



Working Draft

Satellite Voice Guidance Material (SVGGM)

Version 0.8.6

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**International Civil Aviation Organization
Inter-Regional SATCOM Voice Task Force
(IR-SVTF)**

Revision History

Date	Description of changes	Version
13-Jul-10	Initial working draft	
26-Jan-11	Added Joint working relationship with ICAO SATCOM Voice TF, added version control.	0.1
27-Jan-11	Added material from IRSVTF/1 meeting. First TF baseline. no track changes.	0.2
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23-Feb-12	Closes open comments. This version is intended for final coordination	0.8.6

Editor's note 1. — Editor's notes may appear throughout the document, however, refer to the master comment matrix, which includes open comments that may not have been resolved in this "working draft" version. Comments and contributory material should be submitted to "Elkhan NAHMADOV" enahmadov@paris.icao.int, "Catherine DALY" cdaly@paris.icao.int, and "Tom KRAFT" tom.kraft@faa.gov. This version (v0.8.6) is complete, except for Appendices B, C and D. Expect a complete version by mid March 2012.

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FOREWORD.

1. Historical background

1.1 The *Satellite Voice Guidance Material* (SVGGM) is the result of a task force established at the request from the ICAO Air Navigation Commission (ANC) made during its 4th Meeting of the 183rd Session held on 21 January 2010.

1.2 Over the oceanic and remote continental areas, aeronautical communications have historically been conducted with high frequency (HF) radios due to the advantage of being able to transmit and receive air-ground communications for thousands of miles. Most competent authorities hence required two independent HF sets on-board.

1.3 In the early 1980s, civil aviation recognized the increasing limitations of the present communications, navigation, and surveillance (CNS) systems for air traffic management (ATM) and the need to make improvements to overcome them and meet the future needs. Thus the Council of ICAO established the Special Committee on future air navigation systems (FANS) to study new concepts and new technologies and to recommend a system that would overcome the present and foreseen problems. The Committee made an extensive study of existing systems and the applications of new technologies. It concluded that the limitations of the existing systems are intrinsic to the systems themselves and were so restrictive that the problems could not be overcome on a global scale except by the exploitation of satellite technology. Thus a new concept of air navigation based on satellite technology was developed and consequently endorsed by the Tenth Air Navigation Conference in September 1991

1.4 In 1995, the initial future air navigation system (FANS 1/A) provided an integrated airborne CNS package. In addition to required navigation performance (RNP) and global navigation satellite system (GNSS) capabilities, FANS 1/A includes controller pilot data link communications (CPDLC) and automatic dependent surveillance – contract (ADS-C) capabilities using SATCOM, VHF, and HF data links. CPDLC and ADS-C were seen as the normal or preferred means of ATS communications and surveillance over the oceanic and remote continental areas. However, voice communications would continue to be required in situations where data link was not suitable. At the same time, these aircraft became equipped with SATVOICE capability.

1.5 In June 2001, the 37th Meeting of the ICAO North Atlantic Systems Planning Group (NAT SPG, 12-14 June 2001) agreed that a study would be initiated to assess the viability of using SATVOICE for waypoint position reporting as an initial step. The study was accompanied by the NAT trials that had been successful and demonstrated that while there were costs associated with implementation and use, SATVOICE could be an effective and reliable long range communication system to support ATS voice communications.

1.6 In 2003, the 39th NAT SPG Meeting (17-19 June 2003) agreed that the ICAO NAT Regional Supplementary Procedures (SUPPs) Doc 7030 needed to be amended to clearly state the conditions under which SATVOICE could be used. In 2008, the 44th Meeting of the NAT SPG (17-20 June 2008) agreed that the authorization to use SATVOICE for all ATS communications would permit reduction in risk of communications failure, improve safety of operations, and alleviate HF channel congestion. However, guidance material would be needed to address a number of issues related to call setup times, security and system performance and capacity. It was further concluded that any decision regarding Minimum Equipment List (MEL) relief of one HF radio was subject to approval by the appropriate authority.

1.7 Some State authorities had granted some operators time-limited MEL dispatch relief of one HF radio whereby the aircraft may be dispatched for a limited period of time (e.g., 5 or 10 days) with only a single operational HF radio system and a single operational SATVOICE system. Operators were seeking MEL dispatch relief of one HF radio with no time limits by demonstrating that a SATVOICE system was a viable long range communication system (LRCS).

1.8 In 2010, the ICAO ANC having reviewed the progress of the NAT SPG SATVOICE studies, requested that an ICAO inter-regional task force would be established to develop a globally applicable guidance material *Satellite Voice Guidance Material (SVGGM)* in support of the global implementation of aeronautical mobile satellite (route) communications systems (AMS(R)S).

1.9 This edition of the *Satellite Voice Guidance Material (SVGGM)* provides for a comprehensive update of various regional and State guidance material for ANSPs and operators to use SATVOICE for ATS communications. This includes the incorporation of performance-based specifications and associated guidance on data collection, monitoring, and analysis. This guidance material may facilitate the appropriate authority in establishing its policies on MEL regarding the number and type of long range communication radios. However, it assumes that sufficient HF voice infrastructure will remain in service and that the aircraft will be equipped with at least one operational HF voice system.

2. Scope and purpose

2.1 The SVGGM provides guidance and information concerning SATVOICE communications for aeronautical use and is intended to facilitate the uniform application of ICAO Standards and Recommended Practices (SARPs) contained in Annex 2 — *Rules of the Air* and in Annex 11 — *Air Traffic Services*, the provisions in the *Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444)* and, when necessary, the *Regional Supplementary Procedures (Doc 7030)*.

2.2 This guidance material is intended to maximize operational benefits of SATVOICE implementations by promoting seamless and interoperable SATVOICE operations throughout the world. This edition provides guidance material for current and near term operations in oceanic and remote environments. It also includes an appendix that provides a high level vision to serve as a basis for development of future SATVOICE systems. Future editions are expected as experience is gained in the use of SATVOICE capability for ATS communications.

2.3 The following principles were adhered to in the development of this guidance material:

a) build on the ICAO required communication performance (RCP) framework to provide States with flexibility to apply different standards for different uses, without implication to seamless operations, interoperability and safety;

b) provide a basis for States in determining acceptability of any implementation within an ATS unit (ATSU), a radio facility or aircraft equipage, taking into account routine and emergency use, the provision of ATS using SATVOICE communications, procedures for the radio operator, controller and flight crew, performance specifications and qualification;

c) note that in-flight use of portable SATVOICE phones for ATS communications is not allowed, according to many existing State operating regulations;

d) serve to facilitate State authorities or Regional Safety Oversight Organizations (RSOOs) in establishing policies in MEL matters; and

e) address the use of SATVOICE only as an additional means of communication to HF voice capability, which remains available on board and in the ground infrastructure.

2.4 The following personnel and organizations should be knowledgeable with relevant aspects of its contents: regulators, airspace planners, aircraft operators, dispatchers, air navigation service providers (ANSPs), aeronautical stations, communication service providers (CSPs), satellite service providers (SSPs), and radio operators, training organizations, regional/State monitoring agencies, automation specialists at centers and radio facilities, and aircraft manufacturers and equipment suppliers.

2.5 The guidance material will support the following activities:

a) the States' activities in relation to the following:

- 1) safety oversight of air navigation services;
- 2) operational eligibility, flight crew training and qualification; and
- 3) airworthiness certification of aircraft SATVOICE systems.

b) the development of agreements and/or contractual arrangements between ANSPs and aircraft operators and their respective CSPs;

c) development of operational procedures; and

d) operational monitoring, analysis, and exchange of operational data among regions, States, RSOOs and communication service providers.

2.6 Guidance material and information concerning SATCOM data communications is not within the scope of this guidance material and can be found in the *Global Operational Data Link Document (GOLD)*.

3. Status

3.1 This guidance document may contain material that may eventually become Standards and Recommended Practices (SARPs), or PANS provisions when it has reached the maturity and stability necessary for adoption or approval. It may also comprise material prepared as an amplification of the basic provisions in the corresponding SARPs and PANS to assist the user in their application.

4. Implementation

4.1 The implementation of facilities, services and procedures is the responsibility of Contracting States; they are applied in actual operations only after, and in so far as, States have enforced them. However, with a view to facilitating their processing towards implementation by States, this guidance material has been prepared in language which will permit direct use by air navigation service personnel and others associated with the provision of global air navigation services.

5. Promulgation of information

5.1 Information relating to the establishment and withdrawal of and changes to facilities, services and procedures affecting aircraft operations should be notified and take effect in accordance with Annex 15 — Aeronautical Information Services.

6. References

6.1 The following references are cited in this document:

- a) ICAO Annex 1 — Personnel Licensing;
- b) ICAO Annex 2 — Rules of the Air;
- c) ICAO Annex 4 — Aeronautical Charts;
- d) ICAO Annex 6 — Operation of Aircraft – Part I — International Commercial Air Transport — Aeroplanes;
- e) ICAO Annex 10 — Aeronautical Telecommunications – Volume II — Communication Procedures including those with PANS status;
- f) ICAO Annex 10 — Aeronautical Telecommunications – Volume III — Communication Systems;
- g) ICAO Annex 11 — Air Traffic Services;
- h) ICAO Annex 15 — Aeronautical Information Services;
- i) Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, ICAO Doc 4444);
- j) Regional Supplementary Procedures (Regional SUPPs, ICAO Doc 7030);
- k) Procedures for Air Navigation Services — ICAO Abbreviations and Codes (PANS-ABC, ICAO Doc 8400);
- l) Designators for Aircraft Operating Agencies, Aeronautical Authorities and Services (ICAO Doc 8585);
- m) Aircraft Type Designators (ICAO Doc 8643);
- n) Manual of Radiotelephony (ICAO Doc 9432);
- o) Manual on Airspace Planning Methodology for the Determination of Separation Minima (ICAO Doc 9689);
- p) Performance Based Navigation Manual (PBN) (ICAO Doc 9613);
- q) Manual on Required Communication Performance (RCP) (ICAO Doc 9869);
- r) Manual on the Aeronautical Mobile Satellite (Route) Service (ICAO Doc 9925);
- s) RTCA DO-210D, Minimum Operational Performance Standards for Geosynchronous Orbit Aeronautical Mobile Satellite Services (AMSS);
- t) RTCA DO-262A, Minimum Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS);
- u) TSO-159C – Avionics Supporting Next Generation Satellite Systems (NGSS);
- v) Equipment Specifications: ARINC 741, 761, 781; and
- w) FAA Advisory Circular 20-150A – Satellite Voice Equipment as a Means for Air Traffic Services Communications.

7. Changes to the document

This document is maintained as a regional document in coordination with ICAO planning and implementation regional groups (PIRGs) providing SATVOICE services within their region. Each

participating PIRG establishes a mechanism for submitting and administering proposals for amendment (PfAs).

PfAs can be submitted by any stakeholder participating in SATVOICE operations. The stakeholder should submit a PfA to their ICAO Regional Office. The ICAO Regional Office will coordinate the PfA within its own Region, other Regional Offices, and ICAO HQ, to determine the acceptability of the change proposal. Once the ICAO Regional Office has completed coordination and the participating PIRGs accept the PfA, the guidance document would be amended to incorporate the approved proposals.

8. Amendments to the SVGGM

Amendment	Source(s)	Subject(s)	Approved applicable
1 st Edition (2012)	Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/23 – 2012) North Atlantic Systems Planning Group (NAT SPG/48 – 2012)	<i>Satellite Voice Guidance Material (SVGGM)</i>	Applicable within participating Regions on 1 October 2012.

Chapter 1. Definitions

Editor's note 2. — To be administratively updated just prior to completion. Terms generally will only be included if used in the document.

1.1 Terms and definitions

When the following terms are used in the present document they have the following meanings.

Note 1.— Where the term has “(ICAO)” annotated, the term has already been defined as such in ICAO provisions.

Note 2.— The designation (RR) in these definitions indicates a definition which has been extracted from the Radio Regulations of the International Telecommunication Union (ITU).

Term

Access number. The PSTN number used by the ATSU, aeronautical station or aeronautical operational control (AOC) to access the network switch to contact an aircraft via SATVOICE.

Actual communication performance (ACP). The dynamic assessment of the operational performance of the communication path, with human performance and technical performance included in the assessment. (ICAO)

Aeronautical Information Publication (AIP). A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation. (ICAO)

Aeronautical mobile satellite (route) service (AMS(R)S). An aeronautical mobile-satellite service reserved for communications relating to safety and regularity of flights, primarily along national or international civil air routes. (ICAO)

Note.— Includes both voice and data, In this document, the use of AMS(R)S for voice communications is referred to as SATVOICE to reflect the operational use of the term in standard phraseology and messages.

Aeronautical mobile service (RR S1.32). A mobile service between aeronautical stations and aircraft stations, or between aircraft stations, in which survival craft stations may participate; emergency position-indicating radio beacon stations may also participate in this service on designated distress and emergency frequencies. (ICAO)

Aeronautical operational control (AOC). Communication required for the exercise of authority over the initiation, continuation, diversion or termination of flight for safety, regularity and efficiency reasons. (ICAO)

Aeronautical station (RR S1.81). A land station in the aeronautical mobile service. In certain instances, an aeronautical station may be located, for example, on board ship or on a platform at sea. (ICAO)

Note.— Aeronautical station is commonly referred to as a radio facility.

Term

Air navigation service provider (ANSP). An organization responsible for the provision of air navigation services.

Note.— This term is sometimes referred to as air traffic service provider (ATSP), although an ANSP may be considered broader in scope of its service provision. In the context of this document they are synonymous.

Air traffic control (ATC) service. A service provided for the purpose of:

- a) preventing collisions:
 - 1) between aircraft, and
 - 2) on the manoeuvring area between aircraft and obstructions; and
- b) expediting and maintaining an orderly flow of air traffic. (ICAO)

Air traffic management (ATM). The dynamic, integrated management of air traffic and airspace including air traffic services, airspace management and air traffic flow management — safely, economically and efficiently — through the provision of facilities and seamless services in collaboration with all parties and involving airborne and ground-based functions. (ICAO)

Air traffic service (ATS). A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service). (ICAO)

Air traffic services unit (ATSU). A generic term meaning variously, air traffic control unit, flight information centre or air traffic services reporting office. (ICAO)

Aircraft active flight plan. (See flight plan).

Aircraft address. A unique combination of 24 bits available for assignment to an aircraft for the purpose of air-ground communications, navigation and surveillance. (ICAO)

Aircraft identification. A group of letters, figures or a combination thereof which is either identical to, or the coded equivalent of, the aircraft call sign to be used in air-ground communications, and which is used to identify the aircraft in ground-ground air traffic services communications. (ICAO)

Note 1.— The aircraft identification does not exceed 7 characters and is either the aircraft registration or the ICAO designator for the aircraft operating agency followed by the flight identification.

Note 2.— ICAO designators for aircraft operating agencies are contained in ICAO Doc 8585.

Aircraft registration. A group of letters, figures or a combination thereof which is assigned by the State of Registry to identify the aircraft.

Note.— Also referred to as registration marking.

Term

Aircraft system availability (A_{AIR}). The required probability of available capability on an aircraft.

Note.— *The actual aircraft system availability is computed assuming that the service is available in the relevant airspace.*

Appropriate ATS authority. The relevant authority designated by the State responsible for providing air traffic services in the airspace concerned. (ICAO)

Appropriate authority.

a) Regarding flight over the high seas: The relevant authority of the State of Registry.

b) Regarding flight other than over the high seas: The relevant authority of the State having sovereignty over the territory being overflown. (ICAO)

Area control centre (ACC). A unit established to provide air traffic control service to controlled flights in control areas under its jurisdiction. (ICAO)

ATC waypoint. A waypoint contained in Item 15 of the ICAO flight plan, or as amended by ATC.

Note.— *A waypoint inserted by the flight crew for purposes of conducting flight operations such as points of no return are not ATC waypoints.*

C for RCTP. The proportion of intervention messages and responses that can be delivered within the specified RCTP time for intervention.

Note.— *For voice communications, continuity would take into consideration any dropped calls.*

C for $RCTP_{AS}$. The proportion of intervention messages and responses that can be delivered within the specified $RCTP_{AS}$ time for intervention.

C for $RCTP_{AS/AIR}$. The proportion of intervention messages and responses that can be delivered within the specified $RCTP_{AS/AIR}$ time for intervention.

Note.— *For voice communications, continuity would take into consideration any dropped calls.*

C for $RCTP_{ATSU}$. The proportion of intervention messages and responses that can be delivered within the specified $RCTP_{ATSU}$ time for intervention.

C for $RCTP_{CSP}$. The proportion of intervention messages and responses that can be delivered within the specified $RCTP_{CSP}$ time for intervention.

C for operational performance. The proportion of intervention messages and responses that can be delivered within the specified operational performance time for intervention.

Note.— *For voice communications, continuity would take into consideration any dropped calls.*

Term

Call performance. The operational portion of the transaction time to prepare the operational response, and includes the recognition of the instruction, and message composition during an interactive call between the radio operator and flight crew, e.g. flight crew and human/machine interaction for intervention transactions.

Note.— For voice communications, the call begins when the aircraft indicates an incoming call to the flight crew and ends when the callers operationally completes the call. The call includes any tasks for the radio operator to send the message to the ATSU.

Call sign. The designator used in air-ground communications to identify the aircraft and is equivalent to the encoded aircraft identification.

Caller line identification (CLI). A display of the identification of a caller to the recipient prior to answering the call.

Note.— For the purposes of ATS communications, caller line identification to the flight crew is a display of facility name or the facility designator for the aeronautical station or ATS unit. For the radio operator/controller it is a display of the aircraft identification.

Communication service provider (CSP). Any public or private entity providing communication services for general air traffic.

Communication services. Aeronautical fixed and mobile services to enable ground-ground and/or air-ground communications for safety and regularity of flight.

Compulsory reporting point. An ATC waypoint for which a position report is required by the aircraft.

Control area (CTA). A controlled airspace extending upwards from a specified limit above the earth. (ICAO)

Current flight plan. (See flight plan).

Filed flight plan. (See flight plan).

Flight identification. A group of numbers, which is usually associated with an ICAO designator for an aircraft operating agency, to identify the aircraft in Item 7 of the flight plan.

Flight information region (FIR). An airspace of defined dimensions within which flight information service and alerting service are provided. (ICAO)

Term

Flight level (FL). A surface of constant atmospheric pressure which is related to a specific pressure datum, 1 013.2 hectopascals (hPa), and is separated from other such surfaces by specific pressure intervals. (ICAO)

Note 1.— A pressure type altimeter calibrated in accordance with the Standard Atmosphere:

a) when set to a QNH altimeter setting, will indicate altitude;

b) when set to QFE altimeter setting, will indicate height above the QFE reference datum;

c) when set to a pressure of 1 013.2 hPa, may be used to indicate flight levels.

Note 2.— The terms “height” and “altitude”, used in Note 1 above, indicate altimetric rather than geometric heights and altitudes.

Flight management computer waypoint position reporting (FMC WPR). A data link capability used for position reporting.

Note. — See also the GOLD.

Flight plan. Specified information provided to air traffic services units, relative to an intended flight or portion of a flight of an aircraft. (ICAO)

A flight plan can take several forms, such as:

Current flight plan (CPL). The flight plan, including changes, if any, brought about by subsequent clearances. (ICAO)

Note 1.— When the word “message” is used as a suffix to this term, it denotes the content and format of the current flight plan data sent from one unit to another.

Filed flight plan (FPL). The flight plan as filed with an ATS unit by the pilot or a designated representative, without any subsequent changes. (ICAO)

Note 2.— When the word “message” is used as a suffix to this term, it denotes the content and format of the filed flight plan data as transmitted.

Aircraft active flight plan. The flight plan used by the flight crew. The sequence of legs and associated constraints that define the expected 3D or 4D trajectory of the aircraft from takeoff to landing. (RTCA/EUROCAE)

Global mobile satellite system (GMSS). A generic term referring to the selection of satellite phone providers available to private customers.

Note. GMSS is a term analogous to PSTN, referring to traditional wire-based telephony.

Long-range communication system (LRCS). A system that uses satellite relay, data link, high frequency, or another approved communication system which extends beyond line of sight.

Master minimum equipment list (MMEL). A list established for a particular aircraft type by the organization responsible for the type design with the approval of the State of Design containing items, one or more of which is permitted to be unserviceable at the commencement of a flight. The MMEL may be associated with special operating conditions, limitations or procedures. (ICAO)

Term

Maximum accumulated unplanned outage time (min/yr). A criterion applied to a given operational airspace of FIR that defines the maximum time allowed for the total sum of the unplanned outages that exceed the unplanned outage duration limit in any twelve month period

Note.— The criterion does not apply to unplanned outages that are less than the unplanned outage duration limit or planned outages. Unplanned outages that are less than the unplanned outage duration limit are considered against the criterion for continuity.

Maximum number of unplanned outages (per year). A criterion applied to a given operational airspace or FIR that defines the maximum number allowed for unplanned outages in any twelve month period.

Minimum equipment list (MEL). A list which provides for the operation of aircraft, subject to specified conditions, with particular equipment inoperative, prepared by an operator in conformity with, or more restrictive than, the MMEL established for the aircraft type. (ICAO)

Monitored performance. The monitored combination of the time it takes to organize, prepare, dial and perform an interactive call plus the technical performance of the ground and air equipment.

Note.— For voice communications, monitored performance comprises RCTP_{AS/AIR}, queue/connect performance and call performance.

NOTAM. A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations. (ICAO)

Operational communication transaction. The process a human uses to initiate the transmission of an instruction, clearance, flight information, and/or request, and is completed when that human is confident that the transaction is complete.

Operational performance. The portion of the transaction time (used for intervention) that does not include the times for message composition or recognition of the operational response.

Note.— For voice communications, operational performance comprises RCTP, queue/connect performance and call performance.

Personal identification number (PIN). A secret numeric password shared between a user and a system that can be used to authenticate the user to the system.

Note.— For the purposes of ATS communications, all PIN numbers are issued for the same purpose, as there is no PIN that grants higher priority or access than another. The priority of the call is determined by the dialing string and GtA calling service used. Calling Line Identification (caller ID) is just a substitute for the operator not having to dial the PIN number for GtA calls. When CLI is implemented for the customer, then all calls made from the access numbers provided to the GES provider will not be prompted for a PIN when the call is placed to the aircraft. If the switch does not recognize the pre-defined CLI list provided to the GES, then the caller will be prompted for the PIN code.

Term

Preemption. The immediate and automatic seizure of resources allocated to a lower-priority call. A higher priority call will interrupt communication resources being used by a lower-priority communication to establish a connection without any indication or delay.

Note.— If the intervening call is the same or lower, the current call will not be preempted and the intervening caller will get an indication that the line is not available. The effects of preemption can be minimized by multiple channels and conference calling, but not completely eliminated.

Priority level. An indication of call precedence for ground to air or air to ground calls. Priority level may be used to establish preemption.

Public switched telephone network (PSTN). A network of the world's public circuit-switched telephone networks. It consists of telephone lines, fiber optic cables, microwave transmission links, cellular networks, communications satellites, and undersea telephone cables, all inter-connected by switching centers, thus allowing any telephone in the world to communicate with any other.

Queue/connect performance. The operational portion of the transaction time to organize and place the call either via a manual or automated dialing sequence depending on equipment at the aeronautical station.

Note.— For voice communications, queue/connect performance begins when the message from the ATSU via the network is sent to the queue and ends when the last digit of the dialing sequence is finished.

Radio facility. A term commonly used to refer to an aeronautical station.

RCP availability (A). The required probability that an operational communication transaction can be initiated when needed.

Note.— For voice communications, this translates to any failure prohibiting the call to be initiated to include congestion (much like the analogy of a terrestrial mobile phone network). However this definition does not apply to a busy condition whereby the entity being called is already on the phone and does not have a way to put the existing call on hold or if able to, rejects the additional incoming call.

RCP continuity (C). The required probability that an operational communication transaction can be completed within the communication transaction time, either ET or TT 95%, given that the service was available at the start of the transaction.

Note.— For voice communications, this translates into 5 out of 100 calls not being able to conclude their voice transactions within the allotted time or the call could be disconnected for any reason, including aircraft maneuvers, switching satellites or any loss of service while on the call.

RCP expiration time (ET). The maximum time for the completion of the operational communication transaction after which the initiator is required to revert to an alternative procedure.

Term

RCP integrity (I). The required probability that an operational communication transaction is completed with no undetected errors.

Note 1.— Whilst RCP integrity is defined in terms of the “goodness” of the communication capability, it is specified in terms of the likelihood of occurrence of malfunction on a per flight hour basis, e.g. 10-5, consistent with RNAV/RNP specifications.

Note 2.— For voice communications, this translates to the ability to conduct the voice transaction with enough intelligibility to understand the verbal request. Additionally, this could also manifest in the crew executing an incorrect instruction because it was misunderstood. (It may not be clear at the time of this submittal, what type of error rate would reflect this condition, or if the read-back would mitigate or compound this).

RCP nominal time (TT 95%). The maximum nominal time within which 95% of operational communication transactions are required to be completed.

RCP specification. A specification (e.g. RCP 240) that provides the values assigned to RCP parameters for communication transaction time, continuity, availability and integrity, and allocations to ANSP, aircraft, CSP and operator.

RCTP_{AS}. The summed critical transit times for an ATC intervention message and a response message allocated to the aeronautical station.

Note.— For voice communications, RCTP_{AS} includes two concurrent processes:

a) the aircraft and aeronautical station technically disconnect the call; which is assumed. Operationally, the call is disconnected when the flight crew and radio operator complete the call; and

b) the aeronautical station sends the response to the to the ATSU via the ground-ground network; the performance is denoted by RCTP_{AS}.

RCTP_{AS/AIR}. The technical time for the air-ground network and associated components to initiate a call.

Note.— For voice communications, RCTP_{AS/AIR} begins when the last digit of the dialing sequence is finished and ends when the aircraft indicates an incoming call to the flight crew.

RCTP_{ATSU}. The summed critical transit times for an ATC intervention message and a response message, allocated to the ATSU system.

RCTP_{CSP}. The summed critical transit times for an ATC intervention message and a response message, allocated to the CSP system.

Required communication performance (RCP). A statement of the performance requirements for operational communication in support of specific ATM functions. (ICAO)

Term

Required communication technical performance (RCTP). The portion of the (intervention) transaction time that does not include the human times for message composition, operational response, and recognition of the operational response.

Note.— For voice communications, RCTP comprises RTCPATSU, RCTPAS, RCTPAS/AIR and RCTPCSP.

Required navigation performance (RNP). A statement of the navigation performance necessary for operation within a defined airspace. (ICAO)

Note.— Navigation performance and requirements are defined for a particular RNP type and/or application.

Responder performance criteria. The operational portion of the transaction time to prepare the operational response, and includes the recognition of the instruction, and message composition, e.g. flight crew/HMI for intervention transactions.

Satellite communication service provider. Typically provides the inter-working unit of the terrestrial sub-system which connects the satellite ground earth station, or Gateway, and the terrestrial network in support of AMS(R)S. Commonly referred to as SSP (see SSP definition).

Satellite network operations provider. Typically provides the satellite sub-system which includes the satellite(s) and may or may not include the ground earth stations or Gateway. Commonly referred to as SSP (see SSP definition)

Satellite service provider (SSP). An entity or group of entities that provide, via satellite, aeronautical fixed services and/or aeronautical mobile services at least from the signal in space to/from aircraft, to the attachment point of the ground earth station (GES) to the ground communication services network.

SATVOICE number. The number used to contact an aircraft or ground facility via SATVOICE.

Note.— The SATVOICE number takes different forms:

a) After the access number has been dialed, the aircraft SATVOICE number is the ICAO aircraft address represented by an 8-digit octal code;

b) The ATSU or aeronautical station SATVOICE number is a 6-digit short code or a PSTN direct dial number, which are published on aeronautical charts, AIP (or equivalent publication); and

c) AOC SATVOICE number is a PSTN direct dial number.

Service availability (A_{CSP}). The required probability that the communication service is available to all users in a specific airspace when desired.

Terrestrial Network Service Provider. Typically provides the aviation centric terrestrial sub-system which provides connectivity to the end-users, such as ATS providers, airlines and flight departments. Commonly referred to as CSP (see CSP Definition).

Term

Unplanned outage duration (minutes). The time from when an unplanned outage begins to when the ATSU receives notification that the service has been restored.

Unplanned outage duration limit (minutes). A criterion applied to a given operational airspace or FIR that defines the maximum time for the duration of an unplanned outage at which time there is an operational impact.

Unplanned outage notification delay (min). Notification to the ATSU of an unplanned outage. Measured from when the unplanned outage begins to when the ATSU receives notification.

1.2 Acronyms

ACC	area control centre (ICAO)
ACP	actual communication performance
ACTP	actual communication technical performance
AIP	Aeronautical Information Publication (ICAO)
AMS(R)S	aeronautical mobile satellite (route) service (ICAO)
AOC	aeronautical operational control (ICAO)
ATC	air traffic control (ICAO)
AtG	air to ground communication
ATM	air traffic management (ICAO)
ANSP	air navigation service provider
ATS	air traffic service (ICAO)
ATSU	ATS unit
CLI	caller line identification
CNS	communications, navigation and surveillance (ICAO)
CNS/ATM	communications, navigation and surveillance/air traffic management (ICAO)
COM	communications, (ICAO)
CSP	communication service provider

CTA	control area (ICAO)
EMERG	emergency (ICAO)
ETD	estimated time of departure or estimating departure (ICAO)
FANS 1/A	future air navigation system 1/A

Note.— As defined by RTCA DO-258A/EUROCAE ED-100A, or previous standards that defined the FANS 1/A capability. FANS 1/A generally means that the data link system on an aircraft, the ATSU ground system, and communication service provision comply with the standard. In certain cases, specific reference is made to a particular type of FANS 1/A aircraft as follows:

a) FANS 1/A+ means that the aircraft completely complies with Revision A of the standard, which includes message latency timer; and

b) FANS 1/A ADS-C means that the aircraft complies with data link initiation capability and ADS-C applications, but does not include the CPDLC application.

FANS	future air navigation system
FIR	flight information region (ICAO)
FMC WPR	flight management computer waypoint position reporting
GEO	geosynchronous earth orbit
GES	ground earth station
GMSS	global mobile satellite system
GOLD	Global Operational Data Link Document
GtA	ground to air communication
HF	high frequency (3-30 Mhz) (ICAO)
ICD	interface control document
LEO	low earth orbit
LRCS	long-range communication system
MEL	minimum equipment list (ICAO)
MEO	medium earth orbit
MET	meteorological or meteorology (ICAO)
MMEL	master minimum equipment list (ICAO)

PIN	personal identification number
PSTN	public switched telephone network
RCP	required communication performance
RCTP	required communication technical performance
RGS	radio ground station
RNAV	area navigation
RNP	required navigation performance
RTF	radiotelephone (ICAO)
SARPs	Standards and Recommended Practices (ICAO)
SATCOM	satellite communication (ICAO)
SATVOICE	Satellite voice
SELCAL	selective calling system (ICAO)
SSP	satellite service provider
VHF	very high frequency (30-300 MHz) (ICAO)

Chapter 2. Overview of aeronautical SATVOICE system

2.1 General

2.1.1 This guidance material is intended for use of SATVOICE to provide additional ATS communications capability, in accordance with airspace requirements in respective AIP or regional SUPPs and under the following conditions:

- a) the aircraft equipment is approved by the State of the Operator or the State of Registry;
- b) the flight crew communicates with the appropriate aeronautical station or ATS unit depending on the type of communication and as allowed by airspace requirements; and
- c) the flight crew operates SELCAL or maintains a listening watch on the assigned HF frequency.

2.1.2 Dedicated SATVOICE numbers (short codes) for aeronautical stations and air traffic service units (ATSUs) are published in AIPs where approved.

2.1.3 SATVOICE is not a replacement for ADS-C, CPDLC or HF voice communication capability, but rather a means of reducing the risk of communications failure, improving the safety and efficiency of operations and alleviating HF channel congestion. SATVOICE provides an additional communication medium and potential MEL relief as States, approving reduced carriage requirements for HF radio, may allow aircraft to operate with only one serviceable HF radio.

2.1.4 States may allow MEL relief approving reduced carriage requirements for HF radio; however, airspace requirements will take precedence over any relief. This guidance material may be used to facilitate alignment of airspace requirements with State (or Regional) MEL policies and long range radio equipment requirements (See also **paragraph 3.3.2**).

2.2 Aeronautical SATVOICE system overview

2.2.1 This section provides an overview of the aeronautical SATVOICE systems concerning SATVOICE services. A full description of these systems is beyond the scope of this document.

2.2.2 Satellite communication systems are defined by three different altitude orbits; low earth orbit (LEO), medium earth orbit (MEO) and geosynchronous earth orbit (GEO). The altitude of the orbit determines the area illuminated by the satellite. The higher the orbit the weaker the signal is from the satellite, but it has a much larger footprint. Propagation loss is overcome by increased complexity of the antenna systems along with higher transmitter power. Conversely, a LEO satellite's footprint is much smaller requiring a higher number of satellites to provide coverage, but the antennas used are much simpler along with reduced RF power requirement on the subscriber end. Also, the lifetime of a LEO satellite is less due to drag caused by the close proximity of earth.

2.2.3 There are three satellite systems servicing the aeronautical market. Inmarsat and Japan operate GEO satellite systems, and Iridium operates a LEO satellite system. These satellite systems use AMS(R)S L-band frequencies reserved for aeronautical safety services.

2.2.4 **Figure 2-1** provides an overview of the aeronautical SATVOICE system and shows the various components that make up the complete system, including the ANSP(s), ATS unit(s), aeronautical station(s), CSP(s), SSP(s), PSTN, aircraft and the operator(s).

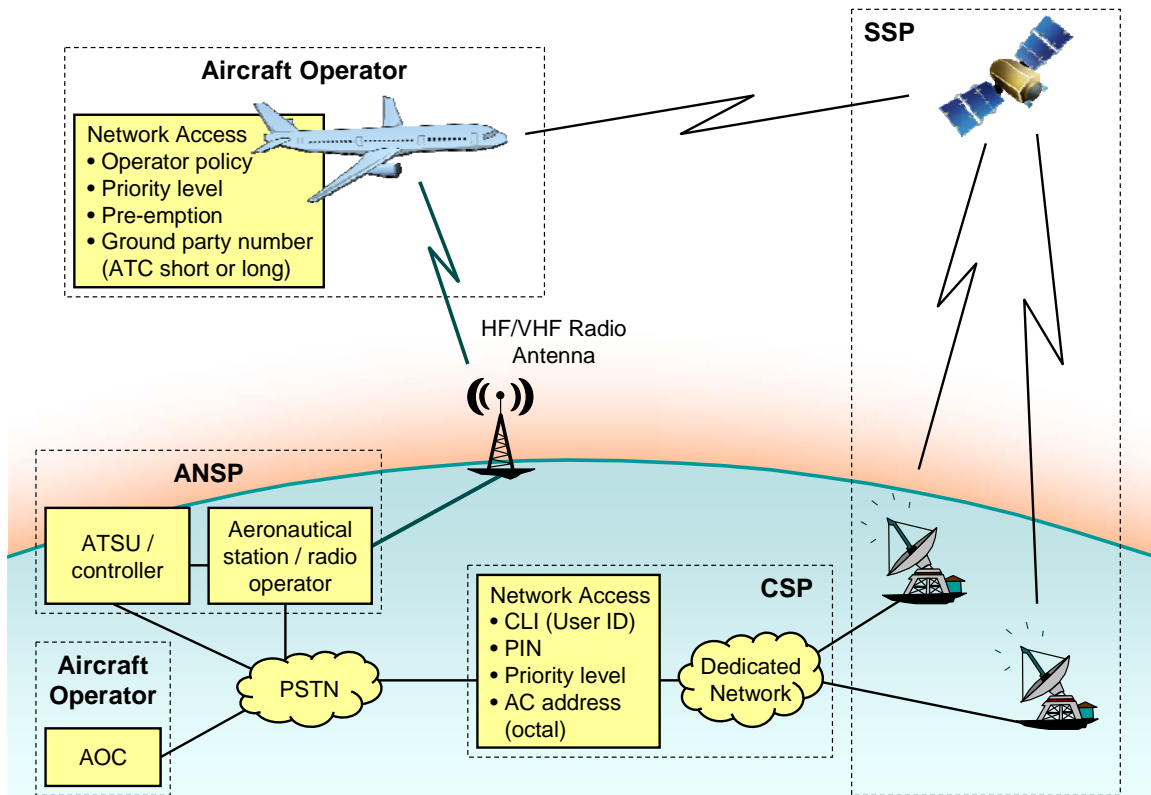


Figure 2-1. Aeronautical SATVOICE system overview

2.3 Iridium

2.3.1 Iridium uses a constellation of 66 satellites at an altitude of 780 km (450 miles) in six orbital planes, with eleven satellites in each orbital plane, providing global coverage. Additionally there are a number of spare satellites to replace any in-orbit failures. At that altitude each satellite covers a circular area of 4700 km (2900 miles) and is in-view to a location on the ground for approximately 9 minutes. Using a small amount of overlap in coverage between each satellite, the Iridium network hands-off the call to the next satellite coming into view to the ground location. This is similar to a GSM cellular telephone system where the subscriber moves from one cell site to another except that the satellite is the moving vehicle. The speed of the aircraft appears almost stationary compared to the speed the satellite moves.

2.3.2 Iridium uses a combination of both frequency and time multiplexing along with 48 spot beams developed by the phased array antenna from each satellite. The frequency band used by subscribers are within L-band AMS(R)S 1616 MHz to 16265 MHz block. Iridium transmits and receives on this single block by multiplexing time slots to control the direction of the signal. This L-band connection from the satellite to the mobile subscriber is cross-linked via inter-satellite connectivity using Ka-band frequencies. Each satellite connects to the satellite in front, behind and to each side on Ka-band. This inter-satellite Ka-band connection is routed within the satellite constellation to the ground station gateway in Tempe, Arizona. Connectivity in Tempe is also on the Ka-band. Iridium's reliability is affected by rain fade on Ka-band to the Tempe gateway. A second ground earth station is being considered.

2.3.3 Iridium's new constellation is called Iridium Next, which will replenish the existing constellation with next generation satellites in the same orbital planes. These satellites will be fully backwards compatible to existing Iridium transceivers, but new services and features will also be introduced.

2.4 Inmarsat

2.4.1 The Inmarsat network of satellites is in geostationary orbit directly above the earth equator at an altitude of 35,786 km (22,236 miles). At that altitude above earth, each satellite's spot beam covers approximately 120 degrees of the earth at the equator and to approximately 82 degrees North and 82 degrees South latitude. The orbital period of each satellite is exactly the same as the rotation period of earth so each satellite appears to remain in the same position. Inmarsat periodically renews its satellite constellations and operates both I-3 and I-4 generation satellites.

2.4.2 There are three new I-4 (Alphasat will become the 4th I-4) and four I-3 satellites providing aviation services, to include PSTN-based voice. L-band frequencies allocated for aviation AMS(R)S are split between a transmit block. This allows the subscriber unit using a frequency duplexer to receive and transmit simultaneously. Inmarsat's primary transmit frequency allocation is adjacent to Iridium's allocation used for both transmit and receive; this can cause interference to the secondary Iridium receive allocation when the aircraft operator desires both satellite services to operate simultaneously and on the same aircraft.

2.4.3 SwiftBroadband (SBB) is the next Safety Services technology to be introduced after Classic Aero. SBB is only available on the Inmarsat I-4 satellites providing such services as PSTN voice, but will also introduce new capabilities not described within this document.

2.5 Japan multi-function transport satellite (MTSAT)

2.5.1 MTSAT is a GEO satellite system. The functionality is equivalent to that of an Inmarsat I-3 except that the coverage footprint is limited to Asia and the Pacific Ocean centered over Japan. MTSAT is therefore interoperable with the I-3 constellation so that the subscriber unit can logon between MTSAT and I-3 (and Classic Aero services of I-4) when the correct commercial service provisions are in place at the operator.

2.5.2 MTSAT consists of two satellites in a hot spare configuration. MTSAT-1R provides the primary communications link and should there be a problem with that satellite, MTSAT-2 will step in as the backup. When the end of life timeframe occurs for the MTSAT-1R satellite, it is expected that MTSAT-2 will become the primary communications link with a single layer of satellite coverage instead of two. This is expected to be sufficient given the reliability record of these satellites.

2.6 Access to SATVOICE services

2.6.1 The aeronautical SATVOICE system uses the public switched telephone network (PSTN) and/or dedicated networks to route calls between the aircraft and the appropriate ground party. Dedicated network access switches locate the aircraft anywhere in the world regardless of the satellite and ground earth station (GES) to which the aircraft is logged on.

2.6.2 The SSP authorizes CSPs (or aeronautical communication service providers) to provide network access to users. However, the authorization may allow the CSP to use parts of the network or

some of the network access switches that are owned and operated by other parties, which are also authorized by the SSP.

2.6.3 For ground-to-air calls to an aircraft with SATVOICE capability as identified in the flight plan, the ground party initiates the call using a network access number. The access number country code for the appropriate SATVOICE system is provided by the International Telecommunication Union (ITU) and is designated as global mobile satellite systems (GMSS). See **Table 2-2** for an example of ground-to-air call.

Note.— The Inmarsat voice communication service uses a single network access code (SNAC) – 870. The Iridium voice communication service employs telephone number ITU sub-blocks and optionally a US-based telephone number. Some CSPs may implement network extensions for local or low cost routing access in the country of the caller, and manage the routing of these calls to the aircraft.

2.6.4 Once connected to the network access switch, the ground party/system provides at least the following information to route the call to the aircraft:

- a) user identification (ID) [Iridium];
- b) personal identification number (PIN);
- c) priority level as defined in **Table 2-1**; and
- d) aircraft address in octal code (derived from the hexadecimal aircraft address or, in some cases, aircraft registration in the flight plan).

2.6.5 The user ID [Iridium only] and/or PIN are provided by the CSP when obtaining access to the network and is used to secure the call.

2.6.6 The priority level will conform to the provisions of Doc 9925, which are reproduced in **Table 2-1**. The priority level is used by dedicated networks and the aircraft system to pre-empt calls of a lower priority, if necessary, and establish precedence for the incoming call of a higher priority. In some cases, the priority level may be determined by the network access switch based on the CLI from the ground party.

Table 2-1. Priority levels for SATVOICE calls

Priority level	Application category	SATVOICE call examples
1 / EMG / Q15 Emergency (highest) Safety of Flight	Distress and Urgency For use by either ANSP or AOC.	Rapid Descent, Urgent Sidestep for Weather
2 / HGH / Q12 Operational High (second highest) Safety of Flight	Flight Safety Typically assigned to calls for ANSP.	Altitude Request

Priority level	Application category	SATVOICE call examples
3 / LOW / Q10 Operational Low (third highest) Safety of Flight	Regularity of Flight, Meteorological, Administrative Typically assigned to calls for aeronautical operational control (AOC).	Air Traffic Information Service, Redispatch, Maintenance
4 / PUB / Q9 Nonoperational (lowest) Nonsafety	Public Correspondence	Public Phone Calls

2.6.7 The octal code is a representation of the aircraft address, which is provided in the flight plan expressed in the form of an alphanumeric code of six hexadecimal characters. In cases where aircraft registration is used, the ground party/system uses a means to correlate the aircraft registration with the aircraft address represented in octal code.

Note.— The ground party may obtain the octal code from a data base obtained from the SSP on a regular basis. However, if the octal code is not in the data base, additional tools would be needed to convert the hexadecimal aircraft address in the flight plan to octal code.

2.6.8 The network access switch may use and provide to the receiving party the caller line identification (CLI) provided by the PSTN network. However, some countries may not allow its use.

Table 2-2. Example of ground-to-air call

Step	Description
Network access	All GtA calls will have to route through a network access switch. Iridium: +1-480-730-xxxx Inmarsat: 870
User ID [Iridium]	For Iridium, the SSP assigns a user ID, which the CSP provides to the aircraft operating agency, aeronautical station or ATSU. Each caller will have to input a 4 digit user ID. The call will be dropped after three invalid entries.
Personal identification number (PIN)	The SSP assigns a PIN, which the CSP provides to the aircraft operating agency, aeronautical station or ATSU. Each caller will have to input a 4 digit PIN code. The call will be dropped after three invalid entries.
Call priority level	A priority level per Table 2-1 is assigned to the call, typically by a default value. The caller may be able to override the default value at the time the call is made.
Aircraft address	The caller enters the aircraft address – represented in octal code – of the aircraft they wish to call. This aircraft address is typically selected from a data base through human-machine interface. The call will be dropped after three invalid entries.

Step	Description
Call attempt	The network access switch initiates the call to the aircraft. The network access switch will provide appropriate information, e.g., CLI, facility name, priority level, for use by the aircraft system.
Call connect	The aircraft receives incoming call and provides indication to the flight crew. The aircraft system may pre-empt a lower priority call to establish precedence for a higher priority incoming call.
Call answer	The flight crew answers the incoming call.

2.6.9 For air-to-ground calls, the aircraft initiates the call by providing the short code assigned to the aeronautical station or air traffic service unit (ATSU), or the long code for the ground party, and the priority level for the call. Calls may be restricted by operator policy. See [Table 2-3](#) for example of air-to-ground call.

Table 2-3. Example of air-to-ground call

Step	Description
Network access	The flight crew can initiate the call through the control/display unit or handset. The flight crew can elect to use a short code assigned to the aeronautical station/ATSU or long number to place call. The aircraft operator may implement policies that restrict calls.
Call priority level	A priority level per Table 2-1 is assigned to the call, typically by a default value. The caller may be able to override the default value at the time the call is made. The aircraft system may pre-empt a lower priority call to establish precedence for a higher priority outgoing call.
Call attempt	The aircraft satellite data unit (SDU) initiates the call to the network access switch. If a short code is used to place the call, the network access switch will translate the short code to the long number to connect the call to the PSTN. The network access switch will provide appropriate information, e.g., CLI, aircraft address, priority level, for use by the aeronautical station/ATSU.
Call connect	The aeronautical station/ATSU receives incoming call and provides indication to the radio operator/controller.
Call answer	The radio operator/controller answers the incoming call.

Chapter 3. Administrative provisions related to SATVOICE operations

3.1 General

3.1.1 The principle of certification and subsequent continued surveillance (or “oversight”) of aviation operators is established in Annexes to the Chicago Convention, for example, Annex 6 Part I for commercial air transport operators.

3.1.2 Annex 11 (Air Traffic Services) requires States to establish a State safety programme, which clarifies that States need to establish effective mechanisms to inspect and audit ANSPs in order to ensure effective safety oversight.

3.1.3 Chapter 2 (i.e., Administrative provisions for the international telecommunication service) of Volume II of Annex 10 also contains standards for the “supervision” of the communication services by the appropriate authority designated by the State. Note 2 to par 2.27.4 of Annex 11 clarifies that, when communication services are directly provided by an ANSP, their oversight is through the State safety programme and the safety management system (SMS) established by the ANSP. If communication services are contracted to an entity other than the ANSP, the SMS requirement applies to those services with direct operational implications (e.g., communications used for ATS purposes).

3.1.4 In accordance with specific ICAO standards, an aviation organization (commercial air transport operator, aerodrome operator, ANSP) is under safety oversight by the appropriate authority. Organizations under safety oversight should take responsibility for the safe, regular and efficient conduct of operations, including for the services provided by any contractors.

Note.— For instance, this latter ICAO provision is transposed in the EU by so called “EU-OPS” in respect of commercial air transport operators and by so called “common requirements” for ANSPs.

3.1.5 When an ANSP or aircraft operator negotiates communication services from a different organization), as depicted in **Figure 3-1** below, the contracting organization takes responsibility to demonstrate to the appropriate authority that proper mechanisms exist to oversee the contracted CSP, and attracts on itself some liability also for the negotiated communication service.

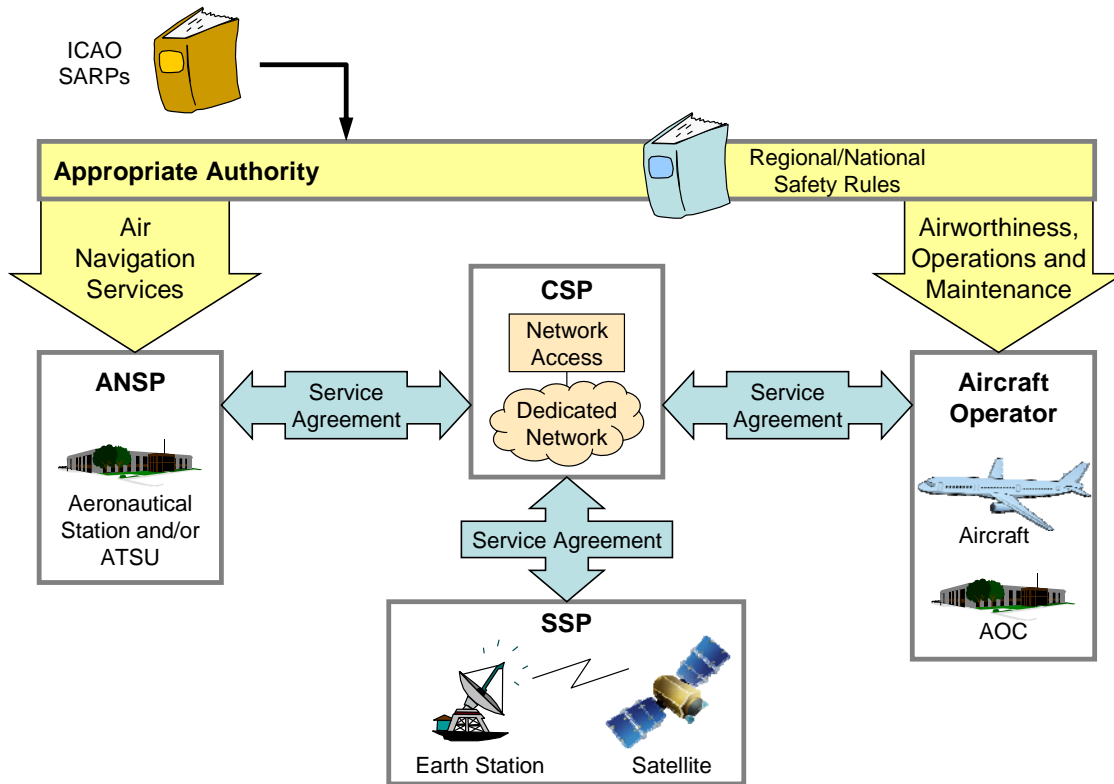


Figure 3-1. SATVOICE communication services contracted by organizations

3.2 ANSP SATVOICE service provision

3.2.1 When providing SATVOICE services whether through an aeronautical station or an ATSU, the ANSP should provide these services consistent with voice communication standards and recommended practices, in accordance with Doc 4444, Doc 9432 and Volume II of Annex 10.

3.2.2 ANSP SATVOICE system validation and operational readiness

3.2.2.1 The ANSP should ensure a validation process that confirms their equipment and procedures and/or its aeronautical stations/ATSUs provide reliable and adequate SATVOICE services for the intended use. This process should include:

- a) A system safety assessment which demonstrates that the service provision meets the safety objectives. The ANSP should conduct a system safety assessment through a functional hazard analysis or a documented system safety case for initial implementation as well as for future enhancements; and
- b) Integration test results confirming interoperability for operational use of the aircraft and ground systems.

3.2.2.2 Following the safety assessment, the ANSP should institute measures including its aeronautical stations, ATSUs, CSPs and SSPs, to ensure acceptable mitigation of the identified failure conditions.

3.2.2.3 The ANSP should ensure that the SATVOICE services it provides meets the performance specifications provided at **Appendix B** and **Appendix C**, and that its aeronautical stations, ATSU, CSPs and SSPs meet their performance allocations under expected capacity and loading conditions.

3.2.2.4 The ANSP should ensure that the controllers and radio operators receive appropriate training in accordance with ICAO Annex 1 taking into account the guidance material contained in this document, and obtain any necessary approval from the State.

3.2.2.5 The ANSP should ensure that the SATVOICE service provision meets applicable security requirements, considering its ATSU/controllers and/or its aeronautical stations/radio operators.

Note.— This guidance includes means to secure SATVOICE calls through SSPs authorizing CSPs to provide SATVOICE services, CSPs administering accounts to authorized subscribers with PIN and priority level calling, restricting calls to the flight deck and/or alerting the flight crew of call priority.

3.2.2.6 The ANSP should establish means to provide safety oversight of its ATSU, aeronautical stations, CSP(s) and SSP(s) in continued operations.

3.2.2.7 The ANSP should ensure that its ATSU, aeronautical stations CSP(s) and SSPs retain records of SATVOICE for at least 30 days to allow for accident/incident investigation purposes. The ANSP, including their CSP(s) and SSP(s), should make these records available for air safety investigative purposes. These recordings should allow replaying of the situation.

3.2.3 Aeronautical information, notifications, and interfacility agreements

3.2.3.1 The ANSP should ensure that aircraft operators are notified of SATVOICE services using the AIP (or equivalent publication), which includes:

- a) Procedures for publishing contact information, that is associated with current airspace boundaries, e.g., specific SATVOICE numbers for applicable facilities;
- b) Requirements for use, e.g., criteria for when to contact the ATS unit or aeronautical station; and
- c) Flight plan form and submission requirements.

3.2.3.2 The ANSP should notify aircraft operators of SATVOICE service outages, performance degradation, and restoration. For example, the ANSP may use NOTAMs and direct communications with aircraft operators for short term notifications or AIP (or equivalent publication) for longer term notifications.

3.2.3.3 The ANSP should notify adjacent ATSU of system failures, software upgrades (or downgrades) or other changes, which may impact them. Such notification procedures will normally be detailed in interfacility agreements between adjacent units.

3.2.4 Considerations for the aeronautical station/ATSU

3.2.4.1 To provide SATVOICE communication services, the aeronautical station/ATSU should be able to accept or place a SATVOICE call given the necessary infrastructure to handle the expected SATVOICE traffic demand and in accordance with performance specifications as prescribed in Regional SUPPs, AIP (or equivalent publication).

3.2.4.2 The aeronautical station/ANSP should develop specific alternative means of communications in the event that SATVOICE services are disrupted.

3.2.4.3 When supporting SATVOICE, the aeronautical station/ATSU should establish procedures and/or provide ATC automation, networks and infrastructure that allows the radio operator/controller to:

- a) Maintain access numbers for satellite services and SATVOICE numbers for aircraft with SATVOICE capability (See also **paragraph 3.2.2.5**);
- b) Verify correct SATVOICE number prior to the flight;
- c) Provide SATVOICE services in accordance with **Chapter 4**;
- d) Dial the appropriate access number(s);
- e) Prioritize, preempt and establish precedence on outgoing SATVOICE calls using the personal identification number (PIN) for networks, priority level accordance with **Table 2-1**, and SATVOICE number for the aircraft;
- f) Receive SATVOICE calls from aircraft and route the call to the appropriate radio operator/controller;
- g) If CLI is used to display incoming SATVOICE calls, display the aircraft identification to the radio operator/controller; and
- h) Exchange air traffic control information between aeronautical stations and ATSUs, including ground-ground data communications supporting SATVOICE services.

Note.— See **Appendix B** and **Appendix C** for applicable performance specifications. Automation may employ autodial capability, data bases and other features to meet performance specifications.

3.2.5 Considerations for the communication service provider (CSP)

3.2.5.1 The CSP should ensure that the SATVOICE service meets the performance criteria as specified by the aeronautical station or ANSP.

Note.— When specifying performance criteria for the CSP, refer to **Appendix B** and **Appendix C** for applicable RCP specifications, which provide allocations to the CSP.

3.2.5.2 The CSP should ensure that the network access switch only processes authorized calls.

3.2.5.3 The CSP should ensure that the network access switch processes priority calls in accordance with **Table 2-1**. The network access switch should provide a minimum of two channels for each aircraft to minimize pre-emption of lower priority calls.

3.2.5.4 The CSP should establish means for aeronautical stations, ATSUs and aircraft operators to report in-service difficulties and to resolve identified problems.

3.2.5.5 The CSP should provide notification of SATVOICE service outages, performance degradation, and restoration to aeronautical stations, ATS units, and aircraft operators that use the service.

3.2.5.6 For those situations when SATVOICE communication services cannot continue to be provided, the CSP should inform the involved ANSPs and aircraft operators and/or, if appropriate, the providers of Aeronautical Information Services, in accordance with coordination procedures established in writing.

3.2.5.7 The CSP should ensure service agreements include relevant specifications for services and associated systems that are owned and operated by other parties.

3.2.6 Considerations for the satellite service provider (SSP)

3.2.6.1 The SSP should ensure that the SATVOICE service meets the performance criteria as specified by the CSP.

Note.— When specifying performance criteria for the SSP, refer to **Appendix B** and **Appendix C** for applicable RCP specifications, which provide allocations to the SSP.

3.2.6.2 The SSP should ensure that it only processes calls from authorized sources.

3.2.6.3 The SSP should ensure that the SATVOICE service prioritizes SATVOICE calls in accordance with **Table 2-1**.

3.2.6.4 The SSP should provide notification of SATVOICE service outages, performance degradation, and restoration to its CSPs.

3.3 Aircraft operator eligibility

3.3.1 Operational authorization to use SATVOICE communications

3.3.1.1 An aircraft operator is eligible to use SATVOICE equipment under its normal operational approval, (e.g., Aircraft Operator Certificate – AOC). When using SATVOICE equipment, the aircraft operator should address flight crew training and qualification, maintenance, MEL, user modifiable software, service agreements with the CSP. The aircraft operator should also ensure that aircraft equipment has been approved for the intended use and that the SATVOICE service is available in the particular FIRs for the flight.

Note.— A specific or written operational authorization from the State of Registry or State of the Operator is typically not required to use SATVOICE equipment. However, a State may under certain circumstances require explicit approval, taking into account several underlying assumptions, such as:

a) the aircraft, including its avionics, has an airworthiness approval covering the type of envisaged IFR operations (e.g., long range) and a radio license;

b) the complexity of using radio equipment, including SATVOICE, does not present particular challenges;

c) the concept and systems upon which the operation will be carried out are mature enough, which is the case of SATVOICE;

d) the risk associated with improper operation (including for third parties in the air or on the ground) is tolerable, which is the case for SATVOICE since the transmission, if unclear can be repeated, and for which, a totally independent long range communication system (i.e., HF) exists;

e) availability and continuity of SATVOICE is ensured, under responsibility of an ANSP as explained in **paragraph 3.2**;

f) appropriate standards for quality and management are established;

g) accuracy and integrity of the address data base is ensured;

h) appropriate training and checking standards and procedures for using SATVOICE equipment exist and are implemented mainly for pilots;

i) provision of information (e.g., MMEL and training requirements) from holders of type design approvals, e.g., Type Certificates (TC), to aircraft operators, throughout the life cycle of the aircraft is ensured; and

j) arrangements are in place for all involved actors to consult aeronautical information and in particular to receive NOTAMs in case of degradation or other relevant changes to SATVOICE service.

3.3.2 Long range communication systems to be carried on board

3.3.2.1 The State of the Operator and/or State of Registry establish the minimum number of long range communication systems (LRCSs) to be carried on board. In principle, where two LRCSs are required, one SATVOICE system and one HF voice system could be approved in regions where both services are available for routine communications, as follows:

- a) An HF radio is considered to be LRCS; and
- b) Other (e.g., SATVOICE) two-way radio equipment may be used if allowed by the relevant airspace procedures.

Note 1.— EASA has proposed rules and means of compliance expected to be effective in 2012 that would allow for one SATVOICE system and one HF communication system, providing that said services are available for routine communications.

Note 2.— The FAA Policy Letter (PL)-106 provides MMEL relief for HF communication systems, if the SATVOICE system is approved as a long range communication system.

3.3.2.2 In principle installed equipment should be operational when commencing a flight and there are no notifications of SATVOICE service outage on the route of flight. However, experience has demonstrated that temporary unserviceable equipment may be tolerated in some cases. Several ICAO Contracting States hence require aircraft manufacturers to provide a Master MEL (MMEL). The MMEL contains a list of which equipment can be tolerated as unserviceable at commencement of flight and for how long. The MMEL is approved by the authority designated by the State of Design.

Note.— The State of Design is the FAA in the USA and EASA in the EU.

3.3.2.3 Aircraft operators are mandated to establish a Minimum Equipment List (MEL), based upon, but no less restrictive than the relevant MMEL. The MEL is approved by the State of the Operator or State of Registry.

Note.— See rule OPS 1.030 in the EU.

3.3.2.4 If changes to the Minimum Equipment List (MEL) are desired to allow dispatch with one SATVOICE system and only one HF radio system, the aircraft operator should obtain approval or acceptance from the State of the Operator or State of Registry. However, regardless of MEL, the aircraft operator will need to carry radio equipment required by the applicable airspace requirements as provided in AIP (or equivalent publication).

3.3.3 Considerations for aircraft operations and maintenance

3.3.3.1 The operator should establish policy and procedures for flight crews and staffs, e.g., dispatchers, maintenance personnel, involved in SATVOICE operations, and incorporate them in appropriate operation manuals, maintenance manuals and training material. These materials should include:

- a) Description of the SATVOICE system;
- b) AFM operating procedures, including operating and maintenance manuals for the system, and any limitations;
- c) Master minimum equipment list/minimum equipment list (MMEL/MEL) and implications of flights departing under MEL relief
- d) Flight planning requirements for use SATVOICE per **paragraph 3.4**;
- e) Procedures for the SATVOICE operations taking into account the guidance for the flight crew provided in **Chapter 5**;
- f) Procedures for notifying flight operations, the flight crews and the appropriate ANSPs of failures with the aircraft SATVOICE system or the service;
- g) Implications of planned and unplanned SATVOICE service outages, service degradation and aircraft SATVOICE system failures on operations; and
- h) Procedures for flight crews and dispatchers to report to the CSP in-service difficulties with the SATVOICE capability and means to resolve identified problems.

3.3.3.2 The operator should ensure the flight crews and staffs receive appropriate training in accordance with ICAO Annex 1 and Annex 6, taking into account the guidance contained in this document, and are licensed.

3.3.3.3 Prior to return to service, the aircraft operator should verify that SATVOICE system installations are operating normally and activated by sending and receiving calls to and from the aircraft in accordance with established operating procedures, e.g., using the aircraft address represented in octal code. The operator should ensure the aircraft equipage operates per **paragraph 3.3.4** and perform verification tests under the following conditions:

- a) new SATVOICE system installation;
- b) after performing maintenance, e.g., SIM card change, upgrade or repair, on an existing SATVOICE system installation; and
- c) after the aircraft has changed aircraft registration or the aircraft address.

Note.— The aircraft operator contacts their CSP to activate the SATVOICE system installation.

3.3.3.4 The aircraft operator should deactivate any aircraft sold or otherwise removed from the fleet.

Note.— The aircraft operator contacts their CSP to deactivate the SATVOICE system installation.

3.3.3.5 The operator should negotiate SATVOICE services in service agreements with their CSP(s) that meet the guidelines in **paragraph 3.2.5**.

3.3.4 Aircraft equipage

3.3.4.1 The installations should be approved by the State of Registry or State of the Operator in accordance with FAA AC 20-150A (or equivalent), and verified to comply with the following, as appropriate for the type of system installed:

- a) RTCA DO-210D, Minimum Operational Performance Standards for Geosynchronous Orbit Aeronautical Mobile Satellite Services (AMSS);

- b) RTCA DO-262A, Minimum Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS);
- c) ARINC 741, Aviation Satellite Communication System;
- d) ARINC 761 (Iridium & Inmarsat-2G); and
- e) ARINC 781 (Inmarsat-3G).

Note 1.— The above criteria apply to the SATVOICE system installation intended for ATS communications.

*Note 2.— Some aircraft SATVOICE systems do not provide alerts of equipment failures to the flight crew. In such cases, flight crew procedures may provide a means to determine system status, (e.g., review of signal strength and “log on” status), to comply with MMEL/MEL requirements and AIP (or equivalent publication). See **paragraph 5.1.3**.*

3.3.4.2 If CLI is used to display incoming calls, the SATVOICE equipment should display the facility name or the facility designator for the aeronautical station or ATS unit to the flight crew.

3.3.4.3 The SATVOICE equipment should configure the flight deck default priority to level 2 / HGH / Q12 for outgoing ATC calls per **Table 2-1** and automatically pre-empt cabin communications, if necessary to establish the ATC call. Level 4 / PUB / Q9 incoming and outgoing calls should be restricted to/from the flight deck.

Note.— The SATVOICE equipment may configure the flight deck default priority to level 3 / LOW / Q10 for outgoing AOC calls and accept incoming AOC calls at level 3 / LOW / Q10 or level 1 / EMG / Q15. Default priority levels and policies on routing calls to the flight deck are typically determined by the satellite data unit’s owners requirement table (SDU ORT).

3.3.4.4 The SATVOICE equipment should have the capability for the flight crew to:

- a) set the priority level for all calls; and
- b) preempt any call at any time.

3.3.4.5 The aircraft manufacturer or avionics supplier should evaluate the general arrangement and operation of controls, displays, circuit breakers, annunciators, alerts, and any placards of the SATVOICE system. Specifically, the aircraft manufacturer should:

- a) verify that the installation will enable the flight crew to easily initiate and receive calls without backing out of multiple branches of a menu structure;
- b) evaluate any self-test features and failure mode displays and annunciators;
- c) evaluate the installation for acceptable identification, accessibility, and visibility;
- d) verify the system is robust by purposely inserting input errors;
- e) evaluate the SATVOICE installation and other aircraft systems for mutual non-interference, which may be associated with radio frequency emissions;
- f) evaluate the integration of the SATVOICE system with other systems. Evaluate other systems, as necessary, to show the SATVOICE system does not interfere with their operation; and
- g) determine whether the SATVOICE system can be used within acceptable workload and with a minimal reliance upon flight crew memory.

3.3.4.6 The aircraft manufacturer or avionics supplier should include in the airplane flight manual (AFM), or equivalent, the following:

- a) a description of normal and non-normal procedures for the use of the system operation, including what actions are expected by the flight crew for each case; and
- b) criteria and intended uses that provided the basis and means of compliance for the airworthiness approval. For example, "The [appropriate authority] has evaluated the SATVOICE system as a supplement to other means of communication, in accordance with FAA AC20-150A. This does not constitute operational approval."

3.4 Flight planning

3.4.1 When filing SATVOICE capability in the flight plan, the aircraft operator should ensure that the planned use of SATVOICE for the flight will be in accordance with regulations, policies and procedures applicable in individual countries and/or FIRs for the flight, as published in documents such as regional supplementary (SUPPs) procedures and AIPs (or equivalent publication).

Note.— Some ANSPs may allow the flight crew to use SATVOICE only for certain types of communications, e.g., of an urgent nature, or may place limitations on use of SATVOICE directly to the controller. Other ANSPs may allow its use only as an additional capability to existing radio equipment carriage requirements (Refer to [paragraph 2.1](#) and [paragraph 3.2.3](#)).

3.4.2 The aircraft operator should ensure that the proper information is included in the ICAO flight plan, which includes one or more type(s) of SATVOICE capability, the aircraft registration and the aircraft address.

3.4.3 Until Amendment 1 to the Doc 4444 becomes applicable in November 2012, the following procedures should be followed:

- a) Insert in item 10, Equipment, the letter "Z" to denote "other equipment;" and
- b) Insert in item 18, Other information, the text "COM/" followed by the letters SV, followed by further identification(s) of the type(s) of equipment such as INMARSAT, MTSAT and/or IRIDIUM.

Example:

```
(FPL-ACA101-IS
-B773/H-SHXWZ/SD
-EGLL1400
-N0450F310 L9 UL9 STU285036/M082F310 UL9 LIMRI
52N020W 52N030W 50N040W 49N050W
-CYQX0455 CYYR
-EET/EISNN0026 EGGX0111 020W0136 CYQX0228 040W0330
050W0415 REG/CFIUV SEL/FQHS COM/SV INMARSAT
CODE/C0173E)
```

3.4.4 After Amendment 1 becomes applicable, the appropriate indication(s) should be inserted in item 10, namely "M1" for an INMARSAT RTF capability, "M2" for an MTSAT RTF capability and/or "M3" for an Iridium RTF capability.

Example:

(FPL-ACA101-IS
-B773/H-SHXWM1M3/S
-EGLL1400
-N0450F310 L9 UL9 STU285036/M082F310 UL9 LIMRI
52N020W 52N030W 50N040W 49N050W
-CYQX0455 CYYR
-EET/EISNN0026 EGGX0111 020W0136 CYQX0228 040W0330
050W0415 REG/CFIU SEL/FQHS CODE/C0173E)

3.4.5 Insert in Item 18:

- a) the indicator REG/ followed by the aircraft registration; and
- b) the indicator CODE/ followed by the aircraft address expressed in the form of an alphanumerical code of six hexadecimal characters.

Note.— *Example: “F00001” is the lowest aircraft address contained in the specific block administered by ICAO. See other examples as shown above.*

Chapter 4. Controller and radio operator procedures

4.1 General

4.1.1 The underlying SATVOICE technology (duplex mode/open mic) lends itself to a conversational mode of communications. Therefore, such use can create misunderstanding and confusion. When using SATVOICE, RTF conventions should be followed in accordance with standard ICAO phraseology, as defined in Annex 10, Volume II, Chapter 5, Doc 4444, Chapter 12, Doc 9432 and Doc 8400. Those communications procedures and examples are listed here to further clarify radio operator and controller procedures.

4.1.2 When establishing a SATVOICE contact, the radio operator or controller should ensure positive identification of the aircraft. With each communication, the radio operator or controller will address the aircraft by its flight plan-filed aircraft identification/callsign for flight safety reasons. The aircraft, in turn, will re-state the caller's identification, e.g., Gander Radio, as well as repeat the aircraft identification.

Note.— Caller ID is not currently available in the aircraft avionics; however, manufacturers will consider this human factors element for ease of use in future design.

4.1.3 When the radio operator is used to communicate with an aircraft, the controller procedures with the radio operator are the same regardless of the means of communication, e.g., VHF, HF, or SATVOICE, the radio operator uses to communicate with the aircraft.

4.1.4 The controller may use SATVOICE to establish direct controller pilot communications (DCPC) with an aircraft depending on the policies and procedures established by the ANSP. Refer to **paragraph 3.2**.

Note.— Some ANSPs have SATVOICE capability, but limit the use to emergency and non-routine types communication, whereas others may accept routine uses. The ANSP notifies aircraft operators of SATVOICE services provided by the controller per AIP (or equivalent publication).

4.1.5 The method of establishing controller or radio operator-initiated calls will be dependent on the technical/operational implementation at each one of the ATSUs and aeronautical stations. However, some steps should be common to each ATSU or aeronautical station regardless of the technical/operational methodology employed. These are:

- a) Identify the aircraft SATVOICE capability (i.e., Iridium, Inmarsat, or MTSAT) and determine the appropriate access number(s) to contact the aircraft;
- b) Correlate the aircraft SATVOICE number (aircraft address represented by an 8-digit octal code) with the aircraft address or aircraft registration in the flight plan;
- c) Initiate the dialing sequence ensuring CLI/PIN and security measures to access the ground earth station are in place;
- d) Use priority levels defined in **Table 2-1**;
- e) Wait for the flight crew to answer the call;
- f) Confirm the aircraft identification/call sign prior to delivering the message;
- g) Initiate the radio telephony conversation and deliver the message;

- h) Advise the aircraft as to the assigned communications media and frequencies, if necessary, upon termination of the SATVOICE call; and
- i) Terminate the call after the conversation is finished.

Note.— See **paragraph 3.2.4** for guidance on considerations for SATVOICE provisions at the ATSU/aeronautical station.

4.2 Controller procedures

4.2.1 Outgoing SATVOICE call – controller-initiated call

4.2.1.1 When using SATVOICE for DCPC, the controller should use standard radio telephony procedure to ensure accuracy and clarity. Normally, these messages will be sent at the priority designated as Level 2 / HGH / Q12 per **Table 2-1**.

Note.— After the SATVOICE call has been established, the controller and flight crew can interactively communicate comparable to VHF voice.

Example:

Controller	<Initiates call and line rings in flight deck>
Flight crew	United 863
Controller	United 863, Oakland Center, <message>
Flight crew	Oakland Center, United 863, <read back message>
Controller	United 863, Oakland Center, readback correct, <issue communications instructions> out

4.2.1.2 If an ATS unit recognizes that an aircraft is in imminent danger, an ATC message is urgent or delivery time is critical, the controller should use the most expeditious means of communications. If SATVOICE is used as the first option, the controller should call the aircraft at the highest priority Level 1 / EMG / Q15 per **Table 2-1**, if possible, and state the threat or delivery the ATC message to the aircraft as part of the initial communication. If unable to contact the aircraft via SATVOICE, then the controller should revert to any other means of voice communication, including HF, VHF, or CPDLC, to establish positive communications for that flight and state the threat to the aircraft as part of the initial communication.

Example:

Controller	<Initiates call and line rings in flight deck>
Flight crew	Air France 465
Controller	Air France 465, Auckland Centre, For Severe Weather avoidance, <message>
Flight crew	Auckland Centre, Air France 465, <read back message>
Controller	Air France 465, Auckland Centre readback correct, <issue communications instructions> out

4.2.1.3 At times it may be necessary for the controller to establish a conference call with more than one aircraft at a time. When this procedure is used the aircraft must be advised that they are on a conference call with more than one aircraft participating.

Example:

Controller	<Initiates calls and line rings in flight deck>
Flight crew	Air France 465
Controller	Air France 465, Oakland Center, Standby we are initiating a conference call with Delta 123 who is initiating an emergency descent in your vicinity due to severe turbulence
Flight crew	Oakland Center, Air France 465, Roger
Controller	<Initiates second calls and line rings in flight deck>
Flight crew	Delta 123
Controller	Delta 123, Oakland Center, You are on conference call with Air France 465 who is in your vicinity at flight level 320 Say your current position and altitude
Flight crew	Oakland Center, Delta 123, Roger, We are 20nm north of JMROY descending out of flight level 340 for 305
Controller	Delta 123, Oakland Center, Roger, BREAK Air France 465 say current position
Flight crew	Oakland Center, Air France 465, Roger we are currently 5nm south of JMROY
Controller	Air France 465, Oakland Center, Roger, BREAK Delta 123 say altitude
Flight crew	Oakland Center, Delta 123, Roger, We are maintaining flight level 305
Controller	Delta 123, Oakland Center, Roger, Now Clear of traffic, Descend to F300 Report maintaining flight level 300 on CPDLC
Flight crew	Oakland Center, Delta 123, Roger, Descend to flight level 300 Report Maintaining
Controller	Delta 123, Oakland Center readback correct BREAK Air France 465 Traffic is no longer a factor
Flight crew	Oakland Center, Air France 465, Roger
Controller	Delta 123, and Air France 465 Oakland Center <issue communications instructions> out

4.2.1.4 **Figure 4-1** provides a flow chart for SATVOICE calls initiated by the controller to the flight crew. **Table 4-1** provides a table for SATVOICE calls initiated by the controller to the flight crew.

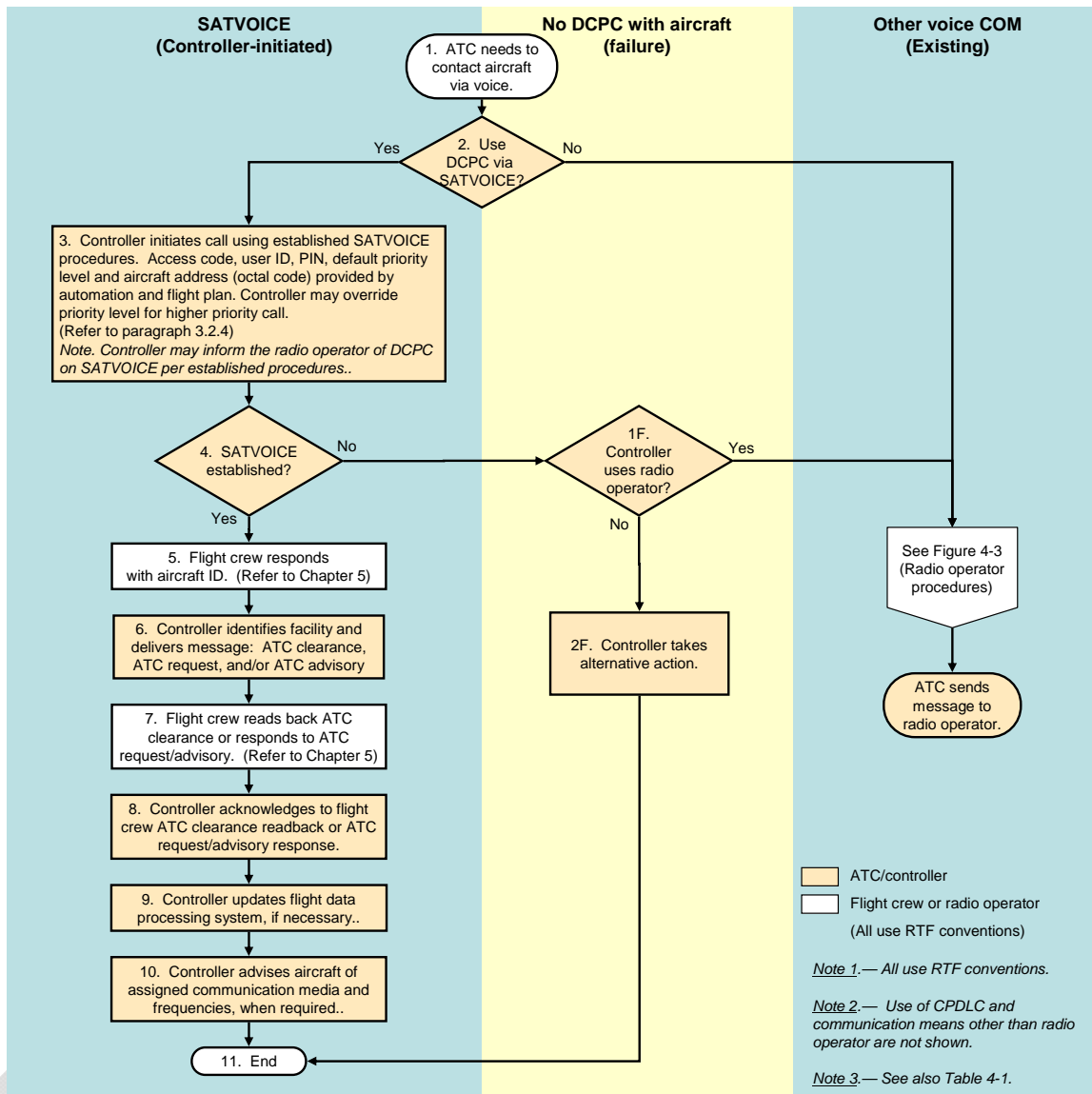


Figure 4-1. Controller-initiated to flight crew SATVOICE call procedures

Table 4-1. Controller-initiated to flight crew SATVOICE call procedures

Ref	Controller-initiated Communication Process	What is done
1	ATC needs to contact an aircraft via voice.	The controller needs to communicate with an aircraft.
2	Use DCPC via SATVOICE?	Decision point – The controller determines that it would be more efficient to contact aircraft using DCPC via SATVOICE. Otherwise, the controller uses the radio operator.

Ref	Controller-initiated Communication Process	What is done
3	ATC initiates call with aircraft using SATVOICE.	The controller initiates the communication using established SATVOICE procedures. The access number, the user ID, if relevant, the PIN, default priority level (level 2 / HGH / Q12 per Table 2-1) and SATVOICE number (aircraft address represented in octal code) are typically provided by automation, data bases and flight plan information. The controller may override the default priority level to initiate a higher priority call (Refer to paragraph 3.2.4). <i>Note.</i> — Controller may inform the radio operator of DCPC on SATVOICE per agreements and established procedures.
4	SATVOICE established?	Decision point – The controller establishes contact with the aircraft using SATVOICE. If contact with the aircraft cannot be established using DCPC via SATVOICE, the controller may use the radio operator or take alternative action. <i>Note.</i> — If contact with the aircraft cannot be established using DCPC via SATVOICE, the controller follows procedures provided below in the table following step 11.
5	Flight crew responds with aircraft identification.	The flight crew answers the call and responds by stating the aircraft identification (Refer to Chapter 5).
6	Controller identifies facility and delivers message <ul style="list-style-type: none"> • ATC Clearance • ATC Request • ATC Advisory 	The controller identifies facility and delivers the message – ATC clearance, ATC request or ATC advisory.
7	Flight crew reads back ATC clearance or responds to ATC request/advisory.	For an ATC clearance, the flight crew reads back the clearance verbatim to the controller. For an ATC request or advisory, the flight crew responds to it, as appropriate.
8	Controller acknowledges to flight crew ATC clearance readback or ATC request/advisory pilot response.	The controller acknowledges to the flight crew receipt of the response, as appropriate.
9	ATC updates flight data processing system.	The controller updates the flight data processing system, if necessary.
10	Controller terminates SATVOICE call.	The controller advises the aircraft as to the assigned communication media and frequencies, when required.
11	End.	End communication either due to successful delivery or controller took alternative action (See below).

Ref	Controller-initiated Communication Process	What is done
Procedures when DCPC using SATVOICE fails		
1F	Controller uses radio operator?	Decision Point – When attempts to establish contact with an aircraft fail using DCPC via SATVOICE, the controller may use the radio operator or take alternative action.
2F	Controller takes alternative action.	The controller may take another action to provide safe and efficient flow of air traffic.

4.2.2 Incoming SATVOICE call – controller receives call

4.2.2.1 When receiving a direct pilot-to-controller communication SATVOICE call, the controller should follow radio telephony practices in responding to the call. Since the flight crew called the controller, the call will generally be ATC priority level 2 / HGH / Q12, but it may be an emergency call priority level 1 / EMG / Q15, depending upon flight status (Refer to **Figure 4-2** and **Table 2-1**).

4.2.2.2 For SATVOICE calls made to ATC, the controller should:

- a) confirm the aircraft identification of the calling flight;
- b) acknowledge message; read back the message or selected contents, as required; and;
- c) Advise the aircraft as to the assigned communications media and frequencies, if necessary, upon termination of the SATVOICE call, when required.

Example:

Flight crew <Initiates call and line rings at the ATC>
 Controller New York Center
 Flight crew New York Center, Speedbird 255, <message>
 Controller Speedbird 255, New York Center < message response>
 Flight crew New York Center, Speedbird 255, ROGER/WILCO/UNABLE
 Controller Speedbird 255, New York Center, <issue communications instructions>, OUT

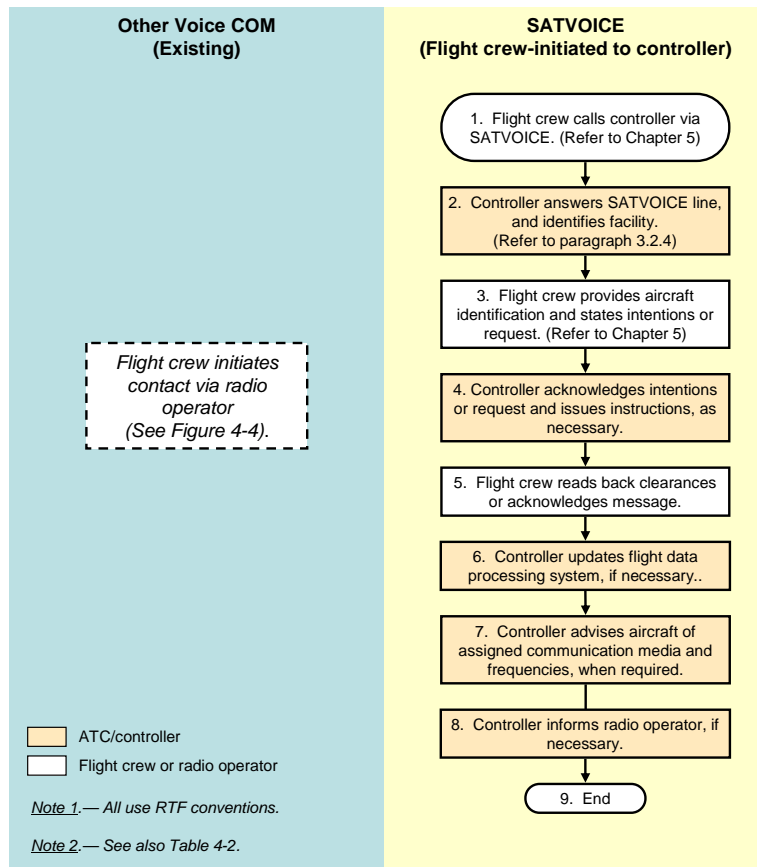


Figure 4-2. Controller receives SATVOICE call procedures

Table 4-2. Controller receives SATVOICE call procedures

Ref	Incoming SATVOICE call communication process	What is done
1	Flight crew calls controller via SATVOICE (Refer to Chapter 5).	The flight crew may decide to call the controller directly.
2	Controller answers SATVOICE line and identifies facility (Refer to paragraph 3.2.4).	The controller answers SATVOICE line and identifies facility. When incoming calls are not automatically routed directly to the controller, the ATSU may establish procedures consistent with intended uses and relevant performance specifications.
3	Flight crew provides aircraft identification and states intentions or request (Refer to Chapter 5).	The flight crew provides aircraft identification and states intentions or request to the controller.
4	Controller acknowledges message and issues instructions as necessary.	The controller responds to the intention or request from the flight crew.

Ref	Incoming SATVOICE call communication process	What is done
5	Flight crew reads back clearances or acknowledges message (Refer to Chapter 5).	When clearances are issued in the instructions, the flight crew reads back the clearance. Otherwise, the instructions are acknowledged.
6	ATC updates flight data processing system.	The controller updates the flight data processing system, if necessary.
7	Controller terminates SATVOICE call.	The controller advises the aircraft as to the assigned communications media and frequencies, when required.
8	Controller informs radio operator.	The controller informs the radio operator, if necessary, in accordance with agreements and established procedures.
9	End.	End communication activities by acceptance of flight crew's position report or request, and/or update of ATSU flight data processing system.

4.3 Radio operator procedures

4.3.1 Outgoing SATVOICE call – radio operator–initiated call

4.3.1.1 The radio operator may initiate a SATVOICE call to an aircraft in order to transmit ATC messages on behalf of the ATC controller. These messages generally consist of clearances, requests, or advisories. Normally, these messages will be sent at the priority reserved for ATC traffic, designated as Level 2 / HGH / Q12 per **Table 2-1**. Given the high priority of ATC messages, the radio operator will use SATVOICE or the most expeditious means possible to deliver the messages to meet ATC performance criteria. The conversations will also maintain a standard of radio telephony procedure to ensure accuracy and clarity.

Example:

Radio operator <Initiates call and line rings in flight deck>
 Flight crew Air France 465
 Radio operator Air France 465, Gander Radio, <message>
 Flight crew Gander Radio, Air France 465, <read back message>
 Radio operator Air France 465, Gander Radio, readback correct, out

4.3.1.2 If a radio facility or ATS unit recognizes that an aircraft is in imminent danger, an ATC message is urgent or delivery time is critical, the RO or controller should use the most expeditious means of communications. If SATVOICE is used as the first attempt, the RO or controller should call the aircraft at the highest priority Level 1 / EMG / Q15 per **Table 2-1**, if possible, and state the threat or delivery the ATC message to the aircraft as part of the initial communication. If unable to contact the

aircraft via SATVOICE, then the RO or controller should revert to any other means of communication, including HF, VHF, or CPDLC, to establish positive communications for that flight and state the threat to the aircraft as part of the initial communication.

Example:

Radio operator <Initiates call and line rings in flight deck>
Flight crew Air France 465
Radio operator Air France 465, Gander Radio, For collision avoidance, ATC clears <message>
Flight crew Gander Radio, Air France 465, <read back message>
Radio operator Air France 465, Gander Radio readback correct, out

4.3.1.3 **Figure 4-3** provides a flow chart for SATVOICE calls initiated by the radio operator to the flight crew. **Table 4-3** provides descriptions associated with each number flowchart item.

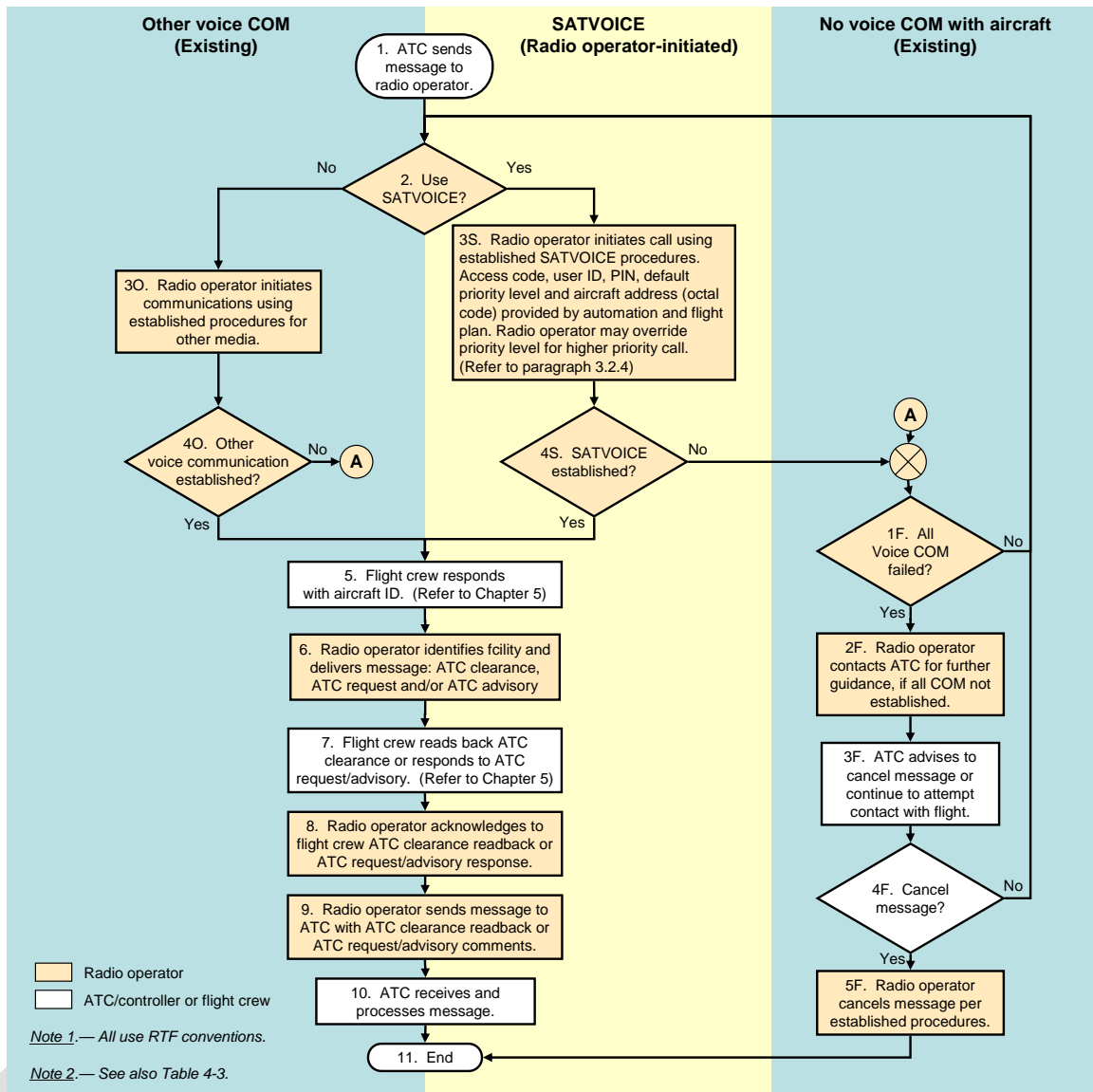


Figure 4-3. Radio operator-initiated to flight crew SATVOICE call procedures

Table 4-3. Radio operator-initiated to flight crew SATVOICE call procedures

Ref	Radio operator-initiated call communication process	What is done
1	ATC sends message to radio operator.	ANSP/ATC (controller) sends a message via ground network to aeronautical station / radio operator for delivery to an aircraft.

Ref	Radio operator-initiated call communication process	What is done
2	Use SATVOICE?	<p>Decision point – This decision occurs when:</p> <ul style="list-style-type: none"> • the radio operator receives a message from ATC for delivery to an aircraft; • when the radio operator previously was unable to establish contact with an aircraft, considering all voice COM capability; or • when ATC instructs the radio operator to continue making attempts to contact an aircraft after advising ATC that all previous attempts had failed. <p>The radio operator determines whether or not to use SATVOICE to contact the aircraft. In addition to business considerations, other factors are relevant, such whether or not the aircraft is SATVOICE capable, the type of SATVOICE capability, the urgency of the communication, and other available voice COM capabilities. The SATVOICE capability is another COM capability for the radio operator to contact the aircraft using standard RTF conventions and phraseology.</p> <p>The radio operator decides to attempt contact with the aircraft using SATVOICE or other voice COM capabilities.</p>
3S 3O	Radio operator initiates call with aircraft using SATVOICE.	<p>The radio operator initiates the communication using established SATVOICE procedures. The access number, the user ID, if relevant, the PIN, default priority level (level 2 / HGH / Q12 per Table 2-1) and SATVOICE number (aircraft address represented in octal code) are typically provided by automation, data bases and flight plan information. The radio operator may override the default priority level to initiate a higher priority call (Refer to paragraph 3.2.4).</p> <p><i>Note.</i>— <i>The radio operator may have initiated communications using established procedures for other media (Ref Step 3O), e.g., HF or VHF voice.</i></p>
4S 4O	SATVOICE established?	<p>Decision point – The radio operator establishes contact with the aircraft using SATVOICE. If contact with aircraft cannot be established using SATVOICE, the radio operator may attempt contact by using other voice COM capability.</p> <p><i>Note.</i>— <i>If contact with the aircraft cannot be established using SATVOICE or other voice COM capability, the radio operator follows procedures provided below in the table following step 11.</i></p>
5	Flight crew responds with aircraft identification.	<p>The flight crew answers the call and responds by stating the aircraft identification (Refer to Chapter 5).</p>

Ref	Radio operator-initiated call communication process	What is done
6	Radio operator delivers message: <ul style="list-style-type: none"> • ATC Clearance • ATC Request • ATC Advisory 	The radio operator delivers one of three types of messages – ATC clearance, ATC request or ATC advisory.
7	Flight crew reads back ATC clearance or responds to ATC request/advisory.	For an ATC clearance, the flight crew reads back the clearance verbatim to the radio operator. For an ATC request or advisory, the flight crew responds to it, as appropriate.
8	Radio operator acknowledges to flight crew ATC clearance readback or ATC request/advisory pilot response.	The radio operator acknowledges to the flight crew receipt of the response, as appropriate. For an ATC clearance, the radio operator monitors the flight crew readback for correctness and includes it in a message intended for ATC. For an ATC request or ATC advisory, the radio operator includes any comments from the flight crew in a message intended for ATC.
9	Radio operator sends message to ATC with ATC clearance readback or ATC request/advisory comments.	Since this message activity started with a message from ATC, the radio operator completes the communication by sending another message back to ATC with the flight crew's response – containing either the flight crew's readback to the clearance or any comments from the flight crew to the request or advisory.
10	ATC receives and processes message.	ATC receives the message sent from the radio operator with the flight crew's response. ATC processes the message, as appropriate.
11	End.	End communication either due to successful delivery or cancellation direction by ATC after all voice COM fails with the aircraft (See below).
Procedures when all voice COM fails		
1F	All Voice COM failed?	Decision Point – When attempts to establish contact with an aircraft using one type of voice COM have failed, the radio operator may attempt to establish contact using voice COM capability that had not been previously used, such as SATVOICE. Otherwise, the radio operator concludes that all attempts have failed.
2F	Radio operator contacts ATC for further guidance, if all COM not established.	If all means of communication are unsuccessful, then the radio operator will contact ATC to report failed communication attempt and obtain further guidance.
3F	ATC advises to cancel message or continue to attempt contact with flight.	Given the radio operator provided a previous status report, ATC provides additional guidance on message delivery – either to cancel the message or to continue attempted delivery.

Ref	Radio operator-initiated call communication process	What is done
4F	Cancel message?	Decision Point – If ATC instructs the radio operator to continue attempts to contact the aircraft, the radio operator uses all voice COM capabilities available. Otherwise, the radio operator cancels the message.
5F	Radio operator cancels message per established procedures.	Radio operator cancels message per established procedures, which completes the communication. These procedures may include logging the actions taken and results of ATC coordination to close it out.

4.3.2 Incoming SATVOICE call – radio operator receives call

4.3.2.1 Similarly, the radio operator may receive a SATVOICE call from the flight crew. The radio operator should follow radio telephony practices in responding to the call. The radio operator serves to relay messages to the controller. Since the flight crew called the radio operator, the call will generally be ATC priority level 2 / HGH / Q12, but it may be an emergency call priority level 1 / EMG / Q15, depending upon flight status (Refer to [Table 2-1](#)). The pilot may also ask the radio operator to facilitate a ground conference to ATC as well as their dispatch and/or maintenance departments.

4.3.2.2 For SATVOICE calls made to an aeronautical station, the radio operator should:

- a) confirm the identification of the calling flight;
- b) acknowledge message; read back the message or selected contents, as required; and;
- c) if not already completed, provide primary and secondary HF frequencies and ensure flight establishes HF/VHF and SELCAL check, when required by the appropriate ATS authority.

Example:

Flight crew <Initiates call and line rings at aero radio>
 Radio operator Flight calling Shanwick Radio
 Flight crew Shanwick Radio, Speedbird 255, <message>
 Radio operator Speedbird 255, Shanwick Radio <read back message>
 Flight crew Shanwick Radio, Speedbird 255, ROGER
 Radio operator Shanwick Radio OUT

4.3.2.3 If the initial call from the flight crew to an aeronautical station is made using SATVOICE, the radio operator should:

- a) receive and read-back the message, if required; and
- b) allocate the primary and secondary HF frequencies and perform a SELCAL check on HF, when required by the appropriate ATS authority.

4.3.2.4 **Figure 4-4** provides a flow chart for SATVOICE calls received by the radio operator from the flight crew. **Table 4-4** provides descriptions associated with each number flowchart item.

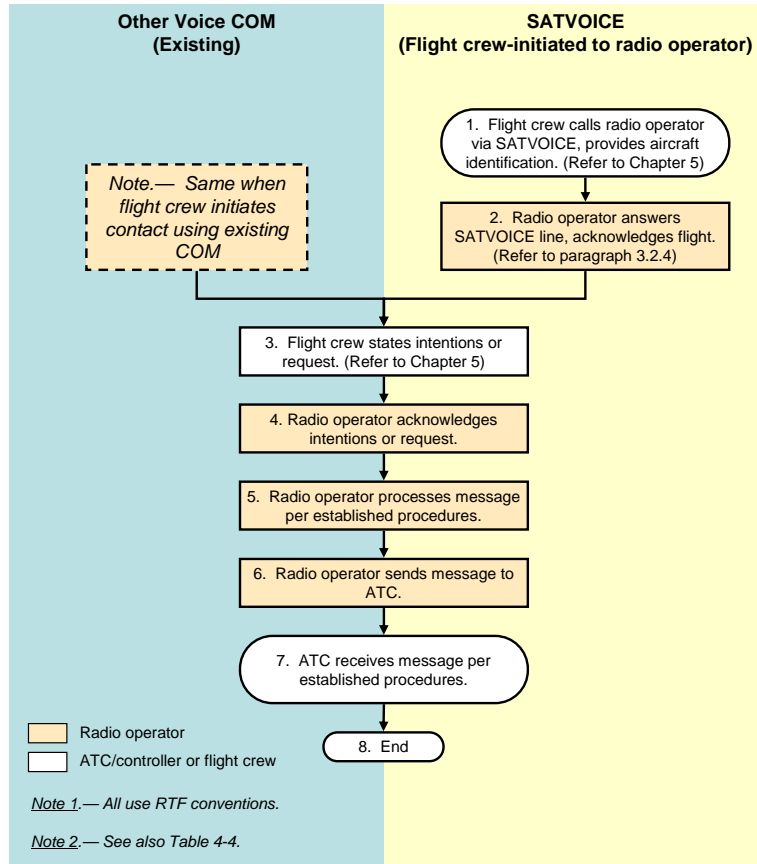


Figure 4-4. Radio operator receives SATVOICE call procedures

Table 4-4. Radio operator receives SATVOICE call procedures

Ref	Incoming SATVOICE call communication process	What is done
1	Flight crew calls radio operator via SATVOICE, provides aircraft identification (Refer to Chapter 5)	Flight crew from a flight calls the radio operator via SATVOICE. Flight crew provides aircraft identification
2	Radio operator answers SATVOICE line; acknowledges flight (Refer to paragraph 3.2.4)	Radio operator answers the SATVOICE line and acknowledges the flight’s call.

Ref	Incoming SATVOICE call communication process	What is done
3	Flight crew states intentions or request (Refer to Chapter 5)	Flight crew states intentions for placing the SATVOICE call or request, which could be an initial check-in, a guard change, a request, or to provide a position report.
4	Radio operator acknowledges intentions or request	Radio operator acknowledges the flight crew's intentions or request.
5	Radio operator processes message per established procedures	Radio operator relays intentions or request to ATC per established procedures.
6	Radio operator sends message to ATC	Radio operator sends a message to ATC. The radio operator may also call the ATC controller depending upon local procedures.
7	ATC receives message per established procedures	The ATC controller will receive the flight crew's intentions or request from the radio operator.
8	End	End communication flow due to completion of communications activities, such as delivery of flight crew's position report or request, and/or update of radio operator's flight information database.

4.4 Using SATVOICE for other voice COM management

4.4.1 Other voice COM frequency assignments

4.4.1.1 The radio operator may use SATVOICE to instruct the flight crew to assign primary and/or secondary frequencies on VHF/HF, as required in accordance with ICAO Annex 10, Volume II, paragraph 5.2.2.5.

Note.— *At the FIR exit boundary, the radio operator would communicate with the current and next centers, as appropriate, in accordance with established procedures.*

4.4.2 Other voice COM radio check – SELCAL

4.4.2.1 The radio operator may use SATVOICE to instruct the flight crew to perform an HF radio check and SELCAL check, as required, in accordance with ICAO Annex 10, Volume II, paragraph 5.2.4.

Note.— *The radio operator or flight crew may have initiated a SATVOICE call owing to inability to establish communications with the intended party using other voice COM.*

4.5 Communication failures and emergencies

4.5.1 Loss of SATVOICE Connection

4.5.1.1 If the SATVOICE connection is lost during a communication, the initiator of the call should:

- a) attempt to contact the aircraft using any means at their discretion, e.g., SATVOICE retry, HF (SELCAL), data link, VHF or relay through another aircraft, to establish positive voice communications for that flight; and
- b) deliver the clearance or receive the message, as appropriate.

4.5.2 Notification of SATVOICE aircraft failure

4.5.2.1 An aeronautical station should notify ATS units of changes to aircraft SATVOICE capabilities per established procedures.

4.5.3 Airspace emergencies – loss of ATSU or radio facility capabilities

4.5.3.1 In situations where the ATSU or radio facility loses capabilities, then the radio operator should comply with procedures related to emergencies, communication failure and contingencies provided (Doc 4444, Chapter 15) and use whatever means are available to provide information on the emergency situation and any directives, for example:

- a) HF broadcast capability – The radio operator will transmit a voice broadcast on HF radio of emergency situation and any directives;
- b) Contact alternate FIR communications facilities for backup communications support;
- c) Aircraft-aircraft communications;
- d) Volmet broadcasts, containing emergency information, where available; and
- e) SATVOICE Group Call Broadcast function for future consideration per ICAO Annex 10, Vol III, Sec 8.5.

Chapter 5. Flight crew procedures

5.1 General

5.1.1 An operator with data link equipped aircraft (CPDLC, ADS-C, and FMC WPR) operating in airspace where data link services are provided should use data link as the normal means of communications. Some normal ATC communications and most non normal communications will require use of voice communications. The flight crew may use either SATVOICE or HF voice at their discretion, provided the use is in accordance with airspace requirements established by Regional SUPPs, AIPs (or equivalent publication) for the flight (Refer to [paragraph 2.1](#) and [paragraph 3.2.3](#)). Urgency, type of message being communicated, current atmospheric conditions, and company standard operating procedures are all factors in determining which voice system to use.

5.1.2 Although the underlying technology lends itself to a conversational mode of communications, such use can create misunderstanding and confusion. Therefore, when using SATVOICE, normal RTF conventions should be followed identical to HF communications in accordance with standard ICAO phraseology, as defined in Annex 10, Volume II, Chapter 5 and Doc 4444 chapter 12 and Doc 8400.

5.1.3 During pre-flight or prior to entry into airspace that requires use of SATVOICE, the flight crew should ensure the aircraft SATVOICE system is operational and there are no notifications of SATVOICE service outage in that airspace.

Note.— *The flight crew will typically receive an alert for aircraft SATVOICE system failures. For aircraft SATVOICE systems that do not provide alerts of equipment failures, the flight crew verifies system status in accordance with established procedures (e.g., by reviewing signal strength and “log on” status). The aircraft satellite communication system needs to be automatically or manually logged on to a satellite and ground earth station (GES) before SATVOICE call can be made. See [paragraph 3.3.4](#).*

5.1.4 If a call is dropped when the flight crew and controller are communicating, the party that initiated the original call should initiate the process to reestablish the call.

5.1.5 On initial contact with a radio station, the flight crew should provide aircraft identification and request frequency assignment and perform a successful SELCAL check on HF, when required by the appropriate ATS authority. Subsequent communications with that radio station may then be performed via SATVOICE or HF voice, in accordance with applicable airworthiness, operating and airspace requirements.

5.1.6 The flight crew should normally make calls to the radio facility serving the airspace in which the aircraft is flying. If oceanic airspace has not been entered, the flight crew should attempt contact with the radio facility serving the first oceanic centre. If communications are lost with the current aeronautical station, the flight crew should attempt contact with any other aeronautical station to relay.

5.1.7 If a HF SELCAL check is required before or after entering a FIR, the flight crew should contact the radio operator and complete a HF SELCAL check.

5.2 Flight crew-initiated SATVOICE call

5.2.1 SATVOICE short codes are published in State AIPs and some charts. Short codes may be stored in SATVOICE system for easy access by the flight crew.

5.2.2 When contacting ATC, the flight crew should initiate calls to the aeronautical station/ATSU using the appropriate priority level 2 / HGH / Q12 or priority level 1 / EMG / Q15 in accordance with **Table 2-1**.

Note.— The flight crew would normally use 3 / LOW / Q10 to contact AOC. However, under some urgent situations, the flight crew may opt to initiate a level 1 / EMG / Q15 call to AOC to avoid the possible preemption of an incoming call from ATC. See **paragraph 3.3.4.3** for priority level default settings and **paragraph 3.3.4.4** for flight crew capability to set priority level and preempt calls.

Example:

<line rings at aeronautical station>
 Flight crew Arctic Radio, Continental 99, position report
 Radio operator Continental 99 Arctic Radio
 Flight crew Arctic Radio, Continental 99, <message>
 Radio operator Continental 99, Arctic Radio, <read back message>
 Flight crew Arctic Radio, Continental 99 out

5.3 Flight crew receives SATVOICE call

5.3.1 The flight crew should respond to an ATC call using standard RTF conventions and phraseology (see **paragraph 5.1.2**).

5.3.2 The flight crew should act only on ATC clearances/instructions from SATVOICE calls with priority level 2 / HGH / Q12 or priority level 1 / EMG / Q15 per **Table 2-1**, and if in doubt terminate the call and initiate a new call for confirmation.

Note.— The aircraft SATVOICE system confirms the priority level of the call by restricting level 4 / PUB / Q9 incoming calls to the flight deck (Refer to **paragraph 3.3.4.3**). If the aircraft SATVOICE system does not restrict incoming calls, the flight crew may use an indication (aural or visual) provided by the SATVOICE system to confirm the call priority level.

5.4 Oceanic clearances

5.4.1 Coordination of oceanic clearances should be in accordance with State AIP (or equivalent publication).

5.5 Contingencies

5.5.1 SATVOICE busy signal or no answer

5.5.1.1 Normally, when initiating a SATVOICE call to a radio facility that supports SATVOICE services, the flight crew should receive an answer. When a SATVOICE call returns a busy signal or there is no answer, the flight crew should use other means of communications.

5.5.2 Aircraft SATVOICE system failure

5.5.2.1 If the aircraft SATVOICE system has malfunctioned or for any other reason the SATVOICE system is unavailable the flight crew should:

- a) revert to an other means of communication; and
- b) notify the aeronautical station of the SATVOICE failure.

DRAFT

Appendix A Future SATVOICE concept of operation – desirable SATVOICE features

This Document provides guidance material on SATVOICE communications for aeronautical use taking into account legacy implementations and uses at the time of publication. It is intended to facilitate globally consistent implementation of SATVOICE services and support a variety of uses of SATVOICE communications via radio operators, DCPC and AOC, ANSPs, aircraft operators, CSPs and SSPs, and other relevant parties are encouraged to use this guidance material to overcome some limitations and ensure current implementations comply with the SARPS and PANS for SATVOICE services and uses.

SATVOICE services should evolve toward allowing full integration of SATVOICE capability into workstations for the controller and the radio operator and communication systems on board aircraft for the flight crew. ANSPs, aircraft operators, commercial SATVOICE service providers (CSPs and SSPs) and other relevant parties should employ standards that ensure a common infrastructure that enables ground facilities to make SATVOICE calls to an aircraft regardless of which commercial satellite/ground station the aircraft is logged on to. Flight crews should be able to contact ground stations by their facility name or code, and controllers/radio operators should be able to contact aircraft by their call sign or aircraft identification, as filed in the flight plan.

It is anticipated that SATVOICE will become a LRCS that will be used for future air traffic management. The aviation community should collaborate on program plans for this purpose and consider:

- a) Developing a “Single Dial Access Point” (CDAP) to enable ANSPs and AOCs to call a single number to initiate two-stage dialing which will reach any aircraft logged onto any commercial SATVOICE system, which is approved as part of the common infrastructure;
- b) Developing a common and sufficiently robust infrastructure to enable use of SATVOICE services even when local PSTNs are overloaded due to natural disasters;
- c) Means to minimize or eliminate the likelihood of priority, pre-emption and precedence, such as through the use of multi-channel radios and air-to-air conference calling;
- d) Means to display caller ID to the recipient of an incoming SATVOICE call (e.g., display of facility name or facility code for the flight crew and display of call sign or aircraft identification for the controller/radio operator); and
- e) Developing additional SATVOICE capabilities such as a “virtual VHF” capability using VoIP applications when such SATVOCIE services are available.

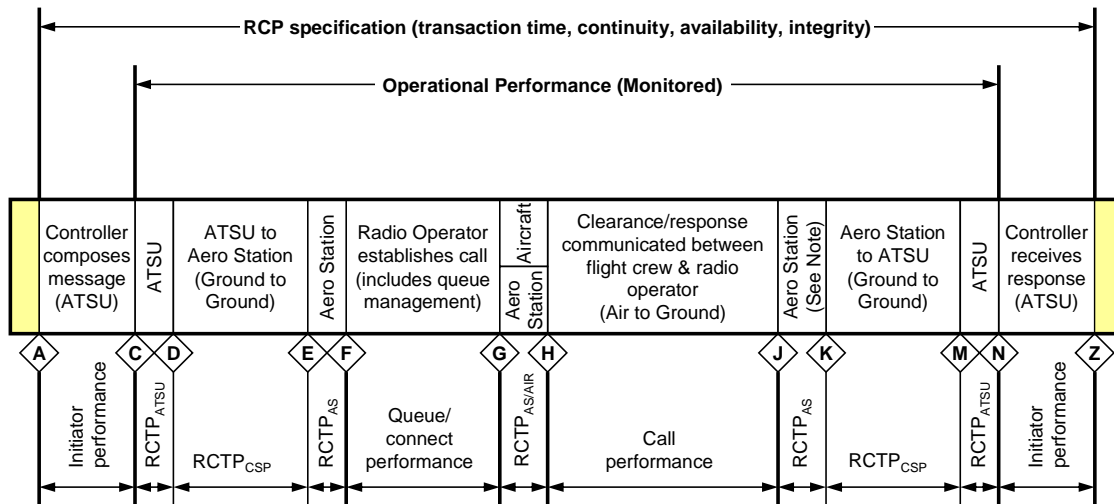
Appendix B – RCP 400 specification – allocations for SATVOICE communications

Editor’s note 3. — This Appendix is still in work. See open comments in comment matrix.

This appendix provides a supplement to the RCP 400 specification provided in the First Edition of the Global Operational Data Link Document (GOLD). The supplement includes the RCP allocations for SATVOICE communications, consistent with RCP 400 “top sheet.” The RCP 400 specification, provided by ICAO Doc 9869, provides performance-based criteria based on intervention capabilities that exist today using HF voice communications via a radio operator. As it is difficult to compare the actual performance of different technologies, the RCP 400 specification provides a common basis for assessing SATVOICE capability or any new technology that may emerge, including data link capabilities such as CPDLC.

B.1 Terms and definitions

Refer to GOLD, Appendix B, paragraph B1 for general terms and definitions applicable to RCP specifications. This section provides additional terms and definitions to describe the RCP allocations for radio operator SATVOICE communications.



Note: The (J to K) component includes two concurrent processes:
 (1) the aircraft and aeronautical station technically disconnect the call; which is assumed. Operationally, the call is disconnected when the flight crew and radio operator complete the call; and
 (2) the aeronautical station sends the response to the network for delivery to the ATSU; its performance is denoted by RCTP_{AS}.

Figure A- 1 Typical voice communication transaction allocation – controller-initiated via a radio operator using SATVOICE communication

RCP specification	
Term	Description
Operational communication transaction	The process a human uses to initiate the transmission of an instruction, clearance, flight information, and/or request, and is completed when that human is confident that the transaction is complete
Required communication performance	A statement of the performance requirements for operational communication in support of specific ATM functions
RCP specification	A specification (e.g., RCP 400) that represents the values assigned to RCP parameters for communication transaction time, continuity, availability and integrity, and allocations to ANSP, aircraft, CSP and operator
RCP expiration time (ET)	The maximum time for the completion of the operational communication transaction after which the initiator is required to revert to an alternative procedure
RCP nominal time (TT 95%)	The maximum nominal time within which 95% of operational communication transactions are required to be completed
RCP continuity (C)	<p>The required probability that an operational communication transaction can be completed within the communication transaction time, either ET or TT 95%, given that the service was available at the start of the transaction</p> <p>Voice communications: This translates into 5 out of 100 calls not being able to conclude their voice transactions within the allotted time or the call could be disconnected for any reason, including aircraft maneuvers, switching satellites or any loss of service while on the call</p>
RCP availability (A)	<p>The required probability that an operational communication transaction can be initiated when needed</p> <p>Voice communications: This translates to any failure prohibiting the call to be initiated to include congestion (much like the analogy of a terrestrial mobile phone network) However this definition does not apply to a busy condition whereby the entity being called is already on the phone and does not have a way to put the existing call on hold or if able to, rejects the additional incoming call</p>

RCP specification	
Term	Description
RCP integrity (I)	<p>The required probability that an operational communication transaction is completed with no undetected errors</p> <p><i>Note.— Whilst RCP integrity is defined in terms of the “goodness” of the communication capability, it is specified in terms of the likelihood of occurrence of malfunction on a per flight hour basis, e.g., 10^{-5}, consistent with RNAV/RNP specifications</i></p> <p>Voice communications: This translates to the ability to conduct the voice transaction with enough intelligibility to understand the verbal request. Additionally, this could also manifest in the crew executing an incorrect instruction because it was misunderstood (It may not be clear at the time of this submittal, what type of error rate would reflect this condition, or if the read-back would mitigate or compound this)</p>

/V transaction time	
Term	Description
Operational Performance	<p>The portion of the transaction time (used for intervention) that does not include the times for message composition or recognition of the operational response</p> <p>Voice communications: Operational Performance (C to N) = RCTP+ Queue/Connect Performance (F to G) + Call Performance (H to J)</p>
Required Communication Technical Performance (RCTP)	<p>The portion of the (intervention) transaction time that does not include the human times for message composition, operational response, and recognition of the operational response</p> <p>Voice communications: $RCTP = RTCP_{ATSU} + RCTP_{AS} + RCTP_{AS/AIR} + RCTP_{CSP}$</p>
Monitored Performance	<p>The monitored combination of the time it takes to organize, prepare, dial and perform an interactive call plus the technical performance of the ground and air equipment</p> <p>Voice communications: Monitored Performance (F to J) = $RCTP_{AS/AIR} + \text{Queue/Connect Performance (F to G) + Call Performance (H to J)}$</p>

/V transaction time	
Term	Description
Call Performance	<p>The operational portion of the transaction time to prepare the operational response, and includes the recognition of the instruction, and message composition during an interactive call between the Radio Operator and Flight Crew, e.g., flight crew/HMI for intervention transactions</p> <p>Voice communications: Call Performance = (H to J), where “H” denotes when the aircraft indicates an incoming call to the flight crew and “J” denotes when the callers operationally completes the call (H to J) includes any tasks for the radio operator to send the message to the ATSU</p>
Queue/Connect Performance	<p>The operational portion of the transaction time to organize and place the call either via a manual or automated dialing sequence depending on equipment at the aeronautical station</p> <p>Voice communications: Queue/Connect Performance = (F to G), where “F” denotes when the message from the ATSU via the network is sent to the queue, and “G” denotes when the last digit of the dialing sequence is finished</p>
$RCTP_{ATSU}$	<p>The summed critical transit times for an ATC intervention message and a response message, allocated to the ATSU system</p> <p>Voice communications: $RCTP_{ATSU} = (C \text{ to } D) + (M \text{ to } N)$</p>
$RCTP_{CSP}$	<p>The summed critical transit times for an ATC intervention message and a response message, allocated to the CSP system</p> <p>Voice communications: $RCTP_{CSP} = (D \text{ to } E) + (K \text{ to } M)$</p>
$RCTP_{AS/AIR}$	<p>The technical time for the air-ground network and associated components to initiate a call</p> <p>Voice communications: $RCTP_{AS/AIR} = (G \text{ to } H)$, where “G” denotes when the last digit of the dialing sequence is finished and “H” denotes when the aircraft indicates an incoming call to the flight crew</p>

/V transaction time	
Term	Description
RCTP _{AS}	<p>The summed critical transit times for an ATC intervention message and a response message allocated to the aeronautical station</p> <p>Voice communications: $RCTP_{AS} = (E \text{ to } F) + (J \text{ to } K)$, where (J to K) includes two concurrent processes:</p> <ul style="list-style-type: none"> a) the aircraft and aeronautical station technically disconnect the call; which is assumed Operationally, the call is disconnected when the flight crew and radio operator complete the call; and b) the aeronautical station sends the response to the ATSU via the ground-ground network; the performance is denoted by RCTP_{AS}

Continuity	
Term	Description
C for operational performance	<p>The proportion of intervention messages and responses that can be delivered within the specified operational performance time for intervention</p> <p>Voice communications: Continuity would take into consideration any dropped calls</p>
C for RCTP	<p>The proportion of intervention messages and responses that can be delivered within the specified RCTP for intervention</p> <p>Voice communications: Continuity would take into consideration any dropped calls</p>
C for RCTP _{ATSU}	<p>The proportion of intervention messages and responses that can be delivered within the specified RCTP_{ATSU} for Intervention</p>
C for RCTP _{CSP}	<p>The proportion of intervention messages and responses that can be delivered within the specified RCTP_{CSP} for Intervention</p>
C for RCTP _{AS/AIR}	<p>The proportion of intervention messages and responses that can be delivered within the specified RCTP_{AS/AIR} for Intervention</p> <p>Voice communications: Continuity would take into consideration any dropped calls</p>

Continuity	
Term	Description
C for RTCP _{AS}	The proportion of intervention messages and responses that can be delivered within the specified RCTP _{AS} for Intervention

Availability	
Term	Description
Service availability (A _{CSP})	The required probability that the communication service is available to all users in a specific airspace when desired
Unplanned outage duration (minutes)	The time from when an unplanned outage begins to when the ATSU receives notification that the service has been restored
Unplanned outage duration limit (minutes)	A criterion applied to a given operational airspace or FIR that defines the maximum time for the duration of an unplanned outage at which time there is an operational impact
Maximum number of unplanned outages (per year)	A criterion applied to a given operational airspace or FIR that defines the maximum number allowed for unplanned outages in any twelve month period
Maximum accumulated unplanned outage time (min/yr)	A criterion applied to a given operational airspace of FIR that defines the maximum time allowed for the total sum of the unplanned outages that exceed the unplanned outage duration limit in any twelve month period <i>Note.— The criterion does not apply to unplanned outages that are less than the unplanned outage duration limit or planned outages. Unplanned outages that are less than the unplanned outage duration limit are considered against the criterion for continuity</i>
Unplanned outage notification delay (min)	Notification to the ATSU of an unplanned outage. Measured from when the unplanned outage begins to when the ATSU receives notification
Aircraft system availability (A _{AIR})	The required probability of available capability on an aircraft <i>Note.— The actual aircraft system availability is computed assuming that the service is available in the relevant airspace</i>

B.2 RCP 240 specification

Refer to GOLD, Appendix B, paragraph B2 for RCP 240 specification

B.3 RCP 400 specification

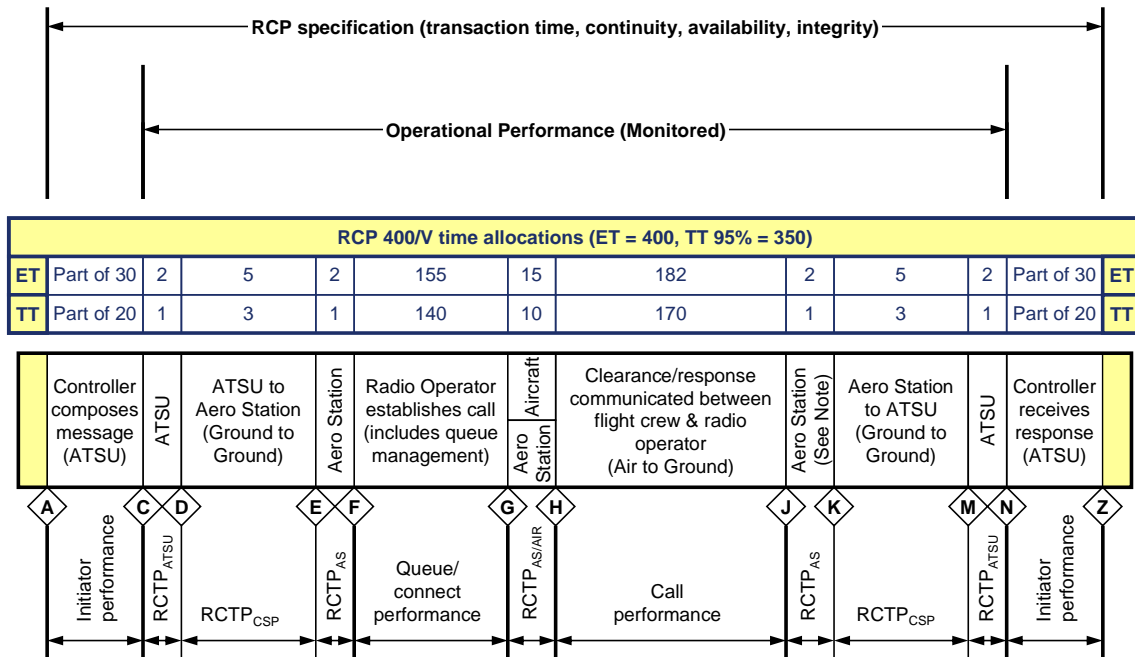
RCP Specification			
RCP specification		RCP 400	
Airspace specific considerations			
Interoperability	Specify interoperability criteria, e.g., FANS 1/A, SATVOICE (Iridium, Inmarsat, and/or MTSAT) communications.		
ATS Function	Specify ATS function(s), e.g., applicable separation standard, if necessary.		
Application	Specify controller-pilot ATC communication intervention capability, e.g., CPDLC, SATVOICE communications.		
RCP parameter values			
Transaction time (sec)	Continuity (C)	Availability (A)	Integrity (I)
ET = 400	C(ET) = 0.999	0.999	Malfunction = 10^{-5} per flight hour
TT 95% = 350	C(TT 95%) = 0.95		
RCP monitoring and alerting criteria			
Ref:	Criteria		
MA-1	The system shall be capable of detecting failures and configuration changes that would cause the communication service to no longer meet the RCP specification for the intended function.		
MA-2	When the communication service can no longer meet the RCP specification for the intended function, the flight crew and/or the controller shall take appropriate action.		
Notes			
<i>Note 1— Rationale for the criteria provided in this specification can be found in ICAO Annex 11, ICAO Doc 4444, ICAO Doc 9689, and RTCA DO-306/ED-122.</i>			
<i>Note 2— The values for transaction times are to be applied to transactions that are representative of communication capability for the controller to intervene with a specific operator, aircraft type, and/or aircraft identification.</i>			
<i>Note 3— If changes are made to the system capacity limits, as specified by the airspace requirements, and the changes cause the system to perform below the RCP specification, this would be considered a change in system configuration.</i>			

B.3.1 RCP 400/D allocations

Refer to GOLD, Appendix B, paragraph B3.1 for RCP 240/D allocations applicable to CPDLC.

B.3.2 RCP 400/V allocations

The RCP 400/V allocations are applicable controller-initiated communications via a radio operator using SATVOICE communications. **Figure A-2** provides an overview of the communication transaction times allocations. Actual performance is monitored and time allocations are measured against the criteria provided from C to N. The remaining allocations are targets and used only when actual performance from C-N does not meet the specified criteria.



Note: The (J to K) component includes two concurrent processes:

- (1) the aircraft and aeronautical station technically disconnect the call; which is assumed. Operationally, the call is disconnected when the flight crew and radio operator complete the call; and
- (2) the aeronautical station sends the response to the network for delivery to the ATSU; its performance is denoted by RCTP_{AS}.

Figure A-2 Overview of RCP 400/V time allocations

Editor's note 4. — The safety requirements in the following table were reviewed at IRSVTF/3 and will be editorially revised and incorporated into the RCP/400 and RSP/400 specification for SATVOICE services.

1	Controller shall be capable of contacting the aircraft.
ANSP	The ANSP shall use the aircraft address from the flight plan to contact the aircraft. The ANSP shall use 2 / HGH / Q12 priority to contact the aircraft. The ANSP shall ensure that access number(s) support the commercial SATVOICE services (e.g., Inmarsat, MTSAT, Iridium), it provides in its airspace. Note. E.g., published in AIP NOTAMs (or equivalent).
CSP/ SSP	The CSP/SSP shall ensure that the aircraft phone number is the aircraft address represented in octal code. The CSP shall ensure that the phone number for the aircraft is the aircraft address represented in octal code.
Aircraft	The aircraft shall be properly maintained to receive calls using the aircraft address represented in octal code.
Aircraft operator	The operator shall file appropriate SATVOICE capability, the aircraft address and aircraft registration in the flight plan. The operator shall ensure that the phone number for the aircraft is activated by the CSP/SSP prior to return to service.
2	Flight crew shall be capable of contacting radio operator and/or controller
ANSP	The ANSP shall provide PSTN phone numbers to SSP for short code assignment. The ANSP shall publish short code in aeronautical publications/charts.
CSP/ SSP	The SSP shall assign a unique short code for each PSTN phone number. The SSP shall provide a means to distribute short code directory to operators, ANSP and other stakeholders that subscribe to receive the directory..
Aircraft	The aircraft SATVOICE system shall be operable prior to entering airspace requiring SATVOICE services..
Aircraft operator	The operator shall ensure that flight crew has means to contact the appropriate ATSU or aeronautical station for route of flight, where .SATVOICE services are available Note. (e.g., short codes, directory dialing, speed dial). Use 2 / HGH / Q12 priority
3	Detected loss of service/equipment/or logon failure
ANSP	The ANSP shall indicate to the radio operator / controller of detected SATVOICE equipment failure. ANSP shall notify operators of service outages, degradation, restoration.
CSP/ SSP	SSPs notify their CSPs. CSPs shall notify subscribers (e.g., ANSPs, operators) of outages, degradation, restoration
Aircraft	Shall detect logon failure or equipment failure
Aircraft operator	Operator shall notify flight crew of service outages, degradation, or restoration.

4	Exceeding transaction time for response of clearance issued via radio operator
ANSP	The ATSU system shall indicate to the controller when a required response for a message sent by the ATSU is not received within the required time (ET_{TRN}).
CSP/ SSP	
Aircraft	
Aircraft operator	
5	Monitoring and alerting
ANSP	The ANSP shall be capable of detecting failures and configuration changes that would cause the communication service to no longer meet the RCP specification for the intended function. Note. –detected through post-implementation monitoring. When the communication service can no longer meet the RCP specification for the intended function, the controller shall take appropriate action. Note. Actions taken through problem reporting by crews and controllers and ANSPs/Operators taking corrective action.
CSP/ SSP	
Aircraft	
Aircraft operator	When the communication service can no longer meet the RCP specification for the intended function, the flight crew shall take appropriate action.

B.3.2.1 Air navigation service provider (ANSP)

RCP communication transaction time and continuity criteria			
Specification: RCP 400/V	Application: Controller intervention, SATVOICE		Component: ANSP
Transaction Time Parameter	ET (sec) C = 99.9%	TT (sec) C = 95%	Compliance Means
Transaction Time (A to Z)	400	350	Analysis, CSP contract/service agreement See also paragraph B.3.2.2
RCP Time Allocations			
Initiator (A to C) + (N to Z)	30	20	Analysis, simulations, safety and human factors assessments
Operational Performance (C to N)	370	330	Post-implementation monitoring, CSP contract/service agreement See also paragraph B.3.2.2
Operational Performance Time Allocations			
Queue/connect performance (F to G)	155	140	Initially, by analysis, simulations, safety human factors assessments
Call performance (H to J)	182	170	Initially, by analysis, simulations, safety human factors assessments.
RCTP (RCTP_{ATSU} + RCTP_{CSP} + RCTP_{AS} + RCTP_{AS/AIR})	33	20	Estimated, CSP contract/service agreement See also paragraph B.3.2.2
RCTP Time Allocation			
RCTP_{ATSU} (C to D) + (M to N)	4	2	Pre-implementation demonstration

RCP availability criteria				
Specification: RCP 400/V		Application: Controller intervention, SATVOICE		Component: ANSP
Availability parameter	Efficiency	Safety	Compliance means	
Service availability (A_{CSP})	N/A	0.999	Contract/service agreement terms <i>Note.</i> — For guidelines to aid in the development of the contract/service agreement with the CSP, see paragraph B.3.2.2 , RCP 400/V allocation to CSP for RCP availability criteria.	

RCP availability criteria			
Specification: RCP 400/V		Application: Controller intervention, SATVOICE	Component: ANSP
Integrity parameter	Integrity value	Compliance means	
Integrity (I)	Malfunction = 10^{-5} per flight hour	Analysis, safety requirements, development assurance level commensurate with integrity level, (compliance shown prior to operational implementation). ANSP. CSP contract/service agreement. See also RCP integrity criteria for CSP, paragraph B.2.1.2.	

RCP monitoring and alerting criteria			
Specification: RCP 400/V		Application: Controller intervention (GtA), SATVOICE	Component: ANSP
Ref:	Criteria	Compliance means	
All	<i>Note.</i> — RCP monitoring and alerting criteria related to RCP 400/D are the same as those related to RCP 240/D See GOLD, paragraph B211		

RCP related safety requirements			
Specification: RCP 400/V		Application: Controller intervention (GtA), SATVOICE	Component: ANSP
Ref	Related RCP Parameter	Safety requirement	
All	A, C, I	<i>Note.</i> — Safety requirements related to RCP 400/D are the same as those related to RCP 240/D See GOLD, paragraph B211	

B.3.2.2 Communication service provider (CSP)

RCP communication transaction time and continuity criteria			
Specification: RCP 400/V	Application: Controller intervention (GtA), SATVOICE		Component: CSP
Transaction Time Parameter	ET (sec) C = 999%	TT (sec) C = 95%	Compliance means
RCTP Time Allocation			
RCTP_{CSP} (D to E) + (K to M)	10	6	Contract/service agreement terms
RCTP_{AS} (E to F) + (J to K)	4	2	Contract/service agreement terms
RCTP_{AS/AIR} (G to H)	15	10	Contract/service agreement terms <i>Note: Criteria are shared between aircraft system, ground system and air-ground network</i>
Queue/connect performance (F to G)	155	140	Monitored, estimated, CSP contract/service agreement
Call performance (H to J)	182	170	Initially, by analysis, simulations, safety human factors assessments Post-implementation, monitored, estimated

RCP availability criteria			
Specification: RCP 400/V	Application: Controller intervention (GtA), SATVOICE		Component: CSP
Availability parameter	Efficiency	Safety	Compliance means
Service availability (A_{CSP})	N/A	0999	Contract/service agreement terms
Unplanned outage duration limit (min)	N/A	20	Contract/service agreement terms
Maximum number of unplanned outages	N/A	24	Contract/service agreement terms
Maximum accumulated unplanned outage time (min/yr)	N/A	520	Contract/service agreement terms
Unplanned outage notification delay (min)	N/A	10	Contract/service agreement terms

RCP integrity criteria		
Specification: RCP 400/V	Application: Controller intervention (GtA), SATVOICE	Component: CSP
Integrity parameter	Integrity value	Compliance means
Integrity (I)	<i>Note.</i> — RCP integrity criteria related to RCP 400/D are the same as those related to RCP 240/D See GOLD, paragraph B212	

B.3.2.3 Aircraft system

RCP communication transaction time and continuity criteria			
Specification: RCP 400/V	Application: Controller intervention (GtA), SATVOICE		Component: Aircraft system
Transaction Time Parameter	ET (sec) C = 999%	TT (sec) C = 95%	Compliance Means
RCP Time Allocation			
Operational Performance Time Allocation			
Call performance (H to J)	182	170	Human-machine interface capability, pre-implementation demonstration
RCTP Time Allocation			
RCTP _{AS/AIR} (G to H)	15	10	Pre-implementation demonstration <i>Note: Criteria are shared between aircraft system, ground system and air-ground network</i>

RCP availability criteria			
Specification: RCP 400/V	Application: Controller intervention (GtA), SATVOICE		Component: Aircraft system
Availability parameter	Efficiency	Safety	Compliance means
A _{AIR}	N/A	0999	Analysis, architecture, design, pre-implementation demonstration

RCP integrity criteria		
Specification: RCP 400/V	Application: Controller intervention (GtA), SATVOICE	Component: Aircraft system
Integrity parameter	Integrity value	Compliance means
Integrity (I)	<i>Note.</i> — RCP integrity criteria related to RCP 400/D are the same as those related to RCP 240/D See GOLD, paragraph B213	

RCP monitoring and alerting criteria		
Specification: RCP 400/V	Application: Controller intervention (GtA), SATVOICE	Component: Aircraft system
Ref:	Criteria	Compliance means
All	<i>Note.</i> — RCP monitoring and alerting criteria related to RCP specification 400/D are the same as those related to RCP 240/D See GOLD, paragraph B213	

RCP related safety requirements		
Specification: RCP 400/V	Application: Controller intervention (GtA), SATVOICE	Component: Aircraft system
Ref	Related RCP Parameter	Safety requirement
All	A, C, I	<i>Note.</i> — Safety requirements related to RCP 400/D are the same as those related to RCP 240/D See GOLD, paragraph B213

B.3.2.4 Aircraft operator

RCP communication transaction time and continuity criteria			
Specification: RCP 400/V	Application: Controller intervention (GtA), SATVOICE		Component: Aircraft operator
Transaction Time Parameter	ET (sec) C = 999%	TT (sec) C = 95%	Compliance Means
RCP Time Allocations			
Operational Performance Time Allocations			
Call performance (H to J)	182	170	Procedural capability, flight crew training and qualification in accordance with safety requirements
RCTP Time Allocation			
RCTP_{AS/AIR} (G to H)	15	10	CSP contract/service agreement Aircraft type design approval, maintenance

RCP availability criteria			
Specification: RCP 400/V	Application: Controller intervention (GtA), SATVOICE		Component: Aircraft operator
Availability parameter	Efficiency	Safety	Compliance means
A_{AIR}	N/A	0999	Aircraft type design approval, maintenance, properly configured user-modifiable software, e.g., ORT
Service availability (A_{CSP})	N/A	0999	Contract/service agreement terms <i>Note.</i> — For guidelines to aid in the development of the contract/service agreement with the CSP, see paragraph B.3.2.2 , RCP 400/D allocation to CSP for RCP availability criteria

RCP integrity criteria		
Specification: RCP 400/V	Application: Controller intervention (GtA), SATVOICE	Component: Aircraft operator
Integrity parameter	Integrity value	Compliance means
Integrity (I)	<i>Note.— RCP integrity criteria related to RCP 400/D are the same as those related to RCP 240/D See GOLD, paragraph B214</i>	

RCP monitoring and alerting criteria		
Specification: RCP 400/V	Application: Controller intervention (GtA), SATVOICE	Component: Aircraft operator
Ref:	Criteria	Compliance means
All	<i>Note.— RCP monitoring and alerting criteria related to RCP 400/D are the same as those related to RCP 240/D See GOLD, paragraph B214</i>	

RCP related safety requirements		
Specification: RCP 400/V	Application: Controller intervention (GtA), SATVOICE	Component: Aircraft operator
Ref	Related RCP Parameter	Safety requirement
All	C, I	<i>Note.— Safety requirements related to RCP 400/D are the same as those related to RCP 240/D See GOLD, paragraph B214</i>

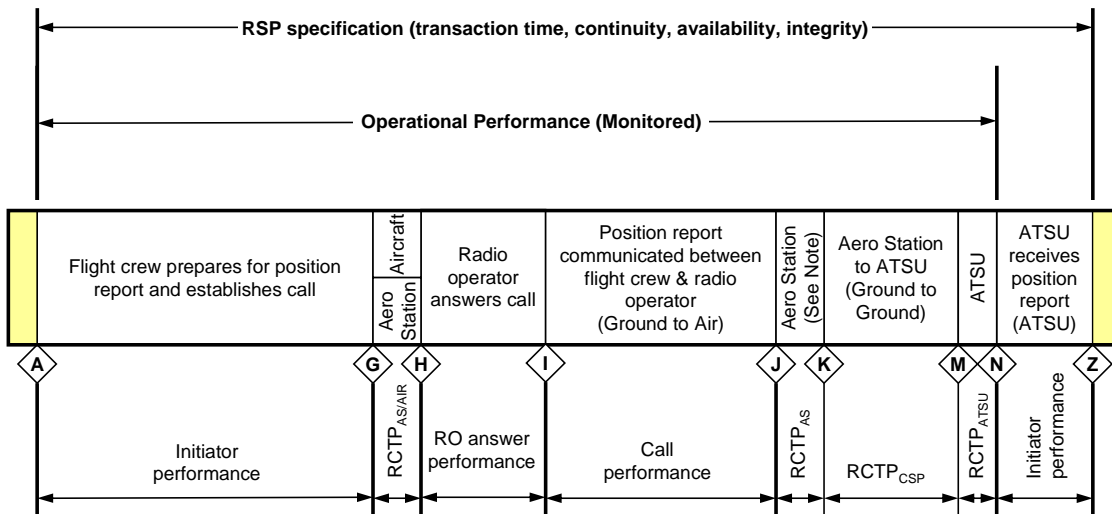
Appendix C RSP 400 specification – allocations for SATVOICE communications

Editor’s note 5. — This Appendix is still in work. See open comments in comment matrix.

This appendix provides a supplement to the RSP 400 specification provided in the First Edition of the Global Operational Data Link Document (GOLD) The supplement includes the RSP allocations for SATVOICE communications, consistent with RSP 400 “top sheet,” except that the accuracy of the time at position is +/- 30 seconds instead of +/- 1 second

C.1 Terms and definitions

Refer to GOLD, Appendix B, paragraph B1 for general terms and definitions applicable to RSP specifications This section provides additional terms and definitions to describe the RCP allocations for radio operator SATVOICE communications



Note 1: The A to G component includes time for flight crew duties at compulsory reporting points

Note 2: The (J to K) component includes two concurrent processes:

- (1) the aircraft and aeronautical station technically disconnect the call; which is assumed. Operationally, the call is disconnected when the flight crew and radio operator complete the call; and
- (2) the aeronautical station sends the response to the network for delivery to the ATSU; its performance is denoted by $RCTP_{AS}$.

Figure A- 3. Typical voice communication transaction allocation – flight crew initiated position report via a radio operator using SATVOICE communication

RSP specification	
Term	Description

C.2 RSP 180 specification

Refer to GOLD, Appendix B, paragraph B2 for RSP180 specification

C.3 RSP 400 specification

Surveillance Performance Specification				
Surveillance performance type		400		
Airspace specific considerations				
Interoperability	Specify interoperability criteria, e.g., FANS 1/A			
ATS Function	Specify ATS function(s), e.g., applicable separation standard			
Application	Specify the required surveillance capability FMC WPR or, for ADS-C, specify the types of contracts required to support the ATS function, e.g., periodic contract at [nn] min, waypoint change event contract, lateral deviation event contract at [n] NM, etc			
Surveillance parameter values				
Transit time (sec)	Continuity (C)	Availability (A)	Integrity (I)	
OT = 400	C(OT) = 0999		Navigation FOM	<i>See Note 3</i>
DT 95% = 300	C(DT 95%) = 095			Time at position accuracy
			Data integrity	Malfunction = 10^{-5} per flight hour
Surveillance monitoring and alerting criteria				
Ref	Criteria			
MA-1	The system shall be capable of detecting failures and configuration changes that would cause the ADS-C or FMC WPR service to no longer meet the surveillance parameter values for the intended function.			
MA-2	When the ADS-C or FMC WPR service can no longer meet the surveillance parameter values for the intended function, the flight crew and/or the controller shall take appropriate action.			

Notes

Note 1— Rationale for the criteria provided in this specification can be found in ICAO Annex 11, ICAO Doc 4444, ICAO Doc 9689, and RTCA DO-306/ED-122.

Note 2— If changes are made to the system capacity limits, as specified by the airspace requirements, and the changes cause the system to perform below the surveillance parameter values, this would be considered a change in system configuration.

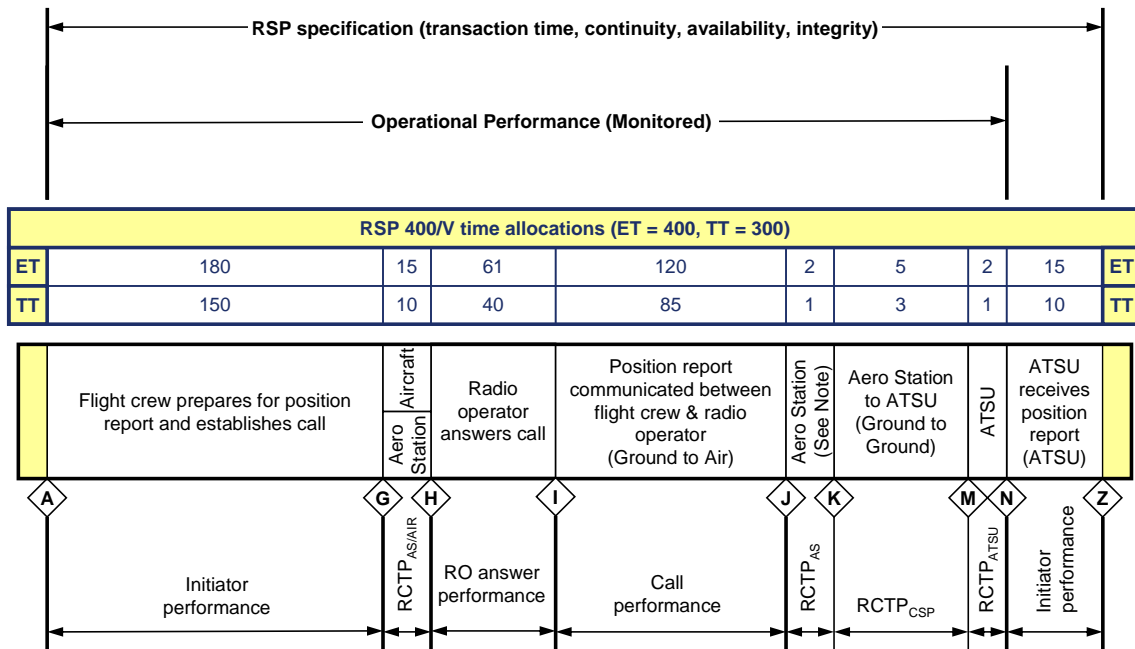
Note 3— The navigation figure of merit (FOM) is specified based on the navigation criteria associated with this spec. For example, if RNP 10 is prescribed, then for ADS-C surveillance service, the FOM level would need to be 3 or higher. In all cases, when the navigation capability no longer meets the criteria specified for the operation, the flight crew is responsible for reporting the non-compliance to ATC in accordance with ICAO procedures.

C.3.1 RSP 400/D allocations

Refer to GOLD, Appendix B, paragraph B31 for RCP 240/D allocations applicable to CPDLC.

C.3.2 RSP 400/V allocations

The RSP 400/V allocations are applicable flight crew-initiated communications via a radio operator using SATVOICE communications to report position at compulsory reporting points. **Figure A- 2** provides an overview of the communication transaction times allocations.



Note 1: The A to G component includes time for flight crew duties at compulsory reporting points

Note 2: The (J to K) component includes two concurrent processes:

- (1) the aircraft and aeronautical station technically disconnect the call; which is assumed. Operationally, the call is disconnected when the flight crew and radio operator complete the call; and
- (2) the aeronautical station sends the response to the network for delivery to the ATSU; its performance is denoted by $RCTP_{AS}$.

Figure A- 4. Overview of RSP 400/V time allocations

C.3.2.1 Air navigation service provider (ANSP)

C.3.2.2 Communication service provider (CSP)

C.3.2.3 Aircraft system

C.3.2.4 Aircraft operator

Appendix D Post-implementation monitoring

Editor's note 6. — This Appendix is still in work. See open comments in comment matrix.

The ICAO Global Plan calls for the implementation of a performance based system and ICAO Annex 11 requires that communication system performance is monitored to verify that an acceptable level of safety continues to be met. Annex 11 at paragraph 2.2.7.5 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.”

Oversight of the compliance to the Annex 11 requirements is a matter for the States. However, States participate in planning and implementation regional groups (PIRGs), and most use a regional monitoring agency to facilitate monitoring activities within their respective region. The individual states/ANSPs will need to provide the data and information and analysis that will portray regional performance measures. The ANSPs, operators, CSPs, airframe manufacturers, and equipment suppliers all need to participate in reporting and resolving problems associated among the ANSPs and with aircraft.

Monitoring of SATVOICE communications in terms of RCP is an important part of the performance based system described in the ICAO global plan. To successfully achieve this performance monitoring on a global scale will require the use of common practices and data. It is only through this common performance monitoring that RCP data can be aggregated from an ANSP level through to a regional monitoring agency level and then to global level. This aggregation of performance data is in accordance with the guidelines provided in ICAO Doc 9883 Manual on Global Performance of the Air Navigation System.

This appendix contains the following guidance material:

- a) ANSP or aeronautical station data collection and analysis - This section defines a common data reporting format. Guidance material is included on how to obtain the required data points and measure actual SATVOICE call performance.
- b) Problem reporting and resolution – This section provides guidance on the problem identification and resolution process.
- c) Regional/global performance monitoring – This section provides guidance on providing a repository for exchange actual SATVOICE communication performance and problem report/resolutions at a regional and global level.

D.1 ANSP or aeronautical station data collection and analysis

D.1.1 ANSP data collection for controller intervention via radio operator using SATVOICE

D.1.2 ANSP data collection for flight position reports via radio operator using SATVOICE

D.1.3 ANSP data collection for controller-initiated communication direct to the flight crew

D.2 Problem reporting and resolution

D.3 Regional/global performance monitoring