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A New Guidance System for Approach and Landing

Volume 1 of 2

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FOREWORD

This report was prepared by Special Committee 117 of the Radio Technical Commission for Aeronautics (RTCA). It was approved by RTCA on December 18, 1970.

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VOLUME ONE

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A NEW GUIDANCE SYSTEM FOR APPROACH AND LANDING

SECTION I

INTRODUCTION

The membership of RTCA Special Committee 117 was comprised of over 465 U. S. and world experts on aircraft operations and instrument landing systems from both government and industry. This Committee, which represented perhaps the largest body of knowledge on landing system technology ever assembled in a focused effort, has completed a task of major proportions. It is a distillation of operational and technical requirements, current and prospective technology, system and economic analyses, which have resulted in recommendations for a new Microwave Scanning Landing Guidance System (LGS). The work, representing a three-year effort by this large international group of government and industry experts, is the basis for a larger task, that of achieving national and international agreement on a New Guidance System for Approach and Landing. The continuation of this effort will require the cooperation of many, but now leadership and financial resources must be provided by government agencies. A series of specific actions which need to be pursued are listed under RECOMMENDATIONS FOR FOLLOW-ON ACTIONS.

The system which has emerged, a major single concept with two end branches (a single judgment on conventional scanning versus Doppler scanning was not possible without further experimentation), is a highly flexible building-block system which promises to meet the needs of minimum-requirement general aviation users on the one hand, and full-scale all-weather automatic landing and multiple closely spaced runway environments on the other. It is a modular concept which does not appear to penalize either end of the spectrum to satisfy the other end. The signal-in-space created appears to be able to meet the broadest possible spectrum of operational needs -- both civil and military.

The recommended LGS provides for guidance information that may be expected to have a high order of integrity, both in terms of accuracy throughout the system coverage and the reliability of the information transmitted and detected. The coding and processing methods were selected to inherently provide a high level of protection against generation of false guidance information and a capability for monitoring to preclude undetected failures.

The recommended system concept and signal structure, the Provisional Signal Format, meets virtually all of the stated operational requirements with the exception of obstacle warning and the extremes of azimuth coverage, and in some cases relatively small compromises on boundary desires were necessary. Also, the Format permits use of techniques which are economically viable now, and makes it possible to introduce new now-emerging technology to provide a better and less expensive system later. Universal use of the system concept and signal format for many uses and by many classes of users is the best way to achieve economy for all. Conversely, those who choose to go their own way toward a new system, with different techniques for minor operational or technical advantages, clearly detract from the prospect of overall economy.

The Report

The Report is contained in two volumes. Volume One includes:

- Introduction
- Background and Terms of Reference
- Recommendations for Follow-on Actions
- Summary of Operational Requirements
- Specific Technical Characteristics of the Provisional Signal Format with its two branches
- Recommended Technical Validations and Investigations
- Membership of RTCA Special Committee 117

Volume Two contains the actual milestone reports of Special Committee 117's work, i.e.:

- Tentative Operational Requirements, RTCA Paper 19-69/SC117-46.
- Report of the Techniques Assessment Team (TAT), RTCA Paper 190-69/SC117TAT-27.
- Report of the Signal Format Development Team, RTCA Paper 189-70/SC117SFDT-27, as amended, including:
  - Report of the Airborne Systems Review Team
  - Report of the Economic Advisory Group