

Data Link Service Requirements

Review of Performance-Based Communications Approach

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Federal Aviation
Administration



Overview

- **North Atlantic (NAT)**
 - Concerns with Inmarsat Classic Aero Satellite Services
 - Special NAT Systems Planning Group (SPG) November 2007
 - RCP Task Force – February 2008
- **IPACG in November 2007**
- **Globally adopt standards**
- **RTCA DO-306/EUROCAE ED-122, Safety and Performance Standard for Air Traffic Data Link Services in Oceanic and Remote Airspace (Oceanic SPR Standard)**
- **Additional requirements consistent with NAT**

Standards & guidance material

- **ICAO performance-based standards/guidance material for data link services**
 - Provisions for Required Communication Performance (RCP) Annexes 6 and 11, effective November 2007
 - Manual on RCP
ICAO Doc 9869, draft available September 2005
- **RTCA/EUROCAE performance-based standards for data link services**
 - Continental Safety and Performance Standard DO-290/ED-120, Chgs 1 and 2, dated June 2007
 - – Oceanic Safety and Performance Standard DO-306/ED-122, dated October 2007



Performance-based standards

- **Establishes specifications for RCP types**
 - Associated with communication capability and performance that support an ATM function, e.g., reduced separation
 - Considers voice and data communications
 - Considers global seamless operations
 - Not based on any particular technology
- **Specifications for RCP types will be used for**
 - Initial qualification of the different parts of the system
 - On-going operational monitoring of actual operational and technical communication performance

FOM criteria

- **Performance of entire population of aircraft in an airspace**
 - Does not consider variations among aircraft types and operators
- **Technical performance**
 - Does not consider operational performance
- **See FIT WP-04 indicating that further breakdown is needed to isolate problem areas and improve operational and technical performance to meet criteria, for example**
 - Per tail number
 - Per operator
 - Per aircraft type
 - Per communication service provider



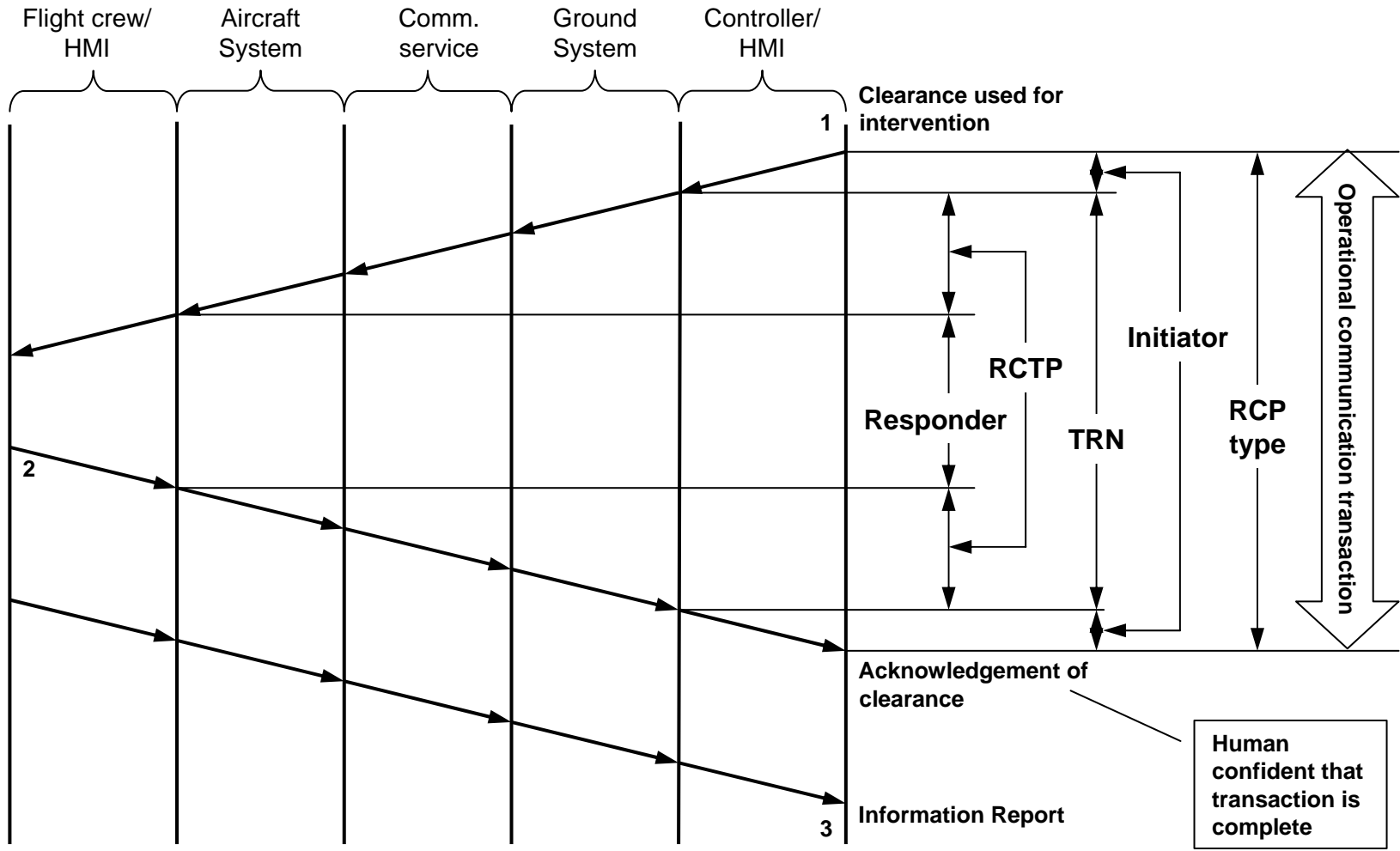
RTCA DO-306/EUROCAE ED-122

- **Oceanic SPR Standard, October 2007, scope of document**
 - Data link services used in lieu of HF voice, includes 50 lateral
 - Data link services required for 30 nm lateral/30 nm longitudinal and 50 nm longitudinal separation standards
 - Considers route conformance monitoring, separation assurance, reroutes, and weather deviations
- **Recognized global standard – U.S. is coordinating with**
 - Asia-Pacific Region via IPACG and ISPACG and
 - NAT Region via NAT SPG Satcom Task Force and NAT FIG
- **Provides “performance-based” criteria for data link services in the above operating context**
 - Consistent with ICAO separation standards
 - Uses RCP 240 and RCP 400 for intervention → CPDLC
 - Other criteria for surveillance → ADS-C



RTCA DO-306/EUROCAE ED-122

- **Operational requirements (descriptions)**
 - ATS functions
 - Data link services
 - Data link applications
- **Safety (FIT WP/2)**
- **Performance (FIT WP/7)**



50 longitudinal and 30/30 Intervention (DO-306/ED-122, Table 5-6)

Expiration time (ET) is at the continuity requirement, which is 99.9%

RCP type	Normal means		Alternative means	
	RCP 240/D		RCP 400/D	
Time Parameter	ET	95%	ET	95%
Time Value	240	210	400	350
RCP Time Allocations				
Initiator	30	30	30	30
TRN	210	180	370	320
TRN Time Allocations				
Responder	60	60	60	60
RCTP	150	120	310	260
RCTP Time Allocation				
Aircraft	15	10	15	10
Communication service	120	100	280	240
ATS unit	15	10	15	10
<i>Note : Values shown in seconds.</i>				

50 longitudinal and 30/30 Surveillance (DO-306/ED-122, Table 5-7)

Expiration time (ET) is at the continuity requirement, which is 99.9%

Position report delivery times	Periodic, Waypoint, or Lateral Deviation Event	
Time Parameter	ET	95%
Time Value	180	90
Time Allocation		
Aircraft	5	3
Communication service	170	84
ATS unit	5	3
<i>Note : Values shown in seconds.</i>		

≥ 50 lateral and time-based longitudinal, Surveillance (DO-306/ED-122, Table 5-8)

Expiration time (ET) is at the continuity requirement, which is 99.9%

Position report delivery times	Periodic, Waypoint, or Lateral Deviation Event	
Time Parameter	ET	95%
Time Value	400	300
Time Allocation		
Aircraft	30	15
Communication service	340	270
ATS unit	30	15
<i>Note : Values shown in seconds.</i>		

Continuity, Integrity, and Availability (DO-306/ED-122, Table 5-9)

Parameter	Value <i>See Note 1 and Note 2.</i>	Source information		
		Safety Objectives per <u>Table 5-2</u>	Hazard/qualitative term per <u>Table 5-2</u>	Quantitative value per <u>Table 1-1</u>
Availability of service provision for all aircraft	0.999 [1-10 ⁻³]	SO-1	Loss of data link service (multiple aircraft, detected case) probable	10 ⁻³
Availability of an aircraft to use the service	0.999 [1-10 ⁻³]	SO-2	Loss of data link capability (single aircraft, detected case) probable	10 ⁻³
Continuity (C)	0.999 [1-10 ⁻³]	SO-3 SO-4 SO-5 SO-6	Unexpected interruption of the transaction (loss after initiation) probable	10 ⁻³
Integrity (I)	10 ⁻⁵	SO-7 SO-8 SO-9 SO-10	Undetected corruption of the transaction remote	10 ⁻⁵

Additional requirements

- **RCP 240 communication service availability**
 - 0.999 for safety, per DO-306/ED-122
0.9999 for operational efficiency
 - On a per Oceanic ATC Centre (OAC) basis (0.9999)
 - No more than 4 outages greater than 10 minutes for any 12 month period
 - Failures causing outages for multiple OACs are not counted more than once
 - No more than 50 minutes of total downtime for any 12 month period

Additional requirements

- **RCP 400 communication service availability**
 - 0.999 for safety, per DO-306/ED-122
 - On a per Oceanic ATC Centre (OAC) basis (0.999)
 - No more than 24 outages greater than 20 minutes for any 12 month period
 - Failures causing outages for multiple OACs are not counted more than once
 - No more than 9 hours of total downtime for any 12 month period

Additional requirements

- **Monitoring and alerting requirement**
 - RCP 240 – After an outage begins, the communications service shall provide ATC automation with a positive indication that there is an outage within 5 minutes
 - RCP 400 – After an outage begins, the communications service shall provide ATC automation with a positive indication that there is an outage within 10 minutes

RCP types being considered for NAT

RCP type	Intended use
RCP 240	Normal means of communication for application of 30 NM lateral separation and reduced longitudinal separation minima.
RCP 400	Alternative means of communication [other than HF voice] for application of 30 NM lateral separation and reduced longitudinal separation minima.
	Normal means of communication for application of lateral separation greater than or equal to 50 NM and time-based longitudinal separation.

Note: Specifications for RCP 240 and RCP 400 are provided in draft NAT SPG RCP Task Force Report, based on RTCA DO-306/EUROCAE ED-122 and ICAO Doc 9869.

Recommendation

- **Prescribe requirements for data link service**
 - Recognize DO-306/ED-122 in appropriate regional documents
 - Additional requirements (per para 2.15) for
 - Service availability
 - Monitoring
- **Validate existing system**
 - Qualification for aircraft approval, operational authorizations, and ATC system validation
 - End-to-end operational performance monitoring