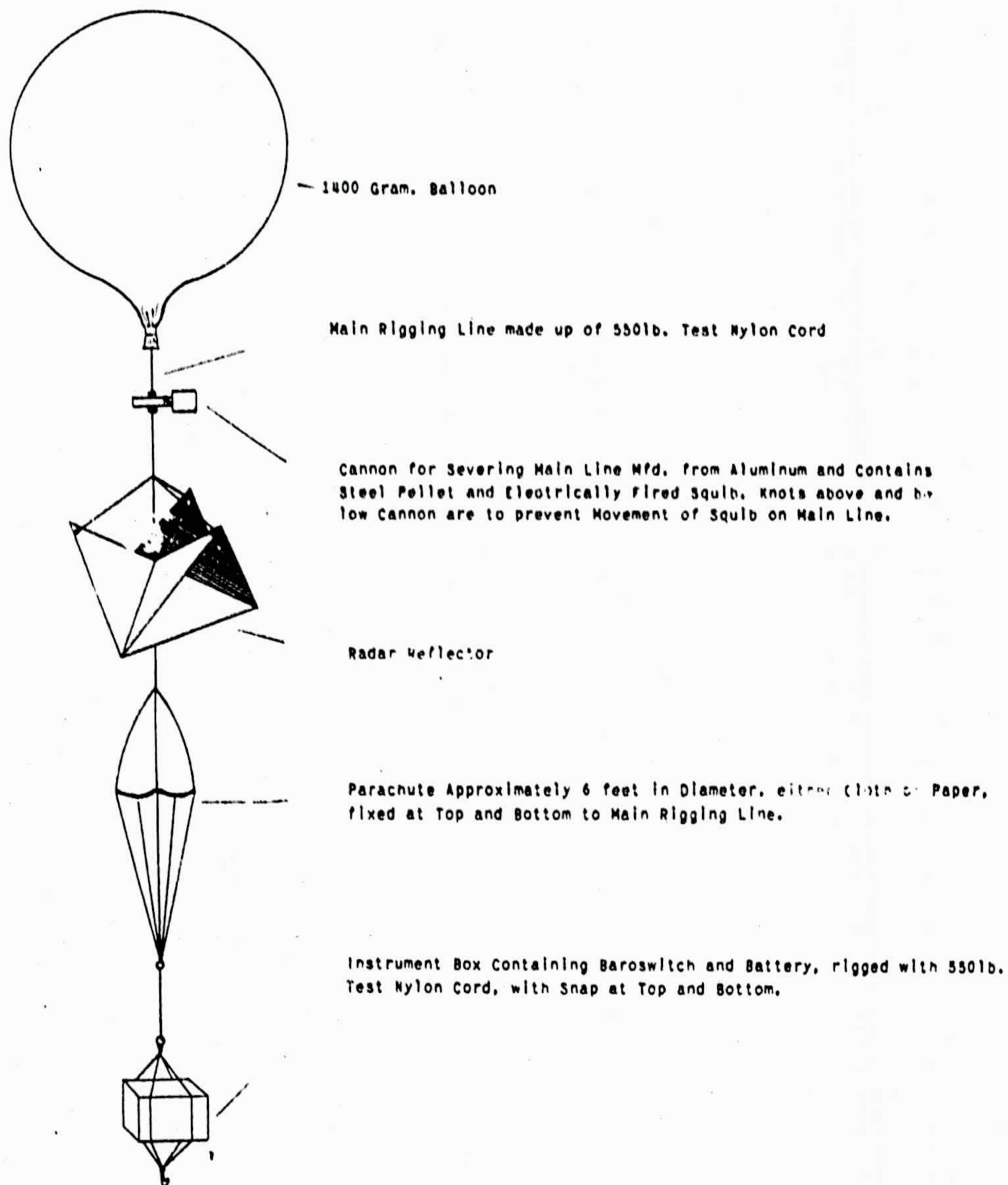


Fig. 3. INSTRUMENT RIGGING FOR BALLOON TEST FLIGHT

Substituting these constants in equations (9) and (11) and simplifying.

$$\frac{x^1 = r_1^2 - r_2^2 + a^2}{2a} \quad (13)$$

$$\frac{y^1 = r_1^2 - r_3^2 + d^2}{2d} \quad (14)$$

The equation for z remains the same as before,

$$z = \left| (r_1^2 - x^2 - y^2)^{1/2} \right|$$

ATMOSPHERIC BRANCH

BRIEF HISTORY OF WORK DURING PRECEDING MONTHS: Previous work on the "Physical and Chemical Atmospheric Constituents" project which was begun in September 1948, includes parachute tests, static balloon tests, and balloon test flights.

A simplified balloon system was developed to practice balloon flying and instrument recovery techniques. This system includes an aneroid pressure element wired into a circuit which fires a squib inside a small cylinder or "cannon" at a predetermined pressure height and separates the balloon from the system. A small parachute lowers the rest of the system to the ground. A radar corner reflector is attached to the system, and by tracking with a 584 radar, its position and motion can be determined continuously during the flight.

Balloon Test Flights: The first flight of the month was to check separation and recovery of the simplified flight equipment. The flight was highly successful, separation occurring at the predetermined altitude of 4,000 feet above the ground. Radar range and theodolite azimuth of impact located the instruments two and one-half (2 1/2) miles south of the launching point and actual recovery was made within range of instrumental error from predicted position.

The second flight was for the same purpose and was also successful. The balloon system was launched from a point about two miles upwind of the tracking equipment. This technique of remote launching will have to be developed for the higher altitude flights where the horizontal travel of the system would otherwise carry it off the Holloman Air Force Base range.

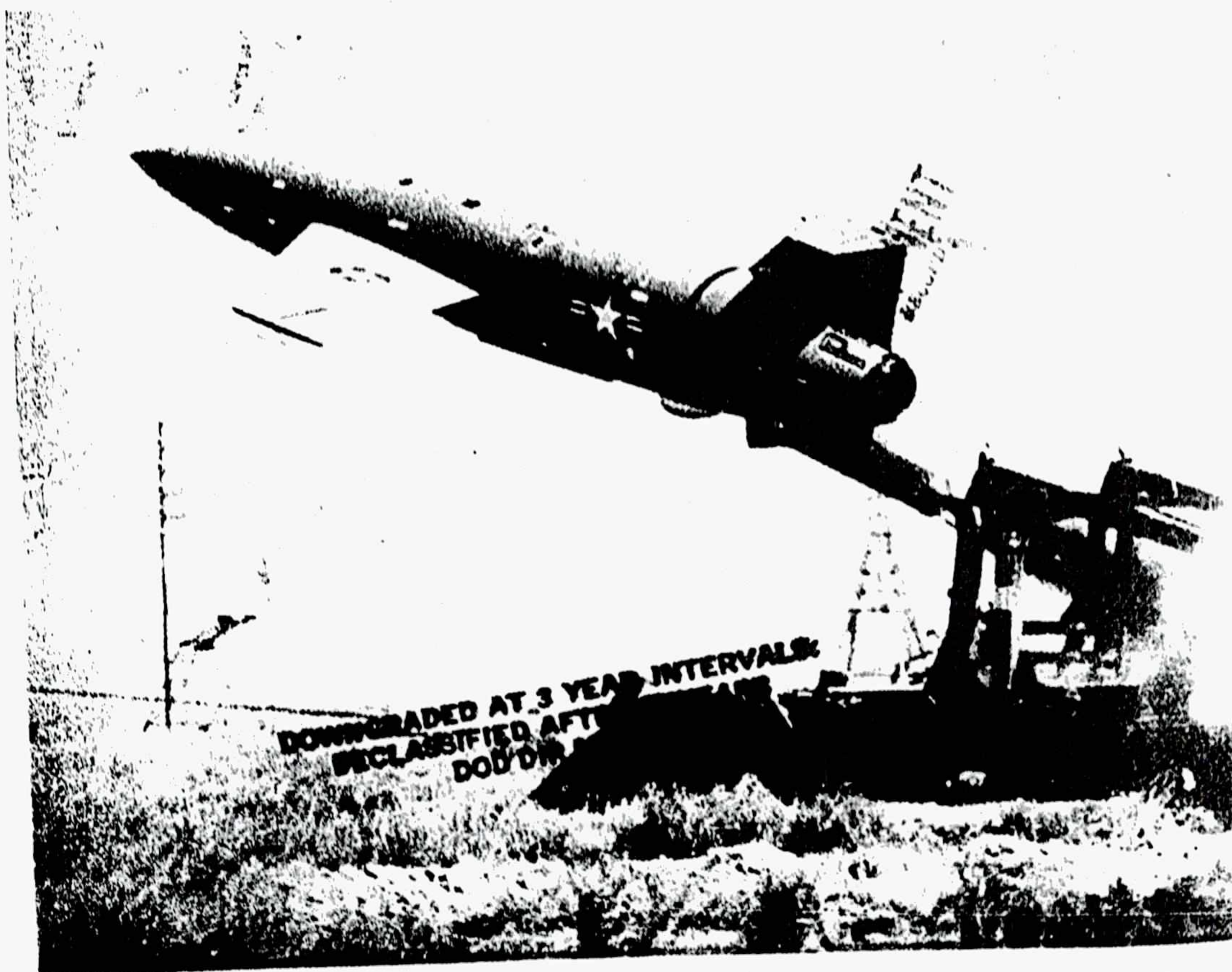
The radar lost the target immediately after separation, but the impact was approximated by the theodolite azimuth and extrapolated range. Recovery was effected along the azimuth line, but with a range error of about 500 yards after a horizontal travel of about three miles.

HOLLOMAN

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*Air Force Base,
Alamogordo, New Mexico*



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instruments to the ground and provided a bearing to the target. The gear was recovered along this line of bearing at a range of about three and one-half miles out. The rapid descent did not injure the aneroid instrument or its container.

Future flights will include a special restraining device to fasten the top of the parachute more securely to the main static line. This device will consist of a knot in the main line and a loop in the parachute canopy vent for the main line to pass through. The knot will be larger than the diameter of the loop to prevent the top of the chute from slipping downward during ascent. Previously, the top of the chute was taped to the main line.

Trailer Van for Remote Launchings: The van modifications have been completed, and preliminary checks indicate that the wind screen should operate very effectively. Field tests have been postponed until April because equipment and personnel will be loaned to the AMC V-2 Blossom IV-A Project during March 1949.

- c. New York University Balloon Flying Project, E. O. 188-11, Test Directive No. 16A: Five members of the New York University Research Division visited Holloman Air Force Base during the period between 21 January and 12 February. Working on Contract W28-099ac-241 with the Cambridge Field Station, AMC, this group used Base facilities to field test controlled altitude balloons.

Ten large 20-foot plastic balloons were released during this period with tracking and telemetering stations located at Holloman Air Force Base, near Joplin, Missouri, and at Nashville, Tennessee. Figure No. 3 shows a 20-foot plastic balloon and instrumentation just after launching. The bottom tank-like structure holds the ballast with transmitter underneath, while the banner and inverted parachute stabilize the flight. Data received from the balloon, while in flight, gives information about balloon altitude, temperatures inside and outside the balloon and in the battery box, as well as a record of the flow of ballast which is automatically released to control the balloon's altitude. Flights were made with three major objectives:

- (1) Field test of servo-type ballast control system.
- (2) Determination of in-flight trajectory by use of aircraft "homing" on a balloon-borne transmitter.
- (3) Field test of equipment designed to make the balloon float first at one level, rise and float at a higher level, then rise again and float at a still higher altitude. The balloon system would spend a specified time at each of these levels.

The servo type ballast control has been designed to release liquid ballast as the balloon loses lift, thus keeping it afloat. This particular control has been tested in a pressure chamber and in cold temperatures, but no completely successful field test has been made before.



Fig. 3. Twenty-foot Plastic Balloon and Instrumentation just after Launching.

Positive control action was clearly demonstrated on six of the balloons released during this trip. Determination of the trajectories of two balloons for a distance of 400 miles in the first flight and 800 miles in the second flight demonstrated that satisfactory reception may be obtained using the standard aircraft radio compass, homing on the NYU, AM-1 balloon borne transmitter. This signal was received by the plane while in excess of 500 miles from the transmitter.

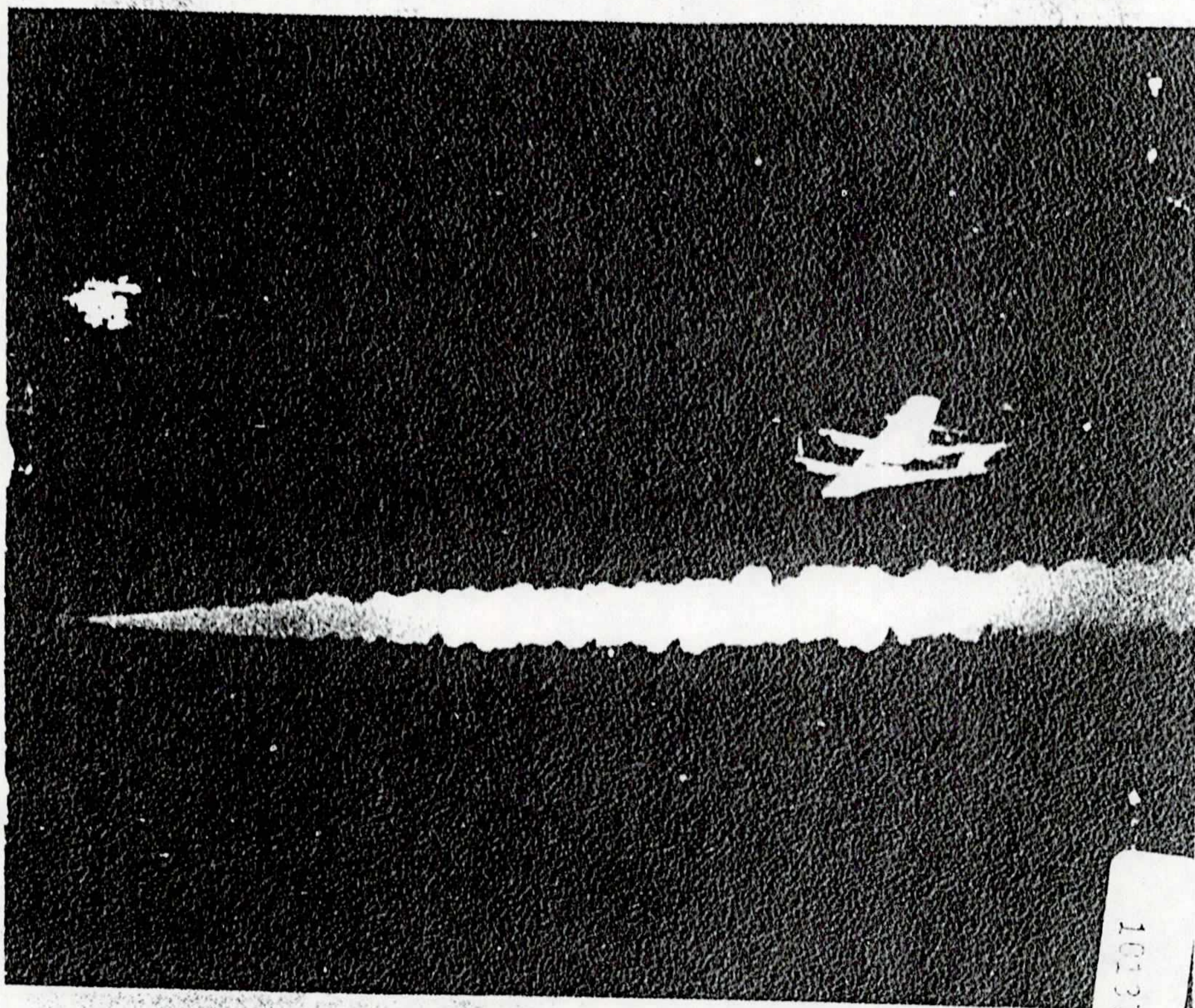
One test was made to keep the balloon at two or more selected levels for a specific duration. It is expected to use this type of gear for flights carrying counters to measure the intensity of cosmic rays at selected altitudes. This first test was completely satisfactory. A height-time curve for 5 February 1949 is shown in Figure No. 4, where the balloon floated at 35,000 feet, then at 44,000 feet, and finally at 47,500 feet. For this series of tests, the windscreen which was recently installed near the ramp in the North Area was used extensively. Figure No. 5 shows a 20-foot plastic balloon being inflated behind this screen preparatory to launching which was made in winds exceeding 20 miles per hour in gusts.

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*Air Force Base,
Alamogordo, New Mexico*



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NO. 7

with a knowledge of the mean size of the powder particles, would give a good indication of the small scale diffusion rate. Holloman Air Force Base would provide the balloon flight and tracking facilities and assist in designing an effective cloud generator.

New York University Balloon Flying Project, E.O. 188-11. Test Directive No. 16A. Previous work on this phase of the project included development of ballast control mechanisms to maintain constant level flights in plastic balloons over periods of time up to twelve or more hours. Trajectories, temperatures, pressures, and ballast release information are telemetered and analyzed from the standpoint of balloon performance. Personnel working on this project will return to Holloman Air Force Base in July 1949 for another series of flights.

- a. "Physical and Chemical Atmospheric Constituents," E.O. 114-11. Test Directive No. 24A. Four balloon flights were made for this project between 8 and 12 April 1949. The purpose was to determine parachute descent characteristics. One flight was made with a six-pound sandbag without the usual radar corner reflector to compare stability during descent. The instruments oscillated rapidly and through a large arc during descent. A second flight with the same load, but including a radar corner reflector, indicated that the radar target definitely lessens oscillation of instrumentation.

The third flight was made with three J-1400 gram balloons, 14-pound sandbag, a radar target, and the six-foot flat cloth parachute to about 4,000 feet. Descent rate averaged 20 feet a second. All three of the flights were recovered near the indicated recovery point. The fourth flight was to test descent of the paper parachute with a light load from a height of 22,000 feet. The radar set was not operating properly, but since the flight contained no instrumentation that required recovery and the balloon flight was already rigged and inflated, the flight was made. The radar failed at 24,000 feet and optical tracking lost the target in the sun. No attempt was made to recover this flight. The principal balloon flights during the month were made for the "High Altitude Dust Diffusion" Project.

- b. Project 9UJ1 "Skyhook," Test Directive No. 40. The decision was made to launch on the west side of the Range, or in the Las Cruces area, rather than at Holloman Air Force Base as previously planned, due to existing wind conditions. Holloman atmospheric personnel participated only in loaning some equipment and in providing auxiliary theodolite and radar tracking units.

One flight was made on 29 April 1949 of three 70-foot plastic balloons. The 9UJ1 free-fall missile, weighing about 230 pounds and 17 feet long, was flown to a height of approximately 100,000 feet on the three-balloon cluster. The technical report on the operation will be prepared and released by the Special Devices Center (Office of Naval Research), Sands Point, Port of Washington, Long Island, New York. Another balloon flight will be made early in May.

SOURCE: Microfilm Roll No. 31739

H O L L O M A N
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Prepared by 6580th Missile Test Group

C. M. Mangum
Lt. Col., USAF
Commander

REPORT FOR THE MONTH OF AUGUST 1953

PROJECT TITLE: Project Horizon

CONTRACTOR: Aberdeen Proving Ground, Maryland

TYPE VEHICLE: High Altitude Plastic Balloon

STARTING DATE AT HOLLOMAN AIR DEVELOPMENT CENTER: 14 August 1953

ESTIMATED COMPLETION DATE: Unknown

PURPOSE OF PROJECT: To take pictures from horizontal angles at high altitudes.

REPORTS ISSUED DURING THE MONTH OF AUGUST WHICH CONCERN THIS PROJECT:

None

Project, Horizon

R E M A R K S

During the reporting period, one flight was made in support of this project. The first attempt at launching proved unsuccessful as the payload line snapped. A second attempt proved successful, however, separation never occurred and recovery has not been accomplished. Recovery procedures are still being carried on by aircraft and ground recovery crews.

PART III

AFFAIRS AND PROGRAMS OF THE BASE

4. VISITORS TO HOLLOMAN AIR FORCE BASE

VISITORS

Brig. Gen. Tom C. Rives
Col. M. Duffy
Lt. Col. M. Yates
Maj. J. O. Fletcher
Lt. P. L. Frank
Lt. R. E. Spence
Wright-Patterson AF Base
Hq. AMC, Dayton, Ohio

Mr. James R. Smith
Mr. Herbert C. Crow
Mr. Murray Hackman
Watson Laboratory
Red Bank, New Jersey

Mr. Aaron Krumbein
Mr. Melvin Parlow
Mr. Bernard Gildenberg
Mr. Warren Brown
Mr. Sammy Greenfield
New York University
New York City, New York

SUBJECTS DISCUSSED

Confer on administrative poli-
cies and extent of Holloman
Air Force Base responsibil-
ities

Administrative problems.

Project Mogul

// RGT NOTE: The "Project Mogul" description immediately above had been circled by hand as shown above. This leaves me with the impression that whoever circled the description thought it should not have been included in the report, which, in turn, suggests that the name "Mogul" was indeed classified, although it seems highly unlikely that the name was classified Top Secret. It would have been far too impractical, if not completely useless, to classify the name at that level, and would in fact defeat the purpose of such a code name. The name does not appear in later editions of the Progress Summary Report, although visits by NYU personnel are listed. The reason given for these later visits is something like to "witness balloon flights," without specific reference to Mogul. I must conclude from all of this that the name "Mogul" was indeed classified, even though the name appears in unclassified documents.

SOURCE: Progress Summary Report of USAF Guided Missile Test Activities, Holloman Air Force Base, Alamogordo, New Mexico, 1 August 1948, a composite from pages 20 and 26 (frames 0991 and 0997).

4. ELECTRONIC AND ATMOSPHERIC PROJECTS DIVISION

MISSION

REPORT FOR THE MONTH OF JULY: by Lawrenz H. Dyvad, Captain, USAF and Max I. Rothman, Radio Engineer; content reviewed by Charles F. Maas, Major, USAF, Electronic and Atmospheric Officer

b. Tracking Projects:

- (1) Radar Tracking Set AN/MPS-6 - A letter was received from Watson Laboratories authorizing changes and modifications of the range circuits necessary for conditions encountered at this location. The fore part of July was spent in achieving these betterments, and in the installation and orientation of an M-2 optical tracker to be used in conjunction with the MPS-6 and as a tracking aid.

Experimental tracking of three balloons furnished and flown by the Atmospheric Group was performed for the dual purpose of checking the signal return of the radar with various reflecting targets, and for precise position data of the balloon equipment for use by the Atmospheric Group. On 19 July, a 130 foot balloon carrying no radar reflector was tracked. Radar contact was made at a range of about 3K yards with signal return being above saturation on the scopes of the MPS-6. Tracking was automatic in Azimuth and Elevation and aided in range. Signal return remained above saturation until a range of 7K yards was read, at which point grass appeared on the scopes and signal to noise averaged about 4 to 1 out to a range of 23K yards where too frequent radar losses necessitated that automatic tracking be abandoned. This balloon was then tracked manually to a maximum range of 27K yards.

On 20 July 1948, a weather balloon carrying one kite type reflector was flown and tracked. Contact was made at a range of 3K yards, and signal return was above saturation at all times until a range of 10K was exceeded and grass showed only occasionally out to 24,360 yards. This balloon was obscured by clouds at a range of 33K yards, but tracking was continuous in automatic Azimuth and Elevation throughout its flight, and the maximum range read was 34 K yards.

On 21 July, a 130 foot balloon, identical with the one flown on 19 July except for three kite reflectors being carried, was flown and tracked. Radar contact was made at a range of 1,510 yards. Grass first appeared on scopes at a range of 24.5K yards, and signal was above saturation to 30K yards. Tracking was continuous and automatic throughout the flight, and a maximum range of 121K yards was reached.

SOURCE: Progress Summary Report on USAF Guided Missile Test Activities, Holloman Air Force Base, Alamogordo, New Mexico, 1 October 1948, composite of pages 15 and 22 (frames 1167 and 1174):

ELECTRONIC AND ATMOSPHERIC PROJECTS SECTION

BRIEF HISTORY OF WORK DURING PRECEDING MONTHS

Radar set SCR-584 was deployed at Holloman Air Force Base in August 1948 for the purpose of tracking special meteorological balloons. Some success was attained. Modifications are under way to improve performance from the standpoint of range and accuracy.

REPORT FOR MONTH OF SEPTEMBER: Radar Research Branch by Lawrenz H. Dyvad, Captain, USAF, and Max I. Rothman, Radio Engineer. Upper Air Research Branch by Edward A. Doty, Captain, USAF. Content reviewed by Charles F. Maas, Major, USAF, Director, Electronic and Atmospheric Projects Section.

UPPER AIR RESEARCH BRANCH

- b. Static Balloon Test for Bursting Diameter: It is necessary to know the maximum bursting size of the atmospheric sonding balloon in order to calculate the maximum altitude which the balloon can reach, and to know how to rig a cluster of balloons. Several balloons were inflated slowly to simulate atmospheric ascension, and the bursting sizes were measured by triangulation.
 - c. General: Two balloon cluster of three balloons each were flown with several corner reflectors for radar tracking; one cluster reached over 100,000 feet. Work on this project is hampered by lack of personnel. Additional personnel are being requested.
-

SOURCE: Microfilm Roll No. 31739, "Monthly Progress Summary Report on U.S.A.F. Guided Missile Test Activities," Holloman AFB, New Mexico, Vol. II, No. 3, 1 January 1949; frames 1425-1426 (pages 25-26).

Holloman Air Force Base,
Alamogordo, New Mexico

PROGRESS SUMMARY REPORT ON
U.S.A.F. GUIDED MISSILE TEST ACTIVITIES

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1 JANUARY 1949

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[Frame 1395]

PART I

BASE PROJECTS and ACTIVITIES

Par. 4. ELECTRONIC and ATMOSPHERIC PROJECTS DIVISION
Report by LAWRENZ H. DYVAD, CAPTAIN, USAF, and MAX I ROTHMAN,
Radio Engineer. Upper Air Research Branch by EDWARD
A. DOTY, CAPTAIN, USAF. Reviewed by CHARLES F. MAAS,
MAJOR, USAF 19 - 27

[Frame 1398]

ATMOSPHERIC BRANCH

BRIEF HISTORY OF WORK DURING PRECEDING MONTHS: Previous work on the "Physical and Chemical Atmospheric Constituents" Project which was begun in September 1948, consisted of testing parachutes of different types, static balloon tests, and balloon test flights. A balloon system was developed to practice balloon flying and recovery of instruments. This system includes either one or two J-1400 gram balloons, depending on the amount of free-lift desired; an aneroid pressure element wired into a circuit which fires a squib inside a small aluminum cylinder or "cannon" at a predetermined pressure height, severing the main rigging and separating the balloon from the system; a parachute rigged into the line, which after separation of the balloon from the system, lowers the system to the ground; and a radar corner reflector, in order that the position and motion of the system may be tracked with a 584 radar set. Visual tracking of the balloon system has been accomplished by the use of a theodolite. In most cases, it has proven very satisfactory in determining the separation point of the balloon from the system and in following the descent of the system to the ground. A K-35 Signal Corps Trailer has been acquired for the purpose of remote launchings away from the base.

Test Directive No. 27, "Upper Air Research Station," dated 16 November 1948,

was received in the Electronic and Atmospheric Projects Section office the first part of December. The purpose of the contract with Harvard University is to initiate a program of basic research on solar and related problems on Sacramento Peak in New Mexico. The main investigation will be with the solar coronagraph; and there will be related experimentation on luminosity of the night sky, the polar aurorae, the zodiacal light, and other upper atmospheric phenomena. All tests will be performed and reported on by Harvard University personnel. Holloman Air Force Base personnel will support the project and report only on provision and maintenance of adequate shelter, utilities, and access roads to Sacramento Peak.

a. The Physical and Chemical Atmospheric Constituents Project, E. O. No. 114-11, Priority 1B:

Balloon Test Flights: One flight was made during the month. The purpose of the flight was to check descent of a light "pay-load" using a regular radiosonde paper parachute with the radar corner reflector rigged above the parachute, and to practice recover techniques. This flight was launched approximately one and one-half miles southwest of the theodolite and radar site because of wind conditions. The aneroid element was pre-set to activate at a height of approximately 6,000 feet above the ground. Since the radar did not really pick up the target, the exact height of separation could not be accurately determined. The descent of the system was observed visually by the theodolite from the time of separation until the system reached the ground, and recovery was made within 100 yards of the predetermined point. The system was observed visually to oscillate somewhat during the descent due to rigging the radar reflectors above the parachute. In this position, the radar reflector seemed to slow the rate of descent appreciably.

General: The K-35 Signal Corps Trailer was stripped of all unnecessary equipment so that modifications could be made to use the trailer for remote launchings away from home base. Modifications include the installation of two-way radio communications; a helium bottle rack to transport helium to launching site; and the construction of a portable wind screen for launching in light winds. Work orders, accompanied by drawings, for the wind screen and bottle rack, have been submitted through proper channels. The radio equipment to be installed is being constructed by the Electronic Section of the Electronic and Atmospheric Projects Section, Holloman Air Force Base.

Plans were drawn for a hot water heater to pre-heat balloons for high altitude flights. The work order, accompanied by a drawing, was submitted through proper channels.

SOURCE: Microfilm Roll No. 31739

Holloman Air Development Center
Monthly Report on USAF Guided Missile Test Activities
at Holloman Air Force Base, New Mexico
Report No. HDT-78, February 1953

Prepared by 6580th Missile Test Group

C. M. Mangum
Lt. Col., USAF
Group Commander

REPORT FOR THE MONTH OF FEBRUARY 1953

PROJECT TITLE: MX-1498, Moby Dick

CONTRACTOR: Air Force Cambridge Research Center

TYPE VEHICLE: High Altitude Plastic Balloons

STARTING DATE AT HOLLOMAN AIR DEVELOPMENT CENTER: October 1951

ESTIMATED COMPLETION DATE: Indefinite

PURPOSE OF PROJECT: To study the very high altitude wind fields.

PHASE OF DEVELOPMENT: Operational test phase

* REPORTS ISSUED DURING THE MONTH OF FEBRUARY CONCERN THIS PROJECT:

Weekly Test Status Report for week ending 3 Feb 53. Weekly Test Status Report for week ending 10 Feb 53, Flights C-3, C-4, C-5, and C-6 at Edwards AFB, Calif.; Flights B-9, B-10, B-11, and SB-1 at Vernalis NAS, Calif.

Weekly Test Status Report for week ending 17 Feb 53. Weekly Test Status Report for week ending 24 Feb 53.

Agencies which are not on distribution to receive the above listed reports may apply to the Armed Services technical Information Agency (ASTIA). In order to receive desired reports from ASTIA, the requesting agency should have a definite need for such reports and should be eligible to receive such information.

R E M A R K S

Project Moby Dick is now a routine program. Launchings are made daily from each site, if directed by the Lowry Plotting Center. Instrument failures and weather conditions have caused a few delays in the launchings. During the month, the condition of the equipment improved and the launching crews had fewer check-out problems.

Dr. A. H. Howell of Tufts College arrived at the sites to direct operation of Project 202. This project has a higher priority than Moby Dick; therefore, many Moby Dick flights were cancelled so that 202 flights could be prepared and launched. Project 202 was almost completed by the end of the month.

Personnel from Holloman Air Development Center attended a meeting at Headquarters, Air Research and Development Command, and Headquarters, United States Air Force, to arrange the transfer of Project Moby Dick to Air Force Cambridge Research Center and Air Resupply and Communications Service. The details were worked out and Headquarters, Air Research and Development Command is preparing the necessary arrangements for the transfer.

REPORT FOR THE MONTH OF FEBRUARY 1953

PROJECT TITLE: MX-1594, Gopher

CONTRACTOR: Stanley Aviation Corporation

TYPE VEHICLE: Large plastic balloons carrying dummy loads

STARTING DATE AT HOLLOMAN AIR DEVELOPMENT CENTER: 20 February 1952

ESTIMATED COMPLETION DATE: Unknown

PURPOSE OF PROJECT: To conduct vulnerability tests on plastic balloons

PHASE OF DEVELOPMENT: Phase II: To conduct detection and vulnerability tests.

REPORTS ISSUED DURING THE MONTH OF FEBRUARY WHICH CONCERN THIS PROJECT:

Weekly Test Status Reports for the weeks ending 3 Feb 53, and 10 Feb 53.

Agencies which are not on distribution to receive the above listed reports may apply to the Armed Services technical Information Agency (ASTIA). In order to receive desired reports from ASTIA, the requesting agency should have a definite need for such reports and should be eligible to receive such information.

R E M A R K S

Phase II, the testing of balloons for vulnerability to .50 caliber slugs, has been completed. The main feature of Project Gopher is to fly a camera at high altitudes for reconnaissance work. Operations in this project are now suspended pending issuance of a new contract.

DOCUMENT TO ROLL INDEX

Frame Number	Classification Number	Date Period	Vol.	Pt.	Title	Security Classification	Remarks
<u>4</u>	1014090	48/01/01			AFMDC--Progress Summary Rpt.	U	
<u>57</u>	1014091	48/02/01			"	U	
<u>118</u>	1014092	48/03/01			"	U	
<u>214</u>	1014093	48/04/01			"	U	
<u>300</u>	1014094	48/05/01			"	U	
<u>384</u>	1014095	48/06/01			"	U	
<u>464</u>	1014096	No Date			Computation Division	U	
<u>616</u>	1014097	"			Development Division	U	
<u>624</u>	1014098	61/04-62/06			Missile Branch	U	
<u>668</u>	1014099	61/10-62/09			Advanced Instrumentation Br.	U	
<u>704</u>	1014100	No Date			Interceptor Systems Test Div.	U	
<u>716</u>	1014101	61/10-62/06			Flight Load Project Branch	U	
<u>735</u>	1014102	62/01-62/06			Test Operations Branch	U	
<u>757</u>	1014103	61/04-62/08			Electronics Countermeasures Br.	U	
<u>813</u>	1014104	61/04-62/06			Systems Engineering Branch	U	
<u>852</u>	1014105	61/04-62/06			Weapons Branch	U	
<u>894</u>	1014106	61/04-62/06			Range Operations Div.	U	
<u>929</u>	1014107	62/07-63/12			Guidance & Control Div.	U	

4. ELECTRONIC AND ATMOSPHERIC PROJECTS DIVISION

PURPOSE

The mission of the Electronic and Atmospheric Projects Division at Holloman Air Force Base is to provide and operate radar research and tracking equipment to obtain data upon which to base developments of an improved air defense system; to cooperate in the instrumentation and test of upper air phenomena as a basis for improved missiles, pilotless aircraft and control system designs; to insure the effective utilization by the Air Force of the guided missiles facilities available at White Sands Proving Ground; to (1) develop an adequate defense against V-2 type missiles, and (2) advance the Air Force guided missile and upper air research programs.

BRIEF HISTORY OF WORK DURING PRECEDING MONTHS

In order to determine the technical characteristics of new radar systems to provide fully effective defense against V-2 type missiles, the following existing radars with feasible field modifications have been operated at various V-2 missile firings, and the data recorded, interpreted and distributed to interested agencies:

- (1) 1 - AN/CPS-1
- (2) 1 - AN/CPS-4
- (3) 1 - AN/CPS-5
- (4) 2 - AN/TPS-1B (modified)
- (5) 2 - AN/TPS-1B
- (6) 2 - AN/TPS-10A
- (7) 4 - SCR-270-DA
- (8) 1 - AN/MPQ-2
- (9) 1 - AN/MPS-6

Present investigations include tests and/or modifications leading to test on the AN/MPS-6, Early Warning Radar Fence Project (Modified SCR-270-DA), Triangulation Project (a fence technique using range triangulation methods) and an AN/TPS-1B (Modified).

REPORT FOR MONTH OF APRIL: by Lawrenz H. Dyvad, Captain, USAF

Status of "Very Long Range Radar" Project (E.O. 161-19).

The "Very Long Range Radar" Project was initiated in 1946 to investigate the feasibility of utilizing ionospheric propagation techniques in an "Early Warning Radar" system designed for ranges up to 5,000 miles. Contract No. W28-099 ac 173 was awarded by Watson Laboratories to the Raytheon Manufacturing Company in 1946 for the development of equipment and its installation at favorable field stations with a view toward gathering ionospheric system data in connection with a coordinated engineering investigation of these phenomena.

4. ELECTRONIC AND ATMOSPHERIC PROJECTS DIVISION

PURPOSE

The mission of the Electronic and Atmospheric Projects Division at Holloman Air Force Base is to provide and operate radar research and tracking equipment as tests to obtain data upon which to base developments of an improved air defense system; to cooperate in the instrumentation and test of upper air phenomena as a basis for improved missiles, pilotless aircraft and control system designs; to insure the effective utilization by the Air Force of the guided missiles facilities available at White Sands Proving Ground; to (1) develop an adequate defense against V-2 type missiles, and (2) advance the Air Force guided missile and upper air research programs.

BRIEF HISTORY OF WORK DURING PRECEDING MONTHS

In order to determine the technical characteristics of new radar systems to provide fully effective defense against V-2 type missiles, the following existing radar and possible field modifications have been operated at various V-2 missile firings, and the data recorded, interpreted and distributed to interested agencies:

- (1) 1 - AN/CPS-1
- (2) 1 - AN/CPS-4
- (3) 1 - AN/CPS-5
- (4) 2 - AN/TPS-1B (Modified)
- (5) 2 - AN/TPS-1B
- (6) 2 - AN/TPS-10A
- (7) 4 - SCR-270-DA
- (8) 1 - AN/MPQ-2
- (9) 1 - AN/MPS-6

Present investigations include tests and/or modifications leading to test on the AN/MPS-6, Early Warning Radar Fence Project (Modified SCR-270-DA), Triangulation Project (a fence technique using range triangulation methods) and an AN/TPS-1B (Modified).

REPORT FOR MONTH OF MARCH: by Van D. Thompson, Jr., 1st Lt., USAF
Technical Data and Analysis by Engineering Staff, Radar Research
Projects Branch.

a. Tracking Projects:

- (1) AN/TPS-1B (modified): Directors associated with antenna system are being fabricated in an effort to provide improved impedance match and to decrease objectionable losses.

RANGE INSTRUMENTATION

REPORT FOR MONTH OF FEBRUARY:

by C. M. Mangum, Major, USAF, and Mr. G. C. Cron.

As was stated in the report for January (Vol. I, No. 4), the initial levelling of Tularosa Peak was completed, as was the access road to the Peak; therefore, the month of February saw quite an exodus of equipment, previously planned for operation at the Tularosa Peak site, from temporary locations on the valley floor to the more advantageous positions on the higher level of the Peak. Among this equipment were telemetering units used by Boeing Airplane Company, Republic Aircraft Corporation and North American Aviation, Inc. North American Aviation Inc. also located on the Peak a "receive-only" SCR-584 radar unit which will be used to remotely control their telemetering receiving antenna, and an M-2 optical tracker which will be used for controlling the position of their telemetering antenna in the event of failure of the beacon transmitter in their missile or of the "receive-only" radar unit itself. Aerial views of the levelled Peak with the equipment in place are included in this report as Figures 1 and 2.

During February, plans were formulated to further develop and improve Tularosa Peak as an instrumentation site. These plans include a network of conduit and pipe to be used for water, power, and instrumentation line distribution over the levelled area. Over the conduit and water lines will be laid a mat of war surplus steel landing mats bonded together and to the conduit. Over the mat, a four-inch thick concrete slab will be poured. The landing mat is to serve as a counterpoise for discharge, through a line to ground, of lightning strikes from electrical storms, and also to provide adequate ground for equipment located on the Peak. The four inches of concrete will serve as a level, stable platform on which to set equipment, and to which the equipment may be anchored as a means of protection against the high winds frequently encountered over the Peak. See Figure 3 for a diagrammatic representation of what the Peak will provide in the way of an instrumentation site when presently planned construction is complete.

Completion of housing and mounting facilities for six (6) Askania sites during the month of January opened the way for installation of six such instruments with their associated timing equipment by North American Aviation Inc. Photographs of a typical Askania site are included in this report as Figures 4 and 5. Also included, as Figures 6 and 7, are photographs of the time standard equipment designed and constructed by North American Aviation, Inc., showing the equipment as it appears installed in Blockhouse No. 1. Additional details relating to instrumentation will be found in the reports of the Project Officers for the various contractors now engaged in development and testing of guided missiles at this range.

Other activities in the Instrumentation Division during February included revising and bringing up to date previous plans and estimates of permanent instrumentation lines. This was necessary in view of changes in original estimates being made by the Signal Corps, Fourth Army, upon receipt of same by that agency. All changes were coordinated with representatives

6. ELECTRONIC AND ATMOSPHERIC PROJECTS DIVISION

REPORT FOR MONTH OF JANUARY: by L. H. Dyvad, Captain, USAF,
V. D. Thompson, Jr., 1st Lt., USAF; Technical Data by Mr.
M. Rothman. Reviewed by William Crawford, Lt. Colonel, USAF.

The mission of the Electronic and Atmospheric Research Group at Holloman Air Force Base is to provide and operate radar research and tracking equipment as tests to obtain data upon which to base developments of an improved Air Defense system; to cooperate in the instrumentation and test of Upper Air Phenomena as a basis for improved missiles, pilotless aircraft and control system designs; to insure the effective utilization by the Air Force of the guided missiles facilities available at White Sands Proving Ground; to (1) develop an adequate defense against V-2 type missiles and (2) advance the AF guided missile and upper air research programs.

RADAR DEVELOPMENT PROJECT

a. Project 189-9-2.

(1) Tracking Tests: RADAR SET AN/MPS-6. (See Figures 1 and 2).

The MPS-6 was run up, adjusted and tested for optimum standards with no deficiencies noted save (1) arcing of wave guide as angle of elevation of 60 degrees is exceeded, (2) erratic "jitter" of electronic range gate, and (3) coincidence of target with electronic range gate occurred slightly before presentation of range gate on J-Scope. Attempts to remedy these faults have been unsuccessful to date.

Accordingly, operational plans for the tracking test on missile #34 were made as follows:

- (a) Due to defects of the electronic range gate, aided range tracking was used. The antenna was to be positioned in azimuth on the calculated bearing to the launcher (207 degree 35') with elevation raised sufficiently so that PS's had perceptibly lessened in amplitude. With the manual range gate set at 45M yards (True Range to Launcher had been calculated as 60,769 yards), wide gate delay was adjusted to display a range of 45M to 77M yards on the 32M yard J-Scope. Rate of track was adjusted to about 250 mph "out" with aided range meter to be turned off until X+10 search was to be made on the 32M yard J-Scope and PFI simultaneously with no sweep of antenna planned until it became certain that no return could be obtained at the fixed position.
- (b) V-2 Rocket #34 was fired at 1315 on 22 January 1948. Before X+2 seconds a weak signal bloomed on the J-Scope at 71M yards and increased rapidly in amplitude. The range gate was run out and the system thrown into automatic

radio link channel of the sine-wave repetition frequency from the SCR 270-DA. After passing through a 0-360° phase-shifter, this signal is used to synchronize an oscilloscope sweep. The output of a mobile radar receiver is used to provide vertical deflections of this sweep. Manipulation of the above-described phase-shifter enables careful examination of any period between radar pulses. The mobile receiving and indicating equipment consists of a modified IFF equipment Mark IV. Modifications consist briefly of the following:

- (a) Frequency change and bandwidth decrease of the receiver to adapt it for use with 106 mc SCR 270 transmissions.
- (b) Addition of phase-shiftable sine-wave synchronization circuits to enable examination of any period between radar pulses.
- (c) Extension of the fast-sweep from 20 miles to 50 miles.
- (d) Elimination of the IFF transmitter.
- (e) Addition of a radio link synchronization receiver.

Work continues on the equipment for preliminary tests on this project.

SIGNAL STRENGTH IN MICROVOLTS
VERSUS
FLIGHT TIME IN SECONDS

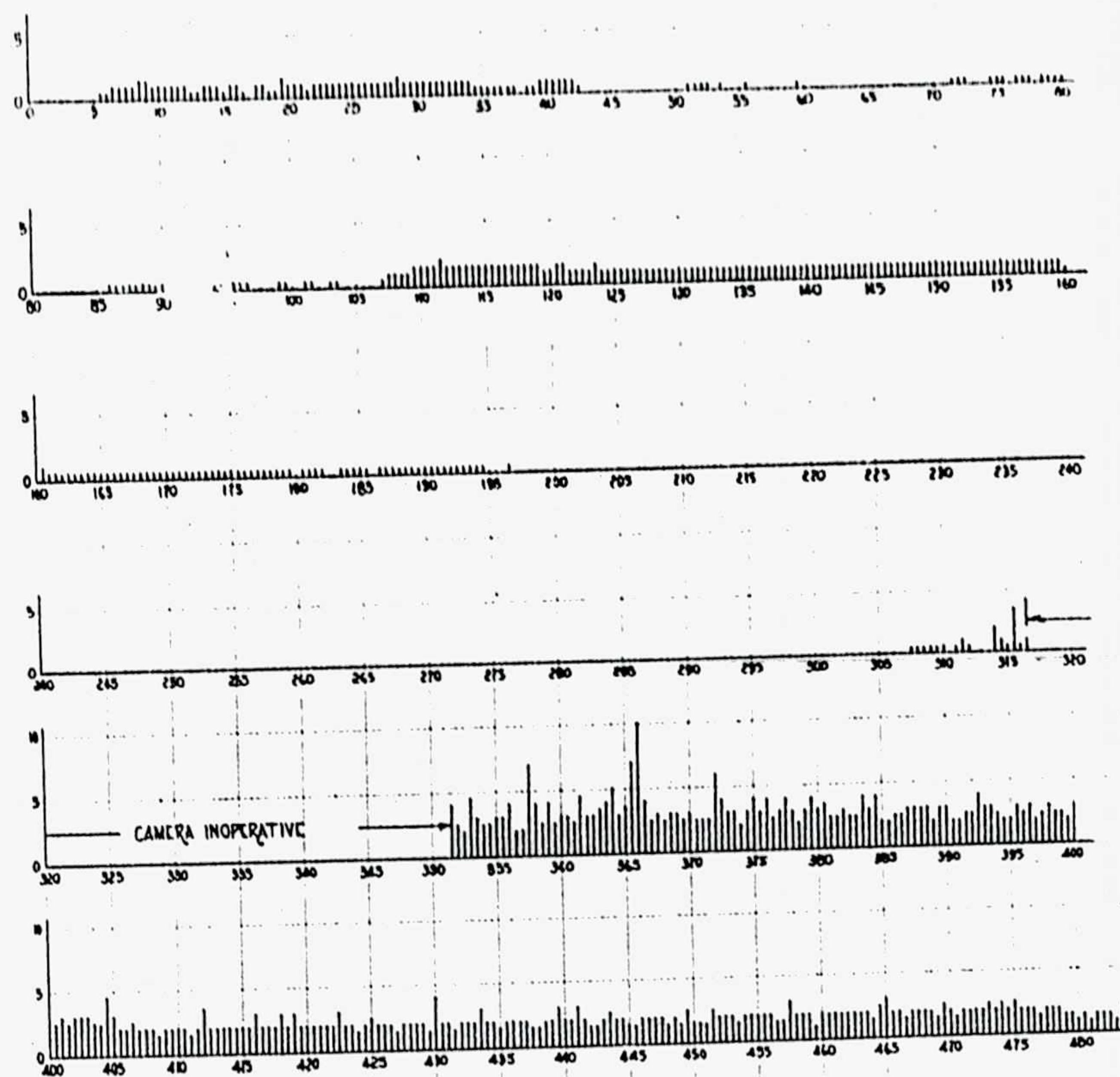


FIG. 1

Board No. 4, Fort Bliss, Texas. This test involves the operation of 2 SCR 270-DA's, 2 AN/TPS-1B's, 1 SCR-548, and 1 AN/MPQ-2 at the Hucce Range Camp in New Mexico. This site is 20 miles directly behind the V-2 launching site. All radars are oriented in azimuth in such a manner that, provided the rocket follows a northward course, it will remain in the radar beams throughout its trajectory. Vertical orientation of the radar beams are 13° for one each of the SCR 270-DA's and the AN/TPS-1B's. The alternate SCR 270-DA and AN/TPS-1B are vertically oriented at 45° . The two remaining sets, SCR 548 and AN/MPQ-2 are periodically vertically oriented at several advantageous angles during the rocket's flight. Operation of these sets during several firings has indicated satisfactory coverage of the missile's trajectory. Successful correlation of this signal-strength data with missile aspect information however is dependent upon the recovery of the photographic data from a rocket-borne heliograph.

Radar set SCR 270-DA No. 2 (elevation 13°) yielded valuable data during the firing of V-2 rocket No. 29. Radar contact was maintained during 70% of the rocket's flight. Figure 1, page 21 is a chart of signal strength in microvolts versus time of rocket flight in seconds; while subject chart is not conclusive it is believed that a correlation of this chart with missile aspect information from the rocket-borne heliograph will allow a comparison that will contribute to a conclusive evaluation of subject radar set.

- (3) Early Warning Radar Fence Tests: The purpose is to accomplish the fabrication and test of a high power radar with a view toward achieving 1000-mile detection of the V-2 rocket. This operation involves the modification of an SCR-270-DA radar for the incorporation of higher transmitter peak power (.75 megawatt) high sensitivity relatively low-bandwidth receiver characteristics, and the use of a modified high-gain 8x8 dipole antenna array. Fabrication of this set is now nearing completion.
- (4) Triangulation Tests: The purpose is to determine the feasibility of designing an early-warning air-defense technique for the detection and plotting of unfriendly projectiles by range triangulation methods. The fundamental prerequisites of such a system is the existence of off-angle radar reflections of sufficient quality and field strength to be successfully received and identified at several strategically located receiving stations. It is for this reason that preliminary efforts have been concentrated on the design and fabrication of a mobile laboratory equipped with the necessary receiving, synchronization, and measuring equipment. This mobile unit may then be moved to strategic locations with respect to its cooperating radar in order to make quantitative and qualitative measurements and records of radar reflections at other than the direct return angle of 180° . It was decided to use one of the SCR 270-DA's sited at Hucce, New Mexico, as the cooperating radar equipment. Synchronization is accomplished through the transmission over a

6. WATSON LABORATORIES ACTIVITIES
Report: by W. D. Fritchard, Major, USAF

PURPOSE

The US Air Forces mission at Alamogordo Guided Missile Test Base is to provide and operate radar research and tracking equipment as tests to obtain data upon which to base developments of an improved Air Defense system; to cooperate in the instrumentation and test of Upper Air Phenomena as a basis for improved missiles, pilotless aircraft and control system designs; to insure the effective utilization by the Air Force of the guided missile facilities available at White Sands Proving Ground; to (1) develop an adequate defense against V-2 type missiles, (2) advance the AF guided missile and upper air research programs.

RADAR DEVELOPMENT PROJECT

Research and Development Objectives:

- a. To investigate the suitability of present radar equipment for use against V-2 type missiles.
- b. To make such field modifications to present radar equipment as are found practical for more effective defense.
- c. To determine the technical characteristics of a new radar system to provide fully effective defense.

The work of the Radar Branch is subdivided into four specific investigations, as follows:

- a. Tracking Tests: The purpose is to evaluate existing tracking radars regarding their suitability for the tracking of high-speed rockets and to perform associated experimentation and modification work with a view toward gathering data pertinent to the development of a satisfactory missile-tracking equipment.
 - (1) During the firing of V-2 rocket No. 28, Radar Set AN/TPS-1B (modified) successfully detected and tracked subject rocket until its echo was obscured by permanent echoes from distant mountains in the same range as the rocket at which time the rocket was lost and never recovered. Development-work on circuitry to utilize the Doppler Effect to enable tracking of rockets through powerful fixed echoes continues.
 - (2) Aspect Tests: Purpose is to determine experimentally at various frequencies the effective radar echoing area of the V-2 rocket as a function of its aspect. Prosecution of this investigation is being accomplished jointly by the Air Materiel Command, the Signal Corps Engineering Laboratory, and the Ground Forces



VOL.1 1 AUG.'48 NO.10
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49-529

HOLLOMAN AIR FORCE BASE
Alamogordo, New Mexico

PROGRESS SUMMARY REPORT

on

U. S. A. F

GUIDED MISSILE TEST ACTIVITIES

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Vol I

1 August 1948

No. 10

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radar station was not troubled by this phenomenon due to its antenna directivity and elevation orientation of 60 degrees. It is believed that the intermediate loss of signal by the radar station is normal because of elevation pattern lobing produced by ground-reflection interference which is initiated by secondary antenna lobe transmission. Since this condition exists in the transmitting pattern, it affects both the radar station and its remote receiving station. Current effort is concentrated on improvement of photography and antenna orientation in preparation for additional tests.

b. Tracking Projects:

- (1) Radar Tracking Set AN/MPS-6 - A letter was received from Watson Laboratories authorizing changes and modifications of the range circuits necessary for conditions as encountered at this location. The fore part of July was spent in achieving these betterments, and in the installation and orientation of an M-2 optical tracker to be used in conjunction with the MPS-6 and as a tracking aid.

Experimental tracking of three balloons furnished and flown by the Atmospheric Group was performed for the dual purpose of checking the signal return of the radar with various reflecting targets, and for precise position data of the balloon equipment for use by the Atmospheric Group. On 19 July, a 130 foot balloon carrying no radar reflector was tracked. Radar contact was made at a range of about 3K yards with signal return being above saturation on the scopes of the MPS-6. Tracking was automatic in Azimuth and Elevation and aided in range. Signal return remained above saturation until a range of 7K yards was read, at which point grass appeared on the scopes and signal to noise averaged about 4 to 1 out to a range of 23K yards where too frequent radar losses necessitated that automatic tracking be abandoned. This balloon was then tracked manually to a maximum range of 27K yards.

On 20 July 1948, a weather balloon carrying one kite type reflector was flown and tracked. Contact was made at a range of 3K yards, and signal return was above saturation at all times until a range of 10K was exceeded and grass showed only occasionally out to 24,360 yards. This balloon was obscured by clouds at a range of 33K yards, but tracking was continuous in automatic Azimuth and Elevation throughout its flight, and the maximum range read was 34K yards.

On 21 July, a 130 foot balloon, identical with the one flown on 19 July except for three kite reflectors being carried, was flown and tracked. Radar contact was made at a range of 1,510 yards. Grass first appeared on scopes at a range of 24.5K yards, and signal was above saturation to 30K yards. Tracking was continuous and automatic throughout the flight, and a maximum range of 121K yards was reached.

Permission to use the MPS-6 in tracking further V-2 missiles having been received, plans were formulated for operation in conjunction with the missile scheduled to be fired Thursday, 22 July and postponed until Monday, 26 July at 1100. Plans contemplated that the crew on the M-2 Optical Tracker would track visually at all times during the flight with their elevation and azimuth readings repeated on the antenna. The MPS-6 antenna was initially positioned in azimuth on the calculated bearing to the launcher and raised slightly above the horizon in elevation, with the correct range gated on the scopes and with a velocity of about 300 MPH set in the aided range motor and the motor initially stopped. It was further planned that when target echo would bloom on the scopes, the echo should be trued up in Azimuth, Elevation, and Range; and antenna control would be thrown to automatic with range followed manually until speed of the missile approximated the 300 MPH as set on the motors, at which time the video motor would be activated and range tracking thrown to "Aided." It was planned to throw antenna control to the M-2 Tracker only if target failed to show or if extended "loss" subsequently occurred.

During the half-hour period prior to the take-off, several random aircraft were noted in the vicinity of the launcher; and at X-5 minutes, one low flying aircraft was observed on the scopes at a range beyond the launcher directly in line with it and flying in towards the launcher.

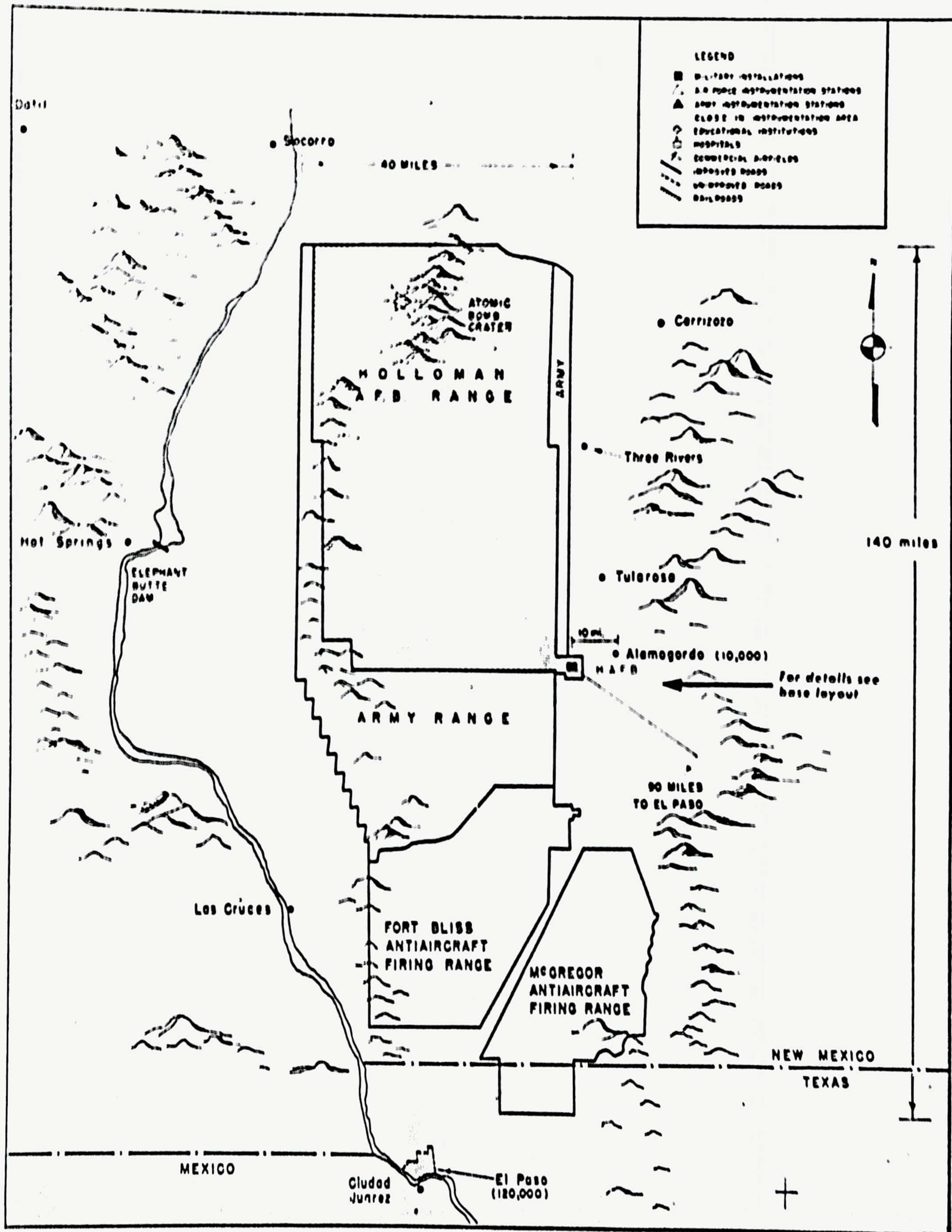
Timing signals and the zero signal were received, and at about X plus 2 seconds the target "bloomed" on the J Scopes at the calculated range to the launcher (62,800 yards). This pip went almost instantly to far beyond saturation, and all grass disappeared from the scopes. The Azimuth and Elevation, and Range controls were centered on the target, and antenna control was thrown to automatic. Range started to slowly increase as did elevation with azimuth being stationary. The echo remained beyond saturation for about two seconds after automatic control was thrown in, at which time grass appeared on the scopes and the signal fell rapidly to zero and the antenna whirled off target at about X plus 6 seconds. Upon returning antenna to position manually, a strong target appeared at a range of about 2K yards outside the range gate, and believing this to be the rocket, this pip was trued up and antenna locked in "Automatic" and this target was tracked for a period of about 10 seconds or until it was noted that range was decreasing and elevation was stationary at the horizon while the M-2 Elevation repeater showed the optical tracker to be looking at approximately 50 degrees. Realizing that the target being followed was the aircraft noticed before take-off, antenna control was transferred to the optical tracker and left in its control until the M-2 crew lost the missile. During this time, no target was visible at any time and no further radar contact was made with the missile. However, slightly before the missile impact was heard, a cluster of small echoes were found at a

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HOLLOMAN AIR FORCE BASE
(INCLUDING SACRAMENTO PEAK)

LOCATION AND ENVIRONMENT



Date of issue this page:
February 15, 1951.

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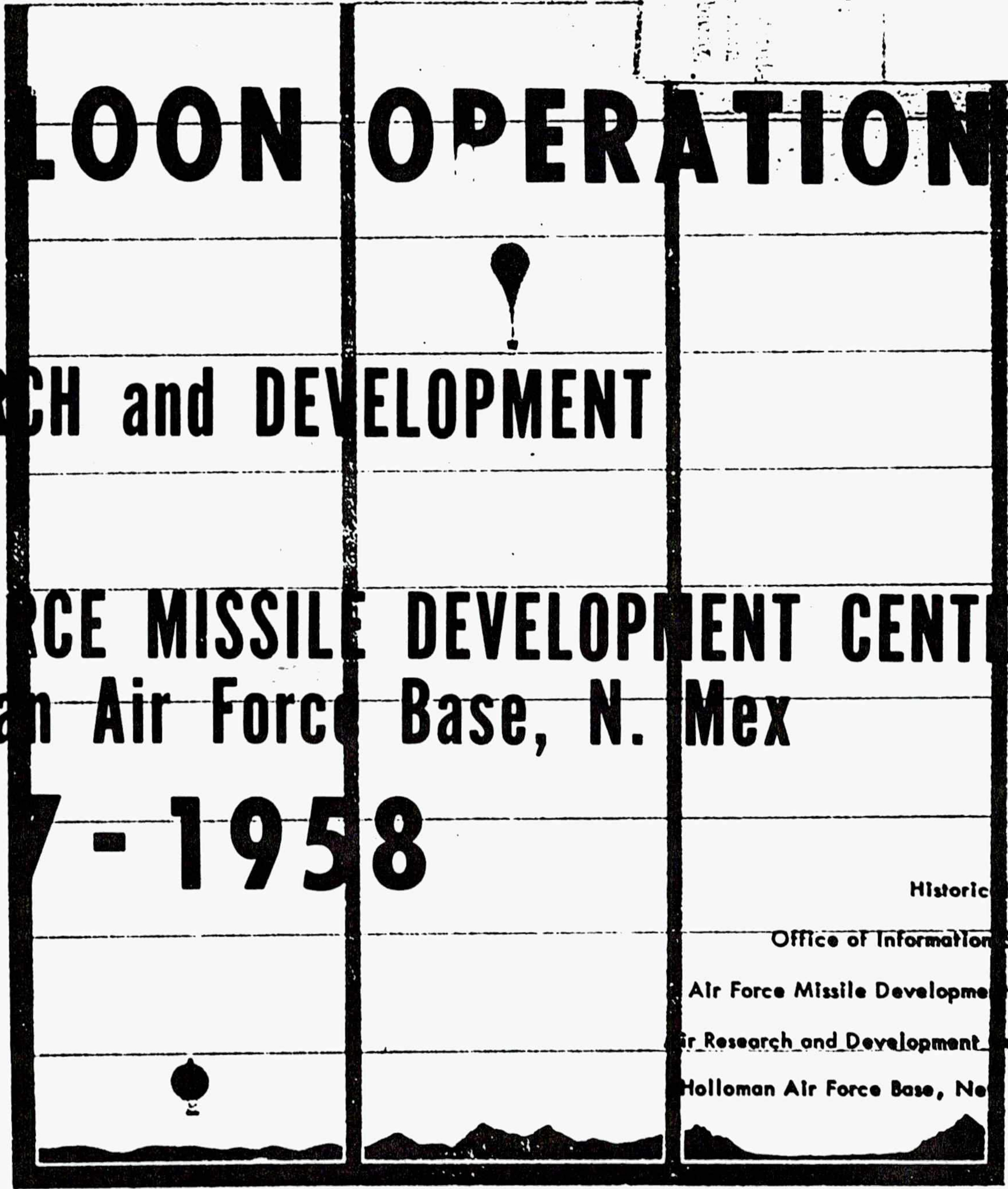
BALLOON OPERATIONS

to
RESEARCH and DEVELOPMENT

at the

AIR FORCE MISSILE DEVELOPMENT CENTER
Holloman Air Force Base, N. Mex

1947-1958



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Historic Branch
Office of Information Services
Air Force Missile Development Center
Air Research and Development Command
Holloman Air Force Base, New Mexico

5-1171-22

CHRONOLOGY

- 5 June 1947 First research balloon launch at Holloman, by New York University team under contract with Air Materiel Command. This was a cluster of rubber balloons.
- 3 July 1947 Start of polyethylene balloon operations at Holloman. A ten-balloon cluster launched by the New York University team; payload less than fifty pounds, peak altitude 18,500 feet. ✓
- 1948 Beginning of research balloon flights launched at Holloman by Air Force personnel.
- 1949 The present Balloon Branch organized as a subdivision within the Electronic and Atmospheric Projects Section.
- 21 July 1950 First polyethylene balloon launched at Holloman, by the Balloon Branch, with Air Force personnel. The series of Holloman numbered flights begins with this flight, which was launched for atmospheric sampling.
- 28 September 1950 First successful animal balloon flight in aeromedical cosmic radiation series takes eight white mice to 97,000 feet from Holloman Air Force Base.
- September 1951 Beginning of the Holloman phase of Project Moby Dick.
- 1 May 1953 Start of Holloman flight operations by the manned-balloon program of Wright Air Development Center's Aero Medical Laboratory ("High-Dive").
- November 1953 Holloman Balloon Branch conducts static tests of balloon performance at a Navy blimp hangar in California.

CHAPTER I

ORIGIN AND EXPANSION OF HOLLOMAN BALLOON OPERATIONS

Since the close of World War II, aircraft have repeatedly established new records in speed and altitude, research satellites have begun to crowd the skies, and the day of manned space vehicles already seems close at hand. Yet one of the most interesting of all recent developments in the field of manned and unmanned flight has been a spectacular revival of free ballooning. The balloon, which was man's first aerial vehicle, has found many new applications as a result of post-war improvements in manufacturing and flight techniques. These new applications have been particularly evident at the military test, research, and development complex that is located at Holloman Air Force Base, New Mexico, and now bears the name of Air Force Missile Development Center.

As a matter of fact, the first research balloon flight at Holloman Air Force Base was launched over a month before the first missile: on 5 June 1947, as compared with the first Holloman missile firing on 23 July of the same year. This was not actually a single but rather a multiple launching, using a cluster of rubber-type weather balloons. The flight lasted not quite six hours, rose to a maximum altitude of 58,000 feet, and ended with successful recovery of the balloon equipment at

a point east of Roswell, New Mexico. The first polyethylene plastic balloons, of the type generally used today, were launched on 3 July 1947, still before the first missile. This, too, was a cluster flight, using ten seven-foot-diameter plastic balloons. Payload was well under fifty pounds, duration 195 minutes, and maximum altitude 18,500 feet; recovery, however, was unsuccessful.¹

Both of these balloon "firsts" were conducted by the Research Division of New York University's College of Engineering, under a contract that it held with Watson Laboratories, Air Materiel Command, "to design, develop, and fly constant-level balloons to carry instruments to altitudes from 10 to 20 km...."² Headquarters of the university's "Balloon Group" remained in New York City, but a great number of actual test flights were launched at Holloman by specialists sent out to New Mexico on temporary duty. New York University crews continued to visit the air base intermittently to launch balloons from 1947 to 1950. However, not all the flights were concerned exclusively with development of balloon techniques. Certain flights were made, using plastic vehicles, to measure cosmic ray intensities with special scientific equipment and to study atmospheric wind conditions by means of extended constant-level balloon trajectories.³

Although New York University sent its own people to Holloman

N O T E S

1. Research Division, College of Engineering, New York University, Technical Report No. 1 (New York, 1 April 1948), Table VII.
2. Ibid., p. 1.
3. New York University's balloon operations are described in the report cited above; in Research Division, College of Engineering, New York University, Technical Report No. 93.03, Constant Level Balloons Final Report (New York, 1 March 1951); and also, passim, in Progress Summary Report on U.S.A.F. Guided Missile Test Activities (HAFB, published monthly 1 November 1947-1 June 1950).
4. Cf. "Visit of General Joseph T. McNarney Commanding General, Air Materiel Command to Holloman Air Force Base 9 April 1948;" Progress Summary Report, 1 August 1948, p. 26.
5. Progress Summary Report, 1 October 1948, pp. 16, 22; later issues, passim.
6. Progress Summary Report, 1 May 1949, pp. 31-33.
7. Progress Summary Report, 1 March 1949, p. 38, and 1 February 1950, p. 60.
8. Progress Summary Report, 1 May 1949, pp. 31, 32 and 1 May 1950, p. 65; interview, Mr. Bernard D. Gildenberg, Chief, Balloon Control Section, Balloon Branch, AFMDC, by Dr. David Bushnell, AFMDC Historian, 9 September 1958; ltr., Maj. Richard H. Braun, Chief, Balloon Development Laboratory, AFCRC, to Cmdr., AFMDC (attention: Dr. Bushnell), subj.: "Air Force Missile Development Center Balloon Launching History," 15 January 1959.
9. Interview, Mr. Gildenberg by Dr. Bushnell, 9 September 1958.
10. 6580th Test Squadron (Special), Flight Summary, Non-Extensible Balloon Operations ... June 1950 to October 1954.
11. Interview, Mr. Gildenberg by Dr. Bushnell, 18 December 1958.
12. Balloon Branch, "Statistical Summary of First 1000 AFMDC Flights," 12 January 1959.
13. Ibid.

Balloons

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Office of Information Services
HOLLOMAN AIR DEVELOPMENT CENTER
Air Research and Development Command
Holloman Air Force Base, New Mexico
Telephone GRanite 3-6511, Ext. 6781

FOR IMMEDIATE RELEASE

In this age of high speed jets and rockets, few people today realize that one of aviation's earliest forms, the balloon, still plays a vital part in the nation's research work.

On many mornings at Holloman Air Development Center in New Mexico, a large, white plastic balloon starts its journey into the upper atmosphere. And because of the data gathered by equipment being carried by these balloons, men will be better able to use today's modern aircraft and aircraft of the future in the upper atmosphere.

Before men and machines can operate at extreme altitudes, it is necessary to find out what prolonged exposure to rarified atmosphere, extreme cold, and various high altitude phenomenon have on test subjects. While rockets are very important in upper air research, they stay at altitudes for only seconds at a time. Thus, balloons are the only test vehicle for carrying instruments aloft and keeping them there for several hours or even days.

The balloons in use by the Air Research and Development Command of the Air Force at Holloman are a far cry from the familiar toy given to children. Some are given the mission of lifting a thousand-pound payload to a hundred thousand feet and remaining there for hours on end. The balloons used are the non-extensible, or non expandable, balloons which are made of polyethylene plastic like that used in the familiar cosmetic "squeeze bottles."

(more)

The first successful balloon flight used to measure data took place in France in 1893 when a non-extensible balloon reached a height of 49,000 feet. The first successful plastic-type balloon was launched during the 1920's by Professor Jean Piccard, the famous Swiss scientist who once rode a balloon to 58,000 feet.

In the fall of 1946, the first of the present day polyethylene balloons was launched. A New York University research team completed the first such balloon flight from the then new research Center at Holloman on July 3, 1947.

The present Air Force Balloon Branch at Holloman launched their first polyethylene balloon three years later, after having experimented for a year with use of clusters of rubber balloons.

According to Capt. Milton M. Hopkins Jr., Chief of Holloman's Balloon Branch, the first non-extensible balloons flown at Holloman were only 20 feet in diameter and carried a payload averaging 50 pounds. Today, the average size of balloons flown is 90 feet in diameter, and occasionally they launch the huge 120 foot balloons which will carry payloads of a half ton or more.

Lt. Jack Cahoon Jr. is assistant Chief of the Branch.

Since the first launching in 1950, more than 300 flights have been completed at Holloman. Initially the balloons were flown as supplementary vehicles for Aerobee Rocket instrumentation to allow the contractors to test their instrumentation at lower altitudes before rocket flights. As the plastic balloon's capacity for carrying heavier payloads and making longer flights increased, it became a separate research vehicle.

(more)

Capt. Hopkins says (12 June 56) that seven foot diameter 14.7 Kilogram
- Dieldenbug Report - NYU Prop Report
- AME Contract

21 July 1950 - 72 footer

balloon to 58,000 feet, and in the fall of 1946 the first of the present day polyethylene balloons was launched.

On July 3rd, 1947, a New York University research team completed the first polyethylene balloon flight from the new research Center at Holloman Air Force Base. The present Air Force Balloon Unit at Holloman launched their first polyethylene balloon on July 21, 1950, after having experimented for a year with use of clusters of neoprene (rubber) balloons.

According to First Lt. Jack Cahoon, Jr., Chief of Holloman's Balloon Unit, the first non-extensible balloons flown at Holloman were only 20 feet in diameter and carried a payload averaging 25 pounds. Today the average size of balloons flown is 90 feet in diameter and occasionally they launch the huge 116 foot balloons which will carry payloads of half a ton or more. Since the first launching in 1950 more than 240 flights have been completed at Holloman. Initially the balloons were flown as supplementary vehicles for Aerobee Rocket instrumentation to allow the contractors to test their instrumentation at lower altitudes before rocket flights. As the plastic balloon's capacity for carrying heavier payloads and making longer flights increased it became a separate research vehicle.

The Balloon unit is a division of the 6580th Test Squadron (Special) which is commanded by Lt. Colonel Wilbur D. Pritchard and has the mission of launching and tracking of Balloons as well as recovery of the experimental equipment they carry. The unit also provides optical tracking data, develops improved launching techniques and maintains a constant study of balloon capabilities. The men of the unit call themselves "Balloonatics" and are a select group in the Air Force. Only a handful of men through the Air Force have the training in balloons that these men do. They have had to do their own developing of techniques and equipment because theirs is a specialized operation done only at Holloman and one or two other places. Many of the men who launch balloons in other locations are those trained by the Holloman unit.

(MORE)

Balloons--Page 3

The Balloon Branch is a part of the Test Facilities Division of the Directorate of Laboratories which is commanded by Lt. Col. Clifton L. Butler Jr. and has the mission of launching and tracking balloons as well as the recovery of the experimental equipment they carry. The Branch also provides optical tracking data, develops improved launching techniques and maintains a constant study of balloon capabilities.

The men in this branch develop their own techniques and equipment because theirs is a specialized operation done only at Holloman and one or two other places.

Mr. B. D. Gildenberg, Chief of Technical Guidance Section of the Balloon Branch, says that when the average person hears the word "Balloon" he visualizes a rubber extensible balloon.

He explains the difference between the familiar extensible and the non-extensible balloon used at Holloman as follows: "The extensible balloon is filled with lifting gas until it will exactly balance out the weight of the balloon plus any attached rigging and payload. Then an extra portion of gas, called the free lift, is added to the balloon. This free lift causes an unbalanced effect with the balloon tending to rise skyward.

"As the density of the atmosphere decreases during the ascent, the flexible matter of the balloon stretches because of the expansion of the lifting gas. When the maximum stretching qualities of the balloon are exceeded, the balloon bursts and flight ends.

(more)

Balloons--Page 4

"Non-extensible balloons are made of the polyethylene plastic instead of rubber. Panels of the plastic are connected by fiber acetate tapes which join together to form a heavy, strong harness at the balloon opening or appendix. This type of construction results in a balloon which is capable of carrying loads far heavier than is possible with the extensible balloons.

"The plastic balloon is flown with an opening to the atmosphere near the base while the rubber balloon is completely closed. As the lifting gas within the plastic balloon expands and fills the balloon, any additional expansion causes the extra gas to syphon out the opening--thus, the balloon fills out completely and floats at the altitude reached rather than bursting as the rubber type does."

Because of the difficulties encountered in launching balloons, Holloman personnel are constantly searching for improved launching methods. Weather is their worst enemy, and because the balloons are fragile and easily damaged while confined to the ground, the wind is the worst offender.

In launching a 128-foot balloon, the most desirable condition is a dead calm. Because of this, most launchings take place shortly after dawn when shifting winds result in a relative calm. In winds over five miles an hour, the balloon will twist and whip about and eventually destroy itself prior to launching. To eliminate the wind effects, several different launching methods are used. The launching method used for any specific flight is determined by the expected wind speed, balloon size, weight of payload, etc.

(more)

Balloons--Page 5

An important method of launching the larger balloons is the "covered wagon" which was developed at Holloman. This launcher uses a 40 foot flat bed trailer as a base and has a high headboard and sides constructed of pipe and iron which have been covered with plywood and nylon. When inflating a balloon, the launcher resembles a high covered wagon because its top is made of nylon material.

With the covered wagon, launchings are successful in higher winds because the actual inflation of the balloon takes place within the launcher. After all the helium has been valved into the balloon and the payload is attached, the balloon is released through a sudden removal of the covering of the launcher. The balloon then rises rapidly from its confinement.

Balloons released at Holloman have floated as high as 109,000 feet and have stayed aloft as long as four days. The average flight is between 75,000 and 95,000 feet and lasts six hours.

Although the Balloon Branch generally can tell fairly closely where the balloon will be by forecasting, some payloads have been returned to Holloman from Norway, Sweden and Algiers.

The payloads can be cut down by either of three methods. The first is an aneroid device which activates a small explosive charge to cause the payload to separate from the balloon and parachute to the earth. The second way is through a special radio command cut down system. Another method of cutdown is the use of a reliable special purpose clock which closes the circuit on the explosive charge used to sever the load line.

(more)

Balloons--Page 6

If the tracking unit which constantly monitors the flight feels that the balloon is going to be over inaccessible territory at cut down time, they will cut down the package sooner, providing the mission has been fulfilled. The same cut down system serves to destroy the balloon so that it will not continue to float and eventually end up as an obstacle in the airplanes.

Each payload contains printed instructions which serve to identify the item to a finder as non-dangerous equipment. The message requests the finder to notify Holloman and offers a payment of \$25 for the finder's assistance. Several packages have been returned from natives deep in old Mexico who had to carry the packages many miles on mules to reach a train station.

A typical balloon operation, according to Lt. James C. Friederichs, Ass't Chief of the Balloon Branch, begins the day before the actual launching with the preparation of the Flight Control Package. This package contains the cutdown mechanisms and a device for telemetering altitudes.

At the same time, other operations are going on, such as scheduling of tracking aircraft, filing notices to all airports lying within the projected flight, and briefing of all support agencies connected with the flight.

The day of the flight, all personnel connected with the flight go to work two hours before the launching, except the meteorologists who have already been on the job about an hour checking the current weather conditions and plotting the balloon's trajectory.

(more)

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If conditions are right, the actual launch preparations then begin. Helium is the only gas used, primarily because of its safety feature.

But the work of the Balloon Branch just begins with the launching. Immediately after the launching, recovery vehicles proceed to the forecasted impact area. These vehicles track the balloon with a radio compass used for "homing in" on the transmitter located in the balloon package.

Launching personnel return to the Balloon Tracking Control Center to monitor the flight and coordinate the movement of recovery vehicles and tracking aircraft until flight termination time. Lt. R. T. Dundas is in charge of operations and he is assisted by Lt. David R. Lawson and M/Sgt. Ralph M. Stevens who has been with the Holloman Balloon Branch since the first balloon was launched there. Lt. Richard Snow is Special Projects Officer in this section.

Throughout the flight, communications between the Balloon Tracking Control Center, recovery vehicles and the tracking aircraft are constantly taking place.

As cutdown time approaches, field personnel keep the balloon under close observation. When the instrumentation is separated from the balloon and begins its descent by parachute, the aircraft tracks it to the ground and directs the recovery vehicles to the impact location.

T/Sgt. Richard Rayner is in charge of the Balloon Ground Recovery section. His job is unique in that he must know the terrain for 600 miles around Holloman as well as flight characteristics of balloons.

(more)

The recovery personnel promptly return the payload to Holloman where it is disassembled. The research part of the instrumentation is then examined by scientists for the valuable data obtained on the flight.

Among the payloads carried in these experiments are instruments to determine composition of the atmosphere at high altitudes, to measure carbon dioxide and rare gases in the atmosphere, to measure sky brightness at high altitudes, to obtain data on the vertical distribution of ozone in the atmosphere, and to record the intensity of solar radiation.

Some of these packages even contain fruit flies from the Aero Medical Field Laboratory to study the effect of cosmic radiation upon them. Because fruit flies multiply rapidly, the hereditary effects of cosmic radiation can be studied in comparatively short periods of time.

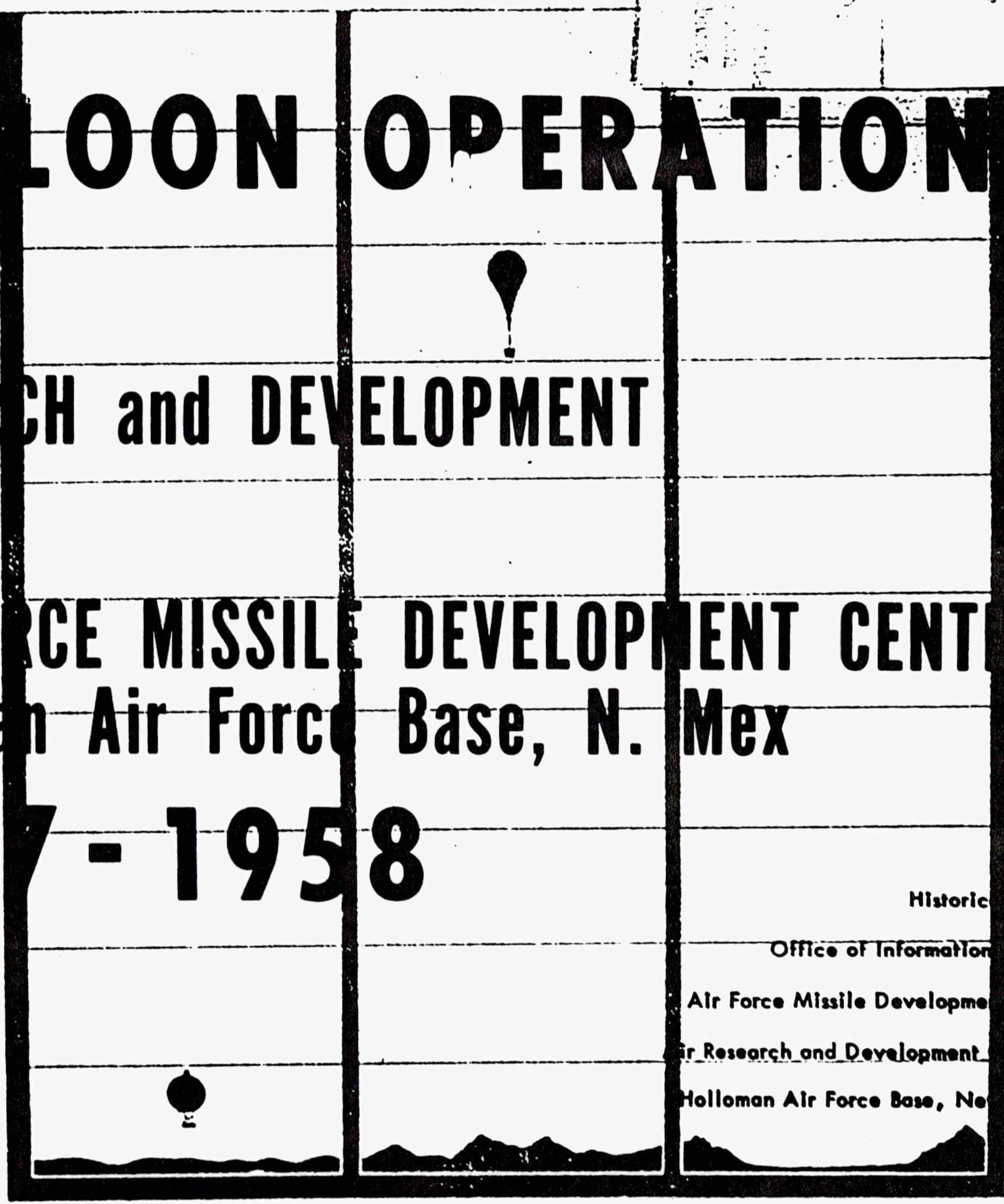
Thus, the balloon which was all but forgotten a few years ago, now plays an important part in today's aviation research.

(end)



1947-1958
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**Contributions
of
BALLOON OPERATIONS
to
RESEARCH and DEVELOPMENT
at the
AIR FORCE MISSILE DEVELOPMENT CENTER
Holloman Air Force Base, N. Mex
1947-1958**



Historic Branch
Office of Information Services
Air Force Missile Development Center
Air Research and Development Command
Holloman Air Force Base, New Mexico

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CHRONOLOGY

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|--------------|------|---|
| 5 June | 1947 | First research balloon launch at Holloman, by New York University team under contract with Air Materiel Command. This was a cluster of rubber balloons. |
| 3 July | 1947 | Start of polyethylene balloon operations at Holloman. Ten-balloon cluster launched by the New York University team; payload less than fifty pounds, peak altitude 18,500 feet. |
| | 1948 | Beginning of research balloon flights launched at Holloman by Air Force personnel. |
| | 1949 | The present Balloon Branch organized as a subdivision within the Electronic and Atmospheric Projects Section. |
| 21 July | 1950 | First polyethylene balloon launched at Holloman, by the Balloon Branch, with Air Force personnel. The series of Holloman numbered flights begins with this flight, which was launched for atmospheric sampling. |
| 28 September | 1950 | First successful animal balloon flight in aeromedical cosmic radiation series takes eight white mice to 97,000 feet from Holloman Air Force Base. |
| September | 1951 | Beginning of the Holloman phase of Project Moby Dick. |
| 1 May | 1953 | Start of Holloman flight operations by the manned-balloon program of Wright Air Development Center's Aero Medical Laboratory ("High-Dive"). |
| November | 1953 | Holloman Balloon Branch conducts static tests of balloon performance at a Navy blimp hangar in California. |

CHAPTER I

ORIGIN AND EXPANSION OF HOLLoman BALLOON OPERATIONS

Since the close of World War II, aircraft have repeatedly established new records in speed and altitude, research satellites have begun to crowd the skies, and the day of manned space vehicles already seems close at hand. Yet one of the most interesting of all recent developments in the field of manned and unmanned flight has been a spectacular revival of free ballooning. The balloon, which was man's first aerial vehicle, has found many new applications as a result of post-war improvements in manufacturing and flight techniques. These new applications have been particularly evident at the military test, research, and development complex that is located at Holloman Air Force Base, New Mexico, and now bears the name of Air Force Missile Development Center.

As a matter of fact, the first research balloon flight at Holloman Air Force Base was launched over a month before the first missile: on 5 June 1947, as compared with the first Holloman missile firing on 23 July of the same year. This was not actually a single but rather a multiple launching, using a cluster of rubber-type weather balloons. The flight lasted not quite six hours, rose to a maximum altitude of 58,000 feet, and ended with successful recovery of the balloon equipment at

a point east of Roswell, New Mexico. The first polyethylene plastic balloons, of the type generally used today, were launched on 3 July 1947, still before the first missile. This, too, was a cluster flight, using ten seven-foot-diameter plastic balloons. Payload was well under fifty pounds, duration 195 minutes, and maximum altitude 18,500 feet; recovery, however, was unsuccessful.¹

Both of these balloon "firsts" were conducted by the Research Division of New York University's College of Engineering, under a contract that it held with Watson Laboratories, Air Materiel Command, "to design, develop, and fly constant-level balloons to carry instruments to altitudes from 10 to 20 km...."² Headquarters of the university's "Balloon Group" remained in New York City, but a great number of actual test flights were launched at Holloman by specialists sent out to New Mexico on temporary duty. New York University crews continued to visit the air base intermittently to launch balloons from 1947 to 1950. However, not all the flights were concerned exclusively with development of balloon techniques. Certain flights were made, using plastic vehicles, to measure cosmic ray intensities with special scientific equipment and to study atmospheric wind conditions by means of extended constant-level balloon trajectories.³

Although New York University sent its own people to Holloman

N O T E S

1. Research Division, College of Engineering, New York University, Technical Report No. 1 (New York, 1 April 1948), Table VII.
2. Ibid., p. 1.
3. New York University's balloon operations are described in the report cited above; in Research Division, College of Engineering, New York University, Technical Report No. 93.03, Constant Level Balloons Final Report (New York, 1 March 1951); and also, passim, in Progress Summary Report on U.S.A.F. Guided Missile Test Activities (HAFB, published monthly 1 November 1947-1 June 1950).
4. Cf. "Visit of General Joseph T. McNarney Commanding General, Air Materiel Command to Holloman Air Force Base 9 April 1948;" Progress Summary Report, 1 August 1948, p. 26.
5. Progress Summary Report, 1 October 1948, pp. 16, 22; later issues, passim.
6. Progress Summary Report, 1 May 1949, pp. 31-33.
7. Progress Summary Report, 1 March 1949, p. 38, and 1 February 1950, p. 60.
8. Progress Summary Report, 1 May 1949, pp. 31, 32 and 1 May 1950, p. 65; interview, Mr. Bernard D. Gildenberg, Chief, Balloon Control Section, Balloon Branch, AFMDC, by Dr. David Bushnell, AFMDC Historian, 9 September 1958; ltr., Maj. Richard H. Braun, Chief, Balloon Development Laboratory, AFCRC, to Cmdr., AFMDC (attention: Dr. Bushnell), subj.: "Air Force Missile Development Center Balloon Launching History," 15 January 1959.
9. Interview, Mr. Gildenberg by Dr. Bushnell, 9 September 1958.
10. 6580th Test Squadron (Special), Flight Summary, Non-Extensible Balloon Operations ... June 1950 to October 1954.
11. Interview, Mr. Gildenberg by Dr. Bushnell, 18 December 1958.
12. Balloon Branch, "Statistical Summary of First 1000 AFMDC Flights," 12 January 1959.
13. Ibid.

