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GOVERNMENT AND INDUSTRY GUIDELINES AND CONCEPTS FOR NAS ANALYSIS AND REDESIGN

Volume I: User Priorities for the National Airspace Redesign
Volume II: High Altitude Airspace Concept
Volume III: Recommendations on Special Use Airspace in National Airspace Redesign

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Prepared by SC-192
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FORWARD

This report was prepared by Special Committee 192 (SC-192) and approved by the RTCA Program Management Committee (PMC) on December 14, 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 Telecommunications 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.

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EXECUTIVE SUMMARY

The Air Traffic Services organization of the Federal Aviation Administration (FAA) is conducting a review of the airspace resources in the NAS. The objectives of this review include developing a cohesive plan for managing airspace changes, establishing and directing a financial plan to meet airspace priorities, establishing standards for modeling and analysis, and developing strategies for environmental assessment of airspace changes. Representation from the user community and industry is critical in completing these challenging objectives.

RTCA Special Committee 192, National Airspace Redesign Planning and Analysis was established to continue to provide guidance, direction, and recommendations to the FAA's review, redesign, and management of the national airspace. Airspace issues associated with free flight implementation were to be considered in developing all of the guidance and recommendations.

BACKGROUND

This document identifies all known types of airspace users and describes how each of the current and future users is affected by special use airspace (SUA). It includes a vision of the future airspace system and the role SUA will play in the future NAS. The document ends with recommendations for making SUA more flexible and efficient. The document should be used in conjunction with the concepts described in the previous RTCA SC-192 report, *Government and Industry Guidelines and Concepts for NAS Analysis and Redesign*, RTCA's *Government/Industry Operational Concept for the Evolution of Free Flight* and RTCA's *Task Force 3 Final Report*.

The Department of Defense (DoD) and other SUA using agencies use various forms of special use airspace to separate non-participating aircraft from both hazardous and non-hazardous training and test activities. In order to conduct the necessary training to maintain readiness, the military requires SUA and will continue to do so for the foreseeable future. However, new, faster aircraft and longer-range weapons are changing the manner and the frequency of SUA use.

SUMMARY OF COMMITTEE RESULTS

This document contains three volumes and represents the products of two work groups of Special Committee 192: National Airspace Review Planning and Analysis. Volume I, entitled *User Priorities for the National Airspace Redesign,* describes the user priorities for the review and redesign of the airspace resources in the National Airspace System (NAS). Not listed in order of importance, these priorities include concepts for a national airspace assessment and redesign that addresses significant change to matters pertaining to the national airspace by the year 2005. Volume II entitled *High Altitude Airspace Concept,* describes an airspace structure within which the FAA could begin to implement many of the Free Flight concepts. Volume III, entitled *Recommendations on Special Use Airspace in National Airspace Redesign,* identifies needs of current users for access to and/or the use of Special Use Airspace. It recommends steps that the FAA could take improve access for all stakeholders to inactive Special Use Airspace.

VOLUME I SUMMARY

This document contains the recommendations of Working Group One. It addresses the user priorities for the National Airspace Redesign and assesses these priorities and recommendations against the initial SC-192 recommendations.

User Meetings

To expand the scope of user input outside of the committee members, the working group decided to hold a series of user meetings throughout the continental United States. The context of the user

meetings was to solicit input from the users of the airspace to identify issues and potential solutions. The meetings were intended to provide a forum for exchanging ideas. They were not intended to result in consensus on the issues or how to resolve them. The objective of the working group was to be able to aggregate and analyze the information about local and regional problems and to draw inference about national needs and priorities. User meetings were held at Hasbrouck Heights, N.J.; Frederick, Md; Chicago, Ill.; Los Angeles, Calif.; Dallas, Tex.; and Orlando, Fla.

Summary of User Meetings Comments

The comments from the user meetings represented the input of users and do not represent a consensus or agreement among users or between users and the FAA. The users provided comments on several key areas:

User Involvement. Local users should be involved in any airspace redesign activities.

Redesign routes. Prior to any redesign, the present route structure must be analyzed for procedural inefficiencies. One of the limiting factors in the NAS today are ground-based navigational systems that can cause constraints to many users.

Redesign sectors. Aircraft should be separated from each other, not from volumes of airspace. In the enroute domain and within the conceptual architecture of Free Flight, the configuration and management of the airspace may favor the establishment of a few very large sectors, which would tend to remove the constraints caused by unnecessary stratification and boundaries.

Redesign traffic flows. Traffic flows should be analyzed and new flows designed for greater efficiencies while accounting for changes in fleet mix. These flows should be analyzed according to how well they will provide benefits and efficiencies to the user while maintaining safe aircraft operations. Procedures should be established that permit optimized climb and descent trajectories.

Equitable Access to Airspace. Users expressed a desire to preserve their access to available airspace. Users often make significant capital investments in their facilities and cannot readily move their operations if encroached upon by other airspace users. In addition, some gliders often need to take advantage of specific orographic and atmospheric features and therefore their activity is fixed to specific locations around the country. These requirements and investments should be taken into consideration in any airspace or procedural design efforts.

SUA Management. Users expressed a strong desire for an effective and flexible "real-time" SUA management system. They feel that they do not currently have reliable access to accurate SUA status information and this results in the under-utilization of airspace. By making this information readily available, the airspace could be utilized much more efficiently. Users felt that making the information available will require both military and civil airspace managers to develop procedures that will enable more flexible real-time use of SUA.

VFR Flexibility. One of the greatest benefits GA users have today is the operational flexibility provided by VFR operations. Increasing regulation, new equipment requirements and additional operations restrictions diminish this flexibility. GA users expressed a desire to gain some flexibility and efficiencies in the benefits-driven evolution to free flight, but even more critical is the requirement that they not lose any access or flexibility available to them now.

VOLUME II SUMMARY

As a step towards mature Free Flight, RTCA SC 192 examined the possibility of defining a high altitude airspace structure where the FAA could begin to implement many of the Free Flight

concepts. *The High Altitude Airspace Concept* reports on this examination by defining how one segment of the NAS could provide more of the freedoms described in the Free Flight Concept while offering an opportunity to deploy new technology and procedures in a controlled environment. This airspace would allow properly equipped users to begin achieving the economic benefits of flying their preferred routes and altitudes with fewer restrictions than the present system requires. RTCA SC 192 envisions the initial implementation of this airspace at the higher flight levels of the enroute structure and introduced at additional levels as technology and procedures allow.

VOLUME III SUMMARY

In today's NAS, special use airspace includes: prohibited areas, restricted areas, warning areas, military operations areas (MOAs), alert areas, and controlled firing areas (CFAs). Except for CFAs, special use airspace areas are depicted on aeronautical charts. Besides the designated special use airspace areas, there are other areas within the NAS where special activities occur and non-participating aircraft are alerted to avoid participating aircraft. These special activities can occur within national security areas, military training routes, air traffic control assigned airspace, altitude reservations, and temporary flight restriction areas.

There are a series of tools, in various stages of development, that are available today for aiding special use airspace management. The Military Airspace Management System (MAMS) is an Internet based system that will become operational in 2000 and provide the FAA with information on military activity within SUA. It will provide a direct input to the FAA's Special Use Airspace Management System, which will be the conduit through which SUA information will eventually be sent directly to controllers and flight service specialists. The Central Altitude Reservation Function (CARF) and the Notice(s) to Airmen (NOTAM) are two airspace management tools that have been in use for several years and are being improved. The OASIS System, which is beginning to be installed in automated flight service stations, will improve the quality and the quantity of the SUA information available to pilots who contact a flight service specialist.

Several prototype tools are being proposed and tested to enhance the rapid and timely dissemination of information about SUA availability. The Falcon View prototype, in use at Jacksonville ARTCC, facilitates making warning area boundary adjustments between the center and the Navy's FACSFAC Jacksonville. Other prototypes focus on providing near-real time SUA information to controllers, flight service station providers, and non-participating airspace users.

Increased collaboration among SUA users, the FAA, and other airspace users provides a record of accomplishment and documentation for future SUA initiatives. In the Phoenix area, the Dryheat departure procedure was the result of collaboration that met the needs of FAA controllers for a northeast departure route and the military for a high altitude training area. When the FAA and the military improved the way in which R-2508 scheduled use and availability was disseminated, airlines to and from the Bay Area were enabled to use J-110 more often for more efficient routing. The solution to problems raised by the Buckeye MOA near Cincinnati demonstrates the ability of DoD and FAA to work together to solve a highly complex airspace challenge. It also shows that real-time, dynamic solutions may require the expenditure of significant resources such as communications equipment, radar, and associated personnel. As this report is being written, SC-192, Work Group-2 is conducting field trials (in central Florida and near Fort Worth, Texas) through which we plan to learn more about the process of disseminating real-time SUA status information.

The Future of Special Use Airspace

Working Group 2 described a concept for the evolution of SUA. The working group agreed that the need for SUA would continue indefinitely. However, more efficient use of SUA can be accomplished in the near-term by improving the flow and dissemination of SUA information to controllers and non-participating users. Armed with this information and new airspace design concepts using adaptive airspace principles, service providers can collaborate with SUA using agencies to enable more efficient air traffic flows while providing SUA participants with the dimensions necessary for each mission.

As the NAS evolves in the far-term, so will the processes required for improving safety, capacity, and efficiency. Most SUA of the future will continue to be defined by the DoD national security and readiness requirements for our national defense. The need for SUA will continue to be defined by what airspace is necessary to execute a mission or training requirement. A NAS wide information system to support the processing and dissemination of SUA scheduling information will be essential for improved efficiency.

Airspace Users' Requirements

The types of operations occurring above the earth's surface are usually divided into three broad categories: operations supporting national objectives by nation-states; operations supporting business and commercial objectives; and general aviation operations. Today, these three categories are joined by new and emerging forms of airspace operations such as: space vehicles, remotely operated (or unmanned) aircraft, and laser beam activities. Each of these emerging forms of user may, at times, require SUA to conduct operations. And likewise, each must avoid SUA activities conducted by other users.

Future airspace users will use more complex aircraft. Onboard computers, coupled with advanced display systems, will provide more assistance with decision making. The roles and responsibility of pilots will evolve to systems management responsibilities. In this automated environment, onboard computer systems will need to receive real-time information about SUA on or near the programmed route of flight. To achieve this goal, the SUA using agencies will be asked to provide near real-time, accurate SUA status information in a uniform and consistent format suitable for input into onboard computer systems.

Special Use Airspace Recommendations to the FAA

Recommendation 1: Develop a concept for SUA evolution and a plan that ensures incremental benefits throughout the transition period

Recommendation 2: Establish a working group of military, FAA and other government agencies, unions, and various types of users to determine specific information requirements concerning SUA availability and time frames for notification of availability.

Recommendation 3: Each SUA improvement initiative should be coordinated with the FAA's regional and national airspace teams. (Focus Leadership Teams (FLTs) and the national Airspace Liaison Team (ALT))

Recommendation 4: Develop procedures to provide more effective distribution of SUA information to service providers, pilots, and other airspace users. The distribution system must include the capability to share SUA information with other ICAO members. This recommendation could mean improvements to such systems as SAMS, MAMS, ETMS, and NOTAMs to support the distribution of information. The information distributed could include,

but would not be limited to, items such as "scheduled time of use." This recommendation reiterates Recommendation 11 from the *Free Flight Action Plan*.

Recommendation 5: The FAA must improve or upgrade automation systems to support information processing for planning, scheduling, and routing using near real-time SUA information. Possible modifications could include: (1) redesigning software to support functional changes needed for effective SUA management, and (2) enhancing the software to support the display of SUA information on controller's scopes.

Recommendation 6: Stakeholders, including the FAA, DoD and other using agencies, plus representatives of non-participating airspace users, must collaborate to develop a standardized process for resolving future SUA issues while giving the highest priority to the security of sovereign airspace and the requirement for DoD to maintain readiness. Continuing the field trials underway in Florida and Texas to improve information flows from using and controlling agencies to the airspace users would be one way to nurture this collaboration.

Recommendation 7: Expedite software development for automation to identify and resolve any conflicts between the national CARF-ALTRV database and each separate local database.

Recommendation 8: Prototype systems, such as SUA/ISE, should be explored for future use in assisting AFSS specialists to provide inflight advisories regarding the status of SUA.

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RTCA Special Committee 192:
National Airspace Redesign Planning and Analysis

BACKGROUND

The Air Traffic Services organization of the Federal Aviation Administration (FAA) is conducting a review of the airspace resources in the National Airspace System. The objectives of this review include developing a cohesive plan for managing airspace changes, establishing and directing a financial plan to meet airspace priorities, establishing standards for modeling and analysis, and developing strategies for environmental assessment of airspace changes. Documenting the user community and industry requirements is critical in completing these challenging objectives.

At the request of the FAA, RTCA Special Committee 192, National Airspace Review Planning and Analysis was established to provide guidance, direction, and recommendations on the FAA's review, redesign, and management of the national airspace. In June 1998, this committee provided a report, *Government and Industry Guidelines and Concepts for NAS Analysis and Redesign*, on its recommendations on both what candidate improvements to the airspace should be considered and how to assess the expected consequences of these and other airspace changes.

The FAA requested RTCA provide a more detailed set of recommendations, and in late 1998, RTCA reestablished Special Committee (SC) 192 as RTCA SC-192 National Airspace Redesign Planning and Analysis. This special committee is chartered to provide detailed recommendations to the FAA for the review and management of national airspace redesign. These recommendations will ensure that the resulting airspace supports increased safety and efficiency in the NAS. This committee represents the views and perspectives of airspace users and stakeholders, and will address issues associated with all types of domestic and oceanic airspace. Three working groups of the SC 192 were established and tasked as follows:

Working Group One: Provide a document on the user priorities for the National Airspace Redesign and assess the user recommendations and priorities against the initial SC192 recommendations in the report *Government and Industry Guidelines and Concepts for National Airspace Analysis and Redesign*.

Working Group Two: Provide a document on recommendations for SUA. This includes identifying the key areas of SUA that may be affected by changes in the National Airspace Redesign and recommendations on improving civilian access to SUA when not in use by the military.

Working Group Three: Provide a document on recommendations and proposed changes to *FAA Order 7400.2, Procedures for Handling Airspace Matters*. This included identifying policies, procedures, guidelines and criteria in the Order that affect the airspace redesign concepts of SC-192 and develop recommendations to support those concepts.

Within this document, Volumes I and II contain the results of Work Group One's work. Volume Three is the product of Working Group Two's work. Working Group Three's work will be conveyed by letter directly to the FAA.

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SCOPE AND INTENDED USE

This document should be used in conjunction with the concepts described in the previous RTCA SC-192 report, Government and Industry Guidelines and Concepts for NAS Analysis and Redesign, RTCA's Government/Industry Operational Concept for the Evolution of Free Flight and RTCA's Task Force 3 Final Report.

The concepts in this document are subject to ongoing evaluation and validation. The concepts will be modified to reflect maturing technologies and their effect on user priorities. These recommended priorities should be used to help coordinate and define FAA policies and priorities.

Each SC-192 working group focused on the requirements of aviation stakeholders. This focus is consistent with the incremental approach to free flight, and will help balance the need for resources of both the FAA and the users. The transition to free flight will occur gradually, as a function of available technologies, procedural changes, different requirements within the aviation community and the need for greater capacity in the airspace system.

OBJECTIVES

In developing the recommendations made within this document, RTCA Special Committee 192 is committed to meeting the following objectives.

Safety:	To maintain or increase, under varying conditions, the level of safety, making full use of available information and technologies.
Efficiency:	To fully exploit the existing capacity of the NAS and to continually improve capacity to meet current and future demands of the users, enabling timely introduction of new functionality.
Cost Effectiveness:	To provide services consistent with needs for a balanced, fair and economically justified system.
User/Provider Preferences:	To allow for optimum flight profiles and trajectories, as well as special user needs such as military operations. This concept must meet the civilian/military coordination and integration requirements.
Adaptability:	To be able to respond to unexpected user demands, and to future user demands, as well as to evolving operational requirements established by the service provider.
Contingency Requirements:	To define and prepare measures that ensure air traffic services can be continued in the event of a complete service outage and/or malfunction, and to provide ample time and scope to solve problems that have occurred.
National Security Requirements:	To accommodate national security requirements, particularly in terms of Department of Defense needs.

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