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Radijska oprema in sistemi (RES) - Prizemni letalski telekomunikacijski sistem (TFTS) - Podatki v paketnem naļ inu

Radio Equipment and Systems (RES); Terrestrial Flight Telecommunications System (TFTS); Packet mode data

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Contents

Foreword

This European Telecommunication Standard (ETS) has been produced by the Radio Equipment and Systems (RES) Technical Committee of the European Telecommunications Standards Institute (ETSI).

Transposition dates	
Date of adoption:	5 September 1997
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1 Scope

This European Telecommunication Standard (ETS) deals with the procedures allowing the technical realization of packet mode data with the Terrestrial Flight Telecommunications System (TFTS) environment using transparent network support according to the teleservice definitions contained in ETS 300 326-1 [1].

The TFTS packet data transmission services build on the existing architecture defined in ETS 300 326 [1], [2] and [3] introducing a new network function termed the Centralised Interworking Function (CIF). The selection of a networking protocol, and its definition is outside the scope of this ETS. The use of a particular protocol does not constrain the actual implementation of CIF functionality.

Transport layer aspects

In order to ensure the resolution of lost or duplicated packets arising from handover, it is assumed that the higher layers implement an end to end acknowledgement function.

2 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] ETS 300 326-1: "Radio Equipment and Systems (RES); Terrestrial Flight Telephone System (TFTS); Part 1: Speech services, facilities and requirements".

[2] ETS 300 326-2 (1996): "Radio Equipment and Systems (RES); Terrestrial Flight Telephone System (TFTS); Part 2: Speech services, radio interface".

[3] ETS 300 326-3: "Radio Equipment and Systems (RES); Terrestrial Flight Telephone System (TFTS); Part 3: Speech services, network aspects".

[4] ITU-T Recommendation X.25: "Interface between Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".

[5] ITU-T Recommendation X.121: "International numbering plan for public data networks".

[6] ARINC Characteristic 746-4: "Cabin Communication Systems (CCS)".

[7] ISO 9577: "Information technology - Protocol identification in the network layer".

[8] ITU-T Recommendation Q.931: "Digital subscriber Signalling System No. 1 (DSS1) - ISDN user-network interface layer 3 specification for basic call control".

[9] Internet Architecture Board RFC 791: "Internet Protocol - DARPA Internet Program protocol specification".

[10] Internet Architecture Board RFC 793: "Transmission Control Protocol - DARPA Internet Program protocol specification".

3 Abbreviations

3.1 Definitions

For the purposes of this ETS, the following definitions apply:

Ba channel: A channel which carries either:

- a 9,6 kbit/s bit stream with an error structure and transmission delay suitable to carry voice encoded information; or
- a bit stream at a gross rate of 9,6 kbit/s with an error structure and transmission delay adapted to a wider range of services.

La channel: A channel with a gross data rate of 2,4 kbit/s.

Ma channel: A channel with a gross data rate of 4,8 kbit/s.

PACKET DATA TRANSFER: The mechanism of transporting messages between the avionic termination and the ground station system.

Ua interface: The interface between the Avionic Termination (AT) and the Ground Station System (GSS) (ETS 300 326-2 [2]).

3.2 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

ACARS	Aircraft Communications, Addressing and Reporting System
AS	Aircraft Station
AT	Avionic Termination
ATEI	Avionic Termination Equipment Identifier
BCCH(D)	Broadcast Control CHannel (Data)
CC	Call Control
CIF	Centralised Interworking Function
CM	Connection Management
CTU	Cabin Telecommunication Unit
DCCH	Dedicated Control CHannel
DT	Data Transmission
DTM	Data Transmission Management
DTM-SAP	Data Transmission Management Service Access Point
FACCH	Fast Associated Control CHannel (a case of a DCCH)
FCT	Flow Control Threshold
GS	Ground Station
GSC	Ground Switching Centre
GSIC	Ground Station Identity Code
GSS	Ground Station System
IE	Information Element
IEI	Information Element Identifier
IPI	Initial Protocol Identifier
MF	Mandatory with Fixed length
MN-SAP	Mobile Network Service Access Point
MV	Mandatory with Variable length
OF	Optional with Fixed length
OV	Optional with Variable length
PSDN	Packet Switched Data Network
RR	Radio Resources
RRM	Radio Resource Management
SACCH	Slow Associated Control CHannel (a case of a DCCH)
SAP	Service Access Point
SAPI	Service Access Point Identifier
SDL	System Description Language

TCT	Throughput Control Threshold
TE	Terminal Equipment
TFTS	Terrestrial Flight Telecommunications System
TI	Transaction Identifier
VC	Virtual Circuit
X.25 RNR	X.25 [4] Receiver Not Ready message
X.25 RR	X.25 [4] Receiver Ready message

3.3 Symbols

For the purposes of this ETS, the following symbols apply:

bps	bits per second
clr	clear
cnf	confirm
conn	connection
CONN	CONNECT
DISC	DISCONNECT
est	establish
ind	indication
kbit/s	kilobits per second
PD	Packet Data
pend	pending
rel	release
req	request
resp	response
trans	transport

4 Service definition

This ETS specifies support for the following data types:

- packet transport on the TFTS radio interface.

The TFTS packet data transmission service allows an aircraft application to send and receive data in an end-to-end, point-to-point, connection-oriented mode.

4.1 Packet mode services

The types of packet mode services supported by the TFTS packet transport service may include the following:

- status update information;
- file transfer;
- information update;
- interactive services.

Annex A provides further information.

5 Network architecture

The TFTS packet data transmission services builds on the existing architecture defined in ETS 300 326 [1], [2] and [3] introducing a new network function termed the Centralised Interworking Function (CIF). This function provides the interworking between the transport mode used between the Avionic Termination (AT) and the Ground Station System (GSS), and that used in the public data network. The interface between the AT and the GSS for the TFTS packet data transmission is defined in clause 7 of this ETS. The interface between the GSS and the CIF is defined in clause 9 of this ETS. The interface between the CIF and the public network is not defined in this ETS but is assumed to be compliant with international standards for data services and in particular for packet data, e.g. ITU-T Recommendation X.25 [4]. Similarly, the interface between the AT and the aircraft Terminal Equipment (TE) is not defined in this ETS, but is assumed to be compliant with international standards for data services and in particular for packet data, e.g. ITU-T Recommendation X.25 [4] or ARINC Characteristic 746-4 [6].

This ETS defines the basic packet transport mechanism required to transport packets from the AT to the GSS and the reverse. It does not address the way in which the end-to-end packet service operates.

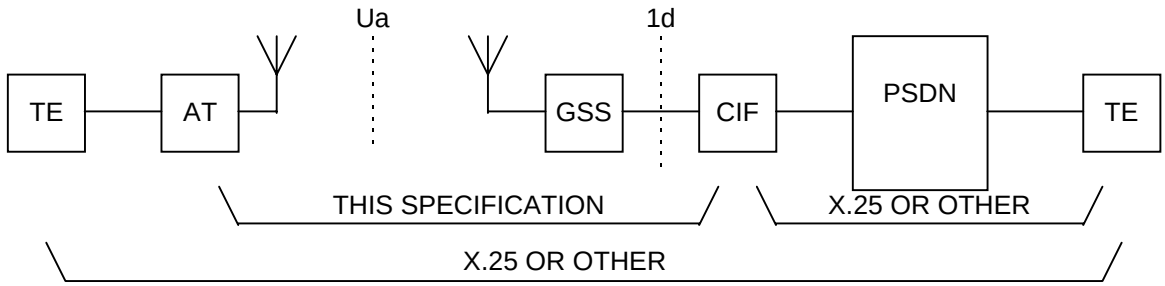

Figure 1: Packet mode architecture

Figure 1 shows the architecture of the system showing the Ua interface defined in ETS 300 326-2 [2], subclause 6.2 figure 5 and a new interface 1d between the GSS and CIF.

5.1 Support of multiple network layer protocols

The TFTS packet mode service provides for the transparent transfer of arbitrary binary data between onboard avionics equipment and the ground user. The TFTS packet mode service provides no constraints on network protocol used. Typical examples of protocols that may be used are ITU-T Recommendation X.25 [4] and Internet Architecture Board RFC 791 [9] and RFC 793 [10].

The interworking between the ground user and the TFTS network is carried out by the CIF. The first octet of the data field defined in subclause 7.9.1 shall be an Initial Protocol Identifier (IPI). IPIs can conform to ISO 9577 [7], in which case the message shall conform to subclause 7.9.1.3; or be defined within TFTS, in which case the message shall conform to subclause 7.9.1.4.

5.2 Data transmission

Data transmission is managed, both on the Avionic Termination (AT) side and on the ground side by the Data Transmission Management (DTM) entity.

The Data Transmission Management (DTM) is part of the Connection Management Layer, i.e. upper part of layer 3.

To distinguish Call Control (CC) messages, Maintenance Resource messages and Data Transmission (DT) messages, a specific protocol discriminator is used.

<table>
<tr><td>Maintenance Resource Management</td><td>Call Control Management</td><td>Data Transmission Management</td></tr>
<tr><td colspan="3">Radio Resources Management</td></tr>
<tr><td colspan="3">Layer 2</td></tr>
<tr><td colspan="3">Layer 1</td></tr>
</table>

Figure 2: Sublayer relationship

Figure 2 illustrates the relationship between the components of layer 3.

5.3 AT functionality

5.3.1 Interworking function

The AT shall provide an interworking function between the application messages and the PACKET DATA TRANSFER messages.

For air-to-ground transfer, the interworking function shall encapsulate the application message into a PACKET DATA TRANSFER message.

For ground-to-air messages the AT shall strip off the PACKET DATA TRANSFER message header and forward the resultant application message to the TE.

There are two cases of PACKET DATA TRANSFER message dependent upon the coding standard of the IPI employed (see subclause 7.9.1).

5.3.2 Location registration procedure

The AT shall carry out the location registration procedure (see subclause 7.7.3) if it is to provide ground-initiated data transfer service.

The location registration procedure allows the AT to inform the CIF that it is capable of receiving data. The message shall be sent every time the AT selects a new cell.

Furthermore, each AT shall also send a periodic location registration message (using the same mechanism) after a pre-defined timeout period (T350).

To differentiate between location registration messages and other services a specific IPI value is used as specified in table 11.

The mandatory contents of the location registration message is defined in subclause 7.9.1.4 with the IPI identifying the TFTS location registration protocol.

The location registration procedure is optional. However, the functionality required for the support of this procedure shall be implemented in all equipment. It shall be possible to enable and disable the location registration functions defined in this ETS in both airborne and CIF equipment in service.

5.3.3 Dynamic resource management

The AT shall dynamically manage Radio Resources (RR) in conjunction with the GSS based on the amount of traffic. This shall be achieved using the mechanism defined in subclause 7.6.

5.4 GSS functionality

The GSS shall provide a gateway function between the AT and the CIF.

On the air interface side (Ua), when receiving a PACKET DATA TRANSFER message (see subclause 9.6.2.2 or subclause 9.6.2.3), the GSS function shall extract the user data transferred and encapsulate it in the corresponding PACKET DATA TRANSFER message (see subclause 9.6.2.2 or 9.6.2.3) before sending it on the ground interface.