

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS.

163

163

COMPARISON OF NONRIGID AND SEMIRIGID AIRSHIPS.

By Lt. Stapfer.

From "Premier Congrès International de la Navigation Aérienne,"
Paris, November, 1921, Vol. IV.

FILE COPY

To be returned to
the files of the Langley
Memorial Aeronautical
Laboratory.

November, 1922.

1.7.5



COMPARISON OF NONRIGID AND SEMIRIGID AIRSHIPS.*

By Lt. Stapfer.

The discussion following the communication of Mr. Nobile on Italian semirigid airships leads me to offer a few considerations which are doubtless not new, but which seem to me to have never been presented from a purely objective point of view.

One of the main objects of airship science consists in establishing cooperation between two vertical forces, the buoyancy of the air and the attraction of gravity. The mechanism for establishing this cooperation must have the minimum weight and offer the minimum head resistance. Starting with this principle, let us consider what improvements can be made in the present type of nonrigid airships (derived from the "short car" type).

The principle of this type is, briefly, as follows: The total lift F is distributed throughout the length L of the envelope. The total weight $P = F$ is distributed along the shorter length l of the car. The necessity of making the shearing stresses and bending moments as small as possible in the car and in the envelope leads to a division of the weight and lift into n parts p_q and f_q , respectively equal, and to connecting them by n suspensions, as shown by an accompanying figure.

The vertical component of the suspension q is equal to $p_q = f_q$. It follows, on the one hand, that the tension T of this suspension increases with its inclination α , since

$$T_q = p_q \times \frac{1}{\cos \alpha}.$$

1949

1. The first part of the report is a general introduction to the subject of the study. It discusses the importance of the study and the objectives of the research.

2. The second part of the report is a detailed description of the methods used in the study. It includes a description of the sample, the data collection methods, and the statistical methods used to analyze the data.

3. The third part of the report is a discussion of the results of the study. It presents the findings of the research and discusses their implications for the field of study.

4. The fourth part of the report is a conclusion and a summary of the findings.

5. The fifth part of the report is a list of references and a bibliography.

6. The sixth part of the report is a list of appendices and a bibliography.

7. The seventh part of the report is a list of appendices and a bibliography.

8. The eighth part of the report is a list of appendices and a bibliography.

9. The ninth part of the report is a list of appendices and a bibliography.

10. The tenth part of the report is a list of appendices and a bibliography.

11. The eleventh part of the report is a list of appendices and a bibliography.

12. The twelfth part of the report is a list of appendices and a bibliography.

13. The thirteenth part of the report is a list of appendices and a bibliography.

From this there follows, on the other hand, compression stresses $\sigma_q = p_q \tan \alpha$, which become considerable for large inclination α of the suspensions. These interior forces must be offset by the interior tension of the gas. The consequences of the obliquity of the suspensions are therefore:

A. The necessity of increasing the strength of the suspensions and, hence, their weight and drag.

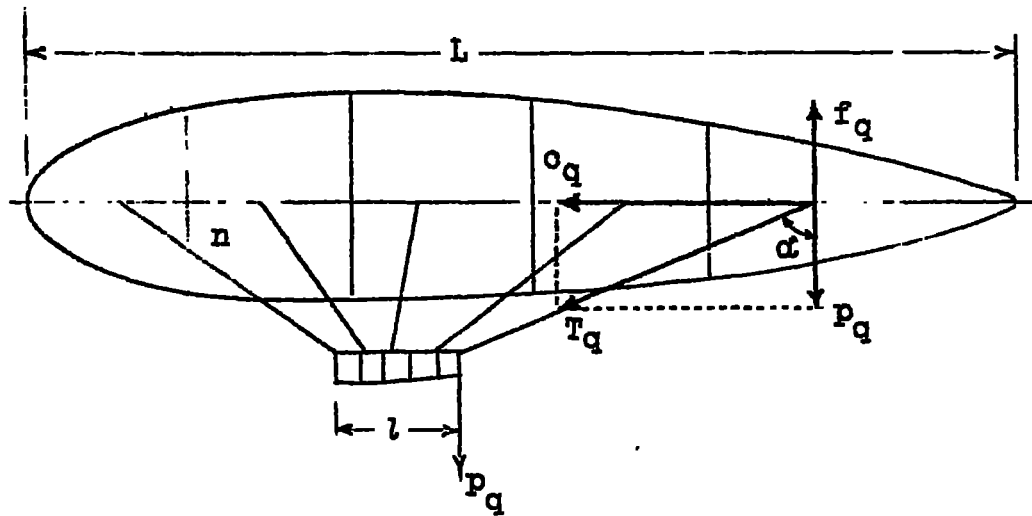
B. The necessity of increasing the inside tension and, hence, the strength of the envelope, its weight, volume and drag.

There are two ways to diminish the inclination of the suspensions:

The first consists in increasing the distance between the envelope and the car. This increases the drag and introduces prohibitive obstructions.

The second way is to place the weights on the vertical lines passing through the corresponding centers of lift. Thus we arrive at the semirigid type, which accordingly appears to be the result of improvements applied to the nonrigid type and which offers, moreover, along with other advantages, increased facility of maneuvering.

Translated by the National Advisory Committee for Aeronautics.



NASA Technical Library



3 1176 01437 3410