METEOROLOGICAL OBSERVATIONS AT THE PROPOSED SITE

By
J. Henric

With introduction, and analysis of data and conclusions by

Dr. Morris Neiburger,

Associate professor of Meteorology, University of California at Los Angeles

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I. INTRODUCTION

The Simi hills constitute a small range extending as a west-southwesterly off-shoot of the Santa Susana mountains and separated therefrom by the Simi valley, and from the Santa Monica mountains by the Russell valley. As such they form the head of the San Fernando valley.

During the day in summer the up-valley winds carry air westward up the San Fernando valley and eastward up the Simi valley, converging toward the Simi hills. During the night the opposite situation prevails, with down-valley winds diverging from the Simi hills. The currents coming up the Simi hills from both sides in the daytime could result in calms along the divide, or they could bend northeastward or southwestward along the range, if there were a general pressure gradient at 2,000 feet of sufficient magnitude. Similarly, the currents descending the hills at night could emanate from a region of calm at the hill-tops, or they could diverge from a general along-the-ridge current.

Because the available meteorological observations are not adequate to answer a question of detail of this sort, a program of observations was undertaken in the attempt to answer it in a period of 2 weeks. Such a short series of observations obviously cannot result in reliable averages or frequency distributions, but must be regarded as a sample which may or may not be representative either of the normal condition to be expected or the degree of variability about that normal. To some extent the representativeness may be judged by the general weather conditions prevailing at the time.

Since the information of interest was not merely the wind at the proposed site itself, but the direction and distance pollutants which might be carried from it by the wind, it was decided to observe constant level balloon trajectories. These trajectories, if the balloon has truly zero lift, would be the paths taken by the pollutants emitted at that level and time. Insofar as personnel permitted, an attempt was made to get a trajectory every 3 hours both day and night for a period of 2 weeks. It was thought that by taking a period of this length it was probable that the various regimes likely to prevail in summer would be encountered.

As a rule, the attempt was to follow the balloon for 1 hour. In cases where considerably shorter runs were made and it seemed feasible that a second one might succeed, a second was attempted. Because of the rough terrain it was usually necessary to give the balloon a slight free lift in order that it should not be carried downward by local currents into obstacles or out of sight. As a result the balloon rose during the course of an hour somewhat more than could be attributed to the vertical currents, and the trajectories do not necessarily represent the path of the surface air. The knowledge of the upper currents likewise is of importance, and thus the slight ascension rate of some of the balloons added to rather than detracted from the information obtained.

II. ANALYSIS OF DATA AND CONCLUSIONS

The results of the observations are displayed day by day on Plates 1 through 11. Several generalizations may be made by inspection of the observations.

(1) The total distance covered during the period of observation was small. None of the balloons watched for the full hour went farther than 8 miles from the point of release, and of those observed for a shorter period, none had an average speed greater than 12 miles an hour.

(2) The directions from the point of release to the final point were widely dispersed, but there was a marked sparsity of net movement toward the south and southeast.

(3) The initial speeds, as shown by the movement during the first 10 minutes, were light, with none greater than 12 miles per hour and most of them less than 6. The night and early morning values were in general lighter than the afternoon and early evening ones.

(4) The initial directions, as shown by the movement during the first 10 minutes, showed a definite diurnal pattern, with northwest and west-northwest winds occurring at the point of release during

almost all the observations taken between 10 a.m. and midnight, and southeast winds occurring between midnight and 10 a.m.

(5) None of the winds, even when the balloon ascended to fairly high elevations (up to 10,000 feet in two cases), were strong. The strongest observed was 24 miles per hour, from the east-northeast, at about 5,000 feet elevation, at 9 a.m. on the morning of July 29.

Plate 12 illustrates points (3) and (4) above by bringing together on the same chart the trajectories of balloons released at approximately 3 a.m. (continuous lines) and 3 p.m. (dashed lines) on several days. In spite of their diverse ultimate courses, all the continuous lines go in the same direction the first 5 or 10 minutes, and all of the dashed lines in more or less the opposite direction.

The irregularities of motion subsequent to the initial 10 minutes are explained largely by the change in elevation of the balloons, which brought them into higher level currents, mostly from the south during the period July 23-25 and July 30-31, from the east during the period July 27-29, and from the west during August 1 and 2. These changes in upper currents show that at least three separate weather regimes occurred during the period sampled.

The meteorological interpretation of the observations is quite clear. The point of release was to the northwest of the main ridge. The winds observed at the release point, as described in (3) and (4) above, are the slope winds, northwest upslope in the afternoon and evening and southeast downslope at night and in the forenoon. The fact that the northwest slope is shaded until late in the day is responsible for the late start of the upslope winds. The upslope winds carry the balloon, even with zero lift, up into the upper current, where it then moves independently of, and frequently in the opposite direction to, the slope wind. The upper current is predominantly southerly, but as indicated above, may shift to easterly or westerly at times.

The interpretation with respect to transport of pollutants by the atmosphere is as follows. Pollutants introduced during the afternoon and early evening in summer would be carried southeastward up the slope and

injected into the upper current where they would be carried normally northward, but possibly eastward or westward. It should be mentioned that frequently this current would be in the inversion layer, and thus the pollutants would be prevented by the stability of the air from mixing downward into the surface air. Even when the upper current was from the west, carrying the air over the San Fernando valley, those particles which had not sufficient fall velocity to drop out in the 4 or 5 miles to the valley would remain suspended. When the inversion is sufficiently high for this current to be below its base, mixing of the thick sub-inversion layer to bring the pollutants to the ground would also dilute the pollution greatly (though not necessarily below harmful limits, if 10^8 dilution is required).

Pollutants introduced during the night would drift slowly northwestward or northward, toward the Simi valley.* Because of the light winds the pollutants would diffuse slowly, even over the rough terrain, and dangerous concentrations could reach the populated areas of the Simi valley.

It must be emphasized that the observations, and the implications deduced therefrom, apply to the summer only. For a reliable evaluation of winter conditions it would be necessary to take a similar series of observations, but preferably over a considerably longer period. However, certain tentative suggestions regarding what may be expected can be advanced by considering the effect of the differences between the winter and the summer on the summer observations. In the first place, during fair weather in the winter the sun is lower and does not come around as far to the west, so that the northwest slope would be much less heated. Thus the daytime upslope wind would be lighter and of shorter duration, and the night-time downslope wind would be stronger and last longer. During winter the periods of fair weather are interspersed with periods of storms, during which the diurnal periodicity is completely displaced. While storms are approaching, the winds are usually from the southeast and south in Southern California. The effect of the mountains might be to make the wind at the Santa Susana site easterly or southeasterly during the approach of the storms. After the storm passage the wind goes around to the northwest or north. In both cases the wind could be strong.

* In the earlier report, "General Reactor Site Survey of the Los Angeles Area," the present writer is quoted to the effect that the night-time drainage from this site would be eastward into the San Fernando valley. This statement was based on the erroneous impression that the site was on the eastern slope of the range.

In terms of pollution disposal in winter, the above discussion leads to the following consequences.

(1) In fair weather there is no likelihood of pollutants injected in the daytime being carried to the San Fernando valley. On the other hand the likelihood of pollution injected at night being carried into the Simi valley is greatly increased.

(2) Pollution injected during the time a storm is approaching might be carried rapidly toward the Simi valley. However, under these conditions the lower layers of the atmosphere would be relatively unstable and the wind fresh and turbulent, so that dilution would be rapid.

In summary, the observations indicate that it is unlikely that pollutants from the Santa Susana site would affect any highly populated areas, but there is some likelihood pollutants injected at night would affect the populated areas of the Simi valley.

III. PROCEDURE

A. Preliminary Survey

Three observation points were established near the proposed site. One, "Able," (see Fig. 1) overlooked the San Fernando valley; a second, "Charley," overlooked the Simi valley, and the third, "Baker," (see Fig. 2) was the highest point in the vicinity and overlooked the entire area except directly behind some of the lower adjacent hills. Lines between the three points formed a triangle and were the observation base lines.

Boundary markers in the area were found, and by triangulation methods the observation points were accurately located. The azimuths and lengths of the three base lines were then determined.

B. Equipment Installation

A jeep was obtained for the field parties to use and with a little road work with an NAA bulldozer the jeep could get within 100 yards of each of the observation stations.

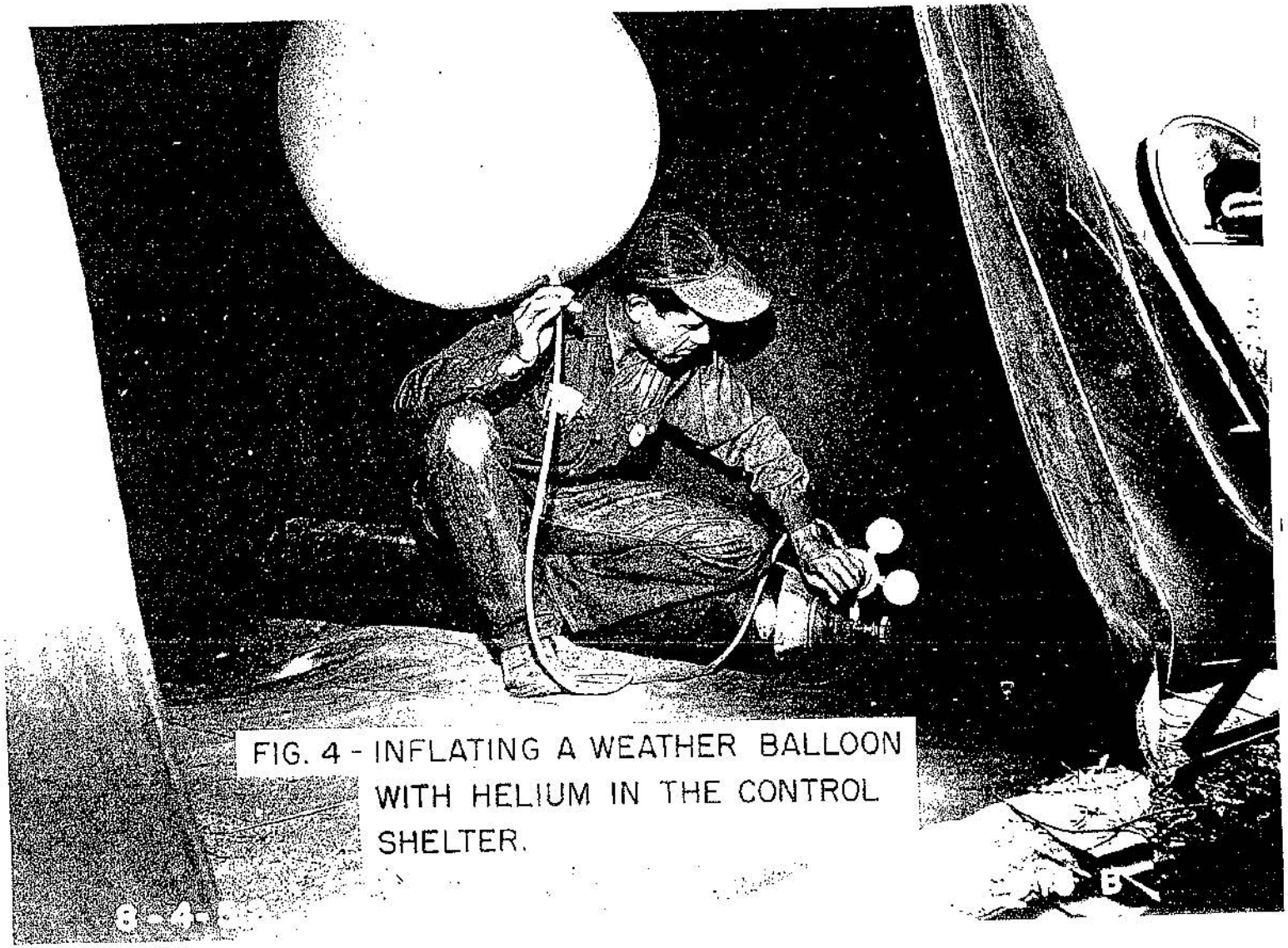

FIG. 4 - INFLATING A WEATHER BALLOON WITH HELIUM IN THE CONTROL SHELTER.

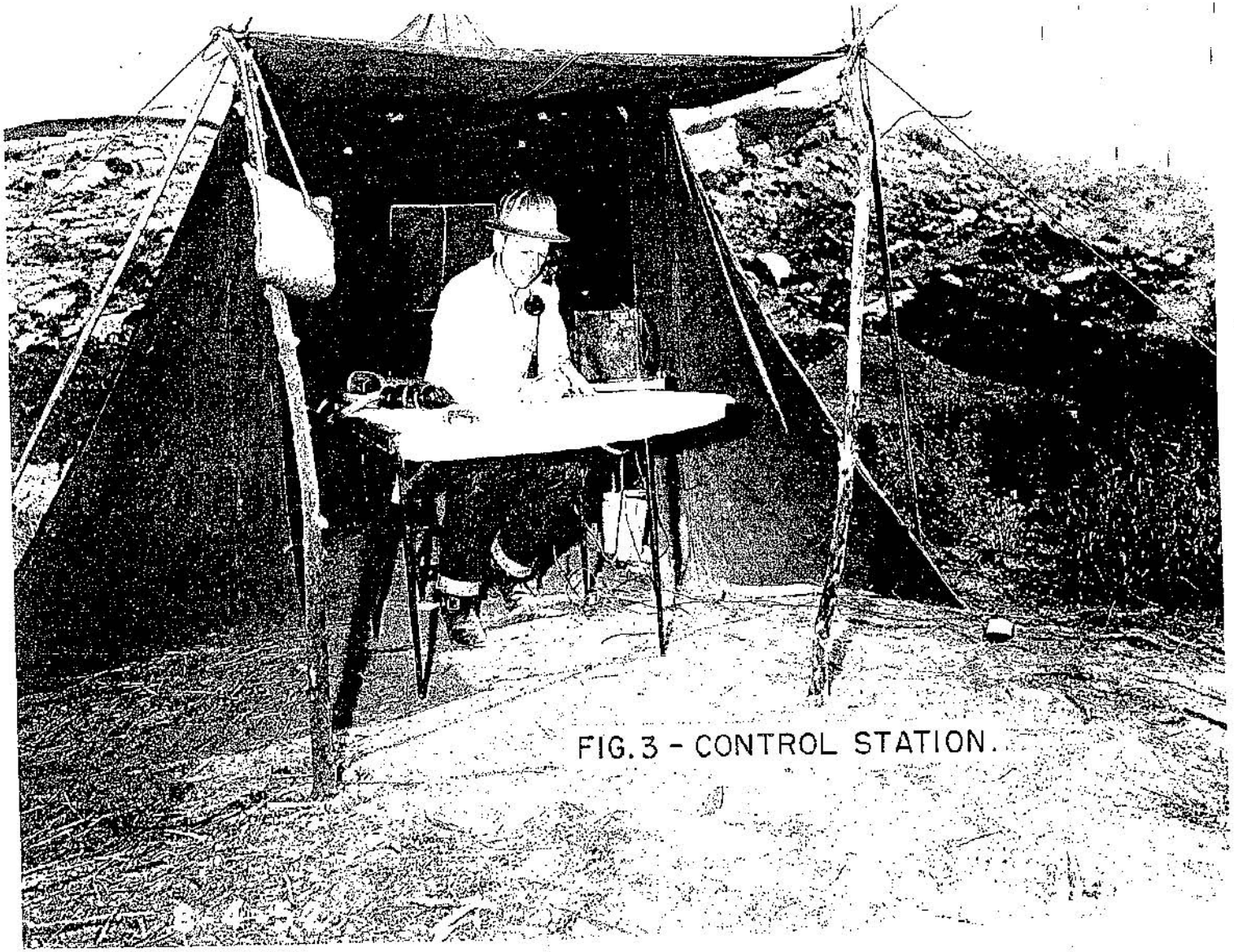

FIG. 3 - CONTROL STATION.

FIG. 2 - OBSERVATION STATION "BAKER" LOOKING WEST TOWARD STATION "CHARLEY" AND THE PROPOSED SITE, AND SHOWING THE OBSERVATION EQUIPMENT.

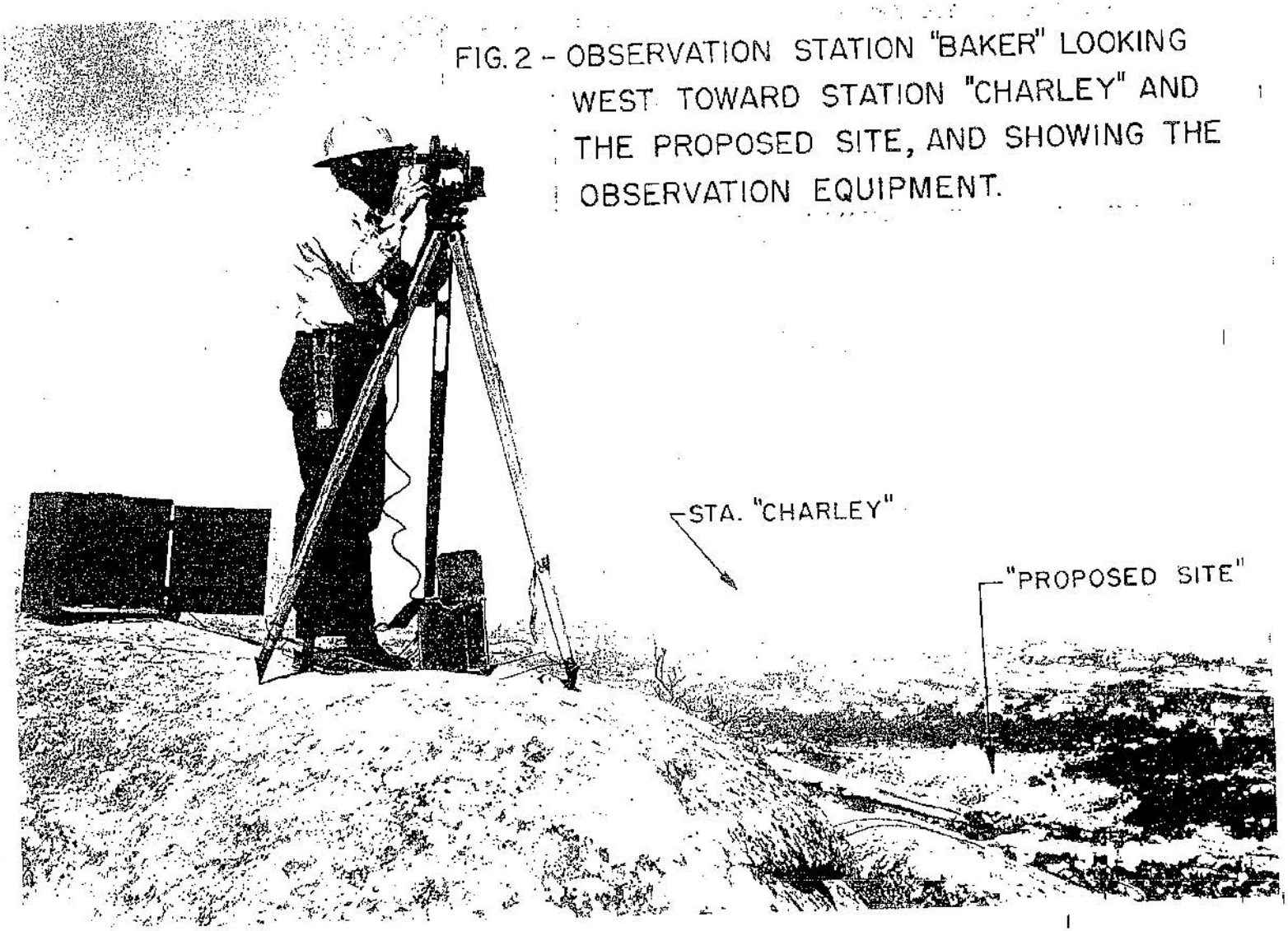

FIG. 1 - OBSERVATION STATION "ABLE" LOOKING WEST TOWARD "BAKER" AND "CHARLEY".

FIG. 5 - A WEATHER BALLOON READY TO BE RELEASED FROM THE CONTROL STATION, THE LIGHT AND BATTERIES HANGING FROM THE BALLOON ARE FOR NIGHT RUNS ONLY.

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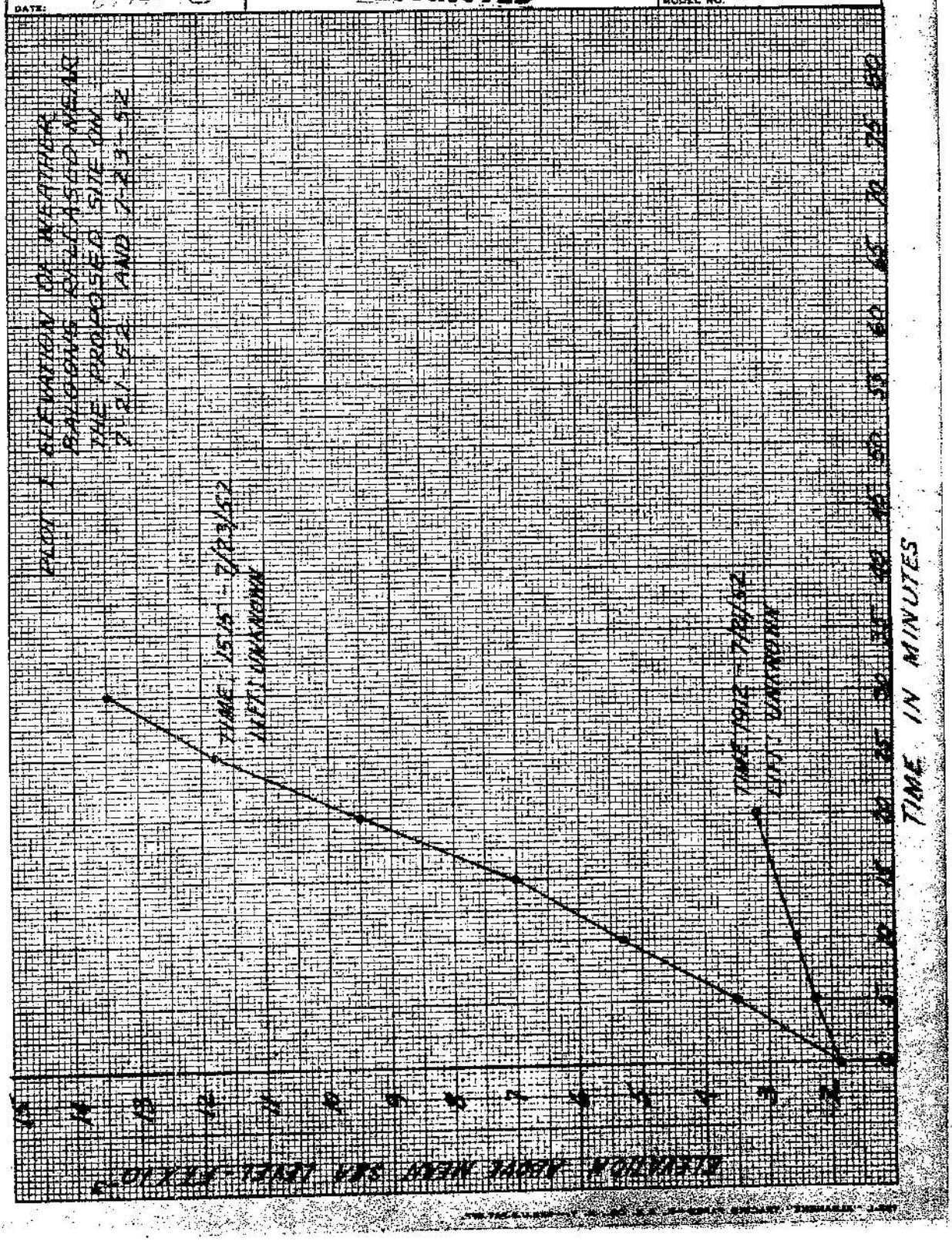

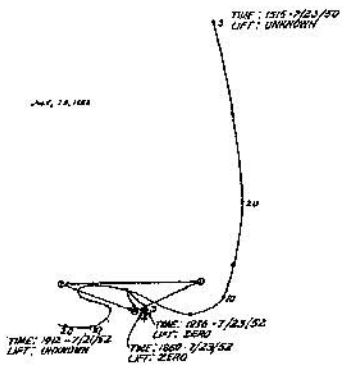
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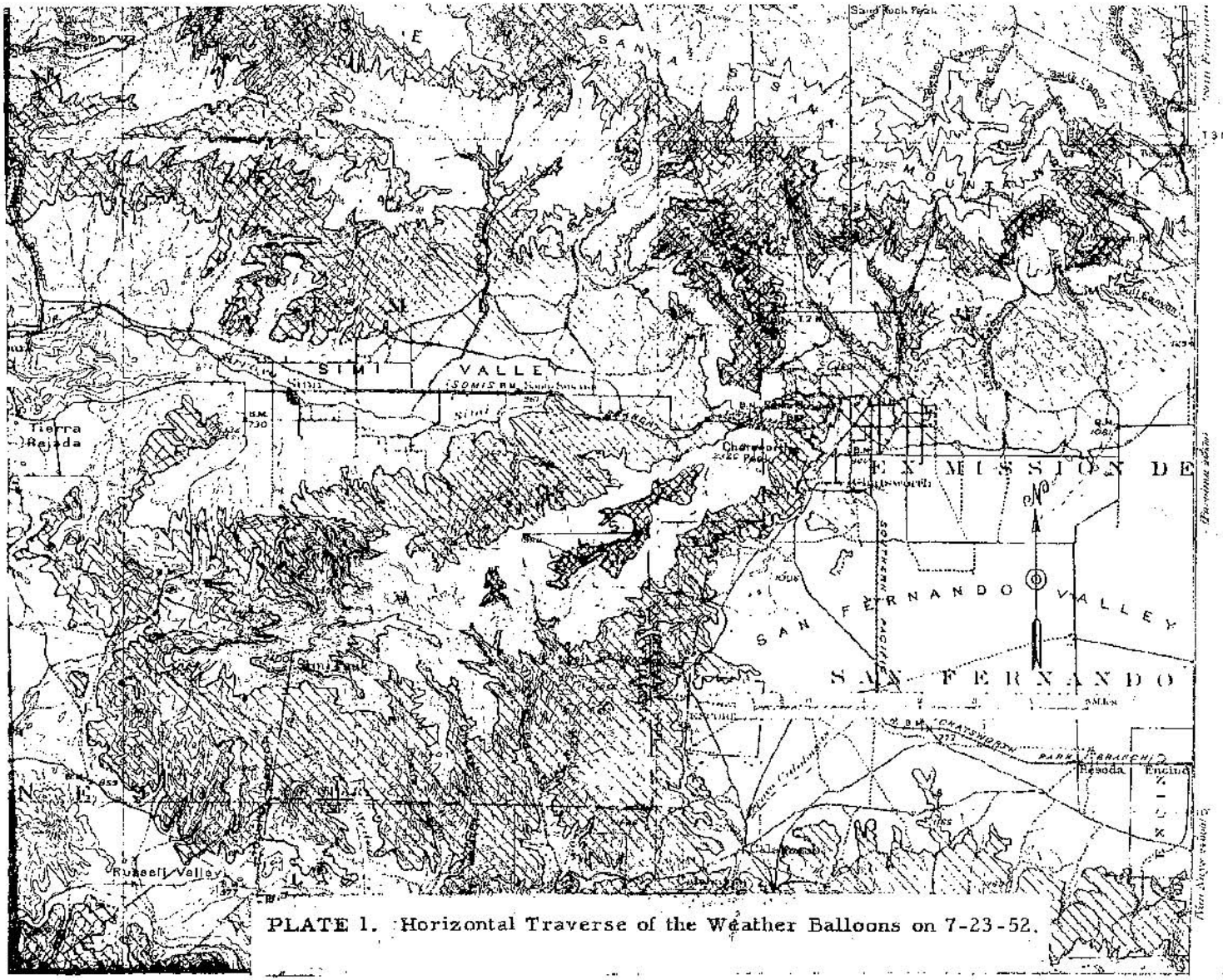

PLATE 1. Horizontal Traverse of the Weather Balloons on 7-23-52.

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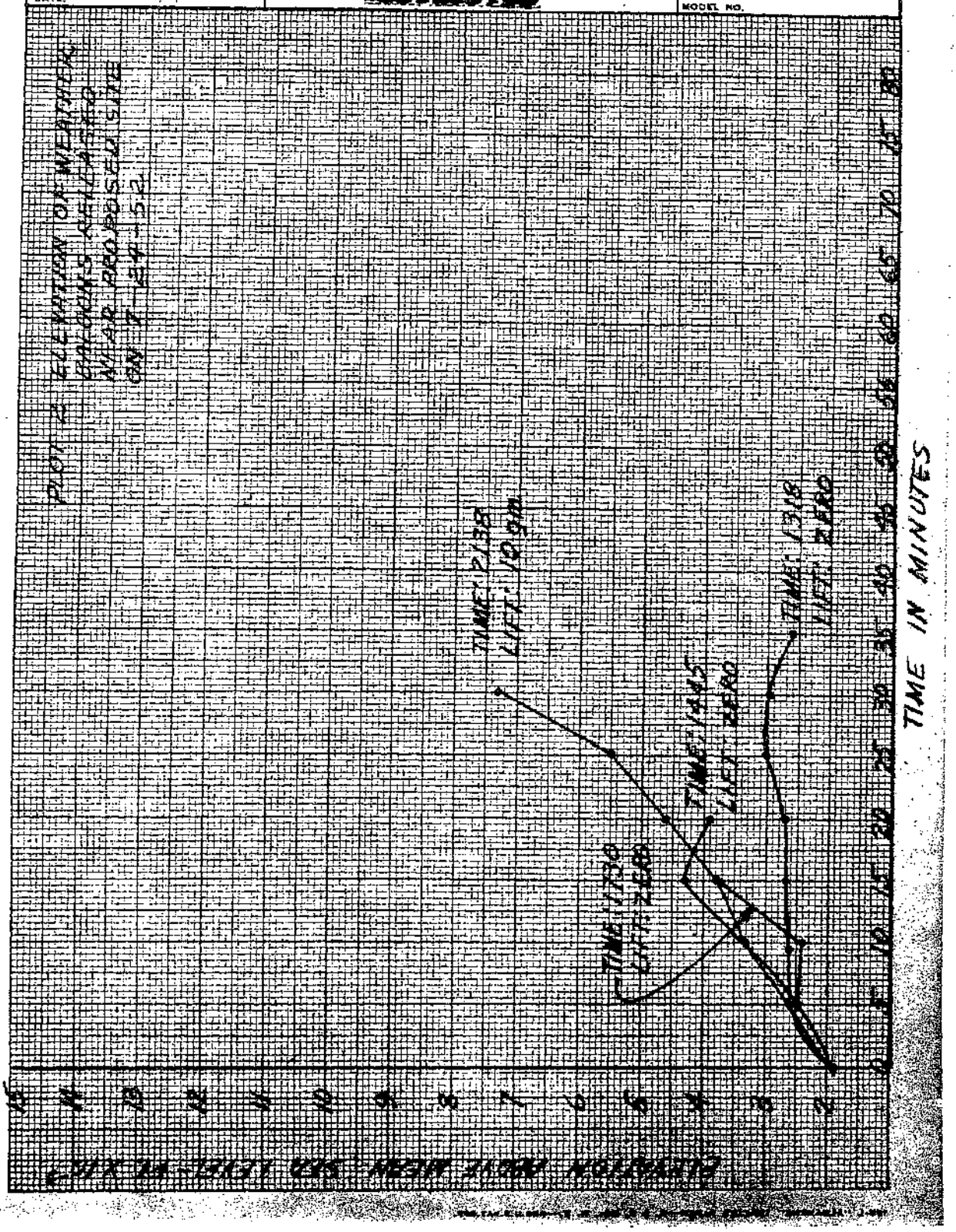
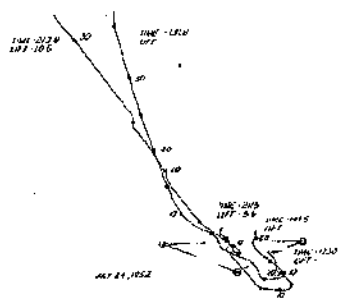
PLOT OF ELEVATION OF METEOR'S EXPLOSIONS RELATIVE TO NIKE PROJECTILE SITE
ON 2-24-52





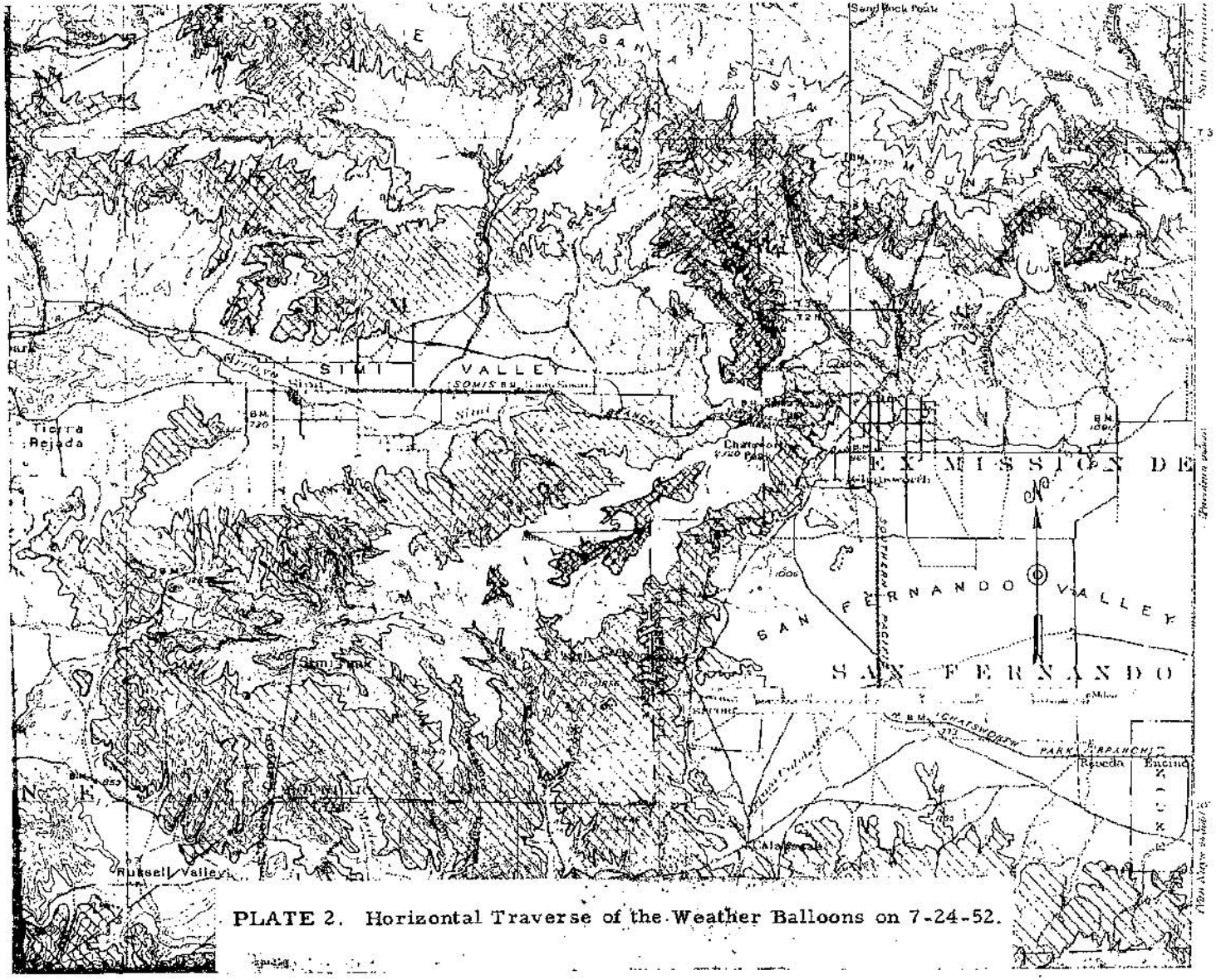


PLATE 2. Horizontal Traverse of the Weather Balloons on 7-24-52.

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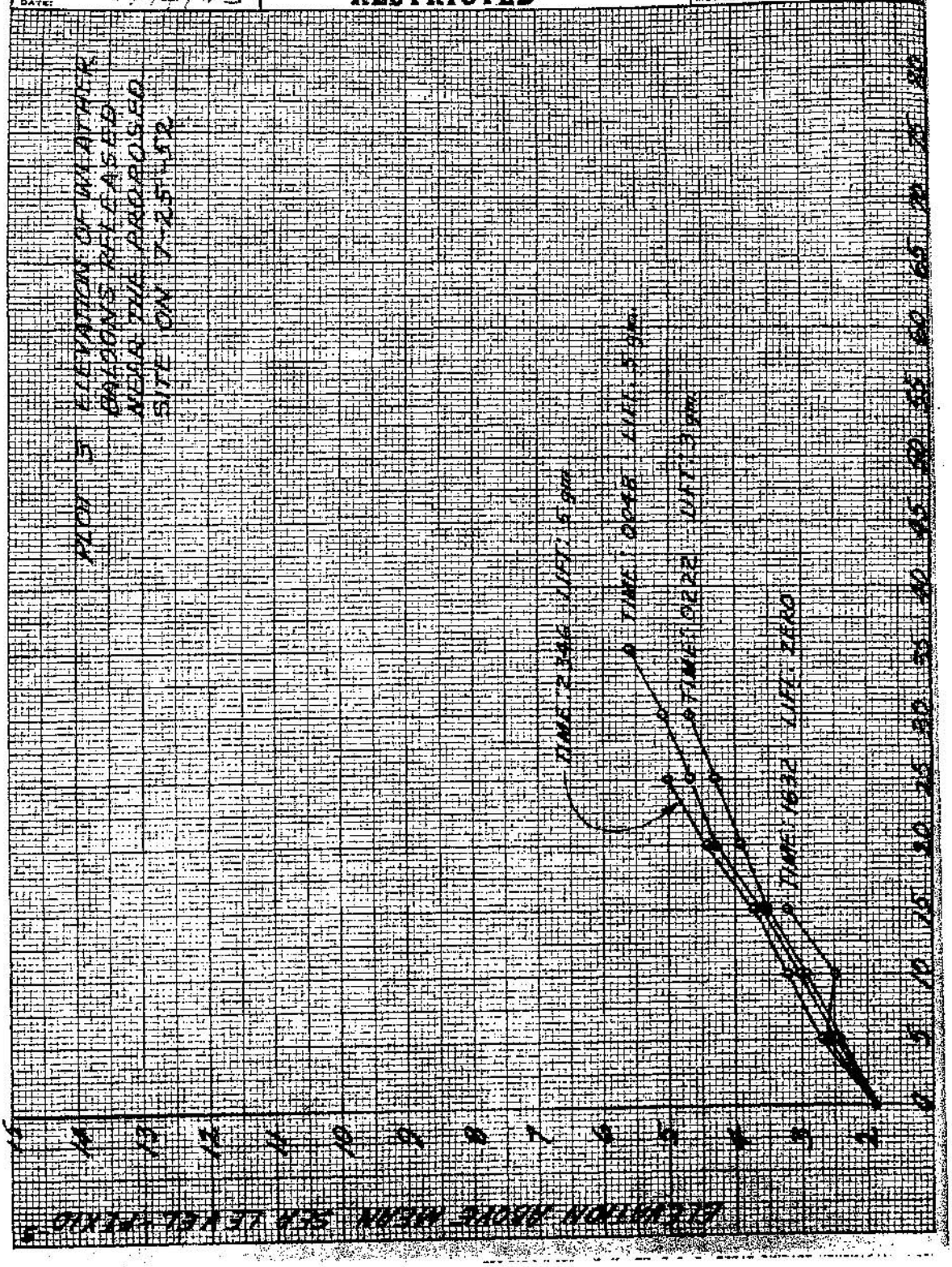

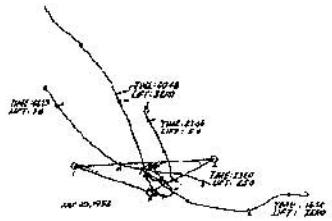

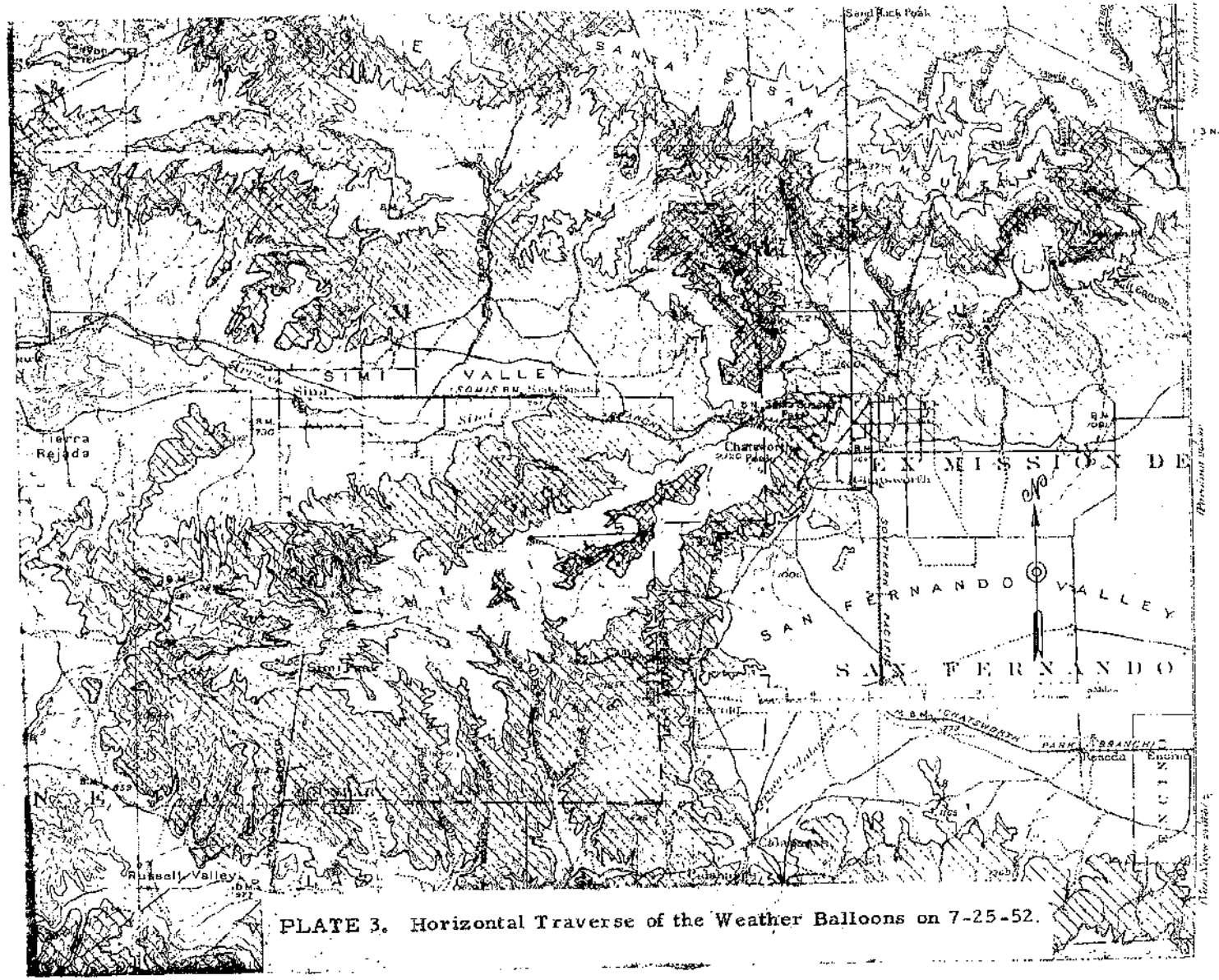

PLATE 3. Horizontal Traverse of the Weather Balloons on 7-25-52.

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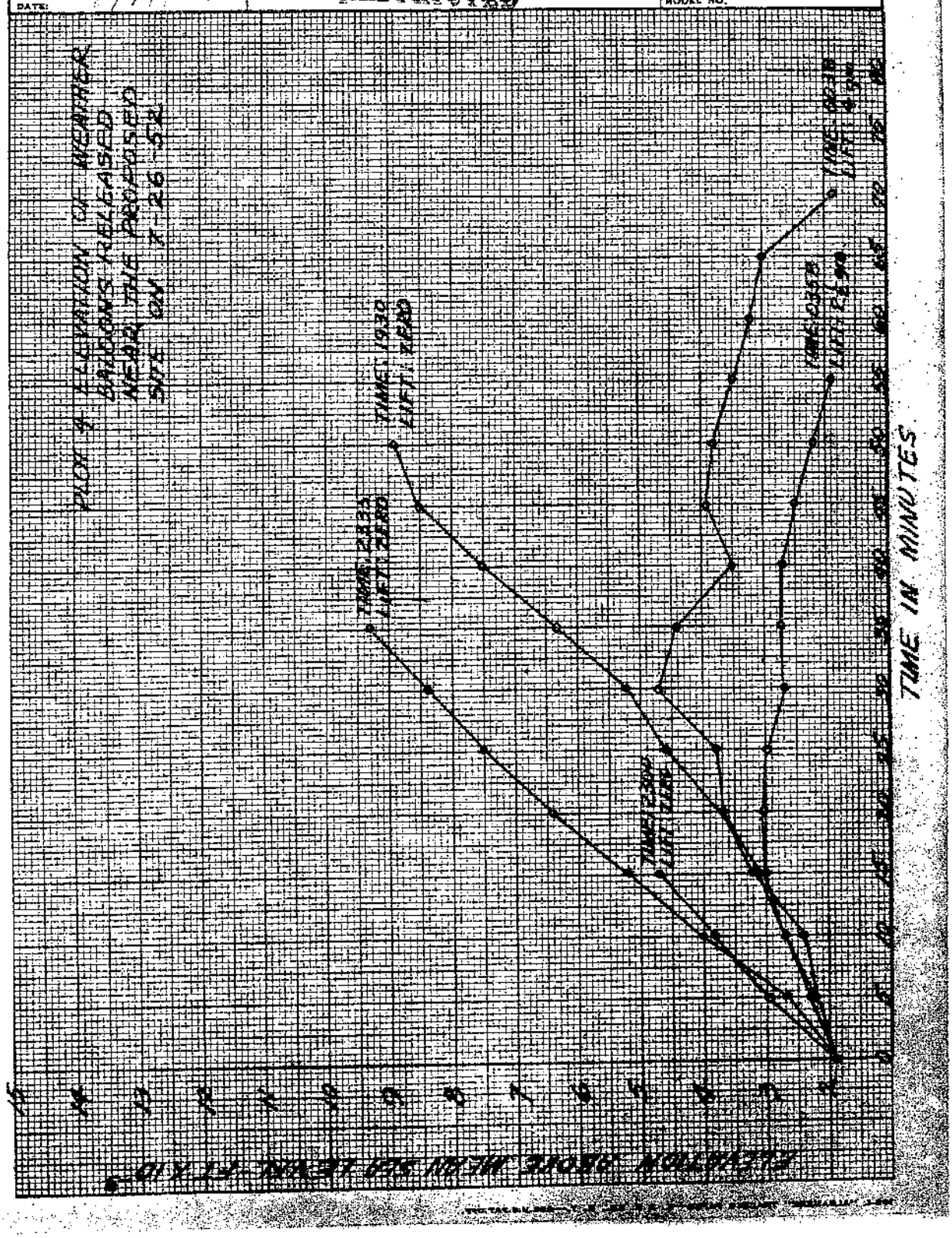

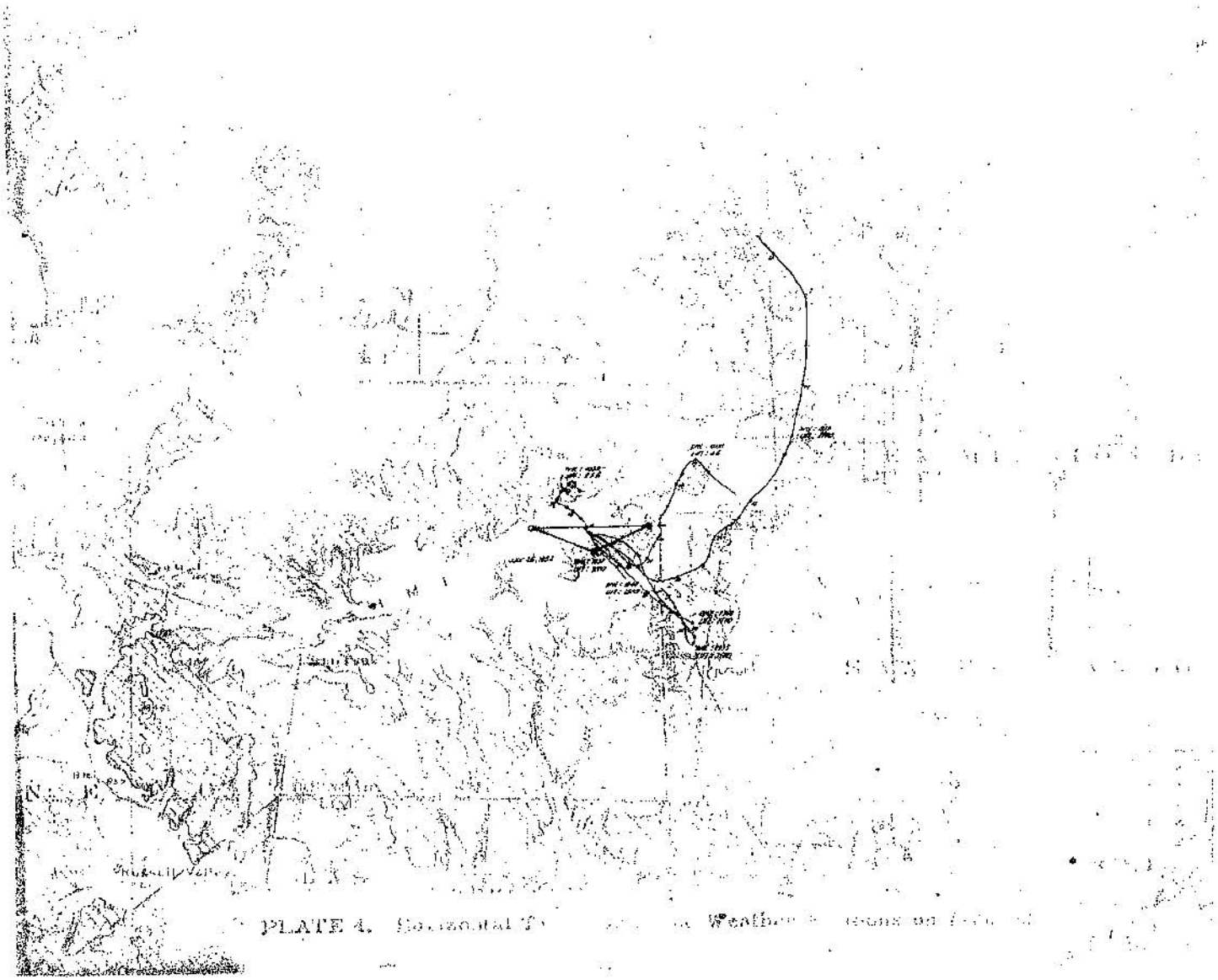

PLATE 4. [illegible] Weather [illegible]

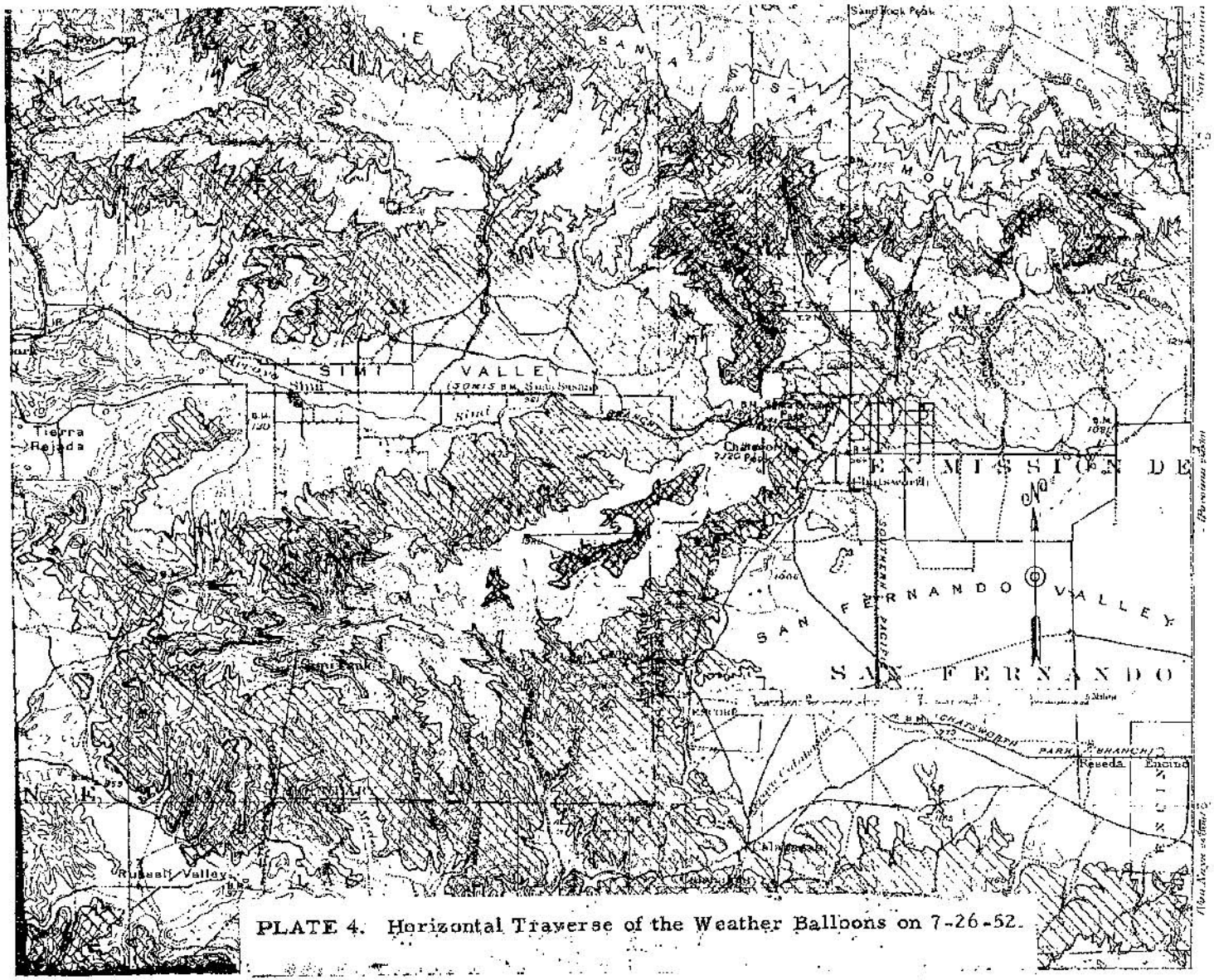

PLATE 4. Horizontal Traverse of the Weather Balloons on 7-26-52.

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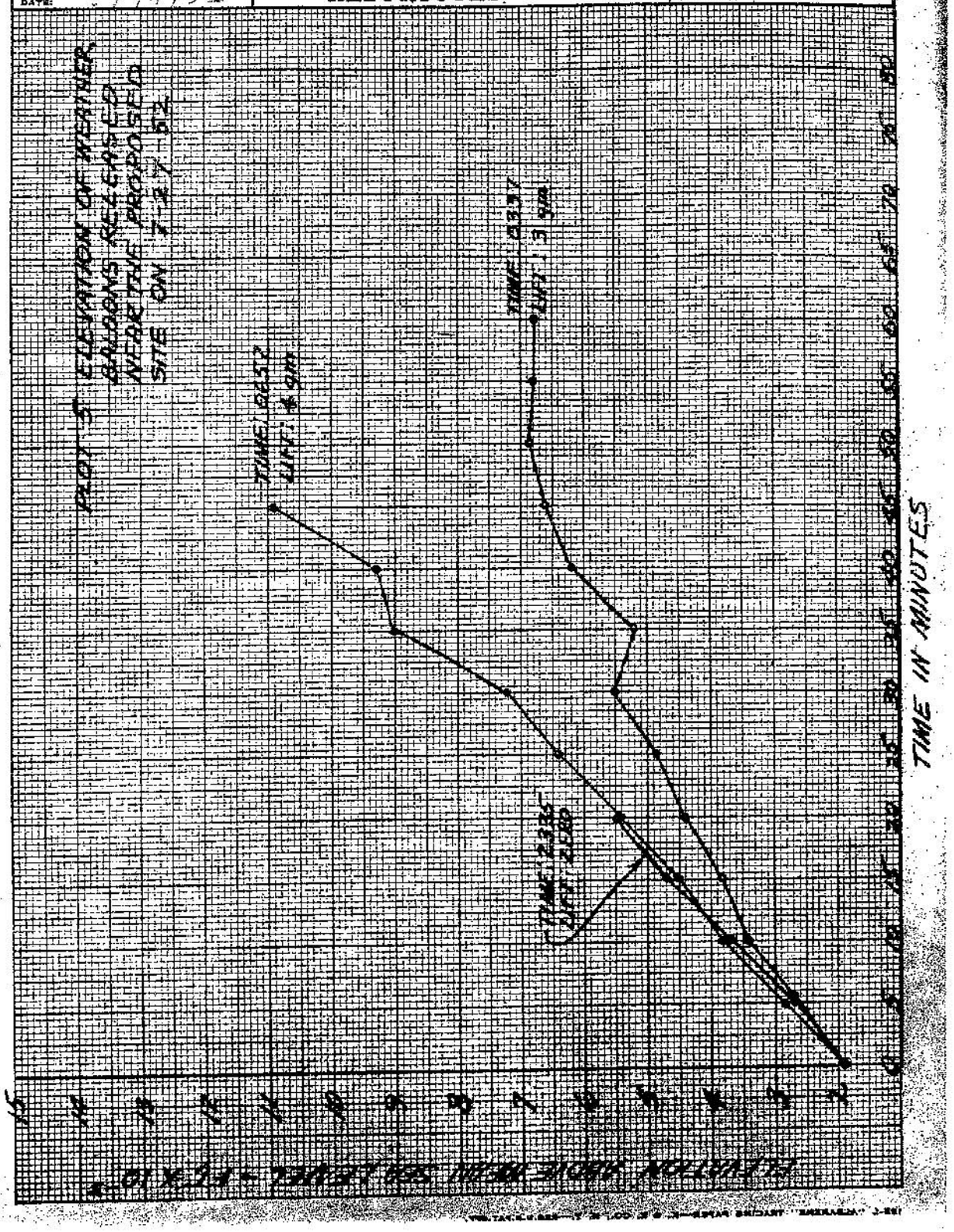

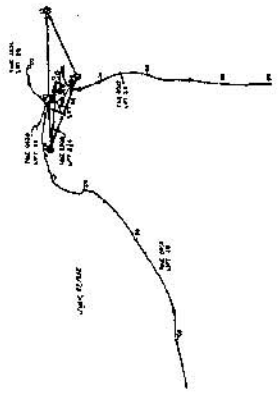

PLATE 5. Horizontal Traverse of the Weather Balloons on 7-27-52.

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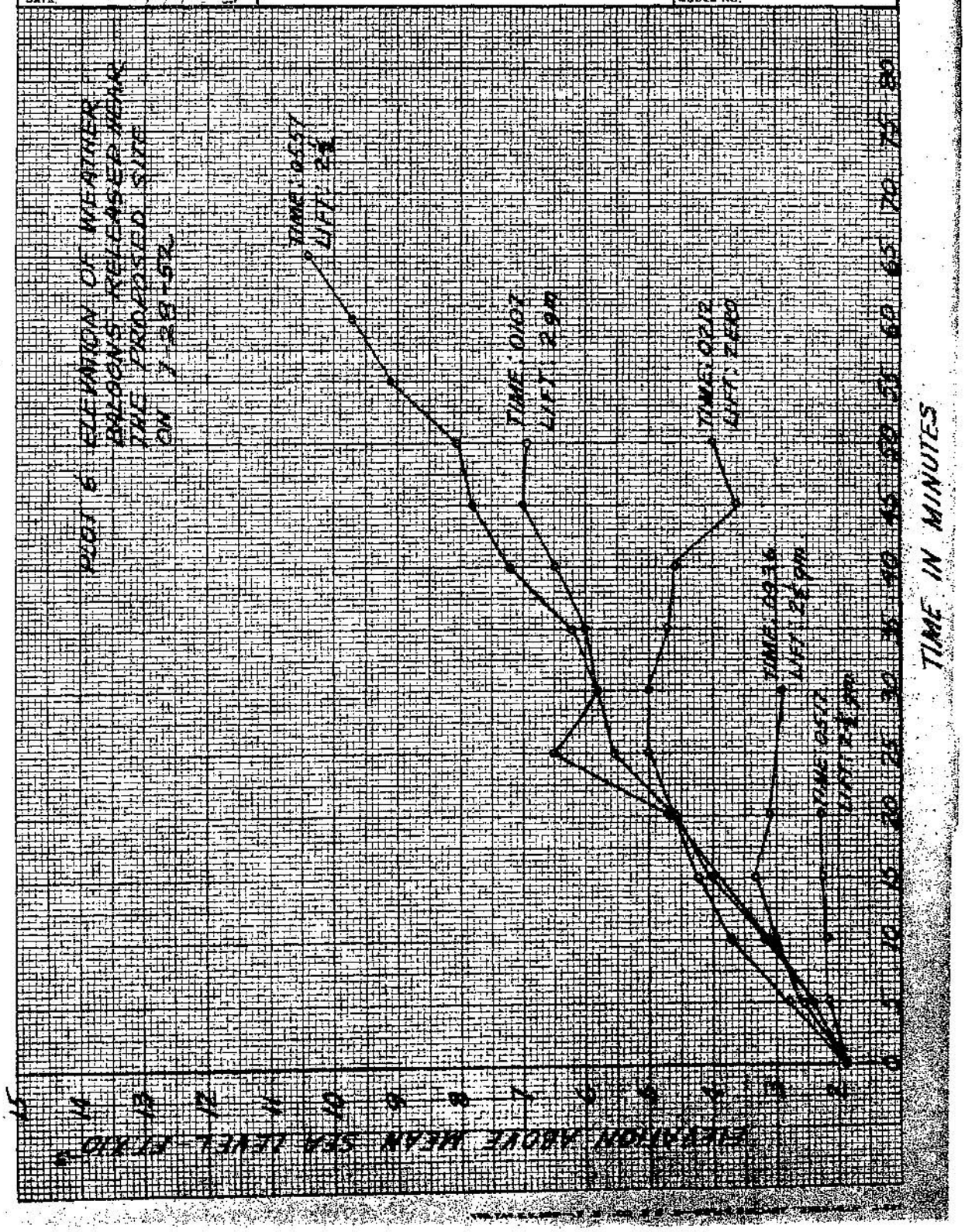

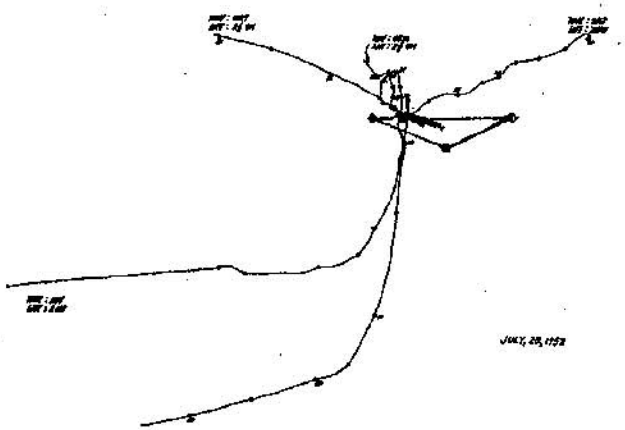

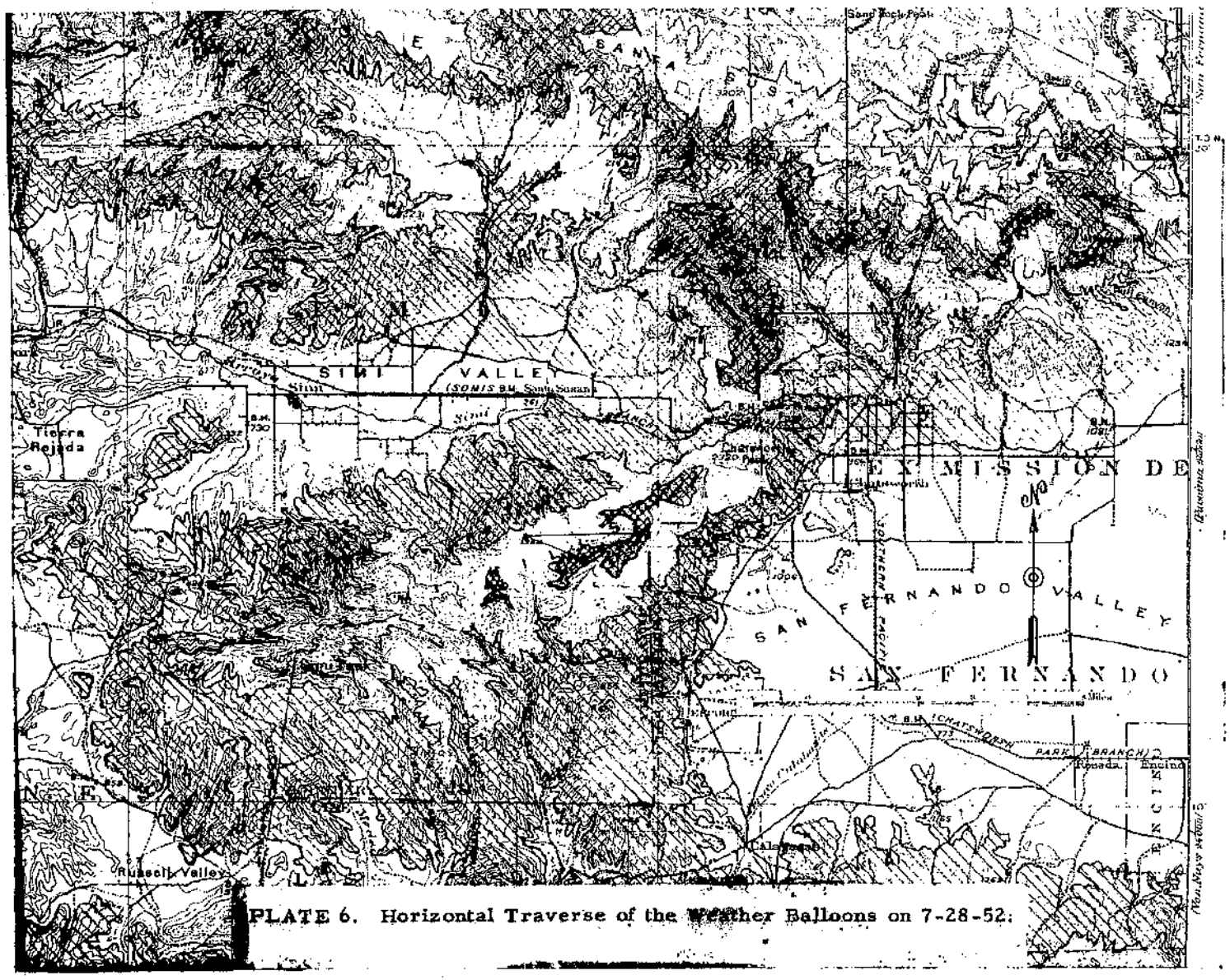

PLATE 6. Horizontal Traverse of the Weather Balloons on 7-28-52.

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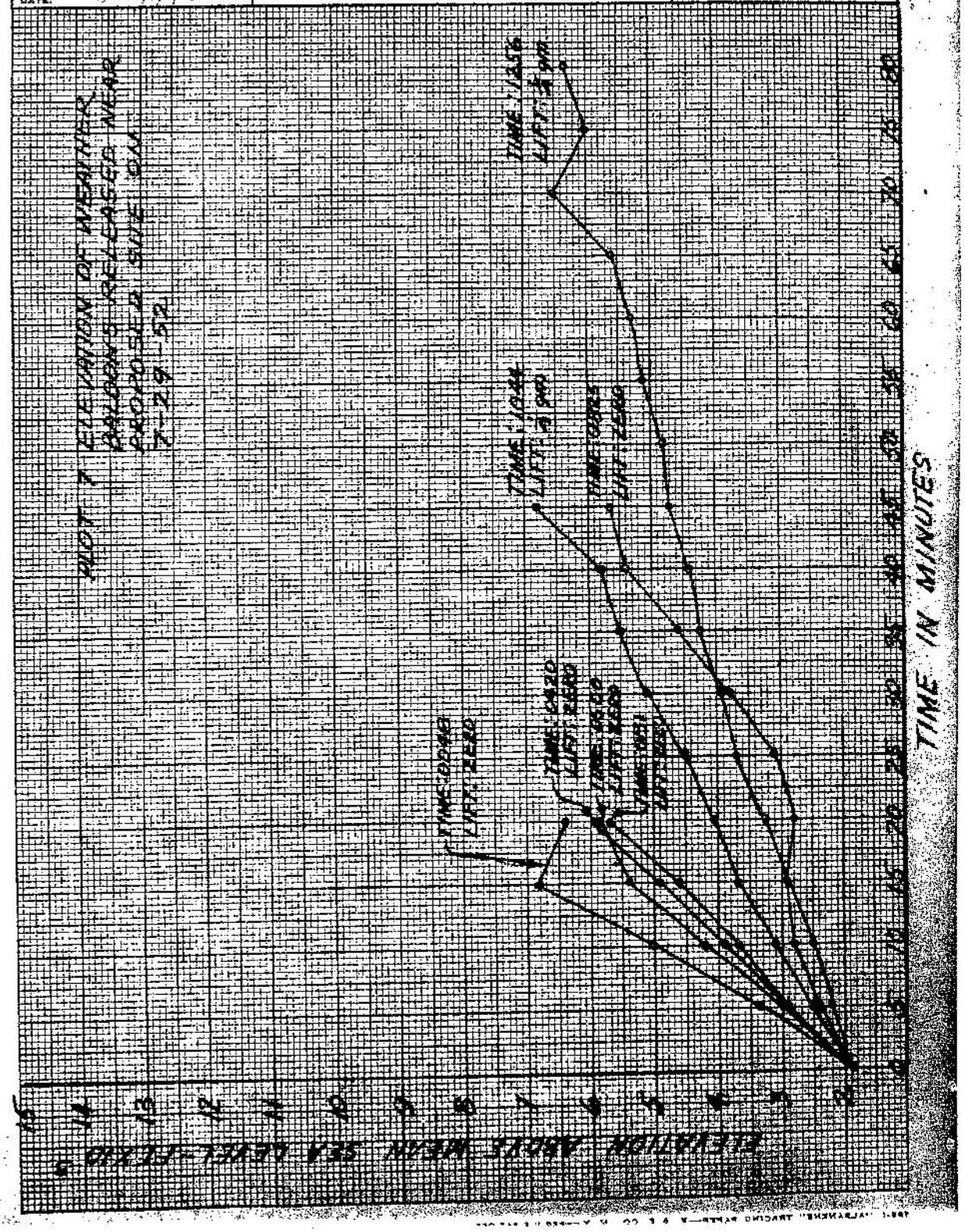

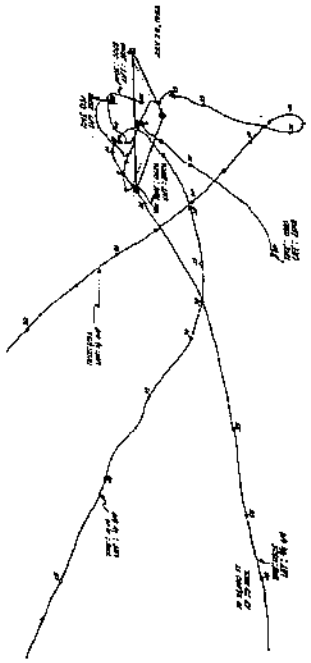

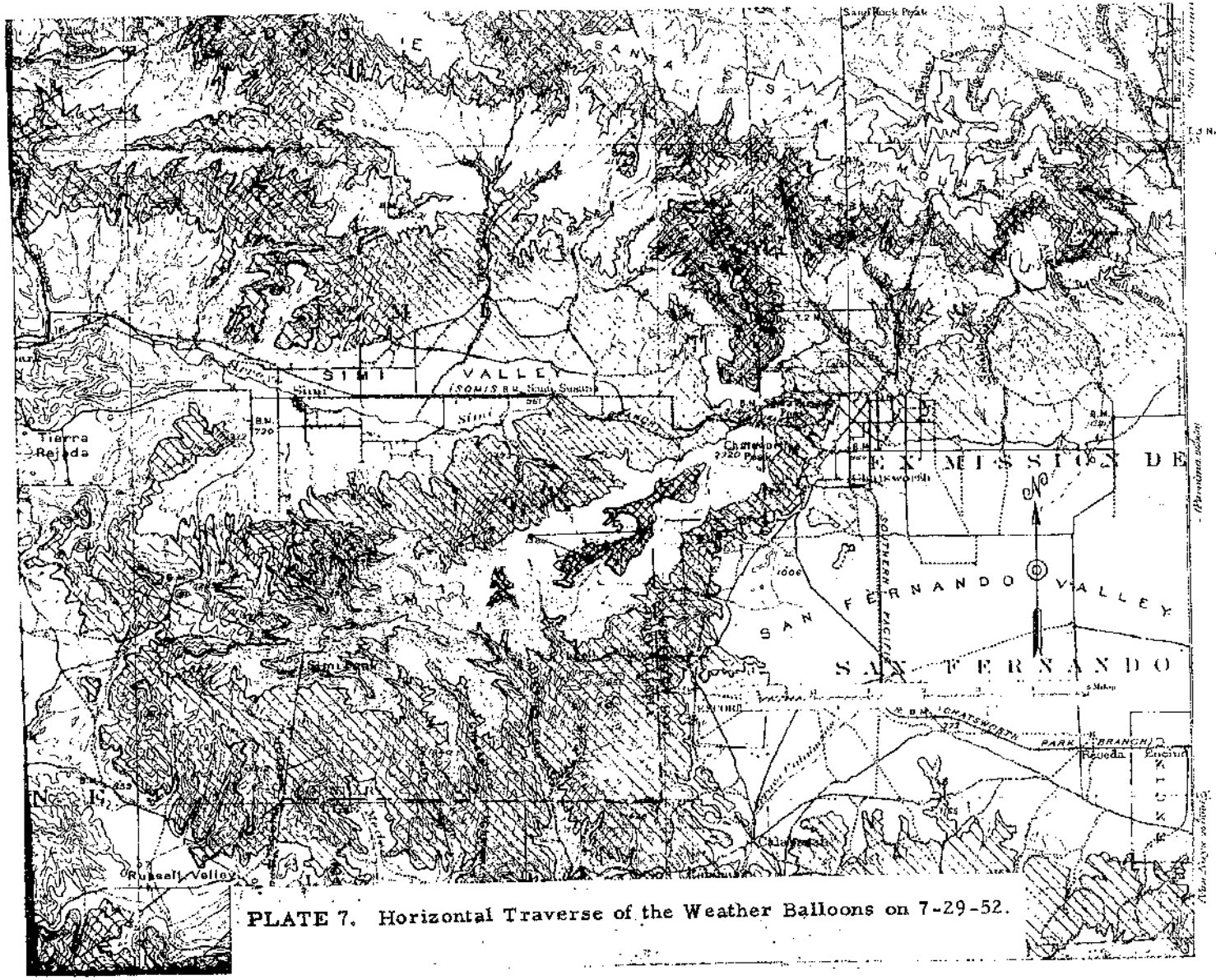

PLATE 7. Horizontal Traverse of the Weather Balloons on 7-29-52.

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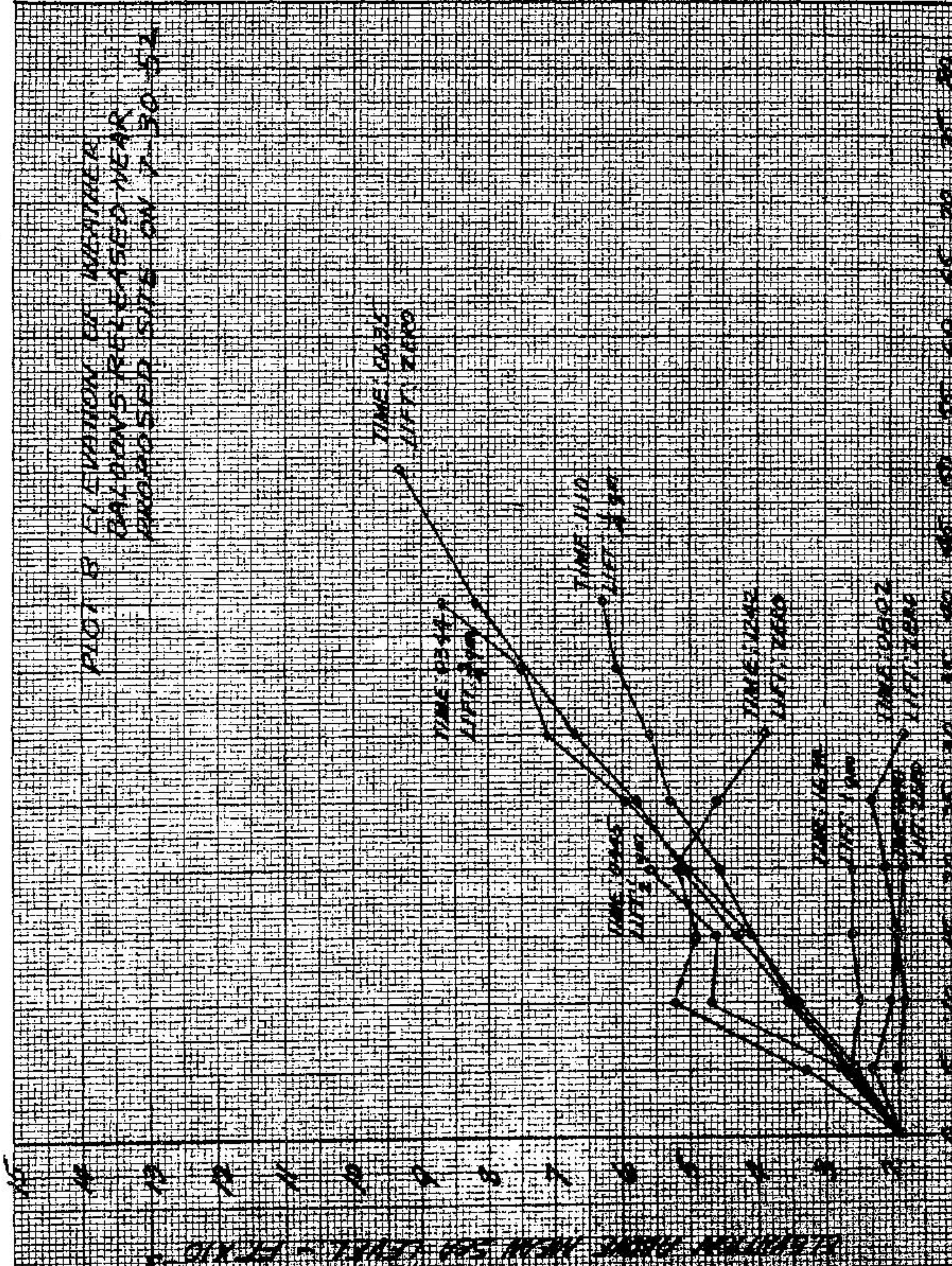

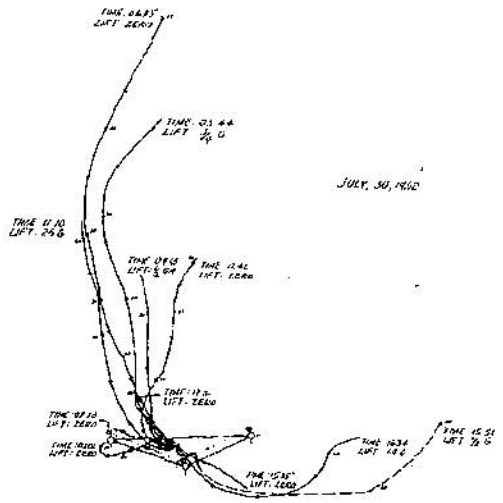
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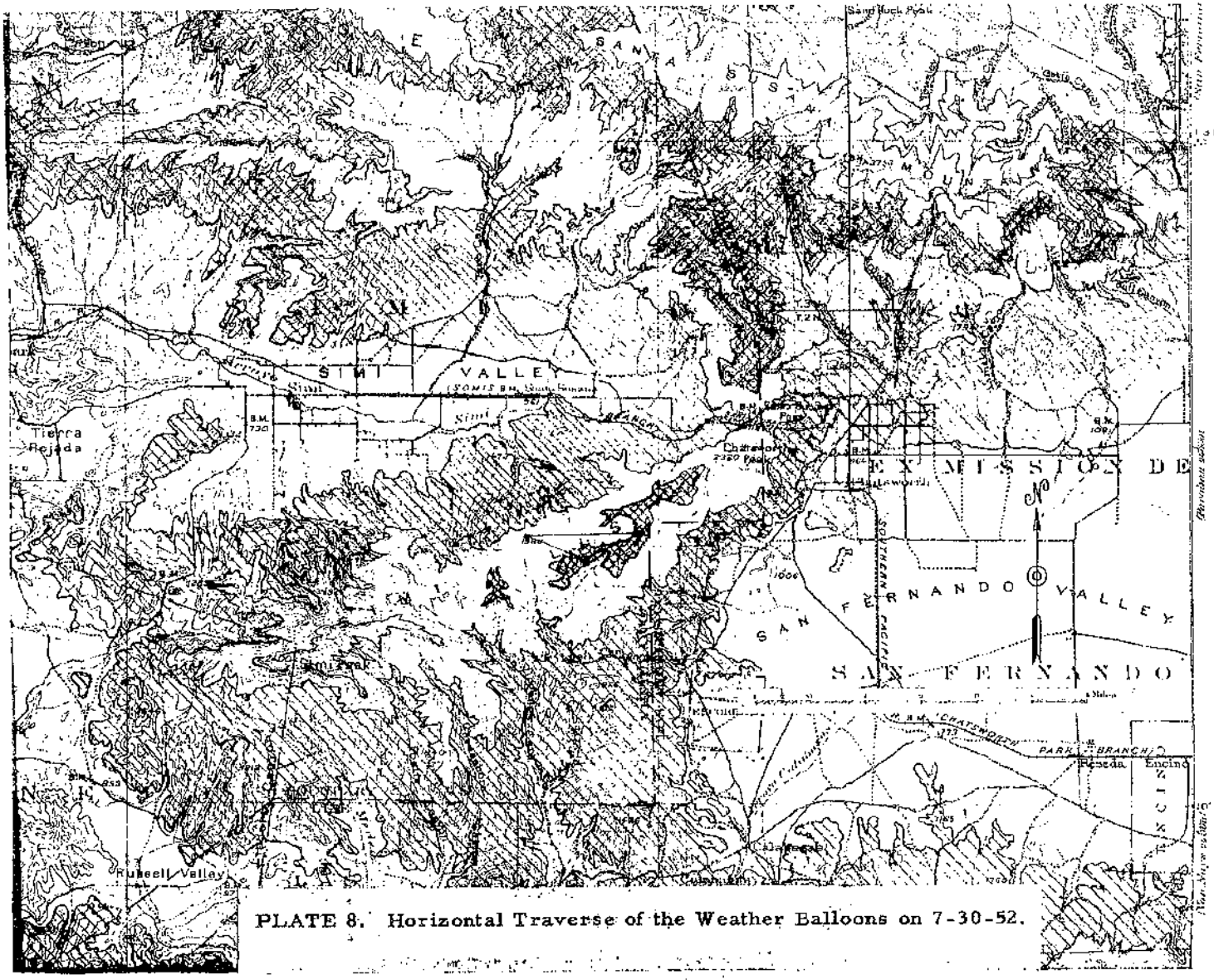

PLATE 8. Horizontal Traverse of the Weather Balloons on 7-30-52.

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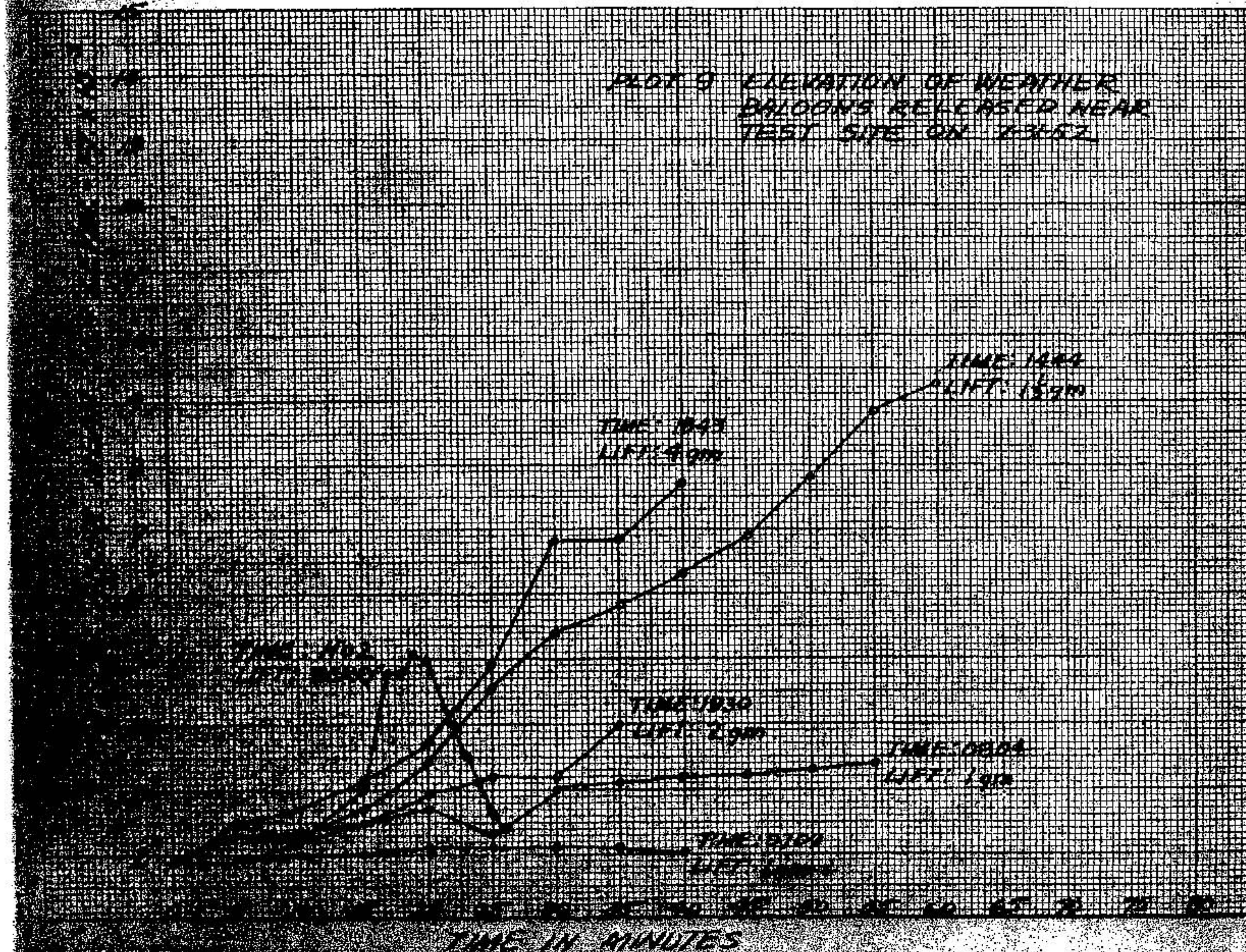

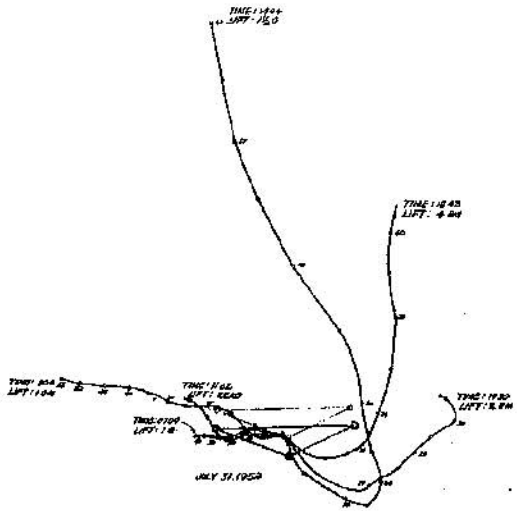
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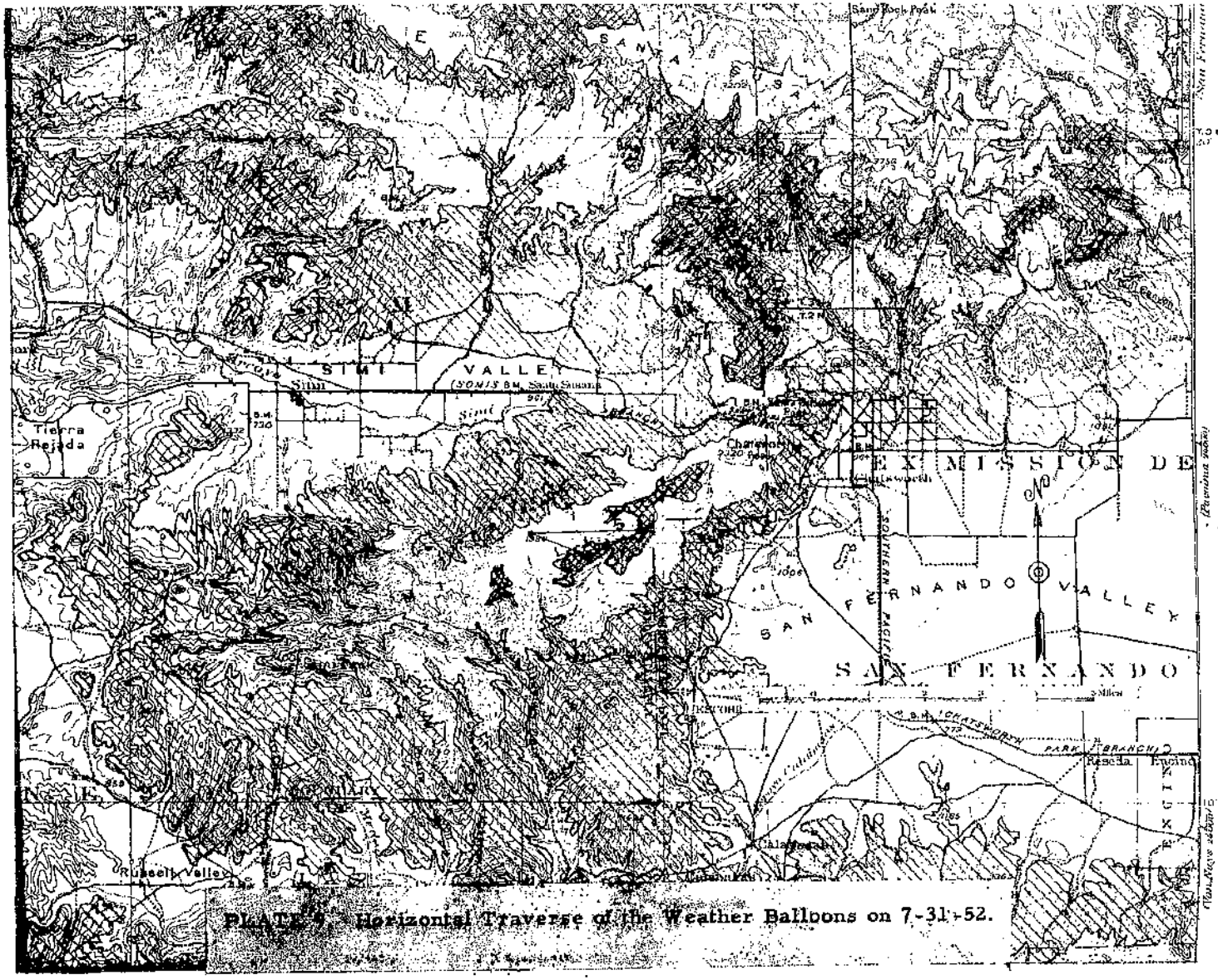

PLATE 7. Horizontal Traverse of the Weather Balloons on 7-31-52.

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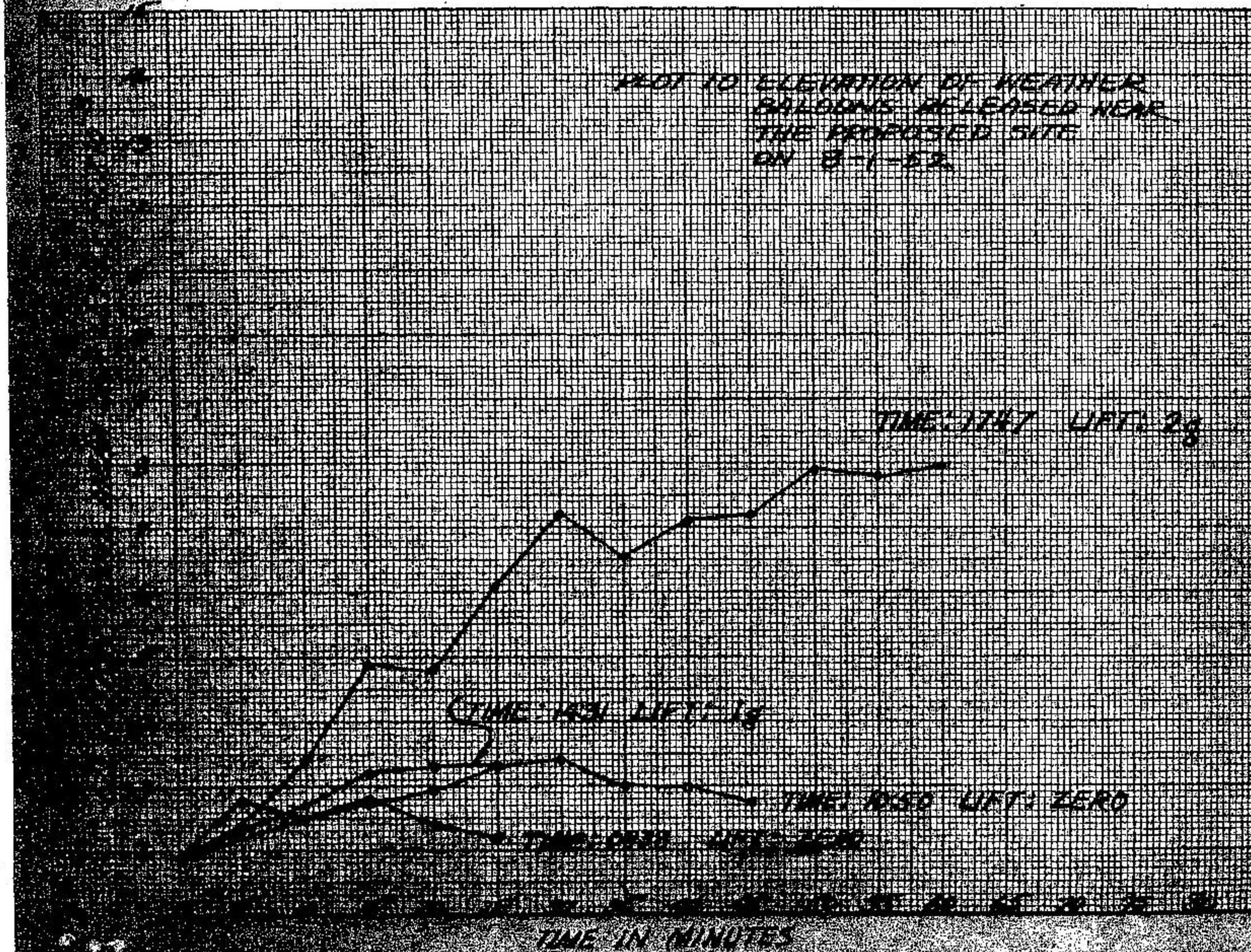

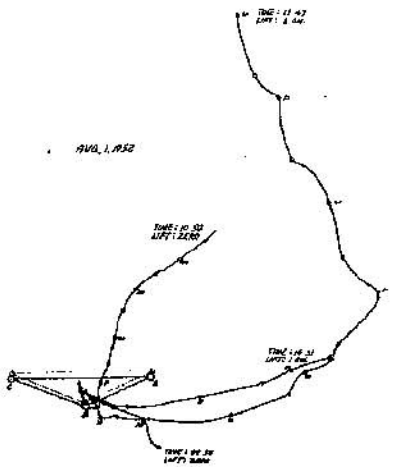

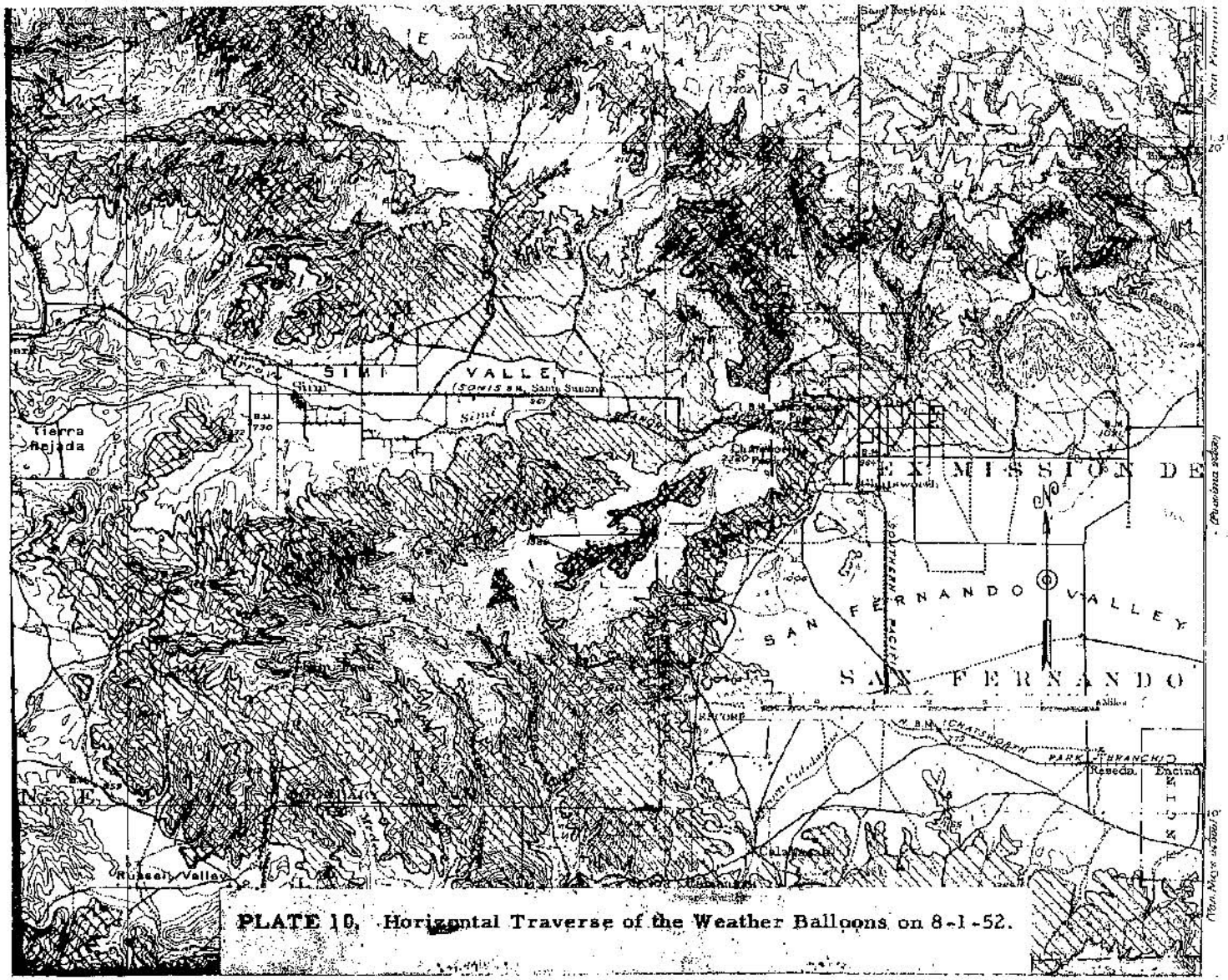

PLATE 10. Horizontal Traverse of the Weather Balloons on 8-1-52.

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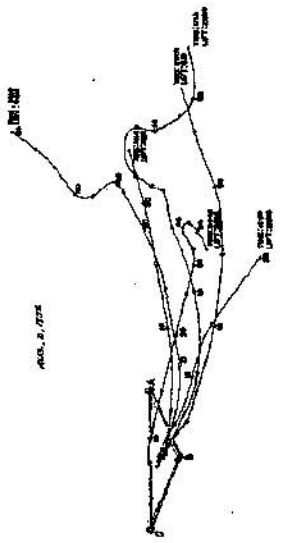


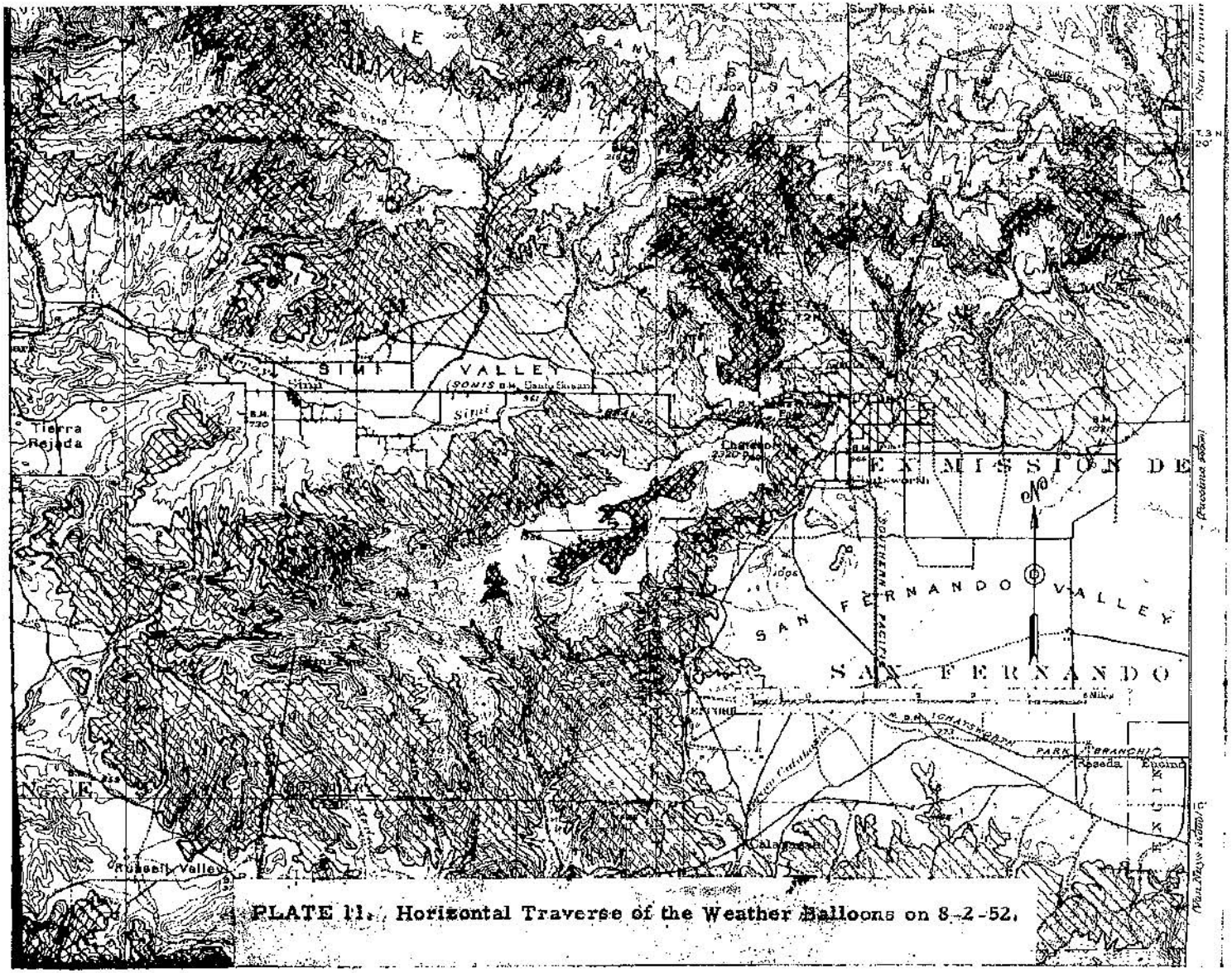
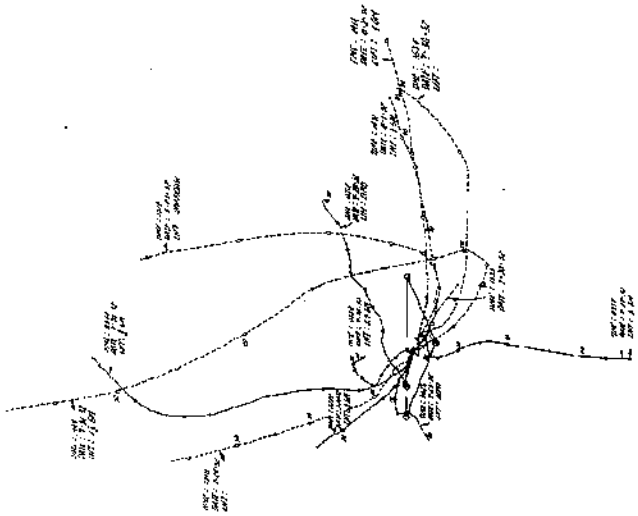


PLATE 11. Horizontal Traverse of the Weather Balloons on 8-2-52.



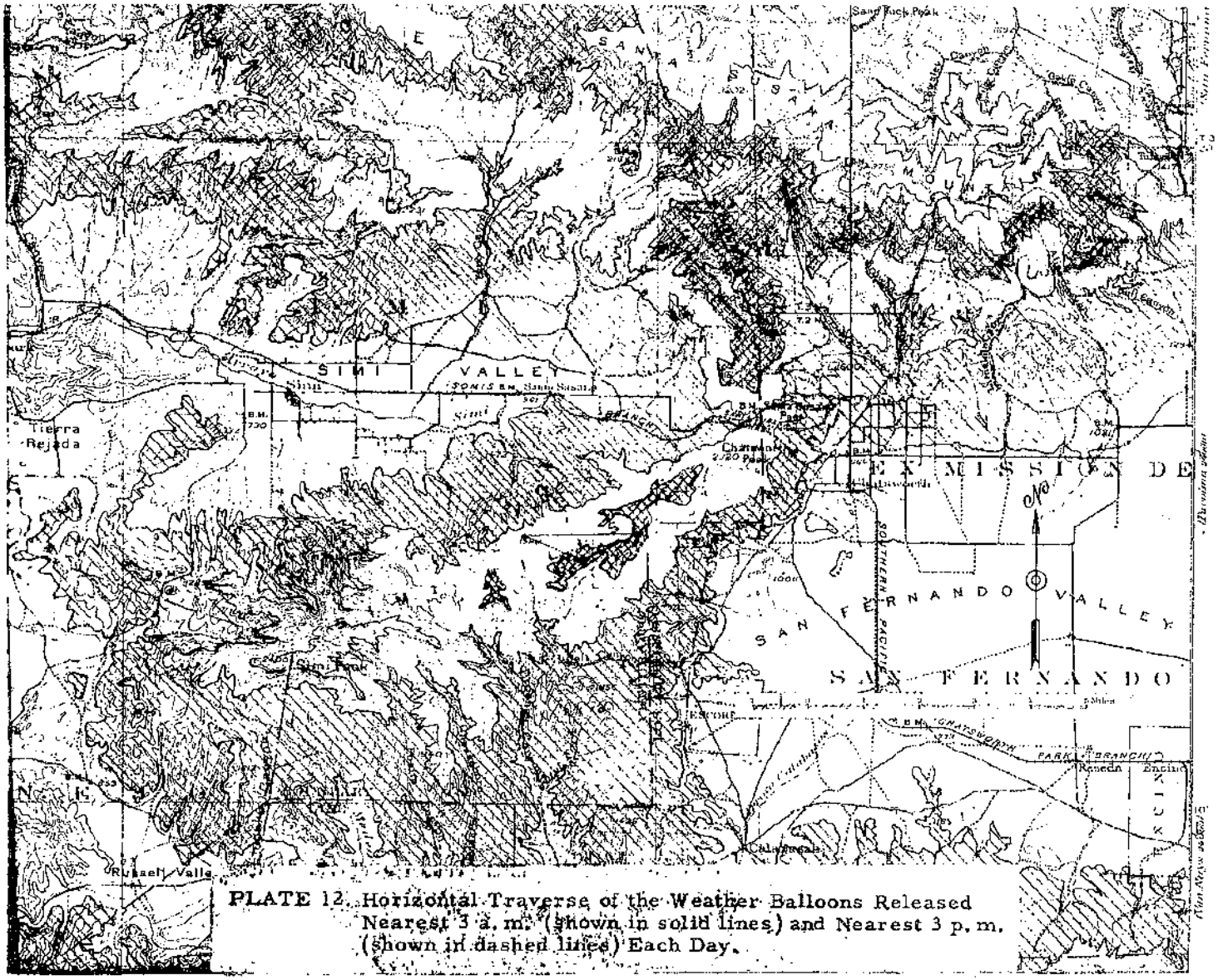


PLATE 12. Horizontal Traverse of the Weather Balloons Released Nearest 3 a. m. (shown in solid lines) and Nearest 3 p. m. (shown in dashed lines) Each Day.