CONFIDENTIAL

3 January 1955

50X1

PROGRESS REPORT
ON
FOUR-INCH ROCKET
FOR
NOVEMBER 1954

CONFIDENTIAL

The month of November was spent in testing various types of non-metallic materials which might be employed in the fabrication of the head plate for the multiple motor rocket.

Greatest emphasis was placed on laying up a combination of glass cloth and polyester resin since it was felt that glass reinforced resins would furnish more strength than any other known plastic or combination plastic material.

A number of different lay-up techniques were used in an effort to obtain greatest strength in all directions since the chamber pressure forces are applied in all directions.

A material consisting of flat disks of glass cloth, laminated together with polyester resin was machined as a one piece head plate to receive the individual motors. Upon static test firing, delamination of the layers occurred with resultant failure of the test motor.

Another one piece head plate was laid up by rolling polyester soaked glass cloth of two inches width into a convolute cylinder. After machining, this motor head was tested using six motor tubes. Again delamination occurred but in a direction parallel to the axis of the motor.

Other materials tested included celeron, a combination of epoxy resin and aluminum powder, rag filled phenolic, hard maple wood, and paper laminated phenolic. All these materials failed to withstand the pressures encountered and ruptured. Although these materials had been previously tested as a part of the original motor design, it was felt that a redesigned one piece head plate, with the cap and tail plate eliminated, would reduce strength requirements thereby permitting the use of at least one of the materials mentioned above.

The tests made on these materials indicate that no non-metallic material alone possesses sufficient strength in all directions to permit use as a head plate. Consequently the most logical approach to be taken from this point forward appears to involve the employment of a network of plastic tubes, such as have been used as motor tubes, connected by a central chamber. This would permit the utilization of the great hoop strength of these materials in withstanding the pressure encountered. This network of interconnecting tubes could then be imbedded in a thermo setting plastic to obtain rigidity. Holes designed to receive individual motor tubes could then be machined into the plastic and into the reinforced tube network.

This system would eliminate considerable machining and would thereby be more satisfactory from a production standpoint.

Construction of this type of head plate is now in progress.

A series of tests were conducted for the purpose of determining whether or not plastic nozzles with metal inserts could be glued into the plastic motor tube with sufficient adhesion to prevent breakage when exposed to the pressure of a burning grain. These tests were very satisfactory and indicated that this system of nozzle insertion can be used.

Further tests, using retaining rings to suspend the individual motor tubes into the head plate, were conducted. These tests were equally satisfactory. Several grains were burned in the plastic motor tube using the retaining ring suspension system with no apparent damage to tube, ring or head plate. In addition to this type of motor tube suspension, another method has been tested satisfactorily. This method involves only the gluing of the motor tube into the head plate with an epoxy resin. Several such grains were burned satisfactorily in tubes suspended in this manner.

Plans for Future Work

Work on this program will continue as outlined above and in previous progress reports. It is believed that as soon as a suitable head plate can be designed and built, the task of fabricating and flying a test rocket can be accomplished.

Financial Statement

50X1

Total Amount of Contract	
Expenditures During November 1954	
Total Expenditures to 30 November 1954	
Total Unexpended Balance	