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R.B. Craner
MAY 20 1959
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MAY 6 1963
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OCT 1 1964
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DATE AUG 10 1960
OCT 25 1962
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Carmelo Dalleo 4/9/97
Ernesto Salas 4/9/97
R.B. Craner
975N971
4/3/97

3428-3 3428-3 APPENDIX G

ANALYSIS OF MISSILE FAILURE PROBLEMS

There are two general categories of problems associated with missile failures. One has to do with the contribution of the missile failure to a possible unwanted nuclear detonation and the other has to do with the hazards associated with operations involving large amounts of flammable or explosive materials including the warhead RD system. Since primaries which are known to be one point safe will be used the two categories do not overlap and may, therefore, be discussed separately.

Nuclear Safety Considerations

By comparing estimated missile failure probabilities (in the range of 0.1 to 0.5) to the over-all nuclear safety criterion ($<10^{-6}$ below 60,000 feet and $<10^{-5}$ above 60,000 feet) it is evident that the missile cannot be relied upon for any significant contribution to the nuclear fuzing system safety. Therefore the nuclear safety considerations discussed in Appendix B are independent of missile performance. Proper operation requires that the missile trajectory be determined after burn out of the first stage but before the arming system safe separation timer completes its function. This information is obtained by tracking the missile. If this tracking confirms that the ballistic trajectory is within predetermined limits consistent with safety requirements, it is allowed to proceed on its ballistic course, and at the appropriate time, the RV command system initiates the arming and firing sequence. If not, the missile and warhead will be destroyed.

Non-Nuclear Safety Considerations

For erratic flights to altitudes of less than 60,000 feet the RV command destruct will reduce the probability of an HE explosion on the earth's surface to something less than one in two hundred. For improper flights to greater than 60,000 feet the RV command destruct and the fuze barometer combined will reduce the probability of a surface HE explosion to something less than one in one hundred thousand.

For ballistic flights to altitudes of less than 60,000 feet the maximum range is not likely to exceed 40 kilometers. Thus, the probability of an HE explosion on the surface in a circle of approximately 40 kilometers radius is less than one in two hundred. Outside this circle the probability is reduced to less than one in one hundred thousand.

For the ultra-high altitude tests additional safety is available by designing the payload such that re-entry heating destroys the warhead and its associated systems. It is estimated that any payload which exceeds a ballistic range of approximately 5000 kilometers will be destroyed during re-entry.

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 ~~Ref. Syst. [illegible] (U)~~

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