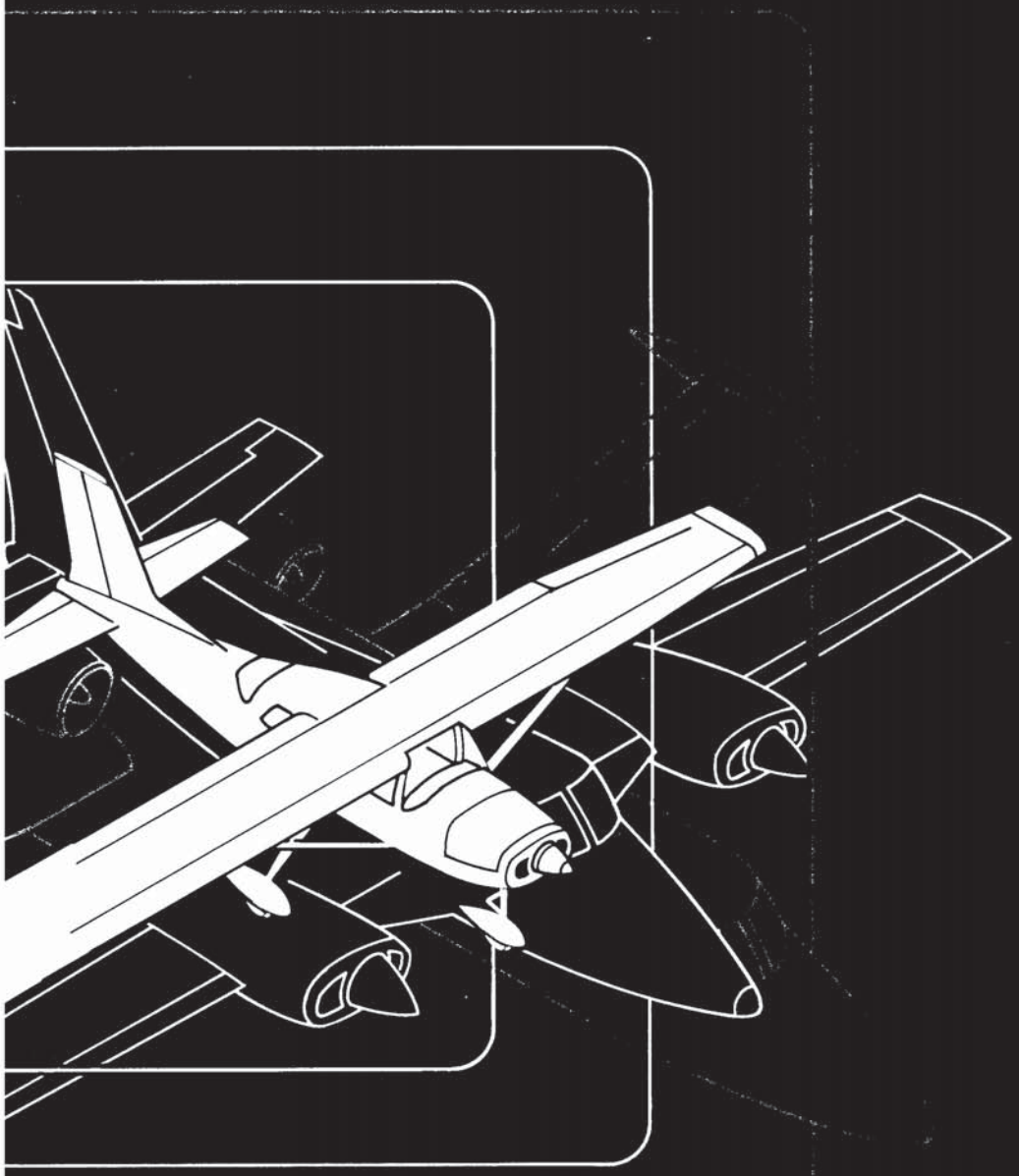
IEEE Std 128-1976

IEEE Guide for AIRCRAFT ELECTRIC SYSTEMS



Published by
The Institute of Electrical and Electronics Engineers, Inc.

IEEE
Std 128-1976
(Revision and
consolidation of
IEEE Stds 128-1960
–131-1960)

IEEE Guide for Aircraft Electric Systems

Sponsor

Flight Vehicle Systems Committee
of the
IEEE Aerospace and Electronics Systems Society

The Institute of Electrical and Electronics Engineers, Inc.

345 East 47th Street, New York, N.Y. 10017

March 22, 1976

SH06072
printed in the U.S.A.

Approved December 13, 1973

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FOREWORD

Purpose

The purpose of this document is to provide in compact form recommendations and technical reasons for the selection, design and application of aircraft electric power systems and electrically-actuated load equipment, without going into specific detailed designs. It forms a fitting companion reference document to the "Design Manual on Aircraft Electrical Installations" put out by the Aircraft Industries Association, in that the latter stresses specific application and installation practices with a minimum of technical explanation.

Form

This standard was originally published in 1960 as AIEE 750 in the form of a series of pamphlets in order to allow for more convenient revision and addition of sections as available without necessitating a reprint of the entire guide.

Sections of this guide are:

000 — Introduction
100 — Criteria for the Electric System
131 — Characteristics of Alternating-Current Generators Affecting Their Application
132 — Distribution System Design
133 — Symmetrical Components
200 — Principal Subdivisions of Electric System
300 — Selection of the System
400 — Installation Practices
500 — Equipment Characteristics
800 — Electric System Design Procedures

Acknowledgment

The first issue of this guide was prepared for AIEE publication by the AIEE Flight Vehicle Electric Systems Integration Subcommittee of the Aero-Space Transportation Committee. The personnel of the Subcommittee was:

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A considerable amount of the material was prepared by the AIEE Aircraft Electric Rotating Machinery Subcommittee and the Electric Control, Protective Devices and Cable Subcommittee.

Revision of this guide was prepared by the IEEE Flight Vehicle Systems Committee. Aerospace industry personnel also contributed to this revision. Acknowledgments are as follows:

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IEEE Guide for Aircraft Electric Systems

000—INTRODUCTION

010 GENERAL

Preparation of material incorporated in this report has been undertaken in the belief that it will materially aid in the realization of better aircraft electric systems. This conviction is confirmed by opinions expressed in joint meetings, including representation from NASA, SAE, NEMA, the U. S. Air Force Systems Command, and the U. S. Naval Air Systems Command.

020 QUALITY ATTAINMENT

Superior quality of performance in an aircraft electric system can be obtained as a result of:

a. Improved device performance

b. Better application and installation techniques.

Improved device performance is the result of more effective utilization of material, the incorporation of ingenious design features, or better manufacturing in a particular device, while better application technique is concerned with selecting the most appropriate combination of devices and coordinating them in the most effective manner so as to realize the best overall results in a composite functional system.

030 SCOPE

Material comprising this report is directed primarily at the *attainment of improved application technique*—the attainment of the highest possible quality of performance from a combination of particular devices to perform a given function. The performance qualities exhibited by a composite system composed of numerous devices will be influenced by the character of devices which are selected to work together and the manner in which they are interconnected or correlated. The extent to which such composite systems may be benefited by proper application technique is great.

Realization of the stated objective involves comprehensive treatment of the following character expressed quantitatively in simple compact form.

a. An explanation of the fundamental electrical problems involved.

b. Typical characteristic performance data of the various elements and devices of which the system is composed, which shall define inherent limitations as well as meritorious qualities.

c. Methods of analysis or test by which the qualities and limitations of a particular composite system may be evaluated.

d. Formulation of particular application practices which experience and judgment confirm as assuring good performance.

e. Formulation of a general analysis procedure outlining the various factors which must be examined or checked.

Although this report will refrain from defining or dictating specific characteristics of particular devices, it is quite possible that desirable features brought out by application considerations may assist other groups in creating new devices or improving existing ones.

Electrical applications in aircraft assume many peculiar aspects. Weight and space are of great importance, and reductions in these quantities deserve infinitely greater consideration than in equipment for land service. Equipment must be capable of successful operation in the presence of wide variations in ambient temperature, humidity, and altitude. In general, equipment must be capable of withstanding severe vibration in the member which supports it and it may be subjected to intense acoustic energy. Apart from these considerations which are peculiar to aircraft service, all knowledge accumulated through years of industrial experience should be used to the fullest advantage in bettering the performance of aircraft electric systems.

Aircraft electric systems have grown over the years from the early nonessential automobile-type systems to the present-day general-purpose systems which perform many vital functions. Installed capacities have grown also, to an extent that more attention to system protection is necessary for safety. This has occurred during a period when the electrical divisions of the aircraft manufacturers have been expanding in size. In fact, much of the engineering expansion has resulted from the increased dependence upon the aircraft electric system and the consequent growth in system size and complexity. In view of the influx of new engineering talent into these organizations it is apparent that immense benefits can result from a comprehensive summary of good application principles which are founded on sound engineering fundamentals. The unprecedented expansion of size and number of aircraft with ever-increasing electric system capacities which has occurred since 1941, principally for military service, has resulted in the accumulation of much knowledge and experience relative to good electrical application practice. It is important that this vast reservoir of knowledge be tapped, coordinated, and compiled in the form of a permanent record.

In the final analysis, the resulting benefits will be measurable in terms of:

a. Improved reliability; fewer outages, less maintenance

b. Lighter weight

c. Simplification of installation, operation, maintenance

d. Greater safety to personnel, the aircraft and electric equipment