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PRELIMINARY REPORT, Cloud Sampling on Mike Shot, Project 1.3

By E. P. Plank

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1. SAMPLES

1.1 Number of Samples

Twelve samples were obtained by the RB-29 aircraft, including the two used for early reconnaissance.

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1.2 Sample Size

Samples obtained by Red Flight (1M, 2M, 3M) as well as one sample from White Flight (7M) were each approximately the size predicted and were satisfactory for yield determination. Samples # 5M and 6M of White Flight and # 9M, 10M, 11M and 12M of Blue Flight were approximately one-third the size of the first four and were satisfactory for the purpose of ratio and detector studies. These samples were from five to ten times smaller than they should have been because of unforseen operational limitations beyond the control of this project. (see paragraph 3.2). The two reconnaissance aircraft gave very small samples (15M and 16M) which should be useful for ratio checks.

1.3 Sample Quality

Sample quality is governed by the capability of penetrating the main body of the cloud. In general all samples except 11M, 12M, 15M and 16M, which were taken at radically different altitudes or sections of the cloud, are considered to be as representative of the cloud as possible. Excluding the exceptions, the samples were taken at altitudes between 42 and 44 thousand feet which was in the region of the juncture between the upper toadstool and its stem. Because of formation flying some of the samples should be almost identical so that the actual spread in the data may not be a true index of the randomness of sampling. By comparison the excepted samples should afford an insight into the representativeness of the others.

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2. RADIATION EXPOSURES

2.1 Magnitude

[redacted]

Only Red Flight Aircraft approached the planned operational exposures. Failure to attain the planned exposure in the other flights is reflected in the lower sample sizes which they obtained. Red Flight exposures were in the [illegible] to four roentgen level, White Flight in the one-half to one roentgen level and Blue Flight in the two-to four tenths roentgen level. Because the aircraft were carefully hand polished by the WSEG personnel, the cockpit background was very much lower than expected. The total radiation exposures were therefore approximately 40% less than had been anticipated. In view of the fact that these aircraft saw radiation intensities in excess of 500 R/hr, the low exposures achieved by Red Flight should be considered a testimony to the skill of its pilots.

2.2 Effectiveness of Shielded Flight Clothing

Use of the shielded flight clothing by Red Flight apparently gave about a four to five-fold reduction in radiation exposures. The effect did not appear to be significant for White Flight, although for Blue Flight there again appeared to be a significant protection. The protection afforded to Red Flight apparently corresponds to evidence that a considerable fraction of the radiation flux in the cloud during Red Flight penetrations may be due to the decay of U^{239} which gives a 75 kev gamma ray. This evidence was gained from an analysis of the decay rate of reported peak radiation intensities in the cloud.

3. OPERATIONAL PROBLEMS

3.1 Altitude Performance of Sampling Aircraft

The bomb burst formed an upper cloud about 100 miles in diameter with a stem in the center approximately 30 miles in diameter. A white

[redacted] vaporous undercloud was present forming a collar around the stem. It had a diameter about the same as the upper cloud. It was initially tangent to the upper cloud at the juncture of the stem with the upper cloud (forty-five thousand feet) but during the course of the day appeared to subside to about 40 thousand feet. Several projecting fingers were present in the neighborhood of the juncture of the stem and upper cloud and some of the sampling aircraft were directed to sample in this region. Under these circumstances the altitude performance of the aircraft was satisfactory. The maximum altitude attained by any aircraft was 45 thousand feet indicated. When such aircraft exist, it would be desirable for very high yield devices in the future to have about five thousand feet additional ceiling capability in order to sample well into the main body of the cloud.

3.2 Flight Times in Sampling Area

Successful sampling requires that the aircraft have a flight time capability long enough to permit radiation exposure to limit the duration of the mission. This condition was true only for Red Flight. The unforseen operational limitation in flight times mentioned in Paragraph 1.2 arose because (1) the radar equipment in the control B-29 ~~ground-radar-bogey~~ (was unable to identify the sampling aircraft) in the cloudy weather which existed at the time of sampling, and (2) the operational commander in charge and giving orders from the control B-29 appeared to be unfamiliar with the limitations of this equipment, with the phenomena associated with a bomb burst, and with the nature of the sampling mission itself. The consequence of this situation was that the sample control B-36 was repeatedly ordered farther from the main cloud mass when the situation called for a closer approach.

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Eventually, the details of the cloud were lost to those in the B-36 and the sampling aircraft were required to fly excessively long distances to reach the cloud vicinity. They then had to conduct a cloud search as well as a sampling mission, the former being the function of the B-36. After sampling, the aircraft then incurred the risk of running very low on fuel by having to return over a great distance to the refueling area. In view of these considerations the [redacted] aircraft in White and Blue Flights did not meet the requirement that they have the capability of spending two hours in the sampling area. This failure has been brought to the attention of the Commander, TG 132.4.2, and corrective measures have been discussed. It is hoped that this condition will have been corrected by King Shot.

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