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RS 5600/114
JUN 16 1965

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To: A. Y. Pope - 9300
W. C. Scrivner - 9400

From: L. D. Smith - 5600

L. D. Smith

Re: Comprehensive Theoretical Re-entry Vehicle Trajectory Model (U)

References: 1. SRD Memo, RS 5600/53, L. D. Smith, 5600, to A. Y. Pope, 9300, dtd 2-8-65, subject, Incorporation of a Sputter Blast Sub-Routine on the Lockheed 6 Degree of Freedom Trajectory Program (U)

2. SRD SC-TM-65-382, RS 3410/451, K. J. Touryan, 9326, R. G. Maydew, 9320, dtd August 1965, subject, Aero-Thermodynamics of Re-entry Vehicle Design (U)

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Organization 5600 is engaged in a design study that will result in the development of the arming and fuzing for the Mk 3 Poseidon re-entry vehicle. Inertial arming and fuzing devices will be an integral part of this system and additional theoretical computer programs are required to determine the structural and component loadings and the fuzing errors that will occur during re-entry. Both natural atmospheric conditions and nuclear counter-measure conditions need to be analyzed, since penetration of enemy defenses is a prime requirement for the Poseidon.

We request that your organizations develop and validate the following computer program for use in this design study:

A Master 3 DOF (point mass) and 6 DOF (rigid body) trajectory program with the following subroutines incorporated:

- a. An ablation subroutine that can calculate the changes in the vehicle aerodynamic coefficients due to ablation occurring in standard and blast perturbed atmospheres. These changing coefficients will be used in the trajectory parameter calculation.

1 st Review Date: <u>7/12/66</u>	2 nd Review Date: <u>2-20-97</u>
Authority: <u>W. C. Scrivner</u>	Authority: <u>W. C. Scrivner</u>
Name: <u>W. C. Scrivner</u>	Name: <u>W. C. Scrivner</u>
CLASSIFICATION CHANGED TO <u>U</u>	
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RECORD ID <u>97SN776</u>	
DATED <u>2-20-97</u>	

JUN 17 1965

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CLASSIFICATION CHANGED TO <u>U</u>	AUTHORITY <u>W. C. Scrivner</u>
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- b. A blast parameter input subroutine that can utilize the outputs from Sputter blast tapes to provide the inputs to the ablation and trajectory calculations.
- c. An X-ray energy deposition input subroutine that utilizes outputs from the X-ray codes to provide inputs for the ablation and trajectory calculations.

It is our understanding that J. A. Allensworth, 9422, has undertaken a major revision of his TTA 6 DOF trajectory program, which he calls TTB. This program is being written for the CDC 3600 and can be readily modified for the next generation of computers. It is being prepared to accept subroutine programs written by other people such as those for blast, ablation, X-ray energy deposition, etc. Either this program or the McDonnell program being used by Organization 9300 could be used as the basic trajectory program.

Our organization has run a series of comparisons on the difference in re-entry vehicle range dispersion and in fuzing altitude errors given by running identical RV-blast intercept conditions on the North Star-Lockheed 6 DOF and on the Sputter-GE 6 DOF blast intercept programs. It was found that differences of a factor of 5 in dispersion and a factor of 10 in fuzing error can occur between these two models. Since the Sputter blast model is recognized as being theoretically superior, we would like to incorporate it (rather than the North Star blast model) in the 6 DOF Master trajectory program.

The development of this master trajectory and subroutine program is an extension of the tasks outlined by Mr. Maydew and Mr. Touryan in Reference 2. It is our understanding that the ablation program is ready for adaptation to the 6 DOF trajectory program and since the Sputter tapes and X-ray codes are available it should now be possible to combine these programs as outlined above.

Because of the urgency of the Poseidon program and of the need for similar analytical studies for Pershing, Mk 17, and Ares-Titan weapon systems, we would like to have these programs operational in three months.

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