SAFETY ASSESSMENT AND OVERSIGHT

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17 June 2003

OVERVIEW I

- Five-Step Process of ICAO Doc 9574 - Basis for RVSM Safety Assessment and Oversight
- 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
- Regional Height-Keeping Performance Specification
- The Role of Regional Monitoring Agency
- Monitoring Height-Keeping Performance
- The Importance of Large Height Deviations
- Safety Assessment Versus Safety Oversight
- Step 4: Verification
- Step 5: Full Implementation

ICAO Doc 9574 - BASIS FOR RVSM SAFETY ASSESSMENT AND OVERSIGHT

- ICAO Doc 9574 *Manual on Implementation of a 300-m (1, 000-ft) Vertical Separation Minimum Between FL290 and FL410 Inclusive*

- ICAO guidance material for worldwide and regional RVSM implementation

ICAO Doc 9574 - FIVE-STEP IMPLEMENTATION PROCESS

- Doc 9574 proposes that a regional planning group follow a five-step process when implementing RVSM:
  - Assessment of Requirements
  - Assessment of System Safety
  - Planning and Preparation
  - Verification
  - Full Operation

STEP 2: PRELIMINARY ASSESSMENT OF SYSTEM SAFETY

- Assess ability to meet RVSM safety goal: target level of safety (TLS)
- Adapt ICAO Collision Risk Methodology to Region
- Assemble data necessary to conduct regional safety assessment
  - Traffic movement data - “Know Your Airspace”
  - History of large height deviations due to turbulence, emergencies and “ATC Loop Errors”

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

- ICAO Doc 9574 employs worldwide TLS value to establish aircraft height-keeping performance requirements:
  - TLS = 2.5 fatal accidents per 10**9 flying hours
- Previous RVSM implementation experience: need to account for risk due to large height deviations
- North American TLS value
  - Overall TLS = 5 fatal accidents per 10**9 flying hours
  - TLS used as bound on aircraft "technical risk" = ICAO Doc 9574 global TLS

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

- Collision Risk Methodology used to develop Doc 9574 global system performance specification, height keeping performance specification and aircraft height keeping performance requirements
- Risk Methodology consists of:
  - TLS (=safety goal)
  - collision risk model (=risk estimation tool)
  - agreed means to evaluate 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 airspace where RVSM will be applied
  - 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 height deviations supports:
  - examination of their effect on overall system risk
  - means to reduce possible future occurrence of this type of event when RVSM is introduced

STEP 3: PLANNING AND PREPARATION

- Develop regional height-keeping performance specification
- Develop regional height-keeping performance monitoring mechanisms and set up regional monitoring agency (RMA) to administer them
- Establish systems for monitoring aircraft height-keeping performance
- Establish means for monitoring large height deviations

STEP 3: DEVELOP REGIONAL HEIGHT KEEPING PERFORMANCE SPECIFICATION

- Doc 9574 sets global requirements on aircraft height keeping performance (altimetry and altitude keeping) systems
- Besides aircraft systems, other source of risk:
  - turbulence
  - emergencies
  - response to TCAS advisories
  - ATC loop errors
- Purpose of performance specification: set bound on frequency and magnitude of large height deviations

STEP 3: THE ROLE OF THE REGIONAL MONITORING AGENCY

- Regional Monitoring Agency is focal point for assembling information needed for safety assessment and safety oversight

- RMA organizes and direct aircraft height-keeping performance monitoring, assembly and assessment of large height deviation data, and reporting safety results to decision makers

STEP 3: MONITORING AIRCRAFT HEIGHT KEEPING PERFORMANCE

- RMA:
  - Assembles the technical systems and staff necessary to conduct aircraft height-keeping performance monitoring
  - Tracks progress of operators in meeting monitoring requirements associated with application of State RVSM approval process
  - Notifies States when requirements are satisfied
  - Notifies State if individual monitoring result indicates non-compliance with RVSM requirements

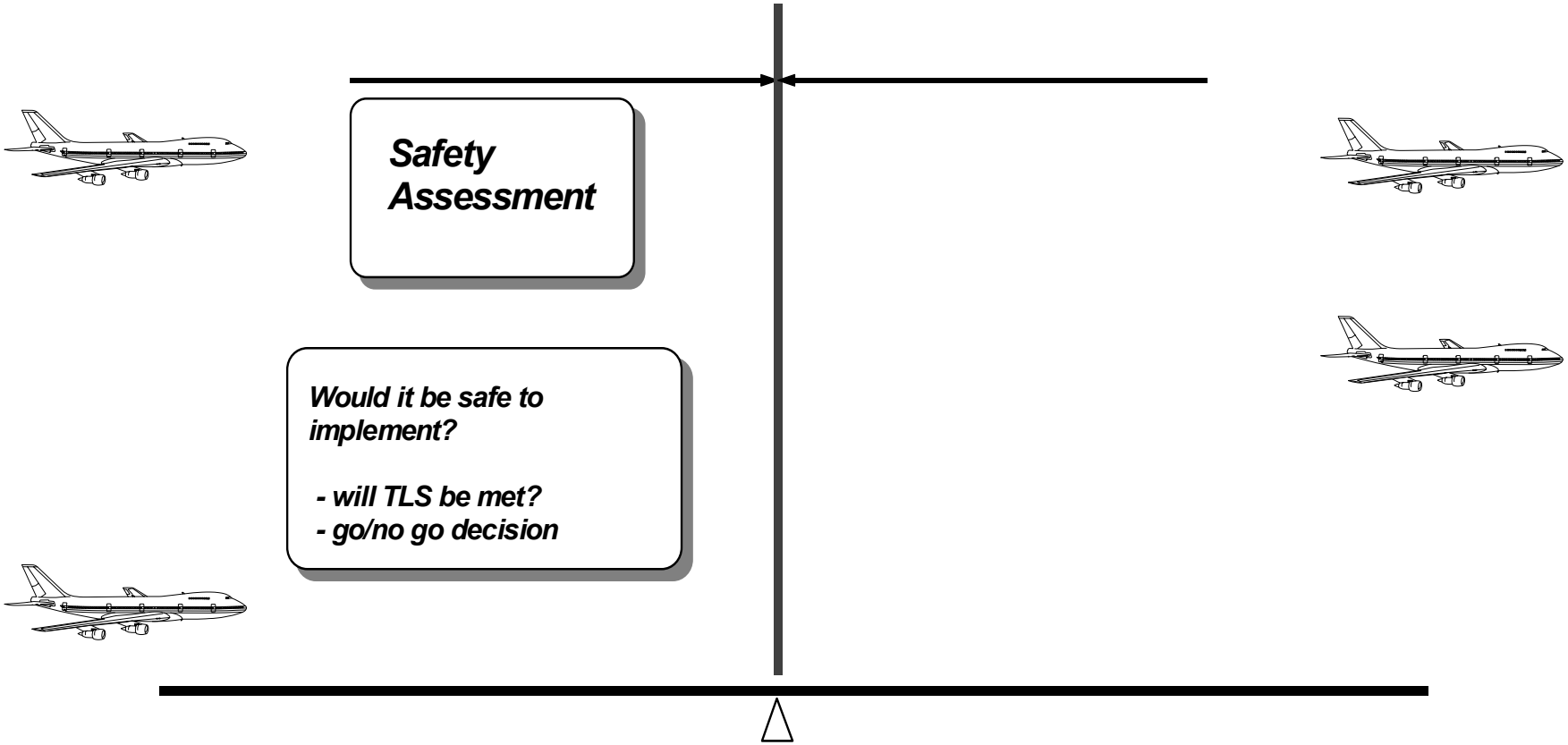
STEP 3: THE IMPORTANCE OF LARGE HEIGHT DEVIATIONS

- Both NAT and Pacific RVSM implementation experience indicate that State approval process results in altimetry and altitude keeping systems which are compliant with RVSM aircraft height keeping performance requirements
- Result: Aircraft system “technical risk” 10 to 20 times less than corresponding TLS value
- Large height deviations - especially ATC Loop Errors - in both NAT and Pacific resulted in overall risk estimate 10 to 20 percent less than overall TLS

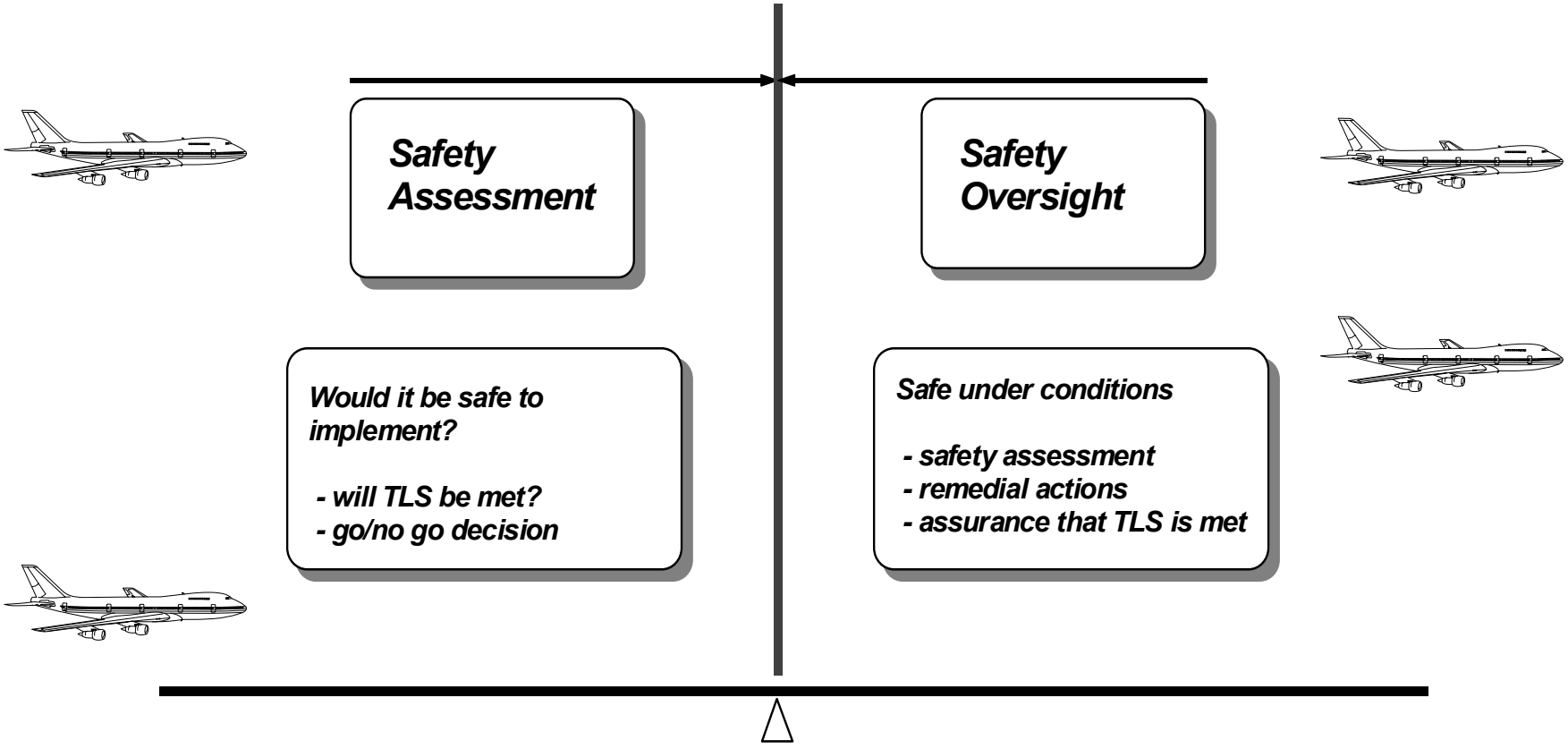
SAFETY ASSESSMENT VERSUS SAFETY OVERSIGHT

- Safety Assessment conducted prior to RVSM implementation
  - Question: Is it safe to implement RVSM?
  - Result: Contribution to GO/NO-GO decision
- Safety Oversight ongoing after RVSM implementation
  - Question: Does RVSM continue to be safe?
  - Results: Remedial actions if systematic problems are observed

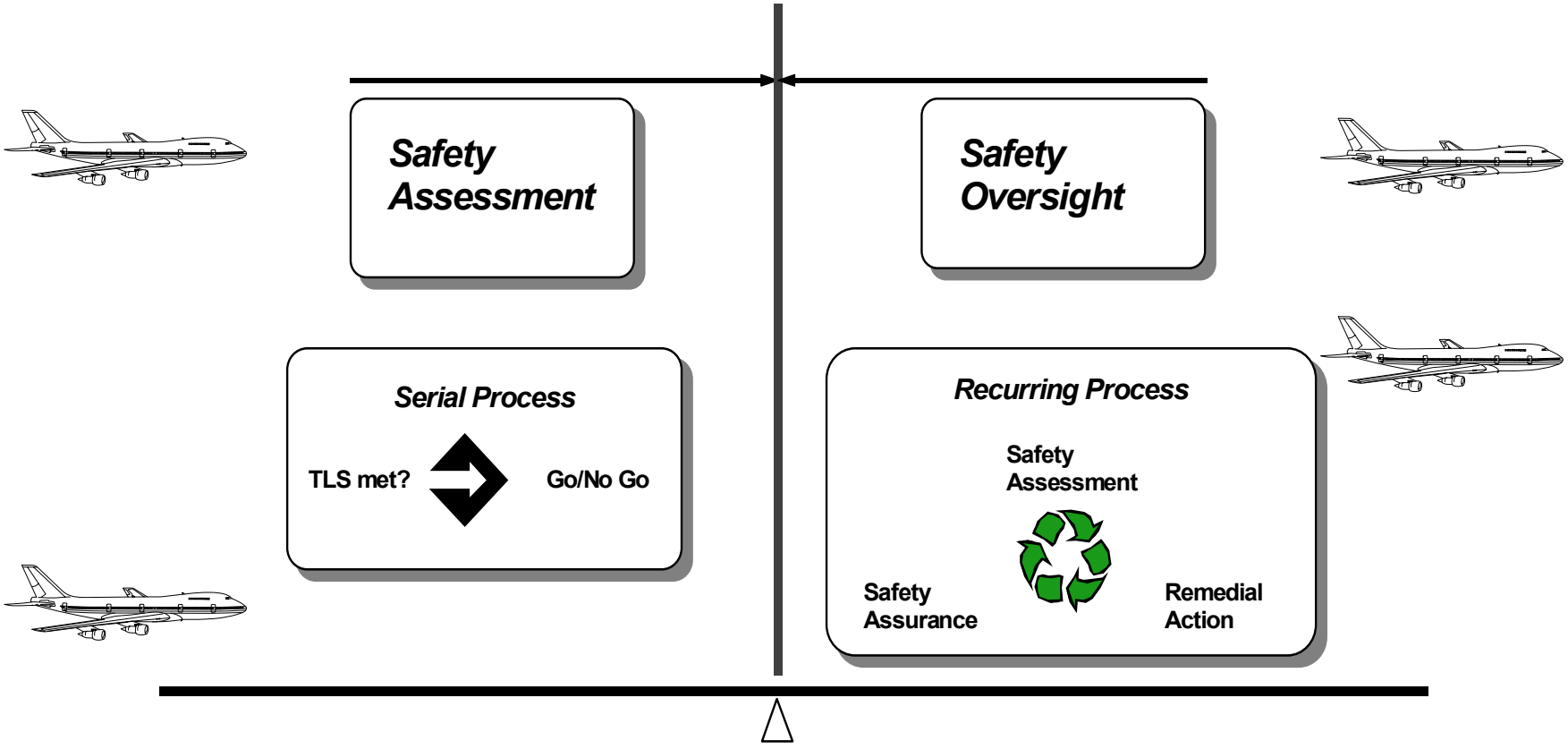
Safety Assessment versus Safety Oversight



Safety Assessment versus Safety Oversight



Safety Assessment versus Safety Oversight



STEP 4: VERIFICATION AND INITIAL IMPLEMENTATION

- Verification:
  - Prior to RVSM implementation
  - Safety Assessment
- Initial Implementation
  - RVSM implemented
  - Safety Oversight
  - Checks to ensure that planned ATC changes are effective
  - Monitoring continues

STEP 5: LONG TERM

- RVSM in long-term use
- Safety Oversight
- Continued aircraft height-keeping performance monitoring to ensure that State approval process continues to be effective
  - long-term requirements: no decisions in NAT or Asia Pacific
- Frequency and magnitude of large height deviations remain important
- Sharing of experience among Regions where RVSM is implemented