STRAWMAN 1

OF

ARINC 628, SECTION 18

CABIN AND CARGO VIDEO SURVEILLANCE

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1.0 INTRODUCTION

1.1 Purpose of this Document

This Specification defines the design philosophy and the interfaces of cabin and cargo video surveillance equipment and system.

Today there is a large variety of Cabin and Cargo Surveillance Systems available with different technologies (analog, digital, PoE), different topologies, different interfaces and different performance. The customization process, adaption to cabin layouts, network wiring definition and integration of the devices are time consuming and expensive.

This specification harmonizes the design by modular architecture scalable to aircraft size and customer needs with standardized interfaces. It allows standardized provisions in the aircraft and reduces the customization effort to a minimum.

…

1.2 Related Documents

The latest revision of the following documents is pertinent to the design of equipment intended to meet this standard. The related documents are listed in two subsections as Normative and Informative.

1.2.1 Normative Documents

Documents listed in this section are directly related and referenced in the text.

ANSI/NEMA WD 6-2002: *Wiring Devices – Dimensional Requirements*

ARINC Specification 600: *Air Transport Avionics Equipment Interfaces*

ARINC Specification 615A: *Software Data Loader Using Ethernet Interfaces*

ARINC Specification 664: *Aircraft Data Networks Part 2 Ethernet Physical and Data-Link Layer Specification*

ARINC Specification 664: *Aircraft Data Networks Part 3 Internet-based Protocols and Services*

ARINC Specification 664: *Aircraft Data Network Part 5 Network Domain Characteristics and Interconnection*

ARINC Specification 665: *Loadable Software Standards*

ARINC Specification 666: *Electronic Distribution of Software*

ARINC Specification 667: *Guidance for the Management of Field Loadable Software*

ARINC Specification 801: *Fiber Optic Connectors*

ARINC Specification 802: *Fiber Optic Cables*

ARINC Specification 803: *Fiber Optic System Design Guidelines*

ARINC Report 804: *Fiber Optic Active Device Specification*

ARINC Report 805: *Fiber Optic Test Procedures*

ARINC Report 806: *Fiber Optic Installation and Maintenance Procedures*

ARINC Specification 811: ***Commercial*** *Aircraft Information Security Concepts of Operation and Process Framework*

Electronic Communications Privacy Act of 1986

ENxxx: Aerospace series: *Connectors ??? electrical, rectangular, with sealed and non-sealed rear, plastic housing, locking device, operating temperatures - 55 °C to 175 °C — Part 001: Technical specification*

IEEE 1394: *Trade Association Specifications and Technical Bulletins*

MIL-DTL-38999: *Connector, Electrical Circular, Miniature, High Density*

Note: For all RFC references, refer to ARINC Specification 664, Part 3, Table 1.4.2.

RTCA DO-178/EUROCAE ED-12: *Software Considerations in Airborne Systems and Equipment Certification*

SAE ARP 4754: *Certification Considerations for Highly-Integrated or Complex Aircraft Systems*

TIA/EIA 626-95: *Multimode Fiber Optic Link Transmission Design*

IETF RFC 7826: *Real time streaming protocol*

IETF RFC 3550: *Real time transport protocol*

1.2.2 Informative Documents

Documents listed in this section provide related information. They are not referenced in the text.

EN62676: *Video Surveillance for use in security applications*

AC 43.13: *Acceptable Methods, Techniques, and Practices-Aircraft Inspection and Repair*

ARINC Specification 413: *Guidance for Aircraft Electrical Power Utilization & Transient Protection*

ARINC Report 604: *Guidance for Design and Built-in Test Equipment (BITE)*

ARINC Report 606: *Guidance for Electrostatic Sensitive Device Utilization and Protection*

ARINC Report 607: *Design Guidance for Avionics Equipment*

ARINC Report 609: *Design Guidance for Aircraft Electrical Power*

ARINC Report 624: *Design Guidance for Onboard Maintenance System (OMS)*

ARINC Specification 626: *Standard ATLAS for Modular Test*

ARINC Specification 628: *Cabin Equipment Interfaces (CEI) Part 7, Cabin Equipment Cooling General Specification*

ARINC Characteristic 720: *Digital Frequency/Function Selection for Airborne Electronic Equipment*

ARINC Characteristic 741: *Aviation Satellite Communication System*

ARINC Characteristic 761: *Second Generation Aviation Satellite Communication System, Aircraft Installation Provisions*

ARINC Characteristic 746: *Cabin Communications System*

ATA Specification 100: *Specification for Manufacturer's Technical Data*

EIA 364:-*() Electrical Connector/Socket Test Procedures Including Environmental Classifications*

Electronic Communications Privacy Act of 1986

Federal Aviation Regulation (FAR) Part 25: *(Airworthiness Standards: Transport Category Airplanes)*

IEC 61930: Fiber Optic Graphical Symbology

IEEE 802.1d: *Internet Working – Spanning Tree Protocol*

IEEE 802.1P: *Traffic Class Expediting and Dynamic Multicast Filtering*

RTCA DO-160/EUROCAE ED 14: *Environmental Conditions and Test Procedures for Airborne Equipment*

RTCA DO-199: *Potential Interference to Aircraft Electronic Equipment from Devices Carried Aboard*

RTCA DO-254/EUROCAE-80: *Design Assurance Guidance for Airborne Electrical Hardware*

RTCA DO-214: *Minimum Operational Performance Standards for Aeronautical Telecommunication Network (ATN) Avionics FOR Aircraft Audio Systems and Equipment*

RTCA DO-240: *Audio System Characteristic and MOPS for Microphones and Audio*

2.0 VIDEO SURVEILLANCE SYSTEM DESCRIPTION

Generic Video Surveillance Systems are composed by:

a) Data Acquisition Unit (DAU),

b) Area Distribution Units (ADU),

c) Cameras (CAM), and

d) Video sinks (e.g. displays and video recorder)

The four elements should be considered as parts of an overall concept, which provide the possibility for easy modular adaptions. All elements are connected by network infrastructure. However, not all elements are mandatory.

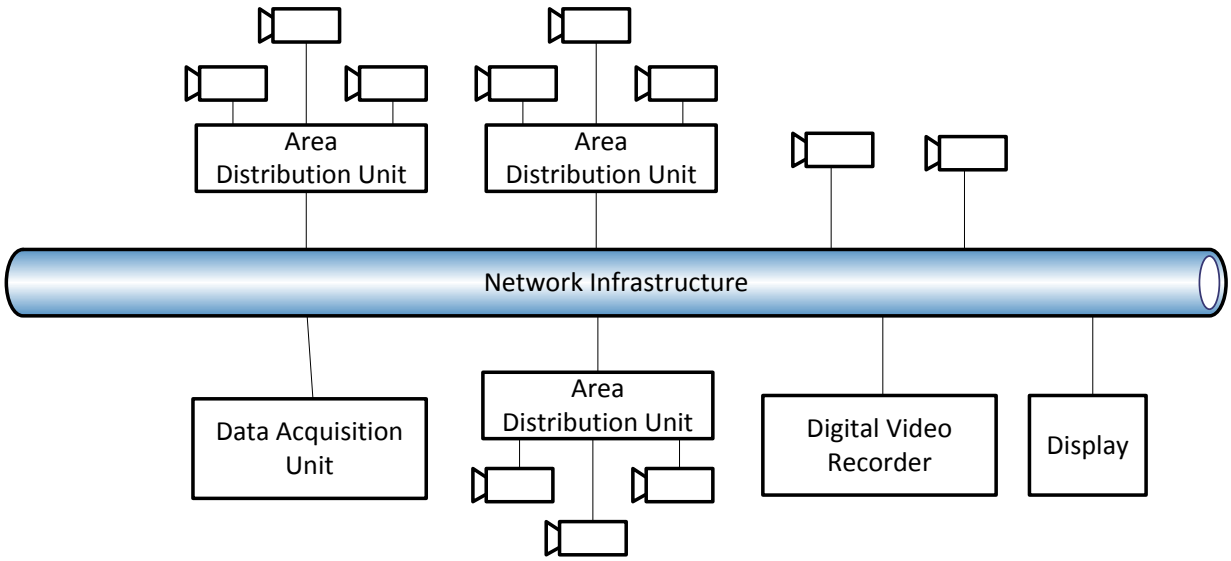

Figure 1: Video System Components

2.1 General description

Video Systems in aircraft cabin and cargo areas are intended to help the crew in order to observe hidden areas and to detect suspicious behaviour as unruly passengers, thefts or other potential threats. The video images can be selected and viewed on displays and can be recorded for later use. Further type of video sinks may be connected to the system.

The system configuration is customisable. The modularity of the system allows customisation depending on the aircraft infrastructure and aircraft layout as well as the intended surveillance objective.

2.1.1 Operation

The operational constraints are the available network bandwidth and the number of cameras needed to perform video surveillance of the entire cabin area on large commercial aircrafts. This is achieved by monitoring at least 80% of the cabin area by camera views.

Smaller system configurations can be used for specific surveillance objectives (e.g. monitoring a dedicated area as galleys, doors, etc.).

2.2 Data Acquisition Unit (DAU)

The DAU is hosting the system configuration data and is responsible to manage the system configuration. It is establishing the communication interfaces between the elements of the system as well as between the video system and the aircraft systems. Smaller system configurations can operate without presence of a DAU if the DAU functions are implemented by other elements of the video system.

2.3 Area Distribution Units (ADU)

ADUs are serving as power supply for connected cameras and connecting multiple cameras to the network infrastructure.

2.4 Cameras (CAM)

Cameras are capturing and encoding the monitored video and audio data. The video and audio streams are sent to the network infrastructure. The cameras are connected to the network infrastructure by ADUs, connection to other elements of the video system or by direct connection to the network infrastructure.

2.5 Video sinks

2.5.1 Digital Video Recorder (DVR)

Video and audio data of connected cameras is recorded on a Digital Video Recorder. The video recorder encrypts the received data.

2.5.2 Displays

The displays are allowing access to the live and optional recorded video and audio to the crew in cabin and/or cockpit. The video and audio streams are decoded by the displays.

2.5.3 Other video sinks

Other video sinks for specific use cases can be added to the system, e.g. remote display unit outside of the aircraft.

3.0 PHYSICAL DEFINITION

3.1 Data Acquisition Unit (DAU)

3.1.1 Mechanical Interface

3.1.1.1 Housing

The DAU housing size shall be in accordance to ARINC600, 6MCU.

The weight of a DAU shall not exceed 6kg.

3.1.1.2 Cooling

The cooling shall be in accordance to ARINC600. In addition the DAU thermal design shall be capable to operate the DAU on ground without ventilation from the ARINC600 rack, e.g. when supplied by ground service power network.

3.1.2 Electrical Interface

The electrical interface between the DAU and aircraft wiring is aircraft model and configuration dependent due to system scalability and level of functionality.

	Interface	Reference	Definition
A	Aircraft Data Network / Network Infrastructure	a) ARINCxxx b) ARINCxxx	a) 100BaseTX / 1000BaseTX b) 100BaseFX / 1000BaseFX
B	Power supply DAU	xxx	115VAC / VF (360 - 800 Hz)
C	Power output to Camera	a) xxx b) xxx	a) Power Over Ethernet b) 28VDC (separate wires)
D	Discrete input	xxx	Digital discrete input
E	Discrete output	xxx	Digital discrete output

Table 1

3.1.2.1 Connectors

The DAU interface should include the connectors listed in Tables xxx.

Table

3.1.3 Performance

3.1.3.1 Computation performance

…

3.1.3.2 Network capabilities

…

Any Ethernet interfaces with aircraft LANs should be consistent with ARINC 628 Part 9 with regard to IP addressing, security, and protocols.

3.2 Area Distribution Unit (ADU)

3.2.1 Mechanical Interface

3.2.1.1 Housing

The volume of

The weight of an ADU shall no exceed 2kg.

3.2.1.2 Cooling

The ADUs shall be passively cooled.

3.2.2 Electrical Interface

The electrical interface between the ADU and aircraft wiring is aircraft model and configuration dependent due to system scalability and level of functionality.

	Interface	Reference	Definition
A	Aircraft Data Network / Network Infrastructure	a) ARINCxxx b) ARINCxxx	a) 100BaseTX / 1000BaseTX b) 100BaseFX / 1000BaseFX
B	Data connection to camera	ARINCxxx	100BaseTX / 1000BaseTX
C	Power supply ADU	xxx	115VAC / VF (360 - 800 Hz)
D	Power output to Camera	a) xxx b) xxx	a) Power Over Ethernet b) 28VDC (separate wires)
E	Discrete input	xxx	Digital discrete input

Table 2

3.2.2.1 Connectors

The ADU interface should include the connectors listed in Tables xxx.

Table

3.2.3 Performance

3.2.3.1 Computation performance

…

3.2.3.2 Network capabilities

…

Any Ethernet interfaces with aircraft LANs should be consistent with ARINC 628 Part 9 with regard to IP addressing, security, and protocols.

3.3 Cameras (CAM)

3.3.1 Mechanical Interface

3.3.1.1 Cargo Camera Housing

…

The weight of one cargo camera inclusive housing shall not exceed 750g.

3.3.1.2 Cabin Camera Housing

…

The weight of one camera inclusive housing shall not exceed 250g.

3.3.1.3 Cooling

The CAMs shall be passively cooled.

3.3.2 Electrical Interface

The electrical interface between the Cameras and aircraft wiring is aircraft model and configuration dependent due to system scalability and level of functionality.

	Interface	Reference	Definition
A	Aircraft Data Network / Network Infrastructure or data connection to camera	ARINCxxx	100BaseTX / 1000BaseTX
B	Power supply camera	a) xxx b) xxx	a) Power Over Ethernet b) 28VDC (separate wires)

Table 3

3.3.2.1 Connectors

The CAM interface should include the connectors listed in Tables xxx.

Table

3.3.3 Optical Interface

3.3.3.1 Lens

Type of lens (pinhole), size, angle of view, light throughput,

3.3.4 Performance

3.3.4.1 Computation performance

…

3.3.4.2 Network capabilities

…

Any Ethernet interfaces with aircraft LANs should be consistent with ARINC 628 Part 9 with regard to IP addressing, security, and protocols.

3.4 Video sinks

3.4.1 Digital Video Recorder (DVR)

3.4.1.1 Mechanical Interface

3.4.1.1.1 Housing

The DVR housing size shall be in accordance to ARINC600, 4MCU.

The weight of the DVR shall not exceed 8kg.

3.4.1.1.2 Cooling

The cooling shall be in accordance to ARINC600. In addition the DVR thermal design shall be capable to operate the DVR on ground without ventilation from the ARINC600 rack, e.g. when supplied by ground service power network.

3.4.1.2 Electrical Interface

The electrical interface (fig. xx) between the DVR and aircraft wiring is aircraft model and configuration dependent due to system scalability and level of functionality.

Figure showing the DVR electrical interfaces.

Connects the DVR to the network infrastructure.

3.4.1.2.1 Connectors

The DVR interface should include the connectors listed in Tables xxx.

Table

3.4.1.3 Performance

3.4.1.3.1 Storage capabilities

…incl. principle to get access to the storage (remov. Cartridge)

3.4.1.3.2 Computation performance

…

3.4.1.3.3 Network capabilities

…

Any Ethernet interfaces with aircraft LANs should be consistent with ARINC 628 Part 9 with regard to IP addressing, security, and protocols.

3.4.2 Video displays

3.4.2.1 Mechanical Interface

The mechanical interface of the video displays is depending on aircraft model and configuration dependent due to system scalability and level of functionality.

3.4.2.2 Electrical Interface

The electrical interface (fig. xx) between the video displays and aircraft wiring is aircraft model and configuration dependent due to system scalability and level of functionality.

Connects the video display to the network infrastructure.

3.4.2.3 Performance

3.4.2.3.1 Video display capabilities

Resolution, dpi, quality performance (colour space, brightness, contrast)

3.4.2.3.2 Computation performance

…

3.4.2.3.3 Network capabilities

…

Any Ethernet interfaces with aircraft LANs should be consistent with ARINC 628 Part 9 with regard to IP addressing, security, and protocols.

3.4.3 Further video sinks

3.4.3.1 Mechanical Interface

The mechanical interface of the video sinks is depending on aircraft model and configuration dependent due to system scalability and level of functionality.

3.4.3.2 Electrical Interface

The electrical interface (fig. xx) between the video sinks and aircraft wiring is aircraft model and configuration dependent due to system scalability and level of functionality.

Connects the video sinks to the network infrastructure.

3.4.3.3 Performance

3.4.3.3.1 Computation performance

…Do not use DAU computation as far as possible.

3.4.3.3.2 Network capabilities

…

Any Ethernet interfaces with aircraft LANs should be consistent with ARINC 628 Part 9 with regard to IP addressing, security, and protocols.

4.0 VIDEO/AUDIO ENCODING AND DECODING

4.1 Motion JPEG

…

4.2 H.264

…

4.3 H.265

…

4.4 Audio encoding

a) Pulse code modulation (PCM) with sampling rate of 16kHz and quantitation of 16bps.

b) MP3

5.0 VIDEO AND AUDIO QUALITY

5.1 Video quality

5.1.1 Image resolution

a) 640x480 pixel, aspect ratio 4:3 (VGA)

b) 1920x1080 pixel, aspect ratio 16:9 (HD)

c) 3840x2160 pixel, aspect ratio 16:9 (Ultra HD)

5.1.2 Key image quality parameter

5.1.2.1 Signal to noise ratio

…

5.1.2.2 Contrast

…

5.1.2.3 Colour space

…

5.1.2.4 Dynamic range

…

5.1.3 Frame rate

A frame of at least 15 frames per second (fps) at VGA and of at least 25fps at HD and Ultra HD has to be used.

5.2 Audio quality

Refer also to 4.4.

5.2.1 Key audio quality parameter

5.2.1.1 Signal to noise ratio

…

5.2.1.2 Frequency bandwidth

…

6.0 COMMUNICATION

The communication between the elements of the Video Surveillance System is based on common internet standards (see figure xx).

Figure xx

6.1 Video transmission

6.1.1 RTSP/RTP

Refer to:

- RTSP IETF RFC 7826
- RTP IETF RFC 3550

…

6.1.2 Ancillary data

…(AC data, etc)

6.2 Control data

6.2.1 Configuration data

…

6.2.2 Build In Test Environment (BITE) data

…

7.0 SECURITY CONSIDERATIONS

…