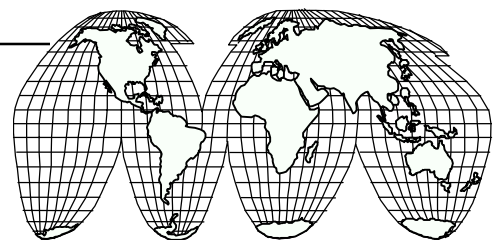




Government/Industry Operational Concept for the Evolution of Free Flight

Addendum 3: SURVEILLANCE

Approved by the RTCA Free Flight Steering Committee
August 16, 2000



RTCA, Incorporated
1140 Connecticut Avenue, N.W., Suite 1020
Washington, DC 20036-4001 USA

Government/Industry Operational Concept for the Evolution of Free Flight

Addendum 3: SURVEILLANCE

Copies of this document may be obtained from

RTCA, Inc.
1140 Connecticut Avenue, NW, Suite 1020
Washington, DC 20036-4001 USA

Telephone: 202-833-9339
Facsimile: 202-833-9434
Internet: www.rtca.org

Please call RTCA for price and ordering information.

Foreword

This report was approved the RTCA Free Flight Steering Committee on August 16, 2000.

RTCA, Incorporated is a not-for-profit corporation formed to advance the art and science of aviation and aviation electronic systems for the benefit of the public. The organization functions as a Federal Advisory Committee and develops consensus based recommendations on contemporary aviation issues. RTCA's objectives include but are not limited to:

- coalescing aviation system user and provider technical requirements in a manner that helps government and industry meet their mutual objectives and responsibilities;
- analyzing and recommending solutions to the system technical issues that aviation faces as it continues to pursue increased safety, system capacity and efficiency;
- 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.

The organization's recommendations are often used as the basis for government and private sector decisions as well as the foundation for many Federal Aviation Administration Technical Standard Orders.

Since RTCA is not an official agency of the United States Government, its recommendations may not be regarded as statements of official government policy unless so enunciated by the U.S. government organization or agency having statutory jurisdiction over any matters to which the recommendations relate.

This page intentionally left blank

Table of Contents

Section	Page
Executive Summary	1
1.0 Introduction	5
1.1 Background	6
1.2 Scope of Document	6
1.3 Objective and Intended Use	7
1.4 Document Organization	7
2.0 Future Operational Environment and Characteristics	9
2.1 Guiding Principles	9
2.2 Overview of Future Surveillance Operational Concept	10
2.2.1 Separation Assurance	13
2.2.2 Conflict Management	16
2.2.3 Collision Avoidance	19
2.3 Architectural Concepts and Functional Needs	19
2.3.1 System Architecture	19
2.3.2 Data Security and Privacy	20
3.0 NAS Surveillance Operations by Domain and/or Phase of Flight	23
3.1 Flight Planning and Flight Assistance	23
3.1.1 Near Term Flight Planning and Flight Assistance	23
3.1.2 Transition Period Flight Planning and Assistance	24
3.1.3 Mature State Flight Planning and Flight Assistance	26
3.2 Airport Surface Surveillance Operations	27
3.2.1 Near Term Airport Surface	27
3.2.2 Transition Period Airport Surface	28
3.2.3 Mature State Airport Surface	30
3.3 Terminal Area, Approach, and Departure Surveillance Operations	31
3.3.1 Near Term Terminal, Approach, and Departure	31
3.3.2 Transition Period Terminal, Approach, and Departure	32
3.3.3 Mature State Terminal, Approach, and Departure	33
3.4 En Route Surveillance Operations	33

3.4.1 Near Term En Route	33
3.4.2 Transition En Route	35
3.4.3 Mature State En Route	37
3.5 Oceanic Surveillance Operations	38
3.5.1 Near Term Oceanic	39
3.5.2 Transition Period Oceanic	41
3.5.3 Mature State Oceanic	42
3.6 Traffic Flow Management Surveillance Operations	44
3.6.1 Near Term TFM	46
3.6.2 Transition TFM	46
3.6.3 Mature State TFM	46
4.0 Summary	47
Appendix A - Participants	A-1
Appendix B- List of References	B-1
Appendix C - Glossary	C-1
Appendix D - Acronyms	D-1

List of Figures

<u>Figure 2-1</u>	Mature State Information-Based Surveillance Operations for NAS Air Traffic Services	11
<u>Figure 2-2</u>	Separation Management	14
<u>Figure 2-3</u>	Shared Common NAS Information	21
<u>Figure 3-1</u>	Graphic Cockpit Display of Runway Clearance	28

This page intentionally left blank.

Executive Summary

Surveillance provides a view of operations within the National Airspace System (NAS). Safety and efficiency are the essentials of this system. As the demands of capacity and efficiency grow, so must our ability to assess the immediate and evolving operations within the NAS. Safety and efficiency can improve when a common understanding of system participant needs and desires are known, and appropriate procedures and technologies applied. Surveillance plays an integral role in the NAS in separation assurance, traffic flow management, flight planning, fleet management, collaborative decision making, and collision avoidance. This document discusses those needs and our opportunities to advance system performance as they have evolved since RTCA published the *Government/Industry Operational Concept for the Evolution of Free Flight* in December 1997. Fundamental to this concept is the recognition that safety is the keystone to future enhancements. The path to enhanced safety also provides an opportunity to increase both efficiency and capacity. Improving the dissemination availability and quality of surveillance information represents one fundamental means by which safety, efficiency, and capacity will be enhanced.

In this document, **surveillance** is defined as the detection, tracking, characterization, and observation of aircraft, other vehicles, and weather phenomena for the purpose of conducting flight operations in a safe and efficient manner. The primary purposes of surveillance are to control the flow of aircraft, to provide situation awareness to pilots and controllers, and to separate aircraft. Methods of surveillance include voice reports, visual acquisition, radar (both primary and secondary), and other new technologies such as automatic dependent surveillance. Surveillance information (including position, velocity vector, identification, and intent) can be used either in a ground facility or in the cockpit. In addition, surveillance may be used to support functions such as fleet monitoring and management, traffic flow management, and search and rescue operations. The quality of aircraft surveillance can be described in terms such as the target update rate, position accuracy, velocity vector accuracy, integrity, reliability, and availability.

This surveillance concept of operations is intended to document one of the essential elements of Free Flight. It is part of an overall government/industry activity to look at the evolution of surveillance services and of the surveillance architecture. A companion document describes the surveillance technology, architecture, and a roadmap needed to achieve the operational concept described herein. Along the way, evaluation of procedures, technologies, advances in Human Computer Interface (HCI), and domestic and international policies will shape the final outcome. In addition, there are other efforts currently underway in international fora, such as Eurocontrol and International Civil Aviation Organization (ICAO), to promote a global airspace, which provides increased capacity, efficiency, cost effectiveness, and safety across international boundaries.

The approach described herein transitions from the current radar/interrogator baseline of surveillance information to a digital information environment that encompasses air and ground operations. This approach focuses on providing shared real-time surveillance