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TASK DESCRIPTION Feasibility Study - Four Algol III Strap-ons		REV. NO.

STATEMENT OF WORK

STUDY TO DETERMINE FEASIBILITY OF FOUR ALGOL III STRAP-ONS TO A SCOUT G-1 CONFIGURATION

1.0 Scope

1.1 The Contractor shall provide the services and materials required to conduct a study to determine the feasibility of adding four (4) Algol III as strap-on motors to the Scout G-1 configuration. Past studies on Scout with strap-ons indicate that the primary critical areas of concern will be stability, control and structural loads. Each of these areas will be investigated. Current Scout launch constraints will be imposed as defined in Vought Report No. 23.434, "Scout Preflight Mission and Planning Constraints for Vehicle S-207, Revision C", except the minimum injection altitude will be 300 N.MI. The purpose of this feasibility study is to identify the major changes that may be required to the vehicle to meet current stability margins and structural integrity.

1.2 The four (4) strap-on Algol III motors will act as the first stage and will be ejected when they burn out. The center Algol III will then be ignited and act as the second stage motor, Castor IIA will become the third stage motor, Antares III the fourth stage motor and the Altair IIIA the fifth stage motor. The heatshield will be ejected when dynamic pressure and heat flux is similar to the current Scout and will be determined during this study. Along with stability and control analyses and loads analyses, preliminary generalized performance for San Marco due East launches will be determined.

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1.3 The following defines the Contractors detailed tasks:

A. Prepare a mass properties list of the Scout with the strap-on Algol III motors.

B. Estimate the aerodynamics coefficients, the center of pressure and the drag coefficient at zero angle of attack. Also estimate the vehicle running air loads at six mach numbers. The nose fairing on the forward end of the strap-on motors will be canted to allow the strap-on motor to have an aerodynamic moment to rotate the forward end of the motor away from the vehicle center line.

C. Determine a flight trajectory for a 300 N.MI. injection orbit.

D. Determine first stage pitch, yaw and roll frequency response sufficient to define gain and plane margins during the strap-on boost phase.

Operating gains, gain ratio, and base a frequency response requirements shall be determined. This evaluation shall be similar in scope as the study presented in Contractor memo 2-16000 -75 dated March 20 1975.

E. Evaluate the second stage pitch, yaw, and roll frequency response similar to that for the first stage.

F. Determine the first stage modes of vibration in bending and torsion. The second stage modes will be assumed to be the same as the current Scout first stage modes.

G. Determine the flight loads during ascent for a 90 knot head wind with peak wind altitude at 27,000, 35,000, and 45,000 ft. Use the standard Scout wind profile. Also, the gust loads for 16 FPS wind will be estimated.

H. Determine generalized performance of this vehicle for orbital launches due east out of San Marco.

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I. Prepare and submit to NASA/LRC and CRA a summary report to include the results of the above studies. Indicate all assumptions made, results and required change, if any, to make this vehicle flightworthy. This report will identify any further analysis or areas of concern that need to be investigated.