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**Minimum Operational Performance Standards
(MOPS) for Nickel-Cadmium, Nickel Metal-
Hydride and Lead-Acid Batteries**

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Prepared by: SC-211
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FOREWORD

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- Developing consensus on the application of pertinent technology to fulfill user and provider requirements, including development of minimum operational performance standards for electronic systems and equipment that support aviation; and
- Assisting in developing the appropriate technical material upon which positions for the International Civil Aviation Organization and the International Telecommunication Union and other appropriate international organizations can be based.

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1 INTRODUCTION

Nickel-Cadmium, Nickel Metal-Hydride, and Lead-Acid batteries of a number of different sizes, and construction details are widely used today. Among their desirable characteristics are high energy density per unit weight and per unit volume, high cell voltage (Lead-Acid), relatively constant voltage during discharge (NiCd), good low-temperature performance and long shelf life. Nickel-Cadmium, Nickel Metal-Hydride, and Lead-Acid batteries provide power for aircraft engine or Auxiliary Power Unit (APU) starting and other equipment including avionics and emergency and standby systems. Because of their high energy content, they can present hazards if improperly designed, tested, used, or stored.

1.1 Purpose

The purpose of this document is to provide guidance on the construction, certification, production and use of Nickel-Cadmium, Nickel Metal-Hydride, and Lead-Acid battery on aircraft. This guidance is provided to the designers and manufacturers of Nickel-Cadmium, Nickel Metal-Hydride, and Lead-Acid batteries, aircraft designers and manufacturers, and users within the aviation community. This document contains minimum operational performance standards for rechargeable Nickel-Cadmium, Nickel Metal-Hydride, and Lead-Acid batteries to be used as power sources on aircraft.

Compliance with these standards is recommended as a means of assuring that the battery will perform its intended function(s) safely under conditions normally encountered in routine aeronautical operations. Any regulatory application of this document is the sole responsibility of the cognizant government agencies.

These standards cover the chemical composition, cell size, cell construction, interconnection of the cells into batteries, venting, operational and storage environments, packaging, handling, test, storage and disposal of Nickel-Cadmium, Nickel Metal-Hydride, and Lead-Acid batteries installed separately or in avionics equipment aboard aircraft. Its further purpose is to provide aircraft designers, and aircraft equipment designers with information on the performance characteristics and operating and environmental limitations of Nickel-Cadmium, Nickel Metal-Hydride, and Lead-Acid batteries.

It is the responsibility of the aircraft and equipment designers and manufacturers to insure that the battery operating environmental limits defined in this document will not be exceeded during the intended use of the battery and equipment on the aircraft.

1.2 References

The following normative documents contain provisions which, through reference in this text, constitute provisions of this Standard. For dated references, subsequent amendments to, or revisions of any of these publications do not apply. However, parties to agreements based on this Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to apply.

ANSI/ASQC M1-1996: American National Standard for Calibration Systems

IEC 60952-1 Aircraft Batteries, Part 1: General test requirements and performance levels

IEC 60952-2 Aircraft Batteries, Part 2: Design and construction requirements