To Code 011
(via 0845 rec) 25X1

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Direct Line: WE 2-7487

26 March 1957

Ballon, Powered

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SUBJECT: Contract [redacted] 25X1

Dear [redacted] 25X1

This is the fourth of a series of informal letter reports concerning the progress under Contract Nonr 1589(07) for the period 21 February to 21 March 1957.

The mathematical treatment dealing with pressurized bodies has been extended so that maximum loads can be determined for any general body of uniform cross section. These maximum loads are described in terms of the cross sectional area, thickness of the body in the direction of the applied load, pressure and length. This general result is quite useful since it permits the determination of body configurations having some optimized feature. The analysis of the mechanical properties of these bodies has been conducted on the basis of purely isothermal conditions. We are also currently determining the bodies' bending characteristics on the basis of adiabatic processes.

The extension of this study to bodies of non-uniform cross section is, of course, our ultimate objective. Streamlined bodies, although basically cylindrical in nature, will be best treated in the forthcoming work. We have at this time some crude descriptions of strength of conic sections but this must be extended greatly.

A rather extensive experimental program is taking form to verify the studies which have been made in this area.

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Washington 25, D. C.

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A general equation has been developed to describe various forms of solid bodies of revolution. This equation generates nine types of bodies, depending on the specification of the boundary conditions. An infinite assortment of shapes is available within each of the nine types. This equation has been compared to several existing lighter-than-air vehicles and has been found to be capable of describing most of them fairly well. The purpose of this general equation is to allow the calculation of many of the physical characteristics of the body, such as the volume, area, center of mass, etc. Another, and more important, use of this equation may be the determination of fluid flow around such bodies. These calculations appear to be quite difficult, and therefore we are investigating the use of various analogues, one of which is the potential distribution around models in an electrolytic trough.

The use of solar batteries has been long questioned as a means of deriving energy on lighter-than-air systems. The relative advantage of solar batteries over common types of batteries is basically dependent on the time interval over which they can be used. We have plotted a number of these rather interesting relationships for ordinary batteries and plan to enlarge this to include many other energy sources.

Our materials survey will be enlarged to include the study of degradation of various plastic films, etc., when subjected to ordinary outdoor conditions.

The moment of instability for a streamlined object moving through a fluid medium is derived from the theory of perfect fluids. It is found to be proportional to the difference of the apparent mass between the longitudinal and transverse directions, as well as to the dynamic pressure, volume and the sine of twice the angle of attack. Mr. Froehlich is evaluating the ring airfoil as a method of exerting correcting moments.

A general equation relating the increased volume of various sizes of pressurized airships to envelope weight has been derived. It is found that increased payloads can be carried on increasingly larger airships up to a maximum value. It is also found that a maximum size exists for a given type airship construction, in that a larger airship would be incapable of carrying the weight of the envelope alone.

Presumably, we shall be presenting an oral quarterly report in April. We look forward to seeing you at that time.

Sincerely yours,

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Geophysics Section

RLS:mm

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