International Civil Aviation Organization

Fifteenth Meeting of the APANPIRG ATM/AIS/SAR Sub-Group (ATM/AIS/SAR/SG/15)

Bangkok, Thailand, 25 – 29 July 2005

Agenda Item 6:   Review progress of the Regional Airspace Safety Monitoring Advisory Group (RASMAG)

DRAFT GUIDANCE MATERIAL FOR END-TO-END SAFETY AND PERFORMANCE MONITORING OF AIR TRAFFIC SERVICE (ATS) DATALINK SYSTEMS IN THE ASIA/PACIFIC REGION

(Presented by the Secretariat)

SUMMARY

The Third Meeting of the Regional Airspace Safety Monitoring and Advisory Group (RASMAG/3, June 2005) continued drafting guidance material for the safety and performance monitoring of ATS data link systems. The final draft of the guidance material is presented for review and comment, with a view to recommending the material to APANPIRG/16 (August 2005) for adoption as regional guidance material.

1   INTRODUCTION

1.1   The Third meeting of the Regional Airspace Safety Monitoring and Advisory Group (RASMAG/3, June 2005) reviewed the *Guidance Material for End-to-End Safety and Performance Monitoring of Air Traffic Service (ATS) Data Link Systems in the Asia/Pacific Region,* noting the development of the material that had occurred since the material was initially presented at RASMAG/1 (April 2004). The guidance material was intended to provide a set of working principles for ATS data link system performance monitoring that would be applied by all States implementing these systems, as well as providing detailed guidance on the requirements for establishing and operating a FANS-1/A Interoperability/Implementation Team (FIT) and Central Reporting Agency (CRA). It was intended that this guidance material would help promote a standardized approach for monitoring the performance of ATS data link systems within the Region.

1.2   RASMAG/3 noted that the draft *Guidance Material* had also been reviewed by the FIT-BOB, FIT-SEA, IPACG and ISPACG forums and enhancements had been incorporated based on the experience of these groups. RASMAG/3 was pleased to note the maturity of the material and, in considering that the document was suitable for application as regional guidance material, requested that the Regional Office submit the draft *Guidance Material* to the ATM/AIS/SAR/SG/15, with a request that the material be considered for submission to APANPIRG/16 in August 2005 for adoption as regional guidance material.

2   DISCUSSION

2.1   The draft *Guidance Material for End-to-End Safety and Performance Monitoring of Air Traffic Service (ATS) Data Link Systems in the Asia/Pacific Region* is included as an **Attachment** to this paper.

2.2   The purpose of the *Guidance Material* is to:

      a)   provide a set of working principles common to all States implementing ATS datalink systems;

      b)   provide detailed guidance on the requirements for establishing and operating an implementation/interoperability team;

      c)   provide detailed guidance on the requirements for establishing and operating a Central Reporting Agency (CRA);

      d)   promote a standardized approach for implementation and monitoring within the Asia/Pacific Region; and

      e)   promote the interchange of information amongst different Regions to support common operational monitoring procedures.

3   ACTION BY THE MEETING

3.1   The meeting is invited to:

      a)   review the attached draft *Guidance Material*;

      b)   incorporate any final enhancements to the *Guidance Material* to ensure suitability as regional guidance material; and

      c)   formulate a draft conclusion for presentation to APANPIRG/16 (August 2005) proposing the *Guidance Material* for adoption as regional guidance material.

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**DRAFT GUIDANCE MATERIAL FOR
END-TO-END SAFETY AND PERFORMANCE MONITORING OF
AIR TRAFFIC SERVICE (ATS) DATALINK SYSTEMS
IN THE ASIA/PACIFIC REGION**

1 Background

1.1   The Asia Pacific Airspace Safety Monitoring (APASM) Task Force established by the Asia Pacific Air Navigation Planning Implementation Regional Group (APANPIRG) noted that requirements for monitoring aircraft height-keeping performance and the safety of reduced vertical separation minimum (RVSM) operations had been more comprehensively developed than for other Air Traffic Management (ATM) services, such as reduced horizontal separation based on required navigation performance (RNP), and monitoring of Air Traffic Services (ATS) datalink systems.   For RVSM, a handbook with detailed guidance on the requirements for establishing and operating Regional Monitoring Agencies (RMA) was at an advanced stage of development by the ICAO Separation and Airspace Safety Panel (SASP).   (The RMA Handbook has since been completed and is expected to be adopted by ICAO in 2005).   There was no comparable document under development by ICAO for ATS datalink applications and so the APASM Task Force developed draft guidance material for the Asia/Pacific Region covering safety and performance monitoring for ATS datalink applications.

1.2   The experience gained by the Informal Pacific ATC Coordinating Group (IPACG) and the Informal South Pacific ATS Coordinating Group (ISPACG) FANS Interoperability Teams (FITs) and the supporting Central Reporting Agency (CRA) to monitor automatic dependent surveillance (ADS) and controller pilot datalink communication (CPDLC) performance for both aircraft and ground systems was used as a resource on which to develop monitoring guidance material.

1.3   The APASM Task Force was succeeded by the Regional Airspace Safety Monitoring Advisory Group (RASMAG) of APANPIRG, which decided to adopt this APASM material and further develop it to become the standard guidance material for end-to-end safety and performance monitoring of ATS datalink systems in the Asia Pacific region.

1.4   Within the remainder of the Asia Pacific Region, the Bay of Bengal and South East Asia Coordinating Groups are mirroring what has been done by IPACG and ISPACG and have created implementation teams and CRAs to accomplish this activity.   These implementation teams also perform the interoperability activities which will continue after the implementation is complete.   This guidance material focuses on interoperability issues, both prior to and following implementation.

2 Requirements for Safety and Performance Monitoring

2.1   Annex 11, at 2.26.5, states:

> "Any significant safety-related change to the ATC system, including the implementation of a reduced separation minimum or a new procedure, shall only be effected after a safety assessment has demonstrated that an acceptable level of safety will be met and users have been consulted.   When appropriate, the responsible authority shall ensure that adequate provision is made for post-implementation monitoring to verify that the defined level of safety continues to be met."

2.2   ATS datalink applications, such as ADS, CPDLC and ATS interfacility data communication (AIDC), are increasingly being used in support of separation and particularly of reduced separation minima.   Accordingly, it is necessary to provide the monitoring required by Annex 11 to those

datalink services. Datalink services comprise both a technical and an operational element. These guidelines, which apply only to the technical element, propose a structure and methodology for monitoring the technical end-to-end safety performance of air-ground and ground-air datalink services. The operational aspects of datalink monitoring are carried out by the appropriate Safety Monitoring Agency (SMA).

2.3   Ground-ground datalink systems supporting applications such as AIDC are essentially simpler and more direct than air-ground systems, and monitoring can be achieved directly between the concerned ATS providers.   However, it should be noted that States have a responsibility to ensure that monitoring of ground-ground datalink systems is carried out in support of the implementation of reduced separation minima.   Monitoring of ground-ground datalink performance is outlined in Appendix A.

2.4   The requirement for on-going monitoring after implementation is based on several factors, including both degradation of performance with time and changes to equipment which may occur, either through modification or under renewal programmes.   The use of ADS-B to support separation and the introduction of the Aeronautical Telecommunication Network (ATN) will bring significant changes to the system that will require monitoring programmes.

3   Purpose of Guidance Material

3.1   The purpose of this guidance material is to:

a)   Provide a set of working principles common to all States implementing ATS datalink systems.

b)   Provide detailed guidance on the requirements for establishing and operating an interoperability team.

c)   Provide detailed guidance on the requirements for establishing and operating a Central Reporting Agency.

d)   Promote a standardized approach for implementation and monitoring within the Region.

e)   Promote interchange of information among different Regions to support common operational monitoring procedures.

4   Establishment and Operation of an Interoperability Team and CRA

4.1   Recognizing the safety oversight responsibilities necessary to support the implementation and continued safe use of ATS datalink systems, the following standards apply to any organization intending to fill the role of an interoperability team:

a)   The organization must receive authority to act as an interoperability team as the result of a decision by a State, a group of States or a regional planning group, or by regional agreement.

b)   States should appoint a CRA that has the required tools and personnel with the technical skills and experience to carry out the CRA functions.

c)   States should ensure that the CRA is adequately funded to carry out its required functions.

5   Interoperability Teams

5.1   The technologies adopted to provide ATS datalink functionality exist in several different domains (e.g. aircraft, satellite, ground network, air traffic service units and human factors) and these elements must be successfully integrated across all domains. Airborne and ground equipment from many different vendors, as well as the sub-systems of several different communication networks, must inter-operate successfully to provide the required end-to-end system performance. In addition, standardised procedures must be coordinated among many different airlines and States to provide the desired operational performance. Technical and operational elements must then coalesce to allow the various applications to demonstrate mature and stable performance. Only then can essential benefits be realized.

5.2   A team approach to interoperability is essential to the success of any ATS datalink implementation, an important lesson learned by the ISPACG, whose members were the first to implement CNS/ATM applications using FANS 1/A systems. Stakeholders had worked closely together during the initial development and subsequent certification of FANS-1/A, but even though a problem-reporting system was in place when FANS-1/A operations commenced, many problems went unresolved and it was not possible in the short term to adopt the new operational procedures that would provide the expected benefits of higher traffic capacity and more economic routes. Therefore, an interoperability team was formed to address both technical and operational issues and help to ensure that benefits would result. However, the ISPACG also realized that a traditional industry team approach would not be effective. Daily attention and sometimes significant research would be required if the many issues were to be adequately resolved. To address these concerns, the interoperability team created a dedicated sub-team, the CRA, to perform the daily monitoring, coordination, testing, and problem research tasks outlined by the team. This approach is similar to that taken for RVSM implementations where supporting groups provide aircraft height keeping monitoring services.

5.3   Although the monitoring process described above was developed for FANS-1/A based CPDLC and ADS applications, it applies equally to ATN-based ATS applications. This was validated during the Preliminary EUROCONTROL Test of Air/ground data Link (PETAL) implementation of ATN-based ATS datalink services in Maastricht Area Control Centre.

5.4   Role of the Interoperability Team

5.4.1   The role of the interoperability team is to address technical and operational problems affecting the transit of datalink aircraft through international airspace. To do this, the interoperability team must oversee the end-to-end monitoring process to ensure the datalink system meets, and continues to meet, its performance, safety, and interoperability requirements and that operations and procedures are working as specified.

5.4.2   The specific tasks of an interoperability team are:

a)   Initiate and oversee problem reporting and problem resolution processes.

b)   Initiate and oversee end-to-end system performance monitoring processes.

c)   Oversee the implementation of new procedures.

d)   Report to the appropriate State regulatory authorities and to the appropriate ATS coordinating group.

5.4.3   Terms of reference for an interoperability team are shown at Appendix B.

5.5   Interoperability Team Members

5.5.1   The principal members of an interoperability team are the major stakeholders of the sub-systems that must interoperate to achieve the desired system performance and end-to-end operation. In the case of ATS datalink systems, the major stakeholders are aircraft operators, ATS providers, and communication service providers. Other stakeholders such as international organizations, and airframe and avionics manufacturers also play an important role and should be invited by the major stakeholders to contribute their expertise.

6   Central Reporting Agencies

6.1   Work must be done on a daily basis for an interoperability team to achieve its important goals of problem resolution, system performance assurance, and planning and testing of operations that will enable benefits.   A dedicated sub-team, the CRA, is required to do the daily monitoring, coordination, testing and problem research tasks for the interoperability team.   Appendix C shows a table of CRA tasks and the associated resource requirements.

6.2   A CRA should be established in order to determine the safety performance of the datalink systems before the implementation of reduced separation minima in a particular area, and it should remain active throughout the early stages of implementation.   However, as the performance of the systems stabilises to a satisfactory level, it should be possible to reduce the number of CRAs in the region by combining responsibility for different areas.

6.3   The functions of a CRA are:

> a)   To develop and administer problem report processes.
>
> b)   To maintain a database of problem reports.
>
> c)   To process monthly end-to-end system performance reports from air traffic service providers.
>
> d)   To coordinate and test the implementation of new procedures resulting from ATS datalink systems for a given region.
>
> e)   To administer and monitor an informal end-to-end configuration process.
>
> f)   To manage data confidentiality agreements as required.
>
> g)   To identify trends.
>
> h)   To provide regular reports to the interoperability team.

6.4   CRA Resource Requirements

6.4.1   To be effective, the CRA must have dedicated staff and adequate tools.   Staffing requirements will depend on the complexity of the region being monitored.   There are several factors that affect regional complexity from an ATS monitoring standpoint such as dimensions of the airspace, variety in operating procedures, number of airlines, number of airborne equipment variants, number of air traffic service providers, number of ground equipment variants and number of communication service providers.

6.4.2   The CRA must be able to simulate an ATS ground station operational capability to the extent of exercising all combinations and ranges of CPDLC uplinks and ADS reports.   The CRA must also have access to airborne equipment: a test bench is adequate, though engineering simulators that can be connected to either the ARINC or SITA communication network can offer additional capability for problem solving.   In support of the datalink audit analysis task, the CRA must have software that can decode communication service provider audit data and produce usable reports. Without these tools it is virtually impossible for a CRA to resolve problems or monitor system performance.

6.4.3   Coordination is an important part of the CRA's job.   In the pursuit of problem resolution, action item resolution, monitoring and testing, many issues arise that require coordination among the various stakeholders.   The CRA has a primary responsibility to provide this coordination function as delegated by the interoperability team.   Coordination between CRAs is also important, particularly to expand the information database on problems and trends; there may be a need for CRA coordination within the region and with CRAs in other regions.   An incident may appear to be an isolated case, but the collation of similar reports by a CRA or the CRA coordinating group might indicate an area that needs more detailed examination

7   Working Principles for Central Reporting Agencies

7.1   The working principles in this guidance material result from the combined experience of the North Atlantic FANS Implementation Group, ISPACG FANS Interoperability Team, IPACG FANS Interoperability Team, and the ATN implementation in Maastricht ACC.

7.2   Confidentiality Agreements

7.2.1   Confidentiality of information is an established principle for problem reporting, and so reports must be de-identified before being made accessible to other agencies.   However, it is necessary for the CRA to retain the identity of the original reports so that problem resolution and follow-up action can be taken.

7.2.2   The CRA must initiate and maintain confidentiality agreements with each entity providing problem reports.

7.3   Problem Identification and Resolution

7.3.1   The problem identification and resolution process, as it applies to an individual problem, consists of a data collection phase, followed by problem analysis and coordination with affected parties to secure a resolution, and recommendation of interim procedures to mitigate the problem in some instances.   This is shown in the diagram below.
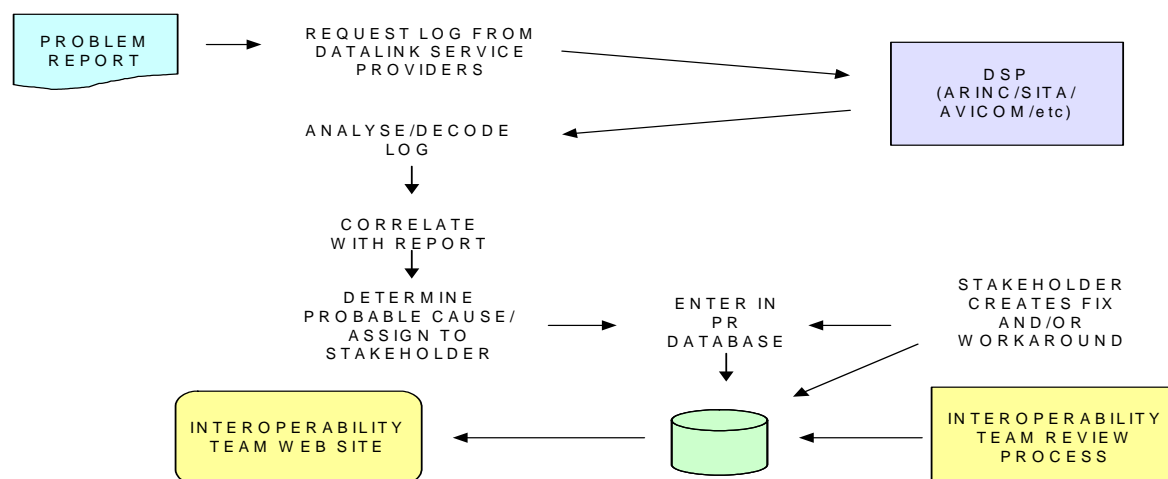
7.3.2   The problem identification task begins with receipt of a report from a stakeholder, usually an operator, ATS provider or communication service provider. If the person reporting the problem has used the problem reporting form provided in the appropriate regional manual, then data collection can begin.   If not, additional data may have to be requested from the person reporting the problem.

7.3.3   The data collection phase consists of obtaining message logs from the appropriate parties (which will depend on which service providers were being used and operator service contracts). Today, this usually means obtaining logs for the appropriate period of time from the communication service providers involved.   (In the future, with ATN development, additional providers will become involved and airborne recordings as per EUROCAE ED-112 should become available.)   Usually, a log for a few hours before and after the event that was reported will suffice, but once the analysis has begun, it is sometimes necessary to request additional data, (perhaps for several days prior to the event if the problem appears to be an on-going one).

7.3.4   Additionally, some airplane-specific recordings may be available that may assist in the data analysis task.   These are not always requested initially as doing so would be an unacceptable imposition on the operators, but may occur when the nature of the problem has been clarified enough to indicate the line of investigation that needs to be pursued.   These additional records include:

- Aircraft maintenance system logs.
- Built-In Test Equipment data dumps for some airplane systems.
- SATCOM activity logs.

7.3.5   Logs and printouts from the flight crew and recordings/logs from the ATS provider(s) involved in the problem may also be necessary. It is important that the organization collecting data for the analysis task requests all this data in a timely manner, as much of it is subject to limited retention.

7.3.6   Once the data has been collected, the analysis can begin.   For this, it is necessary to be able to decode all the messages involved, and a tool that can decode every ATS datalink message type used in the region is essential.   These messages include:

- AFN (ARINC 622), ADS and CPDLC (RTCA DO-258/EUROCAE ED-100) in a region operating FANS-1/A.
- Context Management, ADS and CPDLC applications ICAO Doc 9705 and RTCA DO-280/ED-110) in a region using ATN.
- FIS or ARINC 623 messages used in the region.

7.3.7   The analysis of the decoded messages requires a thorough understanding of the complete message traffic, including:

- Media management messages.
- Relationship of ground-ground and air-ground traffic.
- Message envelope schemes used by the particular datalink technology (ACARS, ATN, etc).

7.3.8   The analyst must also have a good understanding of how the aircraft systems operate and interact to provide the ATS datalink functions, as many of the reported problems are airplane system problems.

7.3.9   This information will enable the analyst to determine a probable cause by working back from the area where the problem was noticed to where it began.   In some cases, this may entail manual decoding of parts of messages based on the appropriate standard to identify particular encoding errors.   It may also require lab testing using the airborne equipment (and sometimes the ground networks) to reliably assign the problem to a particular cause.

7.3.10   Once the problem has been identified, then the task of coordination with affected parties begins.   The stakeholder who is assigned responsibility for fixing the problem must be contacted and a corrective action plan agreed.

7.3.11   This information (the problem description, the results of the analysis and the plan for corrective action) is then entered into a database covering datalink problems, both in a complete form to allow continued analysis and monitoring of the corrective action and in a de-identified form for the information of other stakeholders.   These de-identified summaries are reported at the appropriate regional management forum.

7.4   Mitigating Procedures

7.4.1   The CRA's responsibility does not end with determining the cause of the problem and identifying a fix.   As part of that activity, and because a considerable period may elapse while software updates are applied to all aircraft in a fleet, procedural methods to mitigate the problem may have to be developed while the solution is being coordinated.   The CRA should identify the need for such procedures and develop recommendations for implementation by the service providers and operators involved.

7.5   Routine Datalink Performance Reporting

7.5.1   An important part of datalink safety performance is the measurement of the end-to-end performance.   This should, of course, be carried out prior to implementation of new separation minima, but should continue on a regular basis to give assurance that the safety requirements continue to be met.   Datalink performance assessment is based on round-trip time,

availability, integrity, reliability and continuity, and ATS providers should provide the CRA with regular measurements of these parameters.

7.5.2   The CRA will use the information supplied by ATS providers to produce a performance assessment against the established datalink requirements for the region. These requirements are set according to the separation minima being applied, and so may differ within different areas according to usage.

7.5.3   The CRA performance assessment should be made available to the RMA and SMA for their calculation of system performance against the minimum values defined in the FANS 1/A Operations Manual. The system performance criteria are at Appendix D.

7.5.4   ADS round-trip times are normally measured as the time between sending a contract request and receiving the associated Acknowledgement (ACK) or Message Assurance (MAS) message. CPDLC round-trip times are normally determined from the ATSU end-system time stamps for transmission of the uplink message and reception of the associated MAS.

7.5.5   ADS and CPDLC downlink one-way times are defined by the difference between the aircraft time stamp and the ASTU end-system reception time stamp.

7.5.6   ADS and CPDLC success rates are only available for uplink messages. The success rate is expressed as the percentage of messages that receive a successful ACK or MAS within a specified time.

7.5.7   AIDC round trip times may be obtained from the difference between message transmission and reception of the Logical Acknowledgement Message (LAM). The success rate is expressed as the percentage of messages that are successfully delivered to the destination ATSU.

7.6   Configuration Monitoring

7.6.1   A variety of technical systems are involved in the datalink process and changes, particularly to software and software parameters, are not infrequent; any change may have an impact on the overall performance of the datalink. It is therefore important that the CRA is kept informed of each change of configuration of each system. With this information it is often possible to identify changes that lead to improvements or deteriorations in the datalink performance or that may be associated with particular problems.

7.6.2   All ATS providers, communication service providers, aircraft operators and avionics suppliers should therefore report all system configuration changes to the CRA. The CRA will then maintain a database of configuration changes for each system or sub-system. It is not necessary for the CRA to know the details of changes, but where a change is expected to affect performance, information on the likely effect should be provided.

7.7   New Procedures and Improved Performance Requirements

7.7.1   The CRA may recommend new end-to-end datalink system performance requirements, either to accommodate new operational procedures or to take account of recognised problems.

7.7.2   The CRA may recommend the testing and implementation of new procedures.

APPENDIX A

METHODOLOGY FOR MONITORING AIDC

1   Introduction

1.1   AIDC plays an important role in ATC coordination, and may become a significant element of ATC in the support of reduced separation minima. The performance of AIDC operations should therefore be monitored as part of the required monitoring process prior to the implementation of reduced separation minima.

1.2   AIDC operates essentially over fixed networks and generally has only two or three involved parties: the ATS providers and network providers. It is therefore generally unnecessary to develop a FIT-type approach to safety monitoring; instead such monitoring and problem identification and resolution can be carried out directly by the concerned parties.

1.3   Because, in general, fixed networks are used for AIDC, continuous performance monitoring after implementation of reduced separation minima is not generally necessary, though annual performance and availability checks are recommended. Monitoring should also take place after any changes to the network or the end-user equipment. This will be particularly important during the implementation of the ATN.

2   AIDC Technical Performance

2.1   Two major criteria for monitoring AIDC technical performance are the achievement of acceptable delivery times and the reliability of message delivery. Delivery times can best be measured in terms of the end-to-end round trip time. Reliability is measured as the AIDC message delivery success rate.

3   End-to-end Round-Trip Time

3.1   The end-to-end round trip message time may be measured as the time difference between the transmission of an AIDC message and the reception of the corresponding Logical Acknowledgement Message (LAM) or Logical Rejection Message (LRM). If the originating AIDC system receives neither a LAM nor an LRM from the receiving system within a specified time limit (a variable system parameter, typically 5 minutes), it will declare a time-out, and the time parameter must be used as the round-trip time.

3.2   Any AIDC message requiring a LAM response may be used; CPL messages are perhaps the most used and therefore the most convenient.

3.3   A large number of measurements of round-trip times should be averaged for performance reporting.

4   Message Delivery Success Rate

4.1   The Message Delivery Success Rate may be expressed as the percentage of messages successfully delivered to the destination ATSU.

4.2   Unsuccessful delivery is indicated by either the reception of an LRM or a time-out due to non-reception of a LAM within a specified time.

4.3   Case-1: LRM Received

4.3.1   When an AIDC system detects an error in a received message, it responds with a Logical Reject Message (LRM) to the originating system. Receipt of the LRM indicates that the original message was not successfully delivered.

4.4   Case-2: Time out

4.4.1   The time-out indicates non-delivery of the message (and initiates various actions within the AIDC system).

$$\text{Message Delivery Success Rate} \quad = \quad 1 - \frac{(LRM + TO)}{TOT}$$

Where:
LRM   = number of received LRMs
TO   = number of Time Outs
TOT   = total number of messages

4.5   A large number of measurements of delivery success rates should be averaged for performance reporting.

5   Reporting

5.1   ATS providers should report the results of AIDC performance monitoring to RASMAG.

6   Caution

6.1   It is known that there are incompatibilities between some ATS end-systems leading to a situation in which a satisfactorily received message may not be able to be properly processed. In at least one case, the receiving system has been programmed to send neither LAM nor LRM in response to such messages.

6.2   This will result in a distortion of the true round-trip time and success rate for the originating end-system.

6.3   It is recommended that ATS providers ensure that all involved parties are aware of such situations so that affected messages may be excluded from the performance measurement data.

APPENDIX B

TERMS OF REFERENCE FOR AN INTEROPERABILITY TEAM

Reporting and problem resolution processes

- To establish a problem reporting system.
- To review de-identified problem reports and determine appropriate resolution.
- To identify trends.
- To develop interim operational procedures to mitigate the effects of problems until such time as they are resolved.
- To monitor the progress of problem resolution.
- To prepare summaries of problems encountered and their operational implications.

System performance and monitoring processes

- To determine and validate system performance requirements.
- To establish a performance monitoring system.
- To assess system performance based on information from the CRA.
- To authorise and coordinate system testing.
- To identify accountability for each element of the end-to-end system.
- To develop, document and implement a quality assurance plan that will provide a path to a more stable system.
- To identify configurations of the end-to-end system that provide acceptable datalink performance, and to ensure that such configurations are maintained by all stakeholders.

New procedures

- To coordinate testing in support of implementation of enhanced operational procedures

Reporting

- To report safety-related issues to the appropriate State or regulatory authorities for action
- To provide reports to each meeting of the implementation team or ATS coordinating group, as appropriate.
- To provide reports to RASMAG.

APPENDIX C

CRA TASKS AND RESOURCE REQUIREMENTS

NOTE: CHANGE ORDER TO MATCH PARA 6.3

CRA Task	Resource Requirement
Manage data confidentiality agreements as required	Legal services Technical expertise
Develop and administer problem report process: • de-identify all reports • enter de-identified reports into a database • keep the identified reports for processing • request audit data from communication service providers • assign responsibility for problem resolution where possible • analyse the data Identify trends	Problem reporting data base ATS audit decode capability Airborne test bench as a minimum, simulator highly recommended ATS simulation capability (CPDLC and ADS)
Coordinate and test the implementation of new procedures	Airborne test bench as a minimum, simulator capability highly recommended ATS simulation capability (CPDLC and ADS) ATS audit decode and report capability Technical expertise Operational expertise
Administer and monitor an informal end-to-end configuration process.	Technical expertise
Report to the interoperability team	Technical expertise

APPENDIX D

FANS 1/A OPERATION MANUAL
SYSTEM PERFORMANCE CRITERIA

The table below defines the minimum values to be met and verified. This does not prevent ATS service providers from negotiating more constraining contractual requirements with their communication service providers if it is thought necessary.

Criteria	Definition	Values
Performance	End to end round trip time for uplinks. (sending and reception of MAS)	Round trip time of 2 minutes, 95% of messages. Round trip time of 6 minutes, 99% of messages.
	End to end one way time for downlinks. (comparison of message time stamp and receipt time)	One way time of 1 minute, 95% of messages. One way time of 3 minutes, 99% of messages
	Uplink messages only: Undelivered messages will be determined by: • Message assurance failure is received. After trying VHF and, SATCOM Depending on reason code received, the message might, in fact, have reached the aircraft. • No message assurance or flight crew response is received by ATSU after 900 seconds	Less than 1% of all attempted messages undelivered
Availability	The ability of the network data link service to perform a required function under given conditions at a given time:	99.9%
	The maximum allowed time of continuous unavailability or downtime should be declared MTTR (Mean Time To Repair) ∗	TBD
Reliability	The ability of a data link application/system to perform a required function under given conditions for a given time interval: it can be expressed in MTBF (Mean Time Between failure) ∗	TBD
Integrity	The probability of an undetected failure, event or occurrence within a given time interval.	10^{-6}/hour

∗ Availability = MTBF x 100/(MTBF+MTTR)

Note: RTCA SC189/EUROCAE WG 53 defines the performance requirements for specific operational environments.

— END —