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NASA TECH BRIEF

Lewis Research Center

Design Criteria Monograph on Transmission Seals

A design criteria monograph has been published which is a summary and a systematic ordering of the large and loosely organized body of current techniques and practices for the successful design of transmission seals.

The purpose of this monograph is to organize and present, for effective use in design, the significant experience and knowledge about seals that derived from helicopter transmission development and operational programs to date. It reviews and assesses current design practices, and from them establishes firm guidance for achieving greater consistency in design, increased reliability in the end product, and greater efficiency in the design effort.

Four seal types commonly used in helicopter transmissions are the conventional elastomeric lip seal, the hydrodynamic lip seal, the circumferential shaft seal, and the face seal.

Since the purpose of this design guide is to establish a uniform practice, the guide is based on experience obtained in a wide variety of applications using lip, circumferential and face seals. Particular attention is given to the capabilities and lubrication of the various seal types. Drainage considerations, as they affect the seal operation, are discussed. Also discussed are special limitations as a result of storage requirements, quality control, installation, operation and removal.

Seal problems appear in the form of seal leakage. This usually is not a flight-safety problem. However, seal replacement necessitated by excessive leakage causes maintenance costs to rise and aircraft downtime to increase; and the total costs associated with seal replacement are appreciable and deserve attention.

The following steps were followed in the construction of the design guide:

(1) Identifying the successful transmission seal design practices and applications.

(2) Documenting the existing state of the art and its shortcomings.

(3) Listing the design criteria necessary for successful design.

(4) Recommending practices to be used to achieve successful design.

The end objective of this design guide is to reduce seal leakage problems through the establishment of a uniform seal design and selection practice.

The monograph comprises two major sections: State of the Art, and Design Criteria and Recommended Practices. References complement the text.

The State of the Art section reviews and discusses the total design problem and identifies which design elements are involved in successful design. It describes the current technology pertaining to these elements and points out those areas in which data are lacking. When detailed information is required, the best available references are cited. This section serves as a survey of the subject, provides background material, and prepares a technological base for the Design Criteria and Recommended Practices.

The Design Criteria state briefly the rule, guide, limitation, or standard that must be imposed on each essential design element to assure successful design. The Design Criteria can serve as a checklist for the project manager to use in guiding a seal design or in assessing its adequacy.

The Recommended Practices state how to satisfy each of the criteria. Whenever possible, the best procedure is described; when this cannot be done concisely, appropriate references are provided. The Recommended Practices, in conjunction with the Design Criteria, provide positive guidance to the practicing designer on how to achieve successful design.

This thorough review of design criteria and practices relating to transmission seals should be of interest to manufacturers and users of seals, power drives, turbine drives, and general rotary equipment.

Notes:

1. This monograph has been published as the following report:

   NASA CR-120997 (N74-31948), Design Guide for Helicopter Transmission Seals

(continued overleaf)

Copies may be obtained at cost from:
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Telephone: 812-337-7833
Reference: B75-10011

2. Specific technical questions may be directed to:
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