



International Civil Aviation Organization

North American, Central American and Caribbean Office

**Second Meeting of the North Atlantic/Caribbean ATS Routes Working Group
(NAT/CAR WG/2)**

(Miami, Florida, USA, 8-10 May 2007)

NAT/CAR WG/2 – WP/05

21/04/07

Agenda Item 1: WATRS Plus Project Implementation Issues

SAFETY ASSESSMENT AND OVERSIGHT

(Presented by the United States)

SUMMARY

The attached Safety Assessment and Oversight briefing provides information on United States' plans to use ICAO Collision Risk Methodology as a safety assessment tool for the WATRS Plus project.

1. Introduction

1.1 Analysing the safety of airspace prior to introducing a reduced separation standard is a critical step, followed by monitoring the safety situation post-implementation.

1.2 The attached briefing addresses plans for safety assessment and oversight of the initiative to reduce lateral separation and introduce a redesigned route structure in the WATRS Plus Control Areas.

1.3 The briefing focuses on plans for using ICAO Collision Risk Methodology (CRM) as a tool for safety assessment. It should be noted that the FAA has also implemented a Safety Management System and a Safety Risk Management Document (SRMD) will be required for WATRS Plus.

2. Safety Assessment and Oversight Briefing Content

2.1 The following safety assessment and oversight responsibilities are addressed in the briefing:

- a) Assessment of Requirements
- b) Preliminary System Safety Assessment
 - (i) Setting the Safety Goal – Target Level of Safety
 - (ii) Tools for Safety Assessment - ICAO Collision Risk Methodology
 - (iii) Assembling Safety Related Data

- c) Planning and Preparation
 - (i) The Importance of Monitoring Large Lateral Deviations
 - (ii) Safety Assessment Versus Safety Oversight
- d) Verification – Pre-Implementation Safety Assessment
- e) Post Implementation – Safety Oversight

3. Suggested Actions

3.1 The group is invited to comment on the safety assessment and oversight process and procedures and support their application to the WATRS Plus project.



Federal Aviation
Administration

WATRS Plus

SAFETY ASSESSMENT AND OVERSIGHT

Presented by: Dale Livingston
FAA Technical Center
Atlantic City, New Jersey

Date: May 8, 2007



Safety Management System (SMS) & Collision Risk Methodology

- Briefing focuses on ICAO Collision Risk Methodology (CRM) as safety assessment tool
- FAA has also implemented a Safety Management System
- A Safety Risk Management Document (SRMD) will be required for WATRS Plus



ICAO Documents - BASIS FOR SAFETY ASSESSMENT AND OVERSIGHT

- *ICAO Annex 11 – Attachment B contains consolidated guidance for 50NM lateral separation minimum and associated post-implementation monitoring*
- *Manual On Airspace Planning Methodology for the Determination of Separation Minima (Doc 9689)*
- *Safety Management Manual (Doc 9859)*
- ICAO guidance material for global and regional implementation

OVERVIEW (I)

- Process for Safety Assessment and Oversight
- Step 1: Assessment of Requirements
- Step 2: Preliminary Assessment of System Safety
 - **Setting Safety Goal - The Target Level of Safety (TLS)**
 - **Tools for Safety Assessment - ICAO Collision Risk Methodology**
 - **Assembling Safety-Related Data**

OVERVIEW (II)

- Step 3: Planning and Preparation
 - **The Importance of Large Lateral Deviations**
 - **Safety Assessment Versus Safety Oversight**
- Step 4: Verification
- Step 5: Post-Implementation Safety Oversight



Step 1: Assessment of Requirements For Implementation

- Airspace System Considerations
- Authorization of operators & aircraft for RNP 10 or RNP 4: aircraft and operations program requirements
- Flight crew operating procedures
- ATC policy and procedures
- System Verification and Safety Analysis
- System Monitoring



STEP 2: PRELIMINARY ASSESSMENT OF SYSTEM SAFETY

- Assess ability to meet WATRS Plus safety goal: target level of safety (TLS)
- Adapt ICAO Collision Risk Methodology to the project
- Assemble data necessary to conduct safety assessment
 - **traffic movement data - “Know Your Airspace”**
 - **history of large lateral deviations**

STEP 2: SETTING SAFETY GOAL - THE TARGET LEVEL OF SAFETY (TLS)

- ICAO Doc 9689 employs worldwide TLS value to establish aircraft lateral navigation performance requirements:
 - **TLS = 5.0 fatal accidents per 10^9 flying hours**
- Need to account for risk due to all causes of large height deviations

STEP 2: TOOLS FOR SAFETY ASSESSMENT - ICAO COLLISION RISK METHODOLOGY

- Collision Risk Methodology used to develop Safety Analysis attached to proposed amendments to CAR and NAT Regional Supplementary Procedures (SUPPS)
- Risk Methodology consists of:
 - **TLS (=safety goal)**
 - **collision risk model (=risk estimation tool) and...**
 - **agreed means to determine if safety goal is met, given risk estimate**

STEP 2: ASSEMBLING SAFETY-RELATED DATA (I)

- “Know Your Airspace” traffic movement data provides:
 - operators and aircraft types using WATRS Plus airspace
 - means to estimate passing frequencies (traffic packing) in current airspace
 - means to estimate several risk model parameters

STEP 2: ASSEMBLING SAFETY-RELATED DATA (II)

- Historical information on occurrence of large lateral deviations supports:
 - **examination of their effect on overall system risk**
 - **means to reduce possible future occurrence of this type of event when 50 NM lateral separation is introduced**

STEP 3: PLANNING AND PREPARATION

- Develop parameters of core navigation and estimates of frequency of large deviation for the aircraft population
- Establish WATRS Plus Scrutiny Group to provide valuable operational expertise to review system performance
- Establish system for monitoring aircraft core lateral navigation performance
- Establish means for monitoring large track deviations

STEP 3: DEVELOP PARAMETERS FOR NAVIGATION PERFORMANCE

- Develop parameters for aircraft population:
 - **Core lateral navigation performance**
 - **Frequency of lateral deviations near one-half the separation minimum (i.e., 25 NM)**
 - **Frequency of lateral deviations near 50 NM**
- Besides aircraft systems, other sources of risk:
 - **gross navigation errors**
 - **weather**
 - **emergencies**
 - **ATC loop errors**

STEP 3: THE ROLE OF THE WATRS PLUS SCRUTINY GROUP

- Scrutiny Group is focal point for assembling and analyzing safety oversight information such as risk-bearing events (e.g., large lateral deviations)
 - **Comprised of ATC, Flight Standards and Safety Analysis specialists, pilots and controllers**
- FAA Separation Standards Analysis Group (AJP 7141) will organize and direct:
 - **aircraft navigation performance monitoring**
 - **assembly and assessment of large lateral deviation data, and...**
 - **reporting safety results to decision makers**

STEP 3: MONITORING AIRCRAFT HEIGHT KEEPING PERFORMANCE

- AJP 7141 will:
 - **assemble the technical systems and staff necessary to conduct aircraft lateral performance monitoring**
 - **notify State if operator commits lateral track deviation**

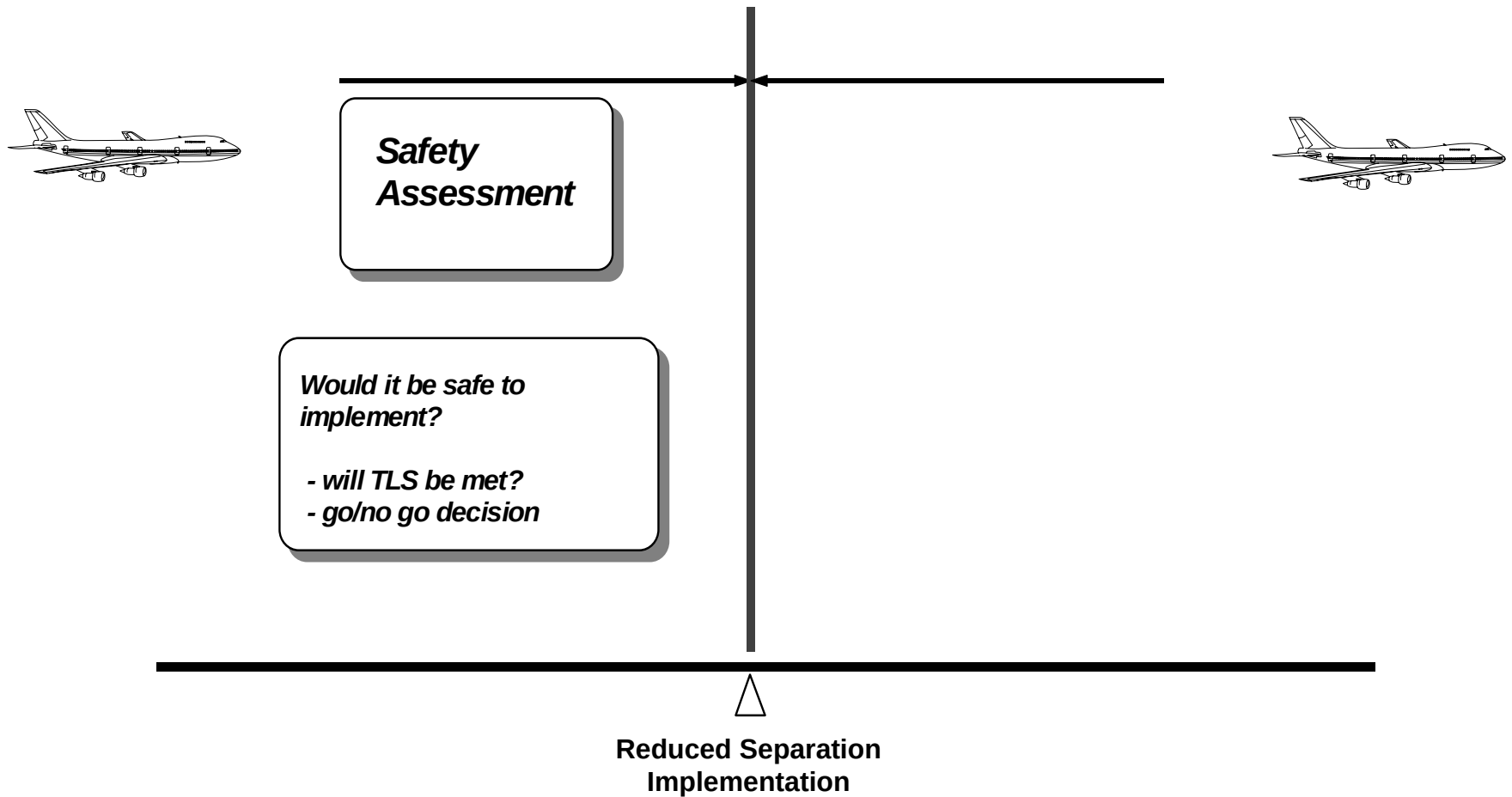


SAFETY ASSESSMENT VERSUS SAFETY OVERSIGHT

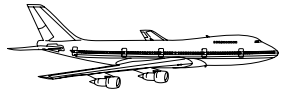
- Safety Assessment conducted prior to implementation
 - **Question: Is it safe to implement reduced lateral separation?**
 - **Result: contribution to GO/NO-GO decision**
- Safety Oversight ongoing after implementation
 - **Question: Does system continue to be safe?**
 - **Results: remedial actions if systematic problems are observed**



Safety Assessment versus Safety Oversight



Safety Assessment versus Safety Oversight



Safety Assessment

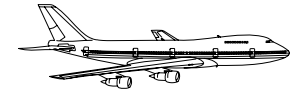
Would it be safe to implement?

- will TLS be met?
- go/no go decision

Safety Oversight

Safe under conditions

- safety assessment
- remedial actions
- assurance that TLS is met



Reduced Separation
Implementation



STEP 4: VERIFICATION AND INITIAL IMPLEMENTATION

- **Verification:**
 - **Pre-implementation Safety Assessment**
 - **Approximately 3 months prior to implementation (early March 2008)**
- **Post-Implementation – Safety Oversight**
 - **50 NM lateral separation implemented**
 - **Monitoring continues for Safety Oversight**
 - **Checks to ensure that planned ATC changes are effective**



Conclusion

- Separation Standards Analysis Group has prepared Safety Assessment and Oversight material for similar programs:
 - **NAT MNPS**
 - **NAT, Pacific and Domestic U.S. RVSM**
 - **Introduction of RNP 10 and 50 NM lateral separation to Pacific operations**
 - **Operational trials for 30 NM lateral and longitudinal separation in the Pacific**
- Will have significant responsibilities for the WATRS Plus project

