ARINC IA Project Initiation/Modification (APIM)

1.0 Name of Proposed Project **APIM #: 08-010**

Manager of Air-Ground Interface Communications (MAGIC)

2.0 Subcommittee Assignment and Project Support

2.1 Identify AEEC Group

JTWG of the Network Infrastructures and Security (NIS) Subcommittee and ANFS Subcommittee

2.2 Support for the activity

Airlines: United Airlines, American Airlines (TBC)

Airframe Manufacturers: Airbus

Suppliers: Rockwell Collins, KID Systems, EMS, Aircell

Others:

2.3 Commitment for resources *(Identify each company by name.)*

Airlines: United Airlines

Airframe Manufacturers: Airbus

Suppliers: Rockwell Collins, KID Systems (TBC)

Others:

2.4 Chairman: Jean-Paul Moreaux, Steve Arentz

2.5 Recommended Coordination with other groups

mainly AGCS, ANFS, AOC, CSS, EFB, SAI, SDL

3.0 Project Scope *(why and when standard is needed)*

3.1 Description

INTRODUCTION: The definition of an IP-based communication management function is crucial at this time. Industry is currently developing IP-based on-board communication and off-aircraft data links and although the ANFS Subcommittee has defined some IP-based services there is no general-purpose aircraft air-ground routing defined. In the past, the SATCOM subnetwork itself acted as a limited router for dissimilar on-board domains. Currently, the number of air-ground links available is expanding (e.g., Gatelink, SwiftBroadband, Ku Band, NATS Broadband, Iridium, etc) each are provided by different vendor's and each have varying availability both geographically and flight phase. As we move further to an IP-based communication environment, there is reason to want to move the aircraft routing function to a higher level that provides all aircraft subnets access to all the dissimilar air-ground data links.

BACKGROUND: When an aircraft has only one air-ground link for IP traffic the problem of interfacing that link to the various onboard applications is simplified.

However, even with just one air-ground data link an interface control document is required such as the one developed for Connexion by Boeing satellite data link to IFE systems in CSS - 808 Attachment 1 which defined a Broadband Off-board Service System. Additionally, when multiple air-ground links are available on a given aircraft and phase of flight, the problem of taking maximum advantage of each link (e.g., coverage, cost, availability, etc) becomes complex and needs to be handled in a standard manner such that onboard applications need not be tailored to the specific characteristics of each available air-ground link.

This situation is similar to the function of the CMU in an aircraft ACARS configuration. It has been suggested in the past that the CMU could merely be given an Ethernet port and the problem would be solved. However, this would be an expensive solution for the airlines and the functions involved in routing ACARS blocks and IP packets are vastly different and combining these functions would be overly complex.

Presently, there are several new in-flight targeted subnetworks that need to be considered. For example, Inmarsat together with manufacturers has developed SwiftBroadBand (SBB) for IP-based satellite communications at up to 432kbps data rates (terminals defined in ARINC 781). The SBB subnetwork has been operational since October 2007, and is capable of different levels of QoS traffic. The aircraft interface from the SBB terminal will vary depending on whether MAGIC will be able to accommodate these data services and so a timely decision is needed.

Another broadband subnetwork being actively developed is the Ku-Band system (AEEC PP791). Currently, the focus of the Ku-Band subnetwork is to offer passenger services only.

Also, Aircell has started a commercial service for ground-based UHF 2Mbps IP-based data link connection dubbed "*gogo"*, over the continental US.

And then there is Gatelink, which already has quite a number of vendors that have developed their own communication capabilities that utilize this data link.

Boundary: While MAGIC is targeted to standardize the interfaces between itself and applications, air-ground communication equipment and counterparts on the ground, as well as the functionality required to perform its mission, it does not attempt to standardize e.g. routing, traffic shaping, or firewalling on any layer. MAGIC is intended to allow for the implementation of "The MAGIC Box", if a supplier chooses to – but it shall not require this implementation, resulting in an A8xx series document.

TASKING: It is recommended to assign this task to a Joint Technical Working Group (JTWG) with AGIE. For the MAGIC portion, this JTWG is tasked to develop a specification for an onboard function that will provide a harmonized interface between applications and IP-based air-ground data links in an end-to-end communication context providing transparent and secure communication services. Generally, Internet protocols (based on IETF standards) should be the basis for the development of this standard. While initially aimed at supporting the Airline Information Services (AIS) Domain as well as the Passenger Information

and Entertainment Services (PIES) Domain as defined in Arinc Specification 664 Part 5, the concepts developed should provide for future expansion to also support the Aircraft Control (AC) Domain in a second phase. This requires the treatment of segregation principles between domains under special scrutiny by the CAA's – as well as other certification and accreditation considerations in the broader sense. In particular this standard needs to target retrofit installations as well as forward fit market beyond the traditional scope of new developments – which requires special consideration of hardware and Operating System independence of the specification.

Areas of standardization include:

Phase 1

- Segregation Principles applicable to all A664, Part 5 defined domains
- Interface of applications to/from MAGIC
- Interface to/from MAGIC to A/C-based Air/Ground Communication Systems
  - New development – Standard A/G Communication System Interface
  - Retro-/Forward-fit – A/G Comm System interface Proxy in MAGIC
- Interface between MAGIC and (CSP)-owned Ground Air/Ground Communication Systems (i.e. development of an ICD)
- Interface between (CSP)-owned Ground Air/Ground Communication Systems and ground communication equipment and applications
- End-to-End Communication Management Services - functionalities and interfaces:
  - Quality of Service (QoS), Policy-based Routing, Performance Enhancement (e.g. Link Optimisation, Compression), Monitoring, Logging, Accounting, Administration
  - Profiling (pre-definable – also for support of legacy applications)
  - Security (Authentication, Authorisation, Access Control, Filtering, Encryption)
- Management Information Structures, Formats and Services

Phase 2

- Interface Between Redundant or Distributed MAGIC Instances
- Particular Requirements of Avionic systems of higher Development Assurance Levels

3.2 Planned usage of the envisioned specification

New aircraft developments planned to use this specification yes ☑ no ❑

Airbus: *A350XWB*

Boeing:

Other:

Modification/retrofit requirement yes ❑ no ☑

Specify:

Needed for airframe manufacturer or airline project yes ☑ no ❑

Specify: *subsequently: A380, A330/A340*

Mandate/regulatory requirement yes ❑ no ☑

Program and date: *(program & date)*

Is the activity defining/changing an infrastructure standard? yes ❑ no ☑

Specify *(e.g., ARINC 429)*

When is the ARINC standard required? *_Mid 2011_*

What is driving this date? *__A350XWB development__*

Are 18 months (min) available for standardization work? yes☑ no ❑

If NO please specify solution: _____

Are Patent(s) involved? yes ❑ no☑

If YES please describe, identify patent holder: _____

3.3 Issues to be worked

- Establish Use Cases;
- Define Segregation Principles
- Query Air/Ground Service Providers;
- Query A/L, OEM's and System Suppliers;
- Identify Functional and Non-Functional Requirements to be met;
- Model Functional Elements and their allocation to a Logical Architecture
- Derive Communication Services
- Derive Logical Interfaces
- Derive /Define Protocols
- Ensure Ground/Air Communication Management (Interface to CSP's)
- Ensure End-to-End Interoperability
- Ensure interoperability with other applicable Arinc standards (e.g. FLS)
- Identify certification and accreditation considerations
- Work closely with Messaging Application (AGIE) TWG

4.0 Benefits

4.1 Basic benefits

Operational enhancements yes ☑ no ❑

For equipment standards:

a. Is this a hardware characteristic? yes ❑ no ☑

b. Is this a software characteristic? yes ☑ no ❑

c. Interchangeable interface definition? yes ☑ no ❑

d. Interchangeable function definition? yes ☑ no ❑

If not fully interchangeable, please explain: on a logical level only, since H/W will not be addressed

Is this a software interface and protocol standard? yes ☑ no ❑

Specify: _____

Product offered by more than one supplier yes ❑ no ☑

Function not yet implemented

Identify:

4.2 Specific project benefits

(Describe overall project benefits.)

A general-purpose IP-based communication management function that can provide off-aircraft routing is needed to take advantage of current commercially available network technologies that are already being deployed on aircraft. Each aircraft domain has differing requirements for certification and security (See A811). These are currently dealt with by installing different systems for each domain. This approach can not continue as there are few choices available for air-ground connectivity and the aircraft operators need to maximize the use of these data links to reduce costs and improve availability of communications. This will be essential in the future, where data communications (including packetized voice) become a necessary part of operating an aircraft. By using commercially available protocols and services the time to market can be reduced and the level of effort or the integration of new communication links and services will be significantly lowered. Similarly the overall product cost can be kept lower than a custom developed solution, due to savings in development costs, testing costs, and documentation costs. MAGIC should serve the aviation community for many years to come.

The end-to-end focus should include all logical interfaces from an application on board through all services on any communication path to its peer application(s) on the ground to ensure the maximum interoperability and interchangeability to all operators and service providers alike.

The use of established and commercially implemented specifications is expected to increase the pace of the development and reduce its risk at the same time. Early proof-of-concept capabilities result from this approach and are provided to all market participants for validation purposes of the material developed.

It is advised to establish an air transport industry simulation project to support the end-to-end validation of the concepts, evaluate integration options and verify operational performance characteristics

4.2.1 Benefits for Airlines

This document would define functionality that would provide IP environment functions similar to the ones provided by the ACARS management unit, i.e., providing seamless message-passing among the various ACARS subnetworks

available, e.g., VHF, VDL, Satcom, HFDL, Iridium.

This function would allow a common interface to be used for any of the various IP (broadband) data links being offered. It would permit common equipment across various fleets that might use different technologies depending upon their anticipated routing, e.g., terrestrial cellular for domestic aircraft, satellite for long-range aircraft. It would allow competition for air-ground IP communication data links as well as ground system implementation services avoiding de-facto monopolies. It will also lead to new uses of the available infrastructure. In the end meeting increasing operational needs and customer expectations all elements will contribute in the reduction of aircraft operating costs and increase of customer-related revenue and satisfaction.

4.2.2 Benefits for Airframe Manufacturers

Airframe manufacturers could provide diverse connectivity options without significant modification of the aircraft infrastructure dependent upon which links are chosen by the customer. Tailoring of the common aircraft design will be facilitated.

4.2.3 Benefits for Avionics Equipment Suppliers

Equipment suppliers could benefit from this standard because the common interface specification will allow them to provide their link offering in more configurations.

4.2.4 Benefits for Communication Service Providers

Communication Service Providers (CSP) will be able to advance their business areas through standardised services and interfaces into support of aircraft operators by integrating their services into a/c operator systems. Also, integration of new technologies and services into aircraft is simplified, reducing entry into market barriers and providing more competition.

5.0 Documents to be Produced and Date of Expected Result

5.1 Meetings and Expected Document Completion

The following table identifies the number of meetings and proposed meeting days needed to produce the documents described above.

Activity	Mtgs	Mtg-Days (Total)	Expected Start Date	Expected Completion Date
NIS Phase 1	*4*	*2 (4 * ½)*	*Nov 2008*	*Apr 2010*
JTWG Phase 1	*6**	*18 (6 * 3)*	*Dec 2008*	*Mar 2010*
NIS Phase 2	*3*	*1*	*Apr 2010*	*Sep 2011*
JTWG Phase 2	*4**	*12*	*Mar 2010*	*Jul 2011*

*) *Indicate unsupported meetings and meeting days, i.e., technical working group or other ad hoc meetings that do not requiring IA staff support.*

6.0 Comments

NIS *will handle the coordination and supervision as part of its normal work program.*

For IA Staff use

Date Received: _____ IA Staff Assigned: _____

Estimated Cost: _____

Potential impact: _____

*(**A**. Safety **B**. Regulatory **C**. New aircraft/system **D**. Other)*

Forward to committee(s) (AEEC, AMC, FSEMC): _____ Date Forwarded:_____

Committee resolution: _____

*(**0** Withdrawn **1** Authorized **2** Deferred **3** More detail needed **4** Rejected)*

Assigned Priority:_____ Date of Resolution:_____

*(**A** High - execute first **B** Normal - may be deferred.)*

Assigned to SC/WG:_____