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U. S. WEATHER BUREAU REPORT ON ALERT NUMBER 112

OF THE ATOMIC DETECTION SYSTEM

WASHINGTON, D. C.
September 29, 1949

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OSD letter, April 12, 1974
By NLT-[illegible], NARS Date 10-14-75

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OSD letter, April 12, 1974
By NLT-KC, NARS Date 10-14-75

I. INTRODUCTION

Radiological detection of the emmission of large quantities of radioactive material began on the third of September 1949 and continued several weeks thereafter. Employing this earliest time of detection as well as some subsequent times, the radioactive cloud was backtracked in time to the 29th, 28th and 27th of August 1949. These dates bracket the most probable times of origin. Only meteorological evidence is used to ascertain the points of origin corresponding to those designated times.

II. METEOROLOGICAL DATA AND ANALYSIS

The filter flights that detected radioactive material were made at a pressure altitude of 500 millibars (roughly 18,500 feet). It is possible that the material filtered from the air at 500 mb was particulate matter falling from much greater altitudes, consequently experiencing a different trajectory from the materials remaining at 500 mb. Early results from particle size measurements suggest that the particle diameters are extremely small so that fall-out is negligible compared to the vertical motions associated with diffusion. The fall-out aspect of the problem is therefore not considered in this report and only 500 mb trajectories are discussed.

Constant pressure charts at 500 mb containing all available upper air observations were prepared for two times each day over the required portion of the northern hemisphere. Also, wherever possible, upper wind data for all other times of the day were used. All possible sources of data were exhausted for information, but many weather reports from the USSR are [illegible] unavailable. Some upper air data from Alaska was not received presumably because of teletype failure and has not been obtained by mail in time for incorporation in this report.

Since the wind observations are insufficient to show speeds at all points along the trajectories, it becomes necessary to employ the geostrophic wind computed from the pressure field, as the best approximation to the true wind. It is well known that the geostrophic wind is at times a poor approximation to the actual wind, giving results as much as 25% in error. For this reason, trajectories based on 25% less than and 25% greater than the geostrophic wind were computed to give the minimum and maximum air transport.

The trajectory technique follows that described in Petterssen's textbook "Weather Analysis and Forecasting" and contains the most worthwhile refinements consistent with the quality of the weather data.

In general the meteorological situation during the period involved in this report is one of very little movement or change of wind patterns. The direction of the wind in general remained quite constant with height above 500 mb but the speed increased with altitude. A stationary flow pattern tends to give more reliable trajectories than a changing pattern, for the trajectory method used.

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III. TRAJECTORIES

A. Backtracking.

For the purpose of backtracking, the most important detection data was obtained from the flight made on the third of September. Since the filter remained in operation for three hours, the leg containing the positive detection extended for about 700 nautical miles. It is possible that the flight encountered radioactivity all along the leg, but it is more likely that the activity was confined to a smaller segment beginning and ending some distance from the ends of the 700 mile leg. The reason for such a conclusion is the absence of activity on either side of the single leg which encountered the material. Entirely different trajectories are obtained by starting at different points along the leg. For these reasons the 700 mile leg is divided into three parts and a point of each part used as the beginning point in backtracking as follows:

1. Northern Half: The midpoint of the northern half of the positive leg was selected at 54°N. 170°E. The trajectory computed backwards in time suggest the origin to be between 50°N and 75°N and 90°E and 130°E, if the zero hour of the burst occurred on the 27th, 28th or 29th of August 1949. Evidence presented below (Page 3, par. 2 &3, Page 4, par 2) suggests that this trajectory is the least likely one of all and this conclusion is reflected in the low probability assigned to this area on Figures 1, 2 and 3. The nature of the meteorological conditions and the paucity of data involved in this trajectory prevent any more accurate location of the origin point but other evidence gives this trajectory little weight.

2. Central Point of Entire Leg: The position of this point is 53°N. 165°E. The trajectory associated with this point is characterized by slow and uncertain movements during the second and first of September. Generally speaking the origins of this trajectory lie mainly in Outer Mongolia and that portion of Russia directly west of Outer Mongolia.

3. Southern Half: The midpoint of the southern half is at 51°N. and 160°E. The trajectory from this point lies in or near the band of maximum west winds just to the north of the Himalaya Mountains, and recurves sharply to the north near longitude 50°E. The upper air observations in this general area are extremely limited and the analysis is based on an empirical model constructed from analogous situations in the western hemisphere. The probability maps (Figures 1, 2 and 3) are based largely on this trajectory.

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B. Forward Tracking.

A seismic disturbance just north of the Black Sea on August 30th, 1600Z, indicated one point that could be tracked forward in time to the surveillance network. It appears that a burst at this time and place could not have furnished the material that was detected east of Kamchatka on the third of September, regardless of the altitude considered.

Forward tracking from Spitzbergen from the 27th, 28th and 29th of August indicates that any material originating this far north would have been transported across the flight path of the Ptarmigan reconnaissance flight approximately three days after origin, but could not have arrived as far south as Kamchatka on the first circuit around the polar region.

IV. OTHER DETECTION AND METEOROLOGICAL EVIDENCE

No filter flights were made on the fourth of September from Yokota to Alaska similar to that made on the third. Two filter flights made on the fifth of September, however, are of interest.

1. A flight south of Fairbanks, Alaska, along the west 150th meridian detected strong activity immediately south of Fairbanks. Backtracking this point to the third of September indicates that this is the same cloud intercepted on the third just east of Kamchatka. This evidence does not shed any additional light on the point of origin, but it does lend weight to the analysis prepared for this purpose.

2. A flight over Yokota on the fifth of September likewise yielded strong detection. Trajectories begun from this area indicate definitely that the path just north of the Himalaya Mountains is the most probable one. There appears to be no possibility of the Yokota detection of the fifth originating north of 50°N or east of 70°E.

3. The pattern of detection after the fifth of September, on the Guam to Japan flights, indicates that a small portion of the cloud described a counter-clockwise loop around a typhoon southeast of Japan. This is further evidence lending weight to the southern trajectory discussed on page two under 3.

The filter flights in the vicinity of the Japanese Islands reveal continued radioactivity at 500 mb after the fifth of September despite the presence of winds strong enough to remove any reasonable-sized cloud within

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a day or two. Further this continued activity occurred at a time when it is improbable that the radioactive material could have circled the globe and returned over Japan for the second time. At this stage of the investigation two hypotheses give reasonably complete explanations of this continued detection near Japan.

1. It is possible that the cloud ascended to well over 18,500 feet and the early material detected was transported at greater elevations (and greater speeds) and fell to the 500 mb level along the flight path of the third, while the portion arriving later fell much more slowly and was transported immediately above, or at the 18,500 ft level. Preliminary work on particle size mentioned on Page 1, Section II, does not favor this hypothesis. With better particle size data available this aspect of the problem will be investigated and reported later.

2. If all of the particles prove to be of very small size, vertical motion due to gravity will be insignificant compared to vertical motions (both upward and downward) caused by diffusion. This vertical transport might easily be of the order of 1000 ft per day. If the radioactive material originated from a cloud that was initially at a minimum elevation of say 5000 feet, then this vertical transport could account for detection at 18,500 feet. Furthermore, atmospheric motion is always characterized by shear in the horizontal. Horizontal shear of the magnitude observed, along with diffusion, can explain the continuous detection near Japan. The southern trajectory (par. 3, page 2) lies along the zone of greatest horizontal wind shear. A trajectory through regions of great shear is indicated by the length of the cloud and the small particle size. This is additional evidence that the southern trajectory is more probable.

V. RESULTS OF TRAJECTORY WORK

The results of the preliminary study are presented in Figures 1, 2 and 3. The region labeled with the largest number (e.g. "90" in Figure 1) indicates the region most likely to be the source of the burst on the day for which the map is prepared. An inspection of the surface weather observations in the most probable areas on all three days indicates a general lack of cloudiness. This feature may be favorable for an atomic bomb test. The probability maps are based on the reasons stated above and upon minor subjective considerations. It is obviously impossible to draw a sharp line about any given probability area so the indicated outlines of

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each sector should be considered as broad boundaries. The results presented on these maps must be viewed as preliminary and subject to alteration. It is felt that no major changes in general pattern will result from the addition of more meteorological data, but it is possible that wind speeds within that pattern might be changed.

Important changes may result if the radioactive cloud extended to well above 500 mb and fall-out was significant, or if the material was initially far below 500 mb and rose to that level by large isentropic lifting in addition to diffusion. Analysis of isentropic charts is now in progress in order to study the possibility of a low level source of material.

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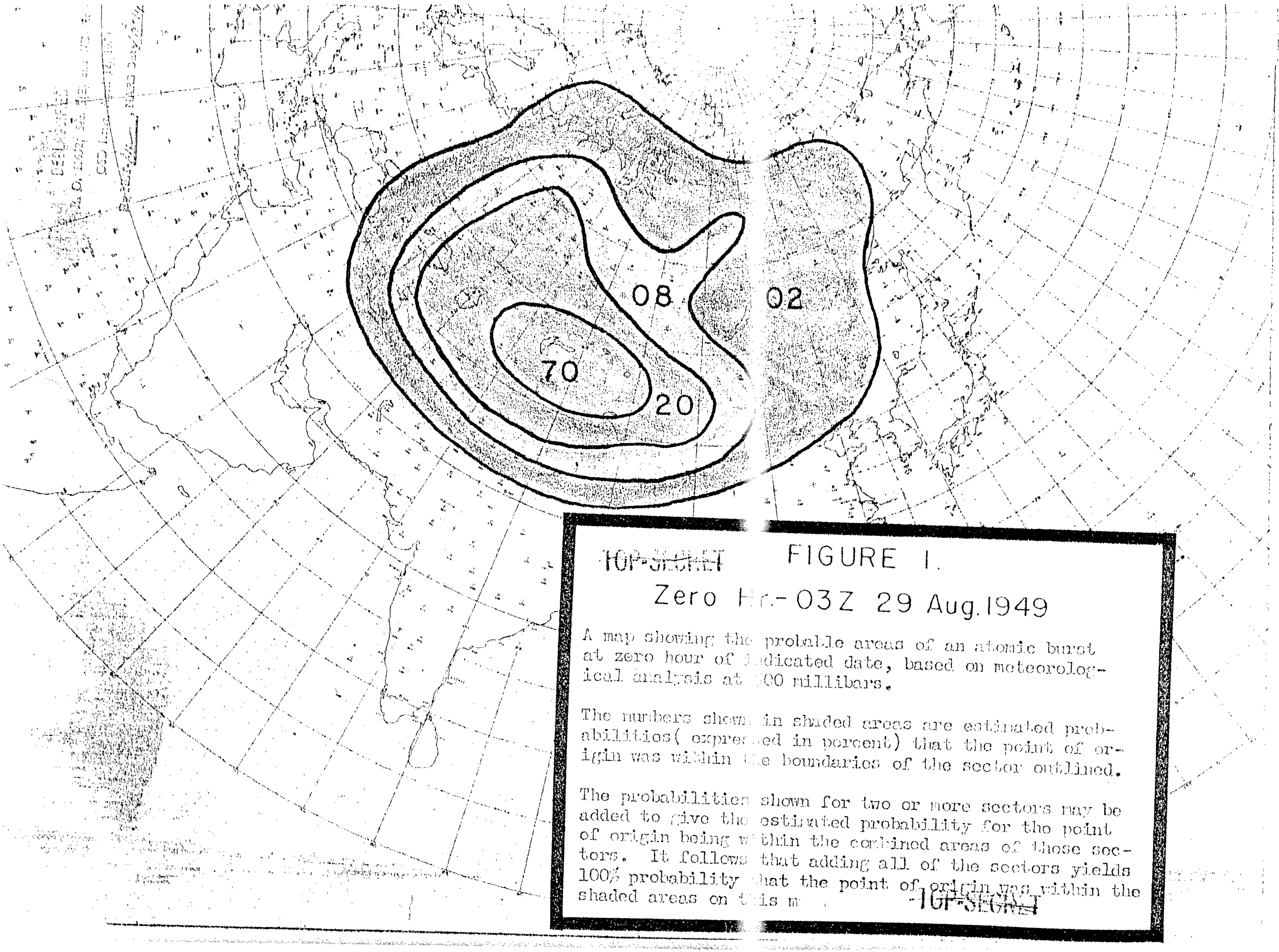

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FIGURE I.

Zero Hr.-03Z 29 Aug.1949

A map showing the probable areas of an atomic burst at zero hour of [illegible]dicated date, based on meteorological analysis at [illegible]00 millibars.

The numbers shown in shaded areas are estimated probabilities(expressed in percent) that the point of origin was within the boundaries of the sector outlined.

The probabilities shown for two or more sectors may be added to give the estimated probability for the point of origin being within the combined areas of those sectors. It follows that adding all of the sectors yields 100% probability that the point of origin was within the shaded areas on this m[illegible]

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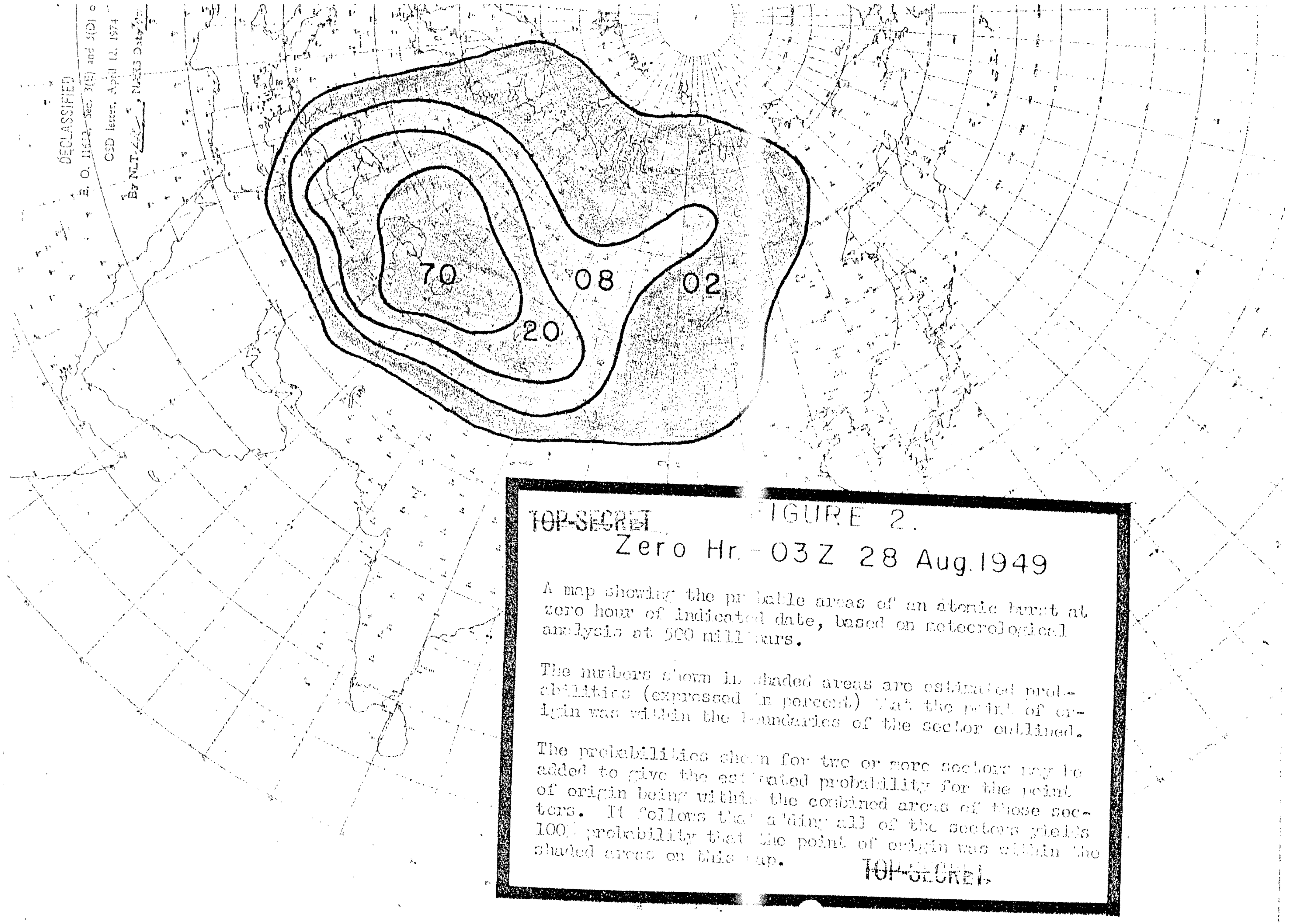

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FIGURE 2.

Zero Hr. - 03Z 28 Aug. 1949

A map showing the probable areas of an atomic burst at zero hour of indicated date, based on meteorological analysis at 500 millibars.

The numbers shown in shaded areas are estimated probabilities (expressed in percent) that the point of origin was within the boundaries of the sector outlined.

The probabilities shown for two or more sectors may be added to give the estimated probability for the point of origin being within the combined areas of those sectors. It follows that adding all of the sectors yields 100% probability that the point of origin was within the shaded areas on this map.

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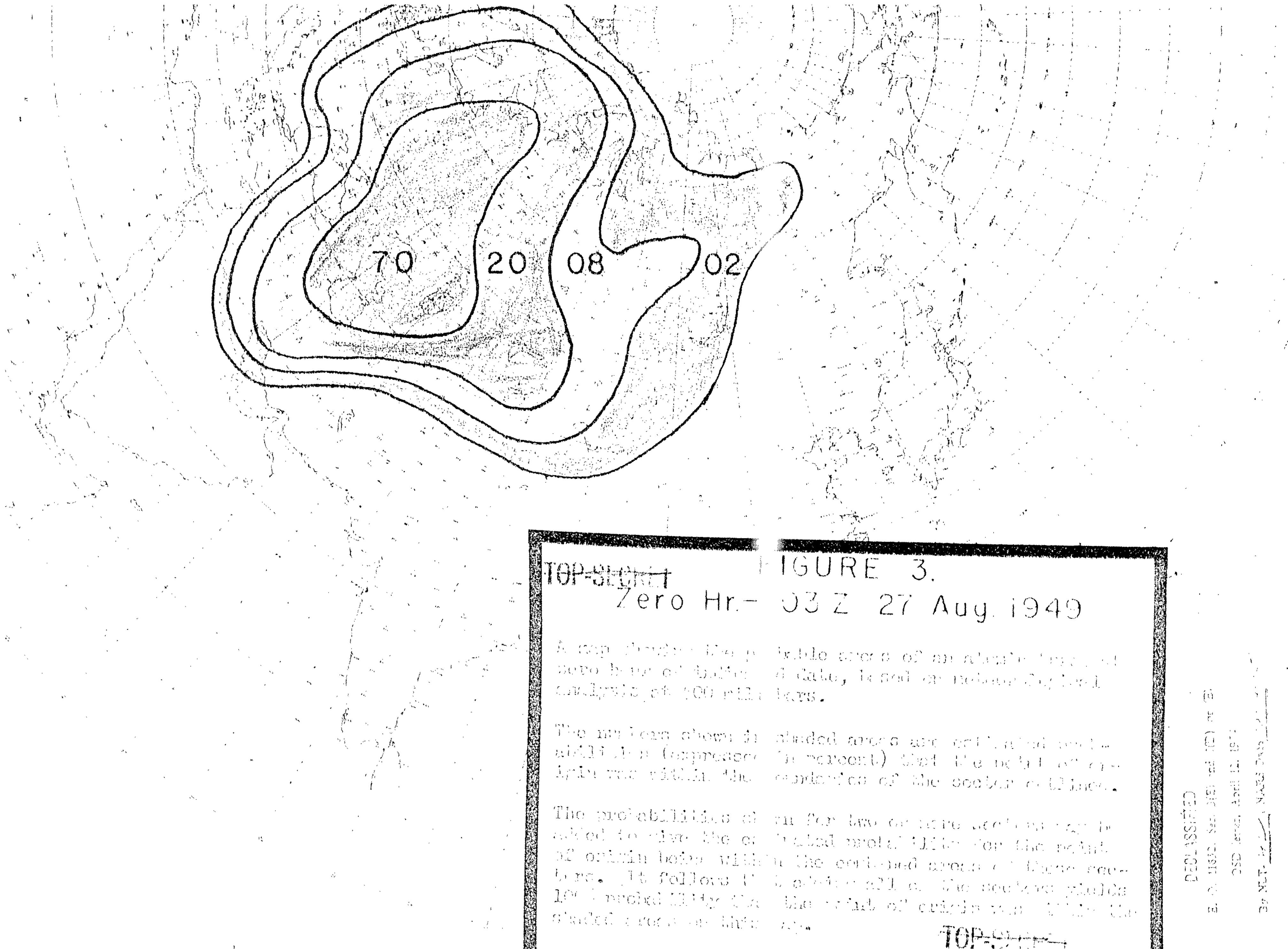

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FIGURE 3.

Zero Hr.- 03 Z 27 Aug. 1949

A map [illegible] the p[illegible]bable area[illegible] of an atomic [illegible] zero hour of [illegible] date, based on [illegible] analysis at 500 milli[illegible]bars.

The numbers shown in shaded areas are [illegible] (expressed in percent) that the point of origin was within the boundaries of the sector outlines.

The probabilities [illegible] for two or more sectors [illegible] added to give the [illegible] probabilities for the point of origin being within the combined areas [illegible] sectors. It follows [illegible] the sectors yields 100 probability [illegible] the point of origin [illegible] the shaded areas [illegible].

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