International Civil Aviation Organization
THIRD MEETING OF AUTOMATIC DEPENDENT SURVEILLANCE – BROADCAST (ADS-B) STUDY AND IMPLEMENTATION TASK FORCE (ADS-B TF/3)
Bangkok, 23-25 March 2005

Agenda Item 6.2 **Progress Items due in 2005**

ADS-B IMPLEMENTATION CHECKLIST

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SUMMARY

This paper outlines a checklist for the implementation of ADS-B.

1 Introduction

1.1 The purpose of this implementation checklist is to document the range of activities that need to take place or consider, to bring an ADS-B application from a initial plan to operational use. This checklist may form the basis of the terms of reference for an ADS-B implementation team, although some activities may be specific to individual stakeholders. This checklist has been developed with reference to RTCA/DO249.

2 Draft checklist

2.1 The activities are categorized into 3 major phases i.e. planning phase, design phase and implementation phase. The activities in each phase are listed in an approximate sequential order. However, each activity does not have to be completed prior to starting the next activity. In many cases, a parallel and iterative process should be used to feed data and experience from one activity to another. It should be noted that not all activities will be required for all applications.

2.2 Planning phase

a) Establish operational concept
   1) Identify the purpose of project
      (e.g. replace SSR to reduce operating cost, extend surveillance to non-radar airspace)
   2) Operational environment
      (e.g. type of airspace, phase of flight, applicability to radar or non-radar environment)
   3) ATM functions which include applications, aircraft separation
   4) Infrastructure

b) Identify benefits
   1) Safety enhancements
   2) Efficiency
   3) Capacity
   4) Environmental
   5) Cost reductions
   6) Other metrics (e.g. predictability, flexibility, usefulness)

c) Identify constraints
   1) Pair-wise equipage
   2) Compatibility with non-equipped aircraft
   3) Need for exclusive airspace
   4) Required ground infrastructure
   5) RF spectrum
   6) Integration with existing technology
   7) Technology availability (e.g. retrofit v.s. production line)

d) Prepare business case
   1) Cost benefit analysis
   2) Demand and Justification for project.

e) Funds availability
   1) To consider the relevant stakeholders to provide the support

2.3 Design phase

a) Identify operational requirements
   1) Coverage
   2) Datalink (UAT, 1090MHz extended squitter, VDL Mode 4)
   3) Regional harmonization of technology used
   4) Security

b) Develop operational procedures
   1) Pilot and controller actions and responsibilities when initiating, authorizing, and terminating the procedure
   2) New phraseology or new usage of current phraseology
   3) Separation/spacing criteria and requirements
   4) Controller's responsibility to maintain a monitoring function, if appropriate
   5) Contingency procedures
      (e.g. to permit effective and safe reapplication of standard procedures, error tolerant system/procedure design, including use of redundant systems)
   6) Emergency procedures

c) Identify human factors issues (Pilot, controllers, others)
   1) Human-machine interfaces
      i) Input devices for aircraft flight identification and target selection
      ii) Display requirements (e.g. visual, aural)
      iii) Alert integration (e.g. priority assessment of visual and aural indications)
   2) Training development and validation
   3) Workload demands
   4) Role of automation vs. role of human
   5) Crew coordination/pilot decision-making interactions

(e.g. crew resource management)

6) ATM collaborative decision-making

d) Identify performance and technical requirements
   1) Standards development (e.g. Minimum Operational Performance Standards, MOPS, ICAO SARPS)
   2) Data required (aircraft state vector, altitude)
   3) Functional processing
      (e.g. aircraft state vector report processing, data fusion)
   4) Functional performance in terms of accuracy, reliability, integrity, latency and etc.
   5) Required certification levels

e) Interoperability requirements for airborne and ground systems
   1) Air-to-air and air-to-ground systems interoperability requirements
      (e.g. system requirements and objectives documents to include RF assignment criteria)
   2) Compatibility verification to ensure no undesirable interactions/interference with other airborne systems such as ACARS, or ground systems or with ATM operations

f) Equipment development, test, and evaluation
   1) Prototype systems built to existing or draft standards/specifications
   2) Developmental bench and flight tests
   3) Feedback into standards and requirements process

g) Prepare design phase safety case[1]
   1) Safety rationale
   2) Safety budget and allocation
   3) Functional hazard assessment

2.4 Implementation phase

a) Approval for project, funds allocation

b) Acquisition process
   1) Develop tender specifications
   2) Procurement of equipment
   3) Installation

c) Prepare implementation phase safety case[1]

d) Conduct operational test and evaluation
   1) Flight deck and ATC validation simulations
   2) Flight tests and operational trials

e) Certification of equipment
   1) Aircraft
      i) Certification plan developed by applicant and reviewed/approved by appropriate authority that includes detailed description of certification proposal, identification of requirements to be verified by

[1] Or methodology as required by the safety management system implemented by the individual ATS provider

lab test, flight simulation, detailed description of flight deck interfaces including displays as well as pilot human factors criteria

ii) Issue papers produced by appropriate certification authority

2) Ground systems
   i) Tests to verify system compliance with specification requirements
   ii) Independent operational and maintainability tests
   iii) Deployment review and production acceptance tests
   iv) Maintenance parameter checks to verify system performance

f) Obtain operational approvals
   1) Flight standards
   (e.g. operational regulations and manuals, approved training module)
   2) Air traffic
   (e.g. proposal for change of appropriate ATC manuals and amendments of ICAO Regional Supplementary Procedures, approved controller training module)

g) Implementation transition
   1) Continue data collection and analysis
   2) Resolve any unforeseen issues
   3) Continue feedback into standards development processes
   4) Performance monitoring to ensure that the agreed performance is maintained

3 Summary

3.1 The meeting is invited to review the checklist for the implementation of ADS-B and make recommendations to the checklist.
