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SAND-97-1524

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Authority: K W. Lange	Date: 4/2/97
Authority: ASD	Name: [Signature]
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Ref. Sym: ~~5141 (613)~~

April 19, 1957

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500.1

TO: M. L. KRAMM - 5233

Re: Status Doorknob Instrumentation Rocket

The second meeting on the Doorknob Instrumentation Rocket was held April 12 for the purpose of bringing other engineers present up-to-date on their phase of the program and to provide an opportunity for discussion of mutual problems. Those in attendance were V. K. Smith, 5251, W. E. Walker, 5143, T. P. Krein, 1216, M. L. Kramm, 5233, K. W. Vallely, 7231, J. O. Davis, 1281, C. A. Loveless, 1216, J. J. Miller, 5251, H. R. Vaughn, 5141, and H. A. Wente, 5141.

FIELD TEST

Sites have been selected for the two launchers to be used at Tonopah. One, to be used for high altitude firings, will be oriented to launch in the direction of 129° and the other, for low altitude shots, will be headed 167° in azimuth. Three bench marks will be provided to aid in setting up fine adjustments in launching angles. Construction of the pads is expected to begin April 29, and should take about one week. A temporary blockhouse, constructed of earth covered multi-plate steel, is planned for the site at a distance of 550 feet from the launchers. Cost of the two launcher pads will be approximately \$25,000 and for the blockhouse \$1,000. Suitable storage for the rocket motors is available at the Tonopah airport and will require only minor re-work of an igloo to insure security of the entrance.

The radar tracking unit should be able to track the rocket through its trajectory with approximately 2 - 3 mils error in azimuth and elevation angles and 5 - 10 yards error in range. The launcher may interfere with reception of the radar beacon before launch and this difficulty should be investigated.

It was decided that Division 5251 would handle the painting of the noses although Division 1216 would provide the paint. The fins would be painted according to the pattern of three white and one black. The painting of the fins is to be accomplished by Division 1216. Division 5251 will ship the fins and rocket skirt to Tonopah and Division 5215 will provide the firing console.

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW DOWNGRADING OR DECLASSIFICATION STAMP	
CLASSIFICATION CHANGED TO: U	AUTHORITY: R. B. Crane
PERSON CHANGING MARKING & DATE: Emilda Sargh 4/17/97	RECORD ID: 975N633
PERSON VERIFYING MARKING: Carmela Pulley	DATED: 4/2/97

Arrow
Deacons (11 for kilo - 22 chuff)
Vipers

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12-222

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With the exception of obtaining amplifiers for thermocouples and strain gages procurement of instrumentation is proceeding according to schedule. The amplifiers are a problem because the present transistorized amplifiers are not compatible; however, it is believed that a Mag-Amp amplifier is suitable and available. The antenna being designed by Jack Ames, Division 1423, should be ready on time.

LAUNCHER

The change in the Redstone trajectory has complicated the manner in which the instrument rockets will have to be launched. The launcher design has been changed to accommodate the range of launching angles required. The re-design may cause a delay of two weeks to a month in delivery of the launcher to Tonopah and may in turn delay the June firing, although this is not certain at the moment.

The launcher elevation angle will be made adjustable through the addition of short lengths to the struts that support the rail. Fine adjustment is obtained in the feet that support the launcher at three points. A small degree of adjustment will be available in azimuth angle. The main beam which carries the rail will weigh about 2000 pounds and the complete launcher will weigh 8 to 10,000 pounds.

The rear shoe can be modified to prevent tip-off which is caused by angle firings.

ENGINEERING

Final drawings have been received from Thiokol on the rocket design and the skirt design and have been corrected, approved and returned to Thiokol by Division 1216. This return was accomplished by April 12, which according to Thiokol was necessary to obtain delivery in the vicinity of June 1. Thiokol apparently still feels that they can ship by May 27.

The noses have been designed and two are ordered from the Sandia shop for delivery about May 15. Precision Sheet Metal, an outside concern, has promised 4 noses per week starting about May 15.

Commitments on fins have been obtained. The first set of steel fins is to be made in the Sandia Shop and is expected on May 15. The other steel fins are expected as follows: 1 set June 1, 2 sets June 15, 4 sets July 1, and all by August 1. The aluminum fins are expected as follows: 1 set June 1, 1 set June 15, 4 sets July 1, and all by August 1. All other parts are expected to be finished by May 15.

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A method of separating the nose has been devised by Division 1216 which eliminates many problems associated with the handling of primacord which was originally considered. The nose is fastened to the motor by a split ring which is held together by two pins inserted in two joints in the ring. The two pins are then driven out by explosive squibs which allows the ring to part and the nose to separate. The squibs are safer and easier to handle than primacord.

An experimental test was conducted which indicates that the high skin temperatures would not significantly effect the instrumentation. However, to be conservative, ceramic paint will be available to coat the interior of the nose to reduce internal temperatures.

AERODYNAMICS

Vertical trajectories were completed on the IASL I.B.M. and Sandia REAC computers. The two stage rockets show a sensitivity of 500 feet of altitude per pound of weight and 6500 feet per per-cent of rocket impulse. Since the impulse is roughly proportional to propellant weight it can be assumed that the sensitivity to propellant weight is about 1300 feet per pound of propellant. As far as altitude dispersion is concerned, all other effects such as variation in drag coefficient, atmosphere, second stage ignition time, rocket burning time, and launch angle appear to have only small effects. It is expected that minor corrections will have to be made for atmosphere in the Pacific. The major items to be controlled are total weight and propellant weight. Since the rocket case will be weighed before and after propellant loading it will be possible to correct for propellant weight variations by either adding or subtracting ballast from the total weight. All altitude corrections will be made by changing the ballast weight and it should be possible to arrive at the proper correction in a simple incremental manner. Trajectories for the angle launcher have been programed and as soon as information on the Redstone trajectory is available, the trajectories will be run. Preliminary trajectories indicate the two stage rockets will be launched at around 2° and 5° for the 230,000 and 250,000 foot altitudes.

Static stability estimates have been made and the stability looks satisfactory. Supersonic wind tunnel tests begin April 16 and transonic tests around May 1. The models are complete. Accurate center of gravity positions are needed.

A calculation on aerodynamic heating of the nose skin (0.1 in. thick) at station 8.35 was made which indicated a maximum temperature of 1000°F. This indicates that wiring and any other light instrumentation parts that are sensitive to temperature should be kept away from the skin, particularly near the nose. Further heating calculations are in progress.

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Calculations were made on the effect of centrifugal acceleration and Coriolis acceleration which result from the earth's rotation. These effects cause the rocket to deviate 2600 feet west, 500 feet south, and 650 feet high when launched at Tonopah. The effect of the earth's curvature is insignificant. Corrections will be made.

A number of problems need to be considered such as roll-pitch coupling, two stage "critical shaft" failure, effect of wind on trajectory, and launching transients.

HANDLING EQUIPMENT

Layouts on all handling equipment are essentially completed and it is expected that it will all be completed by June 1. It has been decided that the second stage will be loaded first and pulled up the rail and then the booster loaded. A crane is to be used for the loading. A test was run on the crane to determine its suitability for this function. Scaffolding will be available around the launcher although the type has not been completely decided upon. It was decided that shade both for the rockets and personnel was desirable. There appear to be no serious difficulties in obtaining the auxiliary equipment.

EXPEDITING

To date 7231-1 has been taking care of all purchase orders and expediting for 5000 organization and 7241 has been performing this function for 1200 organizations. It is felt that a combined status report on all purchase orders should be issued by 7231-1 for the convenience of all organizations. This is to be investigated.

SCHEDULES

With the possible exception of the launcher the original schedule, which was attached to the previous meeting report, appears to be applicable. Until it is definitely known that the launcher will effect the schedule no change is anticipated. Before the next meeting a more-detailed schedule of flight tests, including instrumentation, will be formulated.

Harold Vaughn
HAROLD VAUGHN - 5141

H. A. Wente
H. A. WENTE - 5141

HRV:HAW:ee

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DISTRIBUTION:

G. A. Fowler, 5000
R. W. Henderson, 1200
S. C. Hight, 5100
R. A. Bice, 5200
W. C. Scrivner, 1210
T. F. Marker, 1420
A. B. Metzger, 3210
M. L. Merritt, 5110
A. Y. Pope, 5140
A. P. Gruer, 5210
D. B. Shuster, 5230
H. H. Patterson, 5250
W. J. Denison, 1216
P. E. Jockle, 1281
J. R. Ames, 1423
T. B. Cook, 5111
P. W. Rowe, 5141
R. C. Maydew, 5142
W. H. Curry, 5144
K. F. Crowder, 5143
A. E. Bentz, 5213
C. B. McCampbell, 5233
J. J. Miller, 5251
R. T. Foster, 7231-1



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