Satellite Voice Guidance Material (SVGM)

This edition has been approved by the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) and the North Atlantic Systems Planning Group (NAT SPG)

First Edition — 24 July 2012

International Civil Aviation Organization

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AMENDMENTS

The issue of amendments is announced by the ICAO Regional Offices concerned, which holders of this publication should consult. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

	AMENDMENTS				CORRIGENDA		
No.	Date applicable	Date entered	Entered by	No.	Date applicable	Date entered	Entered by

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FOREWORD.

1.   Historical background

1.1 The *Satellite Voice Guidance Material* (SVGM) is the result of a task force established by the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) and the North Atlantic Systems Planning Group (NAT SPG) at the request of the ICAO Air Navigation Commission (ANC) made during its 4th Meeting of the 183rd Session held on 21 January 2010.

1.2 In procedural airspace, 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 appropriate 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 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 application of new technologies. It concluded that the limitations of the existing systems are intrinsic to the systems themselves and that 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 The potential for improvement in efficiency resulting from the adoption of satellite technology was discussed at length during the Limited NAT Regional Air Navigation (LIM/NAT/RAN) Conference in Cascais, Portugal, in 1992. Although both data and voice communications were evaluated, it was recognised that data offered greater economic benefit and that the emphasis should be put on that form of communications. This was not seen as precluding the use of voice in abnormal circumstances but the use of SATCOM voice for routine communications was not seen as viable.

1.5 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 in procedural airspace. However, voice communications would continue to be required as an alternative means of ATS communications. At the same time, aircraft were equipped with SATVOICE capability.

1.6 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 NAT trials that successfully demonstrated SATVOICE could be an effective and reliable long range communication system (LRCS) to support ATS voice communications. However, there were costs associated with implementation and use.

1.7 In 2003, the 39th NAT SPG Meeting (17-19 June 2003) agreed that the *NAT Regional Supplementary Procedures (SUPPs)* (Doc 7030) needed to be amended to define the non-routine

circumstances that would justify use of SATVOICE between the flight crew and the radio operator as well as indicating that emergency communications should be with the ATC facilities. Work was also started on removing the NAT-specific provisions that prevented use of SATVOICE for routine communications.

1.8 In 2008, the 44th Meeting of the NAT SPG (17-20 June 2008) agreed that 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. This work resulted in NAT SPG Conclusion 45/28 endorsing a proposal for amendment to the NAT SUPPS Doc 7030 that removed the above-mentioned provision.

1.9 Some State authorities had granted aircraft 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. Aircraft operators were seeking MEL dispatch relief of one HF radio with no time limits by demonstrating that a SATVOICE system was a viable LRCS.

1.10 In 2010, the ICAO ANC having reviewed the progress of the NAT SPG SATVOICE studies, requested that an ICAO inter-regional task force be established to develop globally applicable *Satellite Voice Guidance Material* (SVGM) in support of the global implementation of aeronautical mobile satellite (route) communications systems (AMS(R)S). Consistent with ICAO's *Global Air Navigation Plan (Doc 9750)*, this guidance material has been developed within the global ICAO required communication performance (RCP) framework. The guidance material also takes account of the required surveillance performance (RSP) framework as detailed in the *Global Operational Data Link Document (GOLD)*. and required surveillance performance (RSP) framework to provide States with flexibility to apply different standards for different uses, without implication to seamless operations.

1.11 This edition of the *Satellite Voice Guidance Material (SVGM)* provides a comprehensive update of various regional and State guidance material for ANSPs and aircraft operators to use SATVOICE for ATS communications. This includes the incorporation of performance-based specifications to be applied, where appropriate (i.e. RCP for controller intervention and RSP for position reporting), as well as associated guidance on data collection, monitoring, and analysis. This guidance material will aid the appropriate authority in establishing its policies on MEL regarding the number and type of LRCS on board the aircraft, taking into account the SATVOICE infrastructure along the flight and airspace communication requirements. 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 SVGM 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. It also includes an appendix

that provides a high level concept of operations and considerations for the 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 performance based 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 for ATS communications, but assumes aircraft equipage and ground infrastructure will continue to maintain HF voice capability.

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, 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 implemented 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 air traffic services to international air navigation.

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)   Global Air Navigation Plan (Doc 9750)

r)   Manual on Required Communication Performance (RCP) (ICAO Doc 9869);

s)   Global Operational Data Link Document (GOLD);

t)   Manual on the Aeronautical Mobile Satellite (Route) Service (ICAO Doc 9925);

u)   ANSI/ASA S3.2-2009, Method for Measuring the Intelligibility of Speech Over Communication Systems;

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

w)   RTCA DO-262A, Minimum Operational Performance Standards for Avionics Supporting Next Generation Satellite Systems (NGSS);

x)   ARINC 741, Aviation Satellite Communication System ;

y)   ARINC 761, Second Generation Aviation Satellite Communication System, Aircraft Installation Provisions;

z)   ARINC 781, Mark 3 Aviation Satellite Communication System;

aa) FAA TSO-159C – Avionics Supporting Next Generation Satellite Systems (NGSS); and

bb) 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 change proposals.

A change proposal can be submitted by any stakeholder participating in SATVOICE operations. The stakeholder should submit a change proposal to their ICAO Regional Office. The ICAO Regional Office will coordinate the change proposal 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 change proposal, the guidance document would be amended to incorporate the approved proposals.

8.   Amendments to the SVGM

Amendment	Source(s)	Subject(s)	Approved applicable
1st Edition (2012)	Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/23 – 2012)	*Satellite Voice Guidance Material* (SVGM)	Applicable within participating Regions on 1 October 2012.

North Atlantic Implemenation
Management Group (NAT
IMG) on behalf of the NAT
Systems Planning Group
(NAT IMG/41 – 2012)

Chapter 1.   Definitions

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 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 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.*

ATS surveillance service. A term used to indicate service provided directly by means of an ATS surveillance system. (ICAO)

Continuity (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.— Continuity for $RCTP_{AS/AIR}$ is the proportion of calls that, once set up, are not dropped. The actual continuity measurement would exclude calls not set up owing to network congestion, aircraft busy conditions, faulty aircraft equipment, aircraft not in level flight, aircraft outside the coverage area, and aircraft not logged on. These conditions are considerations for assessing availability.*

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.

Term

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

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

C for RSTP$_{AS}$. The proportion of surveillance messages that can be delivered within the specified RSTP$_{AS}$.

C for RSTP$_{AS/AIR}$. The proportion of surveillance messages that can be delivered within the specified RSTP$_{AS/AIR}$.

   Note.— Continuity for RSTP$_{AS/AIR}$ is the proportion of calls that, once set up, are not dropped. The actual continuity measurement would exclude calls not set up owing to network congestion, aircraft busy conditions, faulty aircraft equipment, aircraft not in level flight, aircraft outside the coverage area, and aircraft not logged on. These conditions are considerations for assessing availability.

C for RSTP$_{ATSU}$. The proportion of surveillance messages that can be delivered within the specified RSTP$_{ATSU}$.

C for RSTP$_{CSP}$. The proportion of surveillance messages that can be delivered within the specified RSTP$_{CSP}$.

C for operational performance. The proportion of clearance transactions that can be completed or position reports that can be delivered within the specified operational performance time.

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

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)

Term

Current flight plan. (See flight plan).

Diagnostic Rhyme Test (DRT). A test and scoring system for speech intelligibility using trained listeners to distinguish a standard set of word-pairs with initial consonants that sound somewhat similar. (ANSI/ASA S3.2-2009)

Note.— Speech intelligibility is a vital factor in aeronautical safety communications. The DRT is specifically designed to test intelligibility of speech using trained listeners to distinguish a standard set of word-pairs with initial consonants that sound somewhat similar (e.g, goat/coat). They are then played the same word pairs processed through the condition (e.g, codec) under test and the success rate is scored. Intelligibility is largely dependent on consonant recognition; vowel recognition is less important. The target users for aeronautical communications are, as for the DRT listening panels, trained listeners (pilots, air traffic controllers) who use standard phrases.

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)

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 manual. A manual, associated with the certificate of airworthiness, containing limitations within which the aircraft is to be considered airworthy, and instructions and information necessary to the flight crew members for the safe operation of the aircraft. (ICAO)

Term

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.

Grade of service. The rate at which calls are rejected due to network congestion.

Note.— Grade of service is a criterion for specifying service availability.

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)

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.

Term

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)

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

Note 1.— For voice communications used for intervention, operational performance comprises RCTP, queue/connect performance and call performance.

Note 2,— For voice communications used for position reporting, operational performance comprises RSTP, initiator performance, radio operator answer performance and call performance.

Note 3.— The operational performance is the post-implementation monitored 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 ground initiated calling service used. Calling Line Identification (caller ID) is just a substitute for the radio operator not having to dial the PIN number for ground initiated 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.

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.

Term

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 call performance. The operational portion of a communication from when an indication of an incoming call begins to when the parties on the call have completed the communication and the radio operator sends the message to the ATSU.

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 1 out of 1,000 or 5 out of 100 calls for ET 99.9% and TT 95%, respectively, 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.

RCP initiator performance. The operational portion of the transaction time for the controller to compile the voice clearance message and send it to the radio operator.

Note.— RCP initiator performance is from when the controller needs to send a clearance to when the controller sends it to the radio operator.

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 intelligibility of the voice transaction and the extent to which the parties could potentially misunderstand the communication.

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 400) that provides the values assigned to RCP parameters for communication transaction time, continuity, availability and integrity, and allocations to ANSP, aircraft, CSP and aircraft 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 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 set up a ground-to-air call.

Note.— 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 RCTP$_{ATSU}$, RCTP$_{AS}$, RCTP$_{AS/AIR}$ and RCTP$_{CSP}$.

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.

Required surveillance performance (RSP). A statement of the performance requirements for operational surveillance in support of specific ATM functions.

Required surveillance technical performance (RSTP). The portion of the (position reporting) transaction time that does not include the human times for message composition, operational response, and recognition of the operational response.

Note.— For voice communications, RSTP comprises RSTP$_{ATSU}$, RSTP$_{AS}$, RSTP$_{AS/AIR}$ and RSTP$_{CSP}$.

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).

RSP answer performance. The operational portion of the transaction time to represent when the radio operator is able to answer the incoming call given the other duties that the radio operator may concurrently be performing.

Note.— RSP answer performance is from when the telephone at the radio operator indicates an incoming call to when the call is actually picked up.

RSP availability (A). The required probability that surveillance information can be provided 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.

RSP call performance. The operational portion of a communication from when the radio operator answers an incoming call to when the parties on the call have completed the communication and the radio operator sends the message to the ATSU.

Term

RSP continuity (C). The required probability that surveillance information can be delivered within the RSP delivery time parameter, either OT or DT 95%, given that the service was available at the start of delivery.

Note.— For voice communications, this translates into 1 out of 1,000 calls or 5 out of 100 calls not being able to conclude their voice delivery within the allotted time (OT or DT 95%, respectively) or the call could be disconnected for any reason, including aircraft maneuvers, switching satellites or any loss of service while on the call.

RSP initiator performance. The operational portion of the transaction time to prepare the operational response, and includes the necessary flight deck tasks to compile the voice message position report, finding & selecting the SATVOICE number (e.g. short code) from the aircraft's telephone directory, confirming the correct priority for the call and pressing the "call/send" button.

Note.— RSP initiator performance is from when the flight crew has reached their designated reporting point to when the last digit (call/send) button is pushed in the aircraft to initiate the call.

RSP integrity (I). The required probability that the surveillance information is delivered with no undetected errors.

Note 1.— RSP 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 intelligibility of the voice transaction and the extent to which the parties could potentially misunderstand the communication.

RSP nominal delivery time (DT 95%). The maximum nominal time within which 95% of surveillance information is required to be successfully delivered.

RSP overdue delivery time (OT). The maximum time for the successful delivery of surveillance information after which the initiator is required to revert to an alternative procedure.

RSP specification. A specification (e.g. RSP 400) that represents the values assigned to RSP parameters for communication transaction time, continuity, availability and integrity, and allocations to ANSP, aircraft, CSP/SSP and aircraft operator.

RSTP$_{AS}$. The overdue (OD) or nominal (DT) transit time for surveillance information 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 communication; and

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

Term

$RSTP_{AS/AIR}$. The overdue (OD) or nominal (DT) transit time for surveillance information allocated to the air-ground network and associated aircraft components to initiate an air-to-ground call.

Note.— $RSTP_{AS/AIR}$ begins when the last digit of the dialing sequence is finished and ends when the radio operator receives an indication of an incoming call.

$RSTP_{ATSU}$. The overdue (OD) or nominal (DT) transit time for surveillance information from the CSP interface to the ATSU's flight data processing system.

$RSTP_{CSP}$. The overdue (OD) or nominal (DT) transit time for surveillance information allocated to the CSP.

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.

Surveillance data. Information pertaining to the identification of aircraft and/or obstructions for route conformance monitoring and safety and efficient conduct of flight.

Note.— In this document, surveillance data applies to voice position reports similar in nature to HF voice position reports, except it is conducted using SATVOICE.

Term

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).

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)

ATM   Air traffic management (ICAO)

ANSP   Air navigation service provider

ATS   Air traffic service (ICAO)

ATSU   ATS unit

C   Continuity

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)
DCPC	Direct controller pilot communications
DRT	Diagnostic rhyme test (ANSI/ASA S3.2-2009)
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
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
RSP	Required surveillance performance
RSTP	Required surveillance technical 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 ATS communications, in accordance with AIPs (or equivalent publication), Doc 7030 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; and

c)   when prescribed, while operating in an HF air-ground communications environment, the flight crew operates SELCAL or maintains a listening watch on the assigned HF frequency.

2.1.2   Dedicated SATVOICE numbers for aeronautical stations and air traffic services units (ATSUs) are published in AIPs (or equivalent publication) where a SATVOICE service is available.

2.1.3   SATVOICE provides a means of reducing the risk of communication failures, improving safety and efficiency of operations and alleviating HF/VHF channel congestion. SATVOICE can improve current ATS communications via a radio operator and provide direct controller-pilot communications (DCPC) for more efficient ATS communications, such as in processing negotiations or requests from the flight crew.

2.1.4   SATVOICE could potentially be considered a LRCS as defined by State MMEL/MEL policies. When approving reduced carriage requirements for HF radio, States may allow aircraft to operate with only one serviceable HF radio. However, airspace requirements will take precedence over the MMEL/MEL requirements. This guidance material may facilitate alignment of airspace requirements with State (or Regional) MMEL/MEL policies and LRCS requirements (See also **paragraph 3.3.2**).

Note 1.— HF voice is the only LRCS currently available for ATC communications in many areas. Therefore, this guidance material assumes that in areas requiring two operational LRCSs, at least one will need to be HF voice, and in areas requiring one LRCS, that system will need to be HF voice.

Note 2.— In procedural airspace where CPDLC and ADS-C is available and the aircraft is capable, the controller would normally choose CPDLC and ADS-C as the means of communication. However, the controller may choose to use SATVOICE for DCPC, when necessary, as opposed to relaying through the radio operator. SATVOICE is not a replacement for ADS-C/CPDLC or HF/VHF voice via a radio operator.

Note 3.— This guidance material does not address the use of portable SATVOICE phones, which are not allowed by national regulations of many States.

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. **Appendix A** provides a high level future concept of operations and considerations for the development of future SATVOICE systems.

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 radio frequency 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 aircraft operator(s).
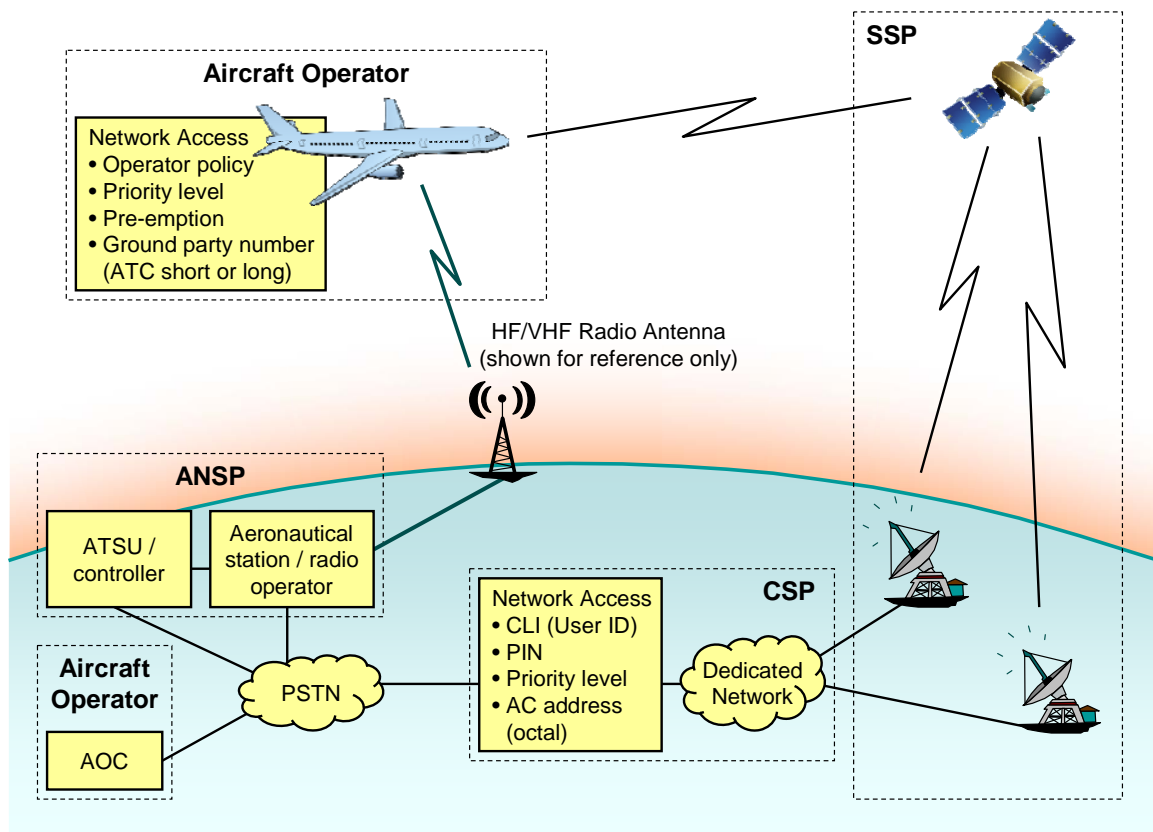
Figure 2-1.   Aeronautical SATVOICE system overview

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 4,700 km (2,900 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 1,616 MHz to 1,626.5 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 to minimize the effects of rain fade.

2.3.3   Iridium's new constellation, referred to as Iridium Next, 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 to properly equipped aircraft.

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 footprint 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 and receive 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 to properly equipped aircraft.

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.

2.5.2   MTSAT consists of two satellites in a hot spare configuration. MTSAT-1R provides the primary communications link and if 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, 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 United States-based telephone number. Some CSPs may implement network extensions for local 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 only];

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 maintained in a data base that is correlated with 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 an 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 weather deviation
2 / HGH / Q12 Operational High (second highest) Safety of Flight	Flight safety Typically assigned to calls for ANSP.	Altitude request
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 SATVOICE number consists of an octal representation of the aircraft address, which is provided in the flight plan expressed in the form of an alphanumerical 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.

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 ground initiated calls will have to route through a network access switch via an access number.
User ID [Iridium only]	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.

Step	Description
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.
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 SATVOICE number (e.g. 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 aircraft 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. For the SATVOICE number, 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 for the SATVOICE number 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 Annex 10, Volume II, also contains standards for the "supervision" of the communication services by the appropriate authority designated by the State. Annex 11, paragraph 2.27.4, Note 2, 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 communication services are negotiated, as depicted in **Figure 3-1**, the ANSP or aircraft operator should demonstrate to the appropriate authority that proper mechanisms exist to oversee the contracted CSP.
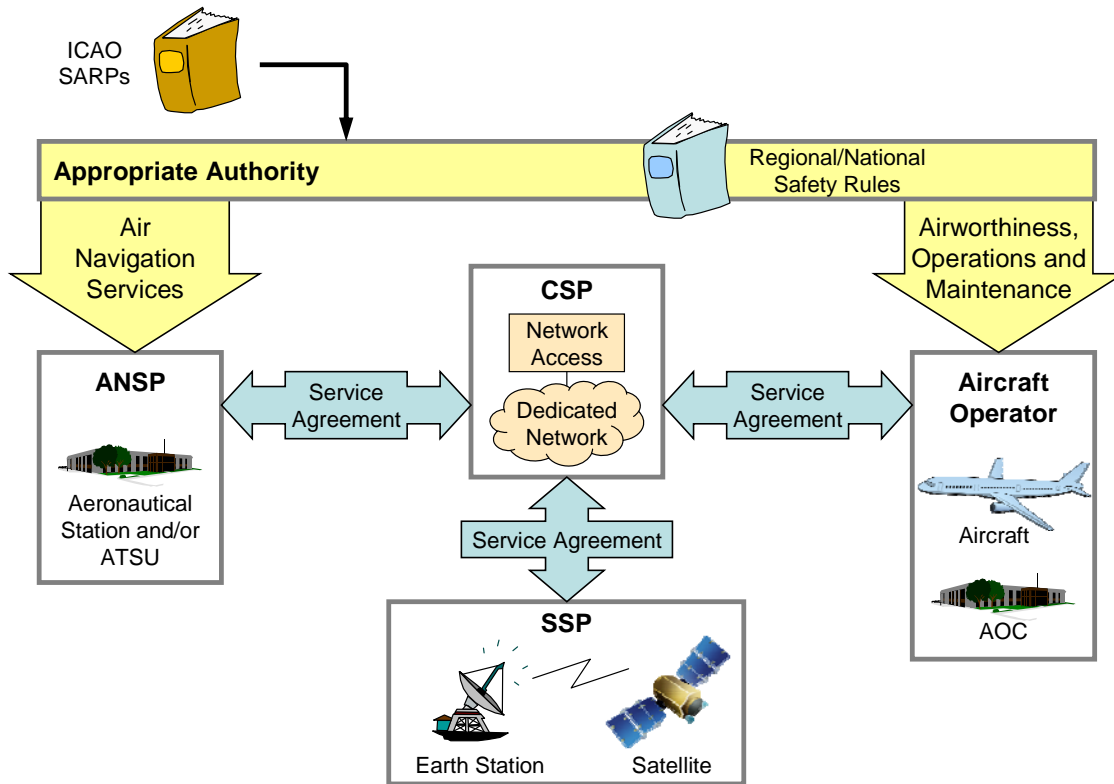
Figure 3-1.   SATVOICE communication services contracted by organizations

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 7030, Doc 9432 and Annex 10, Volume II.

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   When SATVOICE is intended to be used to provide an intervention and/or surveillance capability in support of an ATS service that is subject to a specified RCP or RSP, the ANSP should ensure that the SATVOICE services it provides meets the performance specifications provided at **Appendix B** for RCP specifications and **Appendix C** for RSP specifications, and that its aeronautical stations, ATSUs, CSPs and SSPs meet their performance allocations under expected capacity and loading conditions.

Note.— Per Doc 9869, paragraph 3.2.7, RCP-400 is intended to be applicable to the SATVOICE capability for controller intervention. RSP-400, which is an adaptation of the RCP concept defined in Doc 9869 and the operational performance criteria defined in the GOLD, is intended to be applicable to the SATVOICE capability for surveillance.

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 ATSUs/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 ensure that the SATVOICE services provided by its ATSUs, aeronautical stations, CSP(s) and SSP(s) meet applicable safety requirements. Where SATVOICE is subject to performance specifications provided in **Appendix B** and **Appendix C**, **Appendix D** provides guidance on post-implementation monitoring, problem reporting, analysis and corrective action.

3.2.2.7   In accordance with Annex 11, paragraph 6.1.1.2 and 6.1.1.3, and Annex 10, Volume II, paragraph 3.1.1.5, the ANSP should determine recording requirements and ensure that its ATSUs, aeronautical stations, CSP(s) and SSPs, as appropriate, 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.

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)   SATVOICE number(s) for each air traffic services unit and aeronautical station equipped to receive SATVOICE calls ;

b)   Requirements for use (e.g. criteria for when to contact the ATS unit or aeronautical station); and

c)   Flight planning requirements.

3.2.3.2   The ANSP should establish procedures to provide aeronautical stations, ATS units and aircraft operators with notifications of SATVOICE service outages, performance degradation, and restoration.

*Note.— See **paragraph 3.2.5.5** for CSP guidance to provide notifications, as appropriate. For example, based on notifications received from CSP, the ANSP would use NOTAMs for short term notifications and AIP (or equivalent publication) for longer term notifications. Per Annex 10, Volume II, NOTAMs are required for planned system shutdown of the communications network.*

3.2.3.3   When the controller uses SATVOICE for DCPC, the ANSP may need to establish interfacility agreements with the aeronautical station concerning coordination of communications with the aircraft. If applicable, such agreements should specify whether and how ATC clearances and instructions provided via DCPC should be copied to the aeronautical station for their information.

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).

Note.— This document considers that sufficient HF/VHF voice infrastructure will remain in service and that the aircraft will be equipped with at least one operational HF/VHF voice system.

3.2.4.2   When supporting SATVOICE, the aeronautical station/ATSU should establish procedures and/or provide ATC automation, networks and infrastructure that allow 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)   Provide SATVOICE services in accordance with **Chapter 4**;

c)   Dial the appropriate access number(s);

d)   Prioritize, preempt and establish precedence on an outgoing SATVOICE call using the personal identification number (PIN) for networks, priority level accordance with **Table 2-1**, and SATVOICE number for the aircraft converted from the aircraft address obtained from the flight plan;

e)   Receive a SATVOICE call from an aircraft and route the call to the appropriate radio operator/controller;

f)   If CLI is used to display an incoming SATVOICE call, display the aircraft identification to the radio operator/controller;

g)   Report in-service difficulties and to resolve identified problems; and

h)   Exchange air traffic control information in accordance with any interfacility agreements as per **paragraph 3.2.3.3**.

Note.— Concerning item c), if the aircraft address is not available from the flight plan, the SATVOICE number may be determined by a database lookup using the aircraft registration as the key. However, in such cases, if the octal code/aircraft registration is not in the data base or the octal code/aircraft registration changes after that last data base update, the SATVOICE number may not be obtainable.

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.

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**.

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 in accordance with procedures established by the ANSP and/or aircraft operator.

3.2.5.6   For those situations when SATVOICE communication services cannot continue to be provided, the CSP should inform the involved ANSPs, aircraft operators and, if appropriate, aeronautical data providers.

3.2.5.7   The CSP should ensure service agreements, such as with the SSP as shown in **Figure 3-1**, 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.

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** and provides an indication of the priority level of the call to the recipient's system.

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   When using SATVOICE equipment, the aircraft operator should address flight crew training and qualification, maintenance, MEL, user modifiable software and service agreements with the CSP. In addition, the aircraft operator should ensure that aircraft equipment has been approved, and that the AIP (or equivalent publication) indicates that the SATVOICE service has been approved for the intended use 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.*

3.3.2   Long range communication systems (LRCS) to be carried on board

3.3.2.1   The State of the Operator and/or State of Registry establish the minimum number of LRCSs to be carried on board. In principle, where two LRCSs are required, one SATVOICE system and

one HF voice system could be approved for flight operations 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 is considering rules and means of compliance 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 that allows one HF communication system, if the SATVOICE system is approved as a LRCS.

3.3.2.2   When intending to use SATVOICE to satisfy requirements for communications equipage, the aircraft operator should ensure that installed equipment is 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.— For example, the State of Design is the FAA for the United States and EASA for European Union States.

3.3.2.3   The aircraft operator should establish a Minimum Equipment List (MEL), based upon, but no less restrictive than the relevant MMEL. The aircraft operator obtains approval of the MEL from the State of the Operator or State of Registry.

Note.— For example, 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 aircraft operator should establish policy and procedures for flight crews and other staff (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) Flight manual 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 SATVOICE per **paragraph 3.4**;

e)   Procedures for SATVOICE operations taking into account 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. See **Appendix D, section D.2** for additional guidance on problem reporting and resolution.

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

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 aircraft 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 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 SATVOICE system on 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 aircraft operator should negotiate the requirements for SATVOICE services in service agreements with their CSP(s) that meet the guidelines in **paragraph 3.2.5**.

3.3.3.6   When SATVOICE is intended to be used to provide an intervention and/or surveillance capability in support of an ATS service that is subject to a specified RCP or RSP, the aircraft operator should ensure that its SATVOICE operations meet the requirements allocated to the aircraft operator per performance specifications provided at **Appendix B** and **Appendix C**.

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). When SATVOICE is intended to be used to provide an intervention and/or surveillance capability in support of an ATS service that is subject to a specified RCP or RSP, the requirements allocated to the aircraft system per performance specifications provided at **Appendix B** and **Appendix C**, 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 legacy 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 5.1.4**.

3.3.4.2   If CLI function is provided, the SATVOICE equipment should translate the reported number and 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 calls should be restricted to the flight deck. If the aircraft SATVOICE system does not restrict incoming calls, the SATVOICE system should provide an indication (aural or visual) for the flight crew to confirm the call priority level.

Note 1.— The SATVOICE equipment may configure the flight deck default priority to level 3 / LOW / Q10 or allow the flight crew to select priority level 1 / EMG / Q15 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).

Note 2.— Some aircraft operators may have aircraft that allow public calls to be routed to the flight deck. See **paragraph 5.3.2** *for guidance on flight deck procedures that apply to these aircraft.*

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

a)   override the default priority level when making a call, unless the aircraft SATCOM system provides the appropriate priority level(s) with the SATVOICE number for the aeronautical station, ATSU or AOC for access by the flight crew; and

b)   preempt a passenger cabin 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 for the SATVOICE system. Specifically, the aircraft manufacturer should:

a)   verify that the installation will enable the flight crew to easily initiate and receive calls;

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;

g)   evaluate other systems, as necessary, to show the SATVOICE system does not interfere with their operation; and

h)   determine whether the SATVOICE system can be used within acceptable workload limits.

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

a)   a description of normal and non-normal procedures for the use of the system, including what actions are expected by the flight crew for each case; and

b)   criteria and intended uses that provide 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   After Amendment 1 becomes applicable, the aircraft operator should insert the appropriate indication(s), as follows:

a)   in item 10, insert one or more of "M1" for an INMARSAT RTF capability, "M2" for an MTSAT RTF capability and/or "M3" for an Iridium RTF capability; and .

b)   insert in Item 18, insert:

1)   the indicator REG/ followed by the aircraft registration; and

2)   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.

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/CFIUV EET/EINN0204 SEL/FQHS CODE/C0173E)

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, the radio operator or controller should follow RTF conventions identical to HF/VHF communications in accordance with applicable standards and regulations pertaining to aeronautical communications,

Note.   In addition to State and/or Regional standards and requirements, RTF conventions are defined in, for example, Annex 10, Volume II, Chapter 5, Doc 4444, Chapter 12, Doc 9432 and Doc 8400. The communication procedures and examples contained in this document further clarify radio operator and controller procedures when using SATVOICE.

4.1.2   The controller or radio operator should always use full radiotelephony call sign when establishing communication. The controller or radio operator should consider the response, using the calling aeronautical station's call sign followed by the answering aeronautical station's call sign, as the invitation to proceed with transmission by the station calling.

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

4.1.3   After contact has been established, the controller or radio operator should permit continuous two-way communication without further identification until termination of the call, except when the call is between more than 2 parties (see **paragraph 4.2.1.3**). Furthermore, when issuing ATC clearances and receiving readbacks for such clearances, the controller or radio operator should adhere to the rules set in Annex 10 Volume II, chapter 5, paragraph 5.2.1.7.3 Radiotelephony Procedures.

4.1.4   When communication between flight crew and ATS is routed via a radio operator, the controller procedures with a radio operator should be the same regardless of the means of communication (e.g. VHF, HF, or SATVOICE) the radio operator uses to communicate with the aircraft.

4.1.5   The controller may use SATVOICE to establish 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 of communication, whereas others may accept routine uses. The ANSP will notify aircraft operators of SATVOICE services provided by the controller per AIP (or equivalent publication).

4.1.6   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 (e.g. Iridium, Inmarsat, or MTSAT) and determine the appropriate access number(s) to contact the aircraft;

b)   Derive the SATVOICE number from the information contained in the CODE sub-field of item 18 of the flight plan.

Note.— If the aircraft address is not available from the flight plan, the SATVOICE number may be determined by a database lookup using the aircraft registration as the key. However, in such cases, if the

octal code/aircraft registration is not in the data base or the octal code/aircraft registration changes after that last data base update, the SATVOICE number may not be obtainable.

   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.-- See paragraphs **4.1.2**, **4.1.3** and **5.1.4** for guidance on the use of call-sign and readback.*

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, <message response>
Controller	United 863, Oakland Center, <acknowledgement>, <issue communication instructions>, OUT

4.2.1.2   If an ATS unit recognizes that an aircraft is in imminent danger, an ATC instruction 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 deliver the ATC instruction 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.

   *Note.-- See paragraphs **4.1.2**, **4.1.3** and **5.1.4** for guidance on the use of call-sign and readback.*

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, \<message response\>
Controller	Air France 465, Auckland Centre, \<acknowledgement\>, \<issue communication 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.

*Note.—   When using SATVOICE services to conduct conference calls, it is important that the controller/radio operator and flight crew adhere to proper RTF conventions to mitigate potential confusion owing to inherent delays in SATVOICE transmissions. See paragraphs **4.1.2**, **4.1.3** and **5.1.4** for guidance on the use of call-sign and readback.*

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 20 miles 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 5 miles 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 flight level 300, 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 communication
                    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.
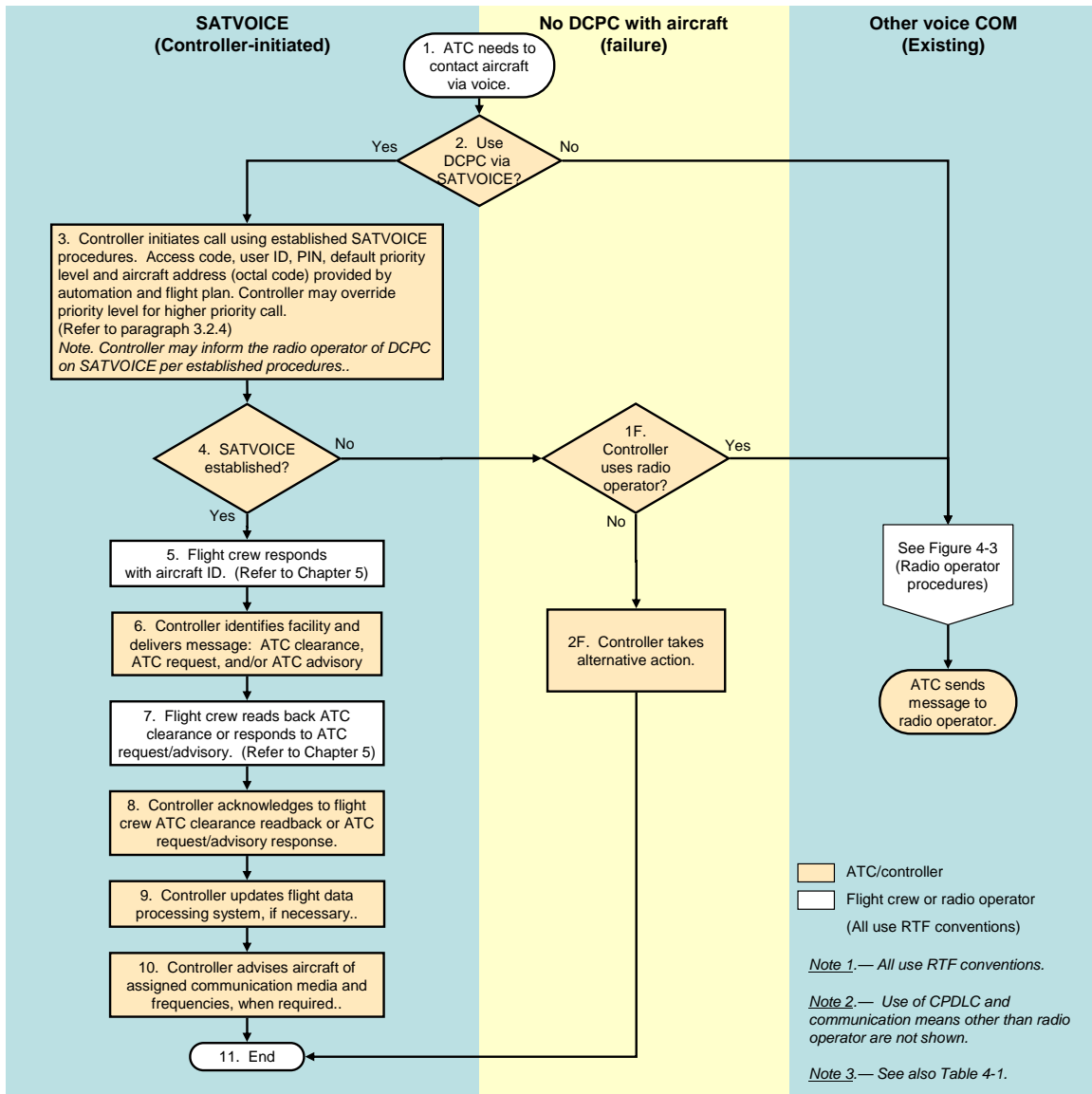

Figure 4-1.   **Controller-initiated to flight crew SATVOICE call procedures**

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 appropriate to contact aircraft using DCPC via SATVOICE. Otherwise, the controller uses the radio operator.
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**). *Note.— Controller may inform the radio operator of DCPC on SATVOICE per agreements and established procedures per **paragraph 3.2.3.3**.*
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. *Note.— 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 by stating the aircraft identification/callsign (Refer to **Chapter 5**).
6	Controller identifies facility and delivers message • 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 as soon as practicable, if necessary.

Ref	Controller-initiated Communication Process	What is done
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).
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**, **Table 4-2** and **Table 2-1**).

4.2.2.2   When receiving a SATVOICE call, the controller should:

a)   answer the call by stating the facility designation;

b)   receive the aircraft identification and message;

c)   state the aircraft identification, the facility designation and respond appropriately to the flight;

d)   acknowledge message; read back the message or selected contents, as required; and;

e)   advise the aircraft as to the assigned communications media and frequencies, if necessary, upon termination of the SATVOICE call, when required.

Note.-- *See paragraphs **4.1.2**, **4.1.3** and **5.1.4** for guidance on the use of call-sign and readback.*

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\> or \<acknowledgement\>, \<issue communication instructions\>, OUT
Flight crew	New York Center, Speedbird 255, \<message response\>
Controller	Speedbird 255, New York Center, \<acknowledgement\>, \<issue communication instructions\>, OUT
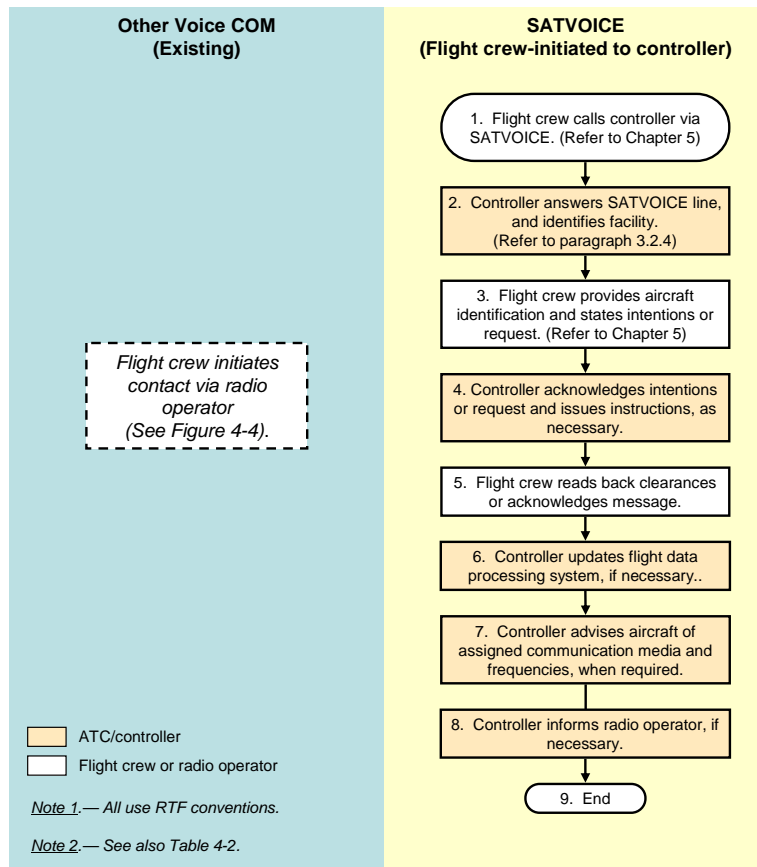
Figure 4-2. Controller receives SATVOICE call procedures

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.
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 as soon as practicable, 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 instructions on behalf of the 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 instructions, the radio operator will use 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.

Note.-- *See paragraphs **4.1.2**, **4.1.3** and **5.1.4** for guidance on the use of call-sign and readback.*

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, <message response>
Radio operator	Air France 465, Gander Radio, <acknowledgement>, <issue communication instructions>, OUT

4.3.1.2   If a radio facility or ATS unit recognizes that an aircraft is in imminent danger, an ATC instruction is urgent or delivery time is critical, the radio operator or controller should use the most expeditious means of communications. If SATVOICE is used as the first attempt, the radio operator 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 deliver the ATC instruction to the aircraft as part of the initial communication. If

unable to contact the aircraft via SATVOICE, then the radio operator 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.

Note.-- See paragraphs **4.1.2**, **4.1.3** and **5.1.4** for guidance on the use of call-sign and readback.

Example:

Radio operator	<Initiates call and line rings in flight deck>
Flight crew	Air France 465
Radio operator	Air France 465, Gander Radio, Due to traffic, ATC clears <message>
Flight crew	Gander Radio, Air France 465, <message response>
Radio operator	Air France 465, Gander Radio, <acknowledgement>, <issue communication instructions>, 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.
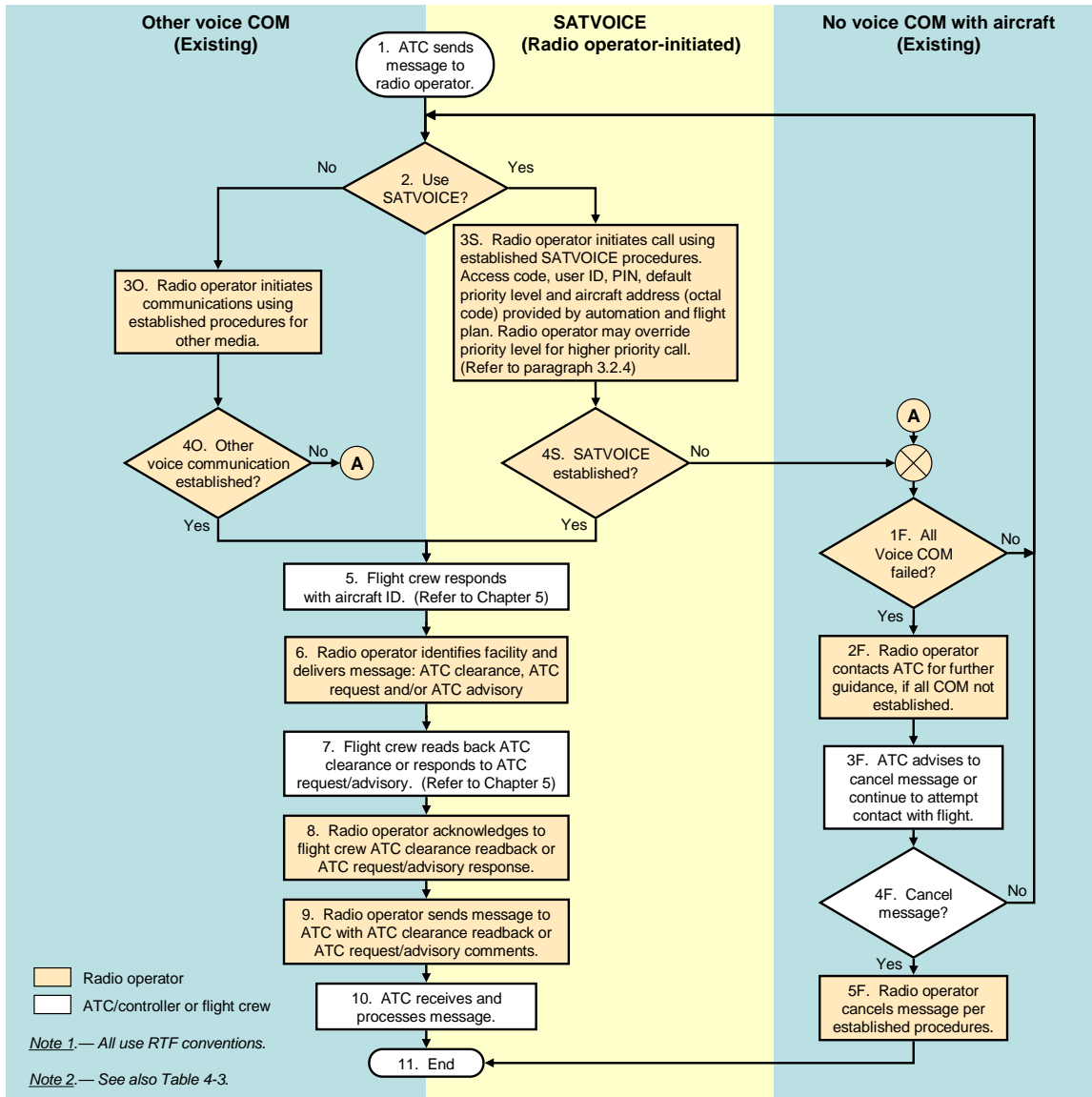
Figure 4-3.   Radio operator-initiated to flight crew SATVOICE call procedures

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?	Decision point – This decision occurs when: • 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. 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. The radio operator decides to attempt contact with the aircraft using SATVOICE or other voice COM capabilities.
3S 3O	Radio operator initiates call with aircraft using SATVOICE.	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**). *Note.— The radio operator may have initiated communications using established procedures for other media (Ref Step 3O) (e.g. HF or VHF voice).*
4S 4O	SATVOICE established?	Decision point – The radio operator establishes communications 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. *Note.— 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.*
5	Flight crew responds with aircraft identification.	The flight crew answers the call and responds by stating the aircraft identification (Refer to **Chapter 5**).

Ref	Radio operator-initiated call communication process	What is done
6	Radio operator delivers message: • 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   When a SATVOICE call is received 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**).

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/VHF frequencies and ensure flight establishes HF/VHF and SELCAL check, when required by the appropriate ATS authority.

Note.-- See paragraphs **4.1.2**, **4.1.3** *and* **5.1.4** *for guidance on the use of call-sign and readback.*

Example:

Flight crew	<Initiates call and line rings at aero radio>
Radio operator	Shanwick Radio
Flight crew	Shanwick Radio, Speedbird 255, <message>
Radio operator	Speedbird 255, Shanwick Radio, <message response> or <acknowledgement>, <issue communication instructions>, OUT
Flight crew	Shanwick Radio, Speedbird 255, <message response>
Radio operator	Shanwick Radio, <acknowledgement>, <issue communication instructions> 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/VHF 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.
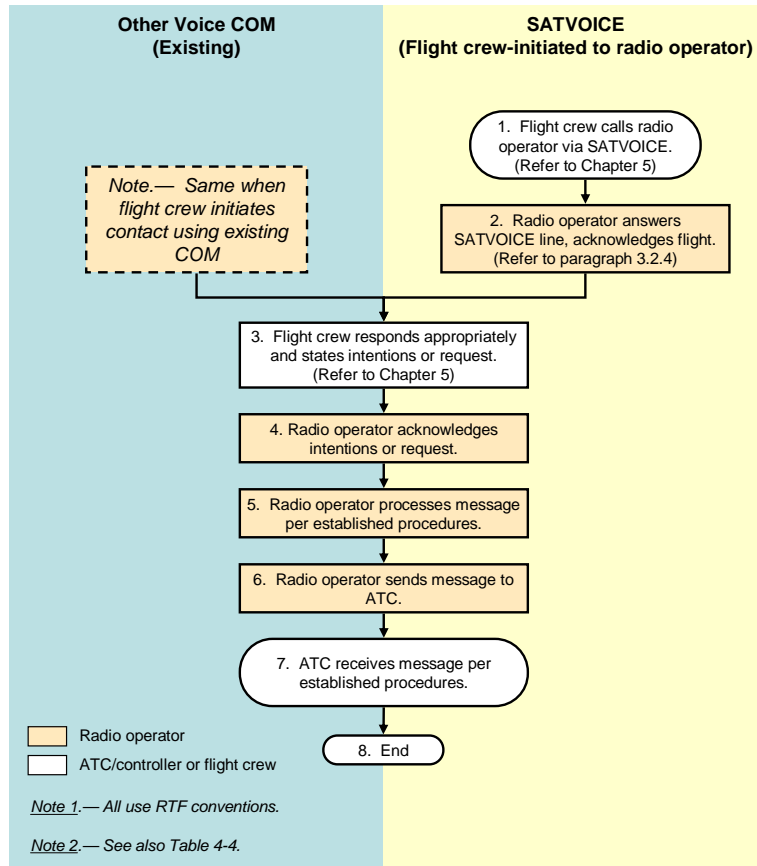
Figure 4-4.   Radio operator receives SATVOICE call procedures

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, (Refer to **Chapter 5**)	Flight crew calls the radio operator via SATVOICE.
2	Radio operator answers SATVOICE line; acknowledges flight (Refer to **paragraph 3.2.4**	Radio operator answers the call by stating the facility designation..
3	Flight crew responds appropriately and states intentions or request (Refer to **Chapter 5**)	Flight crew restates facility designation, provides aircraft identification and states intentions or request, which could be an initial check-in, a guard change, a request, or to provide a position report.

Ref	Incoming SATVOICE call communication process	What is done
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   Communication failures

4.4.1   Loss of SATVOICE Connection

4.4.1.1   If the SATVOICE connection is lost during a communication, the party that initiated the original call should initiate the process to reestablish communications.

4.4.2   Notification of SATVOICE aircraft failure

4.4.2.1   When the flight crew contacts the aeronautical station to notify ATC (and/or AOC) of changes to aircraft SATVOICE capability per **paragraph 5.4.2.1**, the radio operator should relay that information as requested by the flight crew.

Chapter 5.   Flight crew procedures

5.1   General

5.1.1   An aircraft 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 SATVOICE or HF/VHF 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   The aircraft operator should ensure the aircraft SATVOICE system installation complies with criteria of **paragraph 3.3.4**, and procedures/training programs are established in accordance with **section 3.3**.

5.1.3   Although the underlying technology lends itself to a conversational mode of communications, such use can create misunderstanding and confusion. Therefore, when using SATVOICE, the flight crew should follow RTF conventions identical to HF/VHF communications in accordance with applicable standards and regulations pertaining to aeronautical communications.

Note.   In addition to State and/or Regional standards and requirements, RTF conventions are defined in, for example, Annex 10, Volume II, Chapter 5, Doc 4444, Chapter 12, Doc 9432 and Doc 8400. The communication procedures and examples contained in this document further clarify radio operator and controller procedures when using SATVOICE.

5.1.4   The flight crew should read back safety-related parts of certain ATC clearances and instructions as listed in Doc 4444, paragraph 4.5.7.5. The flight crew should acknowledge other clearances and instructions in a manner to clearly indicate that they have been understood and will be complied with.

5.1.5   When SATVOICE is required for the flight, such as for extended operations or to meet airspace communication requirements, then during pre-flight or prior to entry into the relevant airspace, 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**.*

5.1.6   If a call is dropped during a communication, the party that initiated the original call should initiate the process to reestablish communications.

5.1.7   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/VHF voice, in accordance with applicable airworthiness, operating and airspace requirements.

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

5.1.9   If a SELCAL check is required before or after entering a FIR, the flight crew should request a SELCAL check in accordance with ICAO Annex 10, Volume II, paragraph 5.2.4.

5.2   Flight crew-initiated SATVOICE call

5.2.1   The SATVOICE numbers (e.g. short codes) for aeronautical stations and ATSUs are published in State AIPs and some charts. SATVOICE numbers together with the appropriate priority level may be stored in an aircraft SATVOICE system for easy access by the flight crew.

5.2.2   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 1.— 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.*

*Note 2.-- See paragraphs **4.1.2**, **4.1.3** and **5.1.4** for guidance on the use of call-sign and readback.*

Example:

	<line rings at aeronautical station>
Radio operator	Arctic Radio
Flight crew	Arctic Radio, Continental 99, <message>
Radio operator	Continental 99 Arctic Radio, <message response> or <acknowledgement>, OUT
Flight crew	Arctic Radio, Continental 99, <message response>
Radio operator	Continental 99, Arctic Radio, <acknowledgement>
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 5.1.3**).

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 1.— The aircraft SATVOICE system may configure the flight deck default priority to level 3 / LOW / Q10 or allow the flight crew to select priority level 1 / EMG / Q15 for outgoing AOC calls, and accept incoming AOC calls at level 3 / LOW / Q10 or level 1 / EMG / Q15.

Note 2.— 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   Contingencies

5.4.1   SATVOICE busy signal or no answer

5.4.1.1   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.

5.4.2   Aircraft SATVOICE system failure

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

a)   revert to other means of communication; and

b)   notify ATC of the SATVOICE failure per established procedures.

Note.— The flight crew may request the aeronautical station to notify their AOC of the SATVOICE failure.

Appendix A   Future SATVOICE concept of operation and considerations

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 including ATS and AOC communications. ANSPs, aircraft operators, CSPs, SSPs, and other relevant parties are encouraged to use this guidance material to ensure current implementations comply with the SARPS and PANS for SATVOICE services and uses.

The uses of CPDLC and ADS-C are increasing and seen as supporting a more efficient and safer air traffic management. However, SATVOICE can provide a complement to further enhance safety and efficiency. In most cases, aircraft that are equipped with CPDLC and ADS-C are also equipped with SATVOICE. Aircraft that are not equipped CPLDC and ADS-C may still be equipped with SATVOICE. SATVOICE provides an interactive communication capability with greater flexibility than data link to communicate in some situations, such as in negotiating flight crew requests or in emergency and non-routine situations. SATVOICE can diversify the means a radio operator uses to communicate with an aircraft, improving overall reliability, and it can also provide DCPC. However, this document is only intended to facilitate harmonization in the provision and use of SATVOICE and does not address cost and benefit.

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" (SDAP) 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 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 and group call broadcast function.

f)   Means for the flight crew to initiate a call to a facility by reference to its facility name or facility code rather than a PSTN phone number or a 6 digit short code.

g)   Clarification and/or standardization on the nomenclature of priority levels and their use. Consider dedicating priority 2 / HGH / Q12 for ATC use only and if the flight crew or AOC had a justifiable urgent call, then 1 / EMG / Q15 would be a valid use. See **Table 2-1**.

Appendix B   RCP specifications – allocations for SATVOICE communications

This appendix provides a supplement to the RCP 400 specification provided in the Global Operational Data Link Document (GOLD) and is applicable when SATVOICE is intended to be used to provide an intervention and/or surveillance capability in support of an ATS service that is subject to a specified RCP. The supplement includes the RCP allocations for SATVOICE communications, consistent with the RCP 400 operational performance specification provided in **paragraph B.3**. The RCP 400 specification, provided by Doc 9869, provides performance-based criteria based on intervention capabilities. The $/V_{RO}$ designator is used in this specification to indicate the RCP allocations associated with controller intervention via a radio operator and $/V_{ATO}$ designator is reserved for RCP allocations associated with controller intervention via DCPC. As it is difficult to compare the actual performance of different technologies, the RCP 400 operational performance 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. **Figure B- 1** provides a model of a typical voice communication transaction allocation for controller-initiated communication via a radio operator using SATVOICE communication.
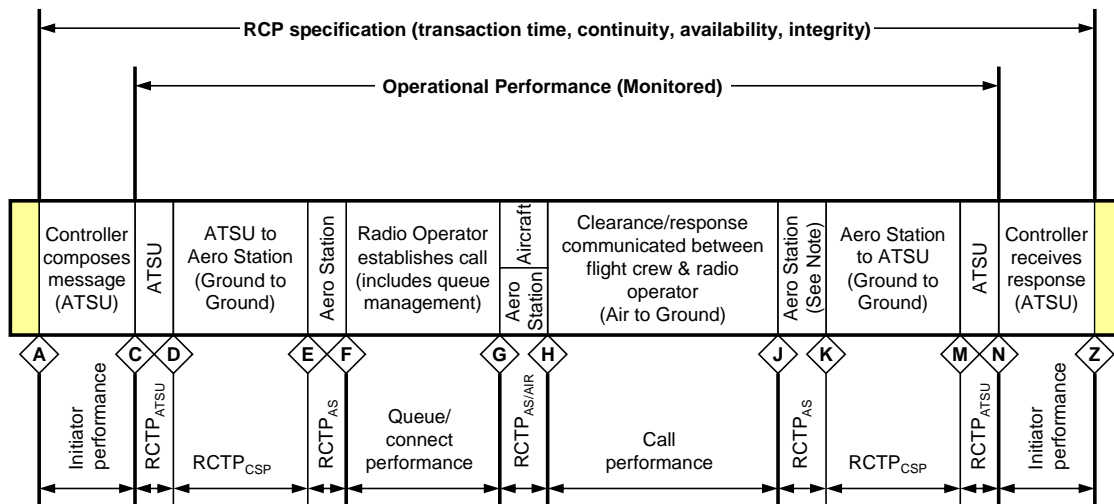
Note: The (J to K) component includes two concurrent processes:

(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 B- 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)	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. Voice communications: This translates into 1 out of 1,000 or 5 out of 100 calls for ET 99.9% and TT 95%, respectively, 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 availability (A)	The required probability that an operational communication transaction can be initiated when needed. 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 specification	
Term	**Description**
RCP integrity (I)	The required probability that an operational communication transaction is completed with no undetected errors. _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._ Voice communications: This translates to the intelligibility of the voice transaction and the extent to which the parties could potentially misunderstand the communication.

RCP /V_{RO} transaction time	
Term	**Description**
Operational performance (monitored)	The portion of the transaction time (used for intervention) that does not include the times for message composition or recognition of the operational response. Voice communications: Operational Performance (C to N) = RCTP+ Queue/Connect Performance (F to G) + Call Performance (H to J)
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. Voice communications: $RCTP = RTCP_{ATSU} + RCTP_{AS} + RCTP_{AS/AIR} + RCTP_{CSP}$
RCP initiator performance	The operational portion of the transaction time for the controller to compile the voice clearance message and send it to the radio operator. Voice communications: Initiator performance = (A to C), where "A" denotes when the time that the controller needs to send a clearance and "C" denotes when the controller sends the message to the radio operator.

RCP /V_{RO} transaction time	
Term	**Description**
Call performance	The operational portion of a communication from when an indication of an incoming call begins to when the parties on the call have completed the communication and the radio operator sends the message to ATSU. 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 parties on the call operationally complete the call and the radio operator sends the message to the ATSU.
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. 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.
RCTP$_{ATSU}$	The summed critical transit times for an ATC intervention message and a response message, allocated to the ATSU system. Voice communications: 　RCTP$_{ATSU}$ = (C to D) + (M to N)
RCTP$_{CSP}$	The summed critical transit times for an ATC intervention message and a response message, allocated to the CSP system. Voice communications: 　RCTP$_{CSP}$ = (D to E) + (K to M)
RCTP$_{AS/AIR}$	The technical time for the air-ground network and associated components to set up a ground-to-air call. Voice communications: 　RCTP$_{AS/AIR}$ = (G 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.

RCP /V_{RO} transaction time	
Term	**Description**
$RCTP_{AS}$	The summed critical transit times for an ATC intervention message and a response message allocated to the aeronautical station. Voice communications: $RCTP_{AS}$ = (E to F) + (J to K), where (J to K) 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 ATSU via the ground-ground network; the performance is denoted by $RCTP_{AS}$.

RCP continuity	
Term	**Description**
C for operational performance	The proportion of clearance transactions that can be completed within the specified operational performance time. Voice communications: Continuity would take into consideration any dropped calls.
C for RCTP	The proportion of intervention messages and responses that can be delivered within the specified RCTP for intervention. 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 $RCTP_{ATSU}$ for intervention.
C for $RCTP_{CSP}$	The proportion of intervention messages and responses that can be delivered within the specified $RCTP_{CSP}$ for intervention.

RCP continuity	
Term	**Description**
C for RCTP$_{AS/AIR}$	The proportion of intervention messages and responses that can be delivered within the specified RCTP$_{AS/AIR}$ for intervention. Voice communications: The proportion of calls that, once set up, are not dropped. The actual continuity measurement would exclude calls not set up owing to network congestion, aircraft busy conditions, faulty aircraft equipment, aircraft not in level flight, aircraft outside the coverage area, and aircraft not logged on. These conditions are considerations for assessing availability.
C for RTCP$_{AS}$	The proportion of intervention messages and responses that can be delivered within the specified RCTP$_{AS}$ for intervention.

RCP 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. *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.*
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. *Note.— The actual aircraft system availability is computed assuming that the service is available in the relevant airspace.*
Grade of service	The rate at which calls are rejected due to network congestion.

RCP integrity	
Term	**Description**
Diagnostic Rhyme Test (DRT)	A test and scoring system for speech intelligibility using trained listeners to distinguish a standard set of word-pairs with initial consonants that sound somewhat similar. (ANSI/ASA S3.2-2009) *Note 1.— Speech intelligibility is a vital factor in aeronautical safety communications. The DRT is specifically designed to test intelligibility of speech using trained listeners to distinguish a standard set of word-pairs with initial consonants that sound somewhat similar (e.g. goat/coat). They are then played the same word pairs processed through the condition (e.g. codec) under test and the success rate is scored. Intelligibility is largely dependent on consonant recognition; vowel recognition is less important. The target users for aeronautical communications are, as for the DRT listening panels, trained listeners (pilots, air traffic controllers) who use standard phrases.*

B.2   RCP 240 specification

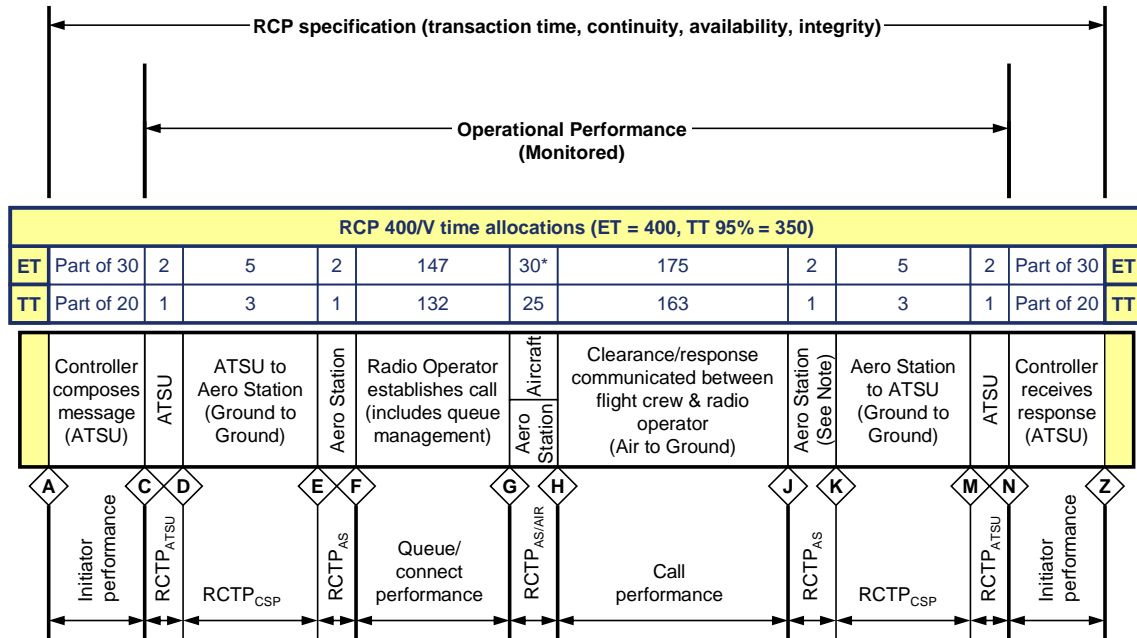(reserved)

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

B.3.1 (reserved)

B.3.2 RCP 400/V_{RO} allocations

The RCP 400/V_{RO} allocations are applicable controller-initiated communications via a radio operator using SATVOICE communications. **Figure B- 2** provides an overview of the communication transaction

time allocations for RCP 400/V$_{RO}$. 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.

Figure B- 2   Overview of RCP 400/V$_{RO}$ time allocations

Table B- 1 provides safety requirements related to the RCP parameters for the RCP 400/V$_{RO}$ specification. The allocation of these requirements to ANSP, CSP/SSP, aircraft SATVOICE system and the aircraft operator are provided in the relevant sections of the specification.

Table B- 1 Safety requirements related to RCP 400/V$_{RO}$ parameters

Reference	Related RCP Parameter	RCP safety requirements
SR-1	A, C	The controller shall be capable of contacting the aircraft.
SR-2	A, C	The flight crew shall be capable of contacting the radio operator and/or controller.
SR-3	I	The ANSP and aircraft operator shall ensure adequate means to mitigate against voice communication errors leading to incorrect execution of clearances.
SR-4	A, C, I	The SATVOICE system shall be capable of detecting loss of service, equipment failures and/or logon failures and provide indication to the controller / radio operator or flight crew of system status.
SR-5	C, ET	The ATSU system shall provide an indication to the controller when the transaction time for response of clearance issued via radio operator exceeds the specified time (ET$_{TRN}$).
SR-6	All	The ANSP and aircraft operator shall ensure means are in place to monitor for compliance to RCP specification and provide alert(s) for appropriate action.

B.3.2.1   Air navigation service provider (ANSP)

Note 1.— The ANSP includes the specification criteria allocated to the aeronautical station.

Note 2.— Automation may employ autodial capability, data bases and other features to meet performance specifications.

RCP communication transaction time and continuity criteria			
Specification: RCP 400/V$_{RO}$	**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/SSP 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.

RCP communication transaction time and continuity criteria			
Specification: RCP 400/V$_{RO}$	**Application: Controller intervention, SATVOICE**		**Component: ANSP**
Transaction Time Parameter	**ET (sec) C = 99.9%**	**TT (sec) C = 95%**	**Compliance Means**
Operational Performance (C to N)	370	330	Post-implementation monitoring, CSP/SSP contract/service agreement. See also **paragraph B.3.2.2**.
Operational Performance Time Allocations			
Queue/connect performance (F to G)	147	132	Initially, by analysis, simulations, safety human factors assessments.
Call performance (H to J)	175	163	Initially, by analysis, simulations, safety human factors assessments.
RCTP (RCTP$_{ATSU}$ + RCTP$_{CSP}$ + RCTP$_{AS}$ + RCTP$_{AS/AIR}$)	48	35	Estimated, CSP/SSP contract/service agreement. See **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$_{RO}$	**Application: Controller intervention, SATVOICE**		**Component: ANSP**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Service availability (A$_{CSP/SSP}$)	N/A	0.999	Contract/service agreement terms *Note.— For guidelines to aid in the development of the contract/service agreement with the CSP/SSP, see **paragraph B.3.2.2**, RCP 400/V$_{RO}$ allocation to CSP/SSP for RCP availability criteria.*

RCP integrity criteria		
Specification: RCP 400/V$_{RO}$	**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). See related safety requirements **SR-3** and **SR-4** for the ANSP. CSP/SSP contract/service agreement. See RCP integrity criteria for CSP/SSP, **paragraph B.3.2.2**.

RCP monitoring and alerting criteria		
Specification: RCP 400/V$_{RO}$	**Application: Controller intervention, SATVOICE**	**Component: ANSP**
Ref	**Criteria**	**Compliance means**
CMA-1 **CMA-2**	*Note.— RCP monitoring and alerting criteria are specified by safety requirements allocated to the ANSP for **SR-6***.	Review.

RCP related safety requirements		
Specification: RCP 400/V$_{RO}$	**Application: Controller intervention, SATVOICE**	**Component: ANSP**
Ref	**Related RCP Parameter**	**Safety requirement**
SR-1	A, C	a) The ANSP shall use the aircraft address from the flight plan to contact the aircraft. b) The ANSP shall use 2 / HGH / Q12 priority to contact the aircraft. c) The ANSP shall ensure that access number(s) support the commercial SATVOICE services (e.g. Inmarsat, MTSAT, Iridium) it provides in its airspace.
SR-2	A, C	a) The ANSP shall provide PSTN phone numbers to SSP for short code assignment. b) The ANSP shall publish its SATVOICE number(s) (e.g. short code(s)) for its ATSUs and aeronautical stations in aeronautical publications/charts.
SR-3	I	a) The ANSP shall establish procedures that use RTF conventions and provide training for the controller. b) The ANSP shall ensure the SATVOICE system at its aeronautical stations and ATSUs provide a DRT score of at least 85 when measured in accordance with ANSI/ASA S3.2-2009 in a jet transport aircraft noise environment. c) The ANSP shall ensure that its CSP/SSP maintains acceptable voice call quality for contracted SATVOICE services.
SR-4	A, C, I	a) The ANSP shall indicate to the radio operator / controller of detected SATVOICE equipment failure. b) ANSP shall notify operators of service outages, degradation and restoration by NOTAM (or equivalent publication).
SR-5	C, ET	a) 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$_{TRN}$).
SR-6	All	a) 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 uses. b) The ANSP shall ensure that when the communication service can no longer meet the RCP specification for the intended uses, the controller shall take appropriate action. *Note.— Compliance with the RCP specification is determined by initial approvals of system components, compliance with safety requirements, and means for the flight crew and controller to report problems and for ANSPs to conduct post-implementation monitoring, analysis and corrective actions.*

B.3.2.2   Communication/satellite service provider (CSP/SSP)

RCP communication transaction time and continuity criteria				
Specification: RCP 400/V$_{RO}$	**Application: Controller intervention, SATVOICE**		**Component: CSP/SSP**	
Transaction Time Parameter	**ET (sec) C = 99.9%**	**IT (sec) C = 99%**	**TT (sec) C = 95%**	**Compliance means**
RCTP Time Allocation	44	[Not defined]	33	Contract/service agreement terms.
RCTP$_{CSP}$ (D to E) + (K to M)	10	[Not defined]	6	Contract/service agreement terms.
RCTP$_{AS}$ (E to F) + (J to K)	4	[Not defined]	2	Contract/service agreement terms.
RCTP$_{AS/AIR}$ (G to H)	[Not defined]	30	25	Contract/service agreement terms. *Note: Criteria are shared between aircraft system, ground system and air-ground network*

RCP availability criteria			
Specification: RCP 400/V$_{RO}$	**Application: Controller intervention, SATVOICE**		**Component: CSP/SSP**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Service availability (A$_{CSP/SSP}$)	N/A	0.999	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.
Grade of service	N/A	1%	Contract/service agreement terms. *Note.— This value is the same as that defined in Annex 10.*

RCP integrity criteria		
Specification: RCP 400/V$_{RO}$	Application: Controller intervention, SATVOICE	Component: CSP/SSP
Integrity parameter	Integrity value	Compliance means
Integrity (I)	[not defined]	Pre-implementation demonstration and contract/service agreement terms. *Note.— RCP integrity criteria are specified by safety requirements allocated to the CSP/SSP for **SR-3** and **SR-4**.*

RCP related safety requirements		
Specification: RCP 400/V$_{RO}$	Application: Controller intervention, SATVOICE	Component: CSP/SSP
Ref	Related RCP Parameter	Safety requirement
SR-1	A, C	a) The CSP/SSP shall ensure that the aircraft SATVOICE number is the aircraft address represented in octal code.
SR-2	A, C	a) The CSP/SSP shall assign a unique short code for each PSTN phone number. b) The CSP/SSP shall provide a means to distribute a SATVOICE number (e.g. short code, direct dial) directory to operators, ANSP and other stakeholders that subscribe to receive the directory.
SR-3	I	a) The CSP/SSP shall ensure the SATVOICE network provides a DRT score of at least 85 when measured in accordance with ANSI/ASA S3.2-2009 in a jet transport aircraft noise environment.
SR-4	A, C, I	a) The SSP shall notify its CSPs of outages, degradation and restoration. b) The CSP shall notify its subscribers (e.g. ANSPs, operators) of outages, degradation and restoration.
SR-5	C, ET	[Not applicable]
SR-6	All	a) The CSP/SSP shall provide notification to its ANSP and aircraft operator subscribers of any service impairment that would cause the SATVOICE service to no longer comply with the RCP specification.

B.3.2.3   Aircraft system

RCP communication transaction time and continuity criteria				
Specification: RCP 400/V$_{RO}$	**Application: Controller intervention, SATVOICE**		**Component: Aircraft system**	
Transaction Time Parameter	**ET (sec) C = 99.9%**	**IT (sec) C = 99%**	**TT (sec) C = 95%**	**Compliance Means**
Operational Performance Time Allocation				
Call performance (H to J)	175	[Not defined]	163	Human-machine interface capability, pre-implementation demonstration
RCTP Time Allocation				
RCTP$_{AS/AIR}$ **(G to H)**	[Not defined]	30	25	Pre-implementation demonstration _Note: Criteria are shared between aircraft system, ground system and air-ground network_

RCP availability criteria			
Specification: RCP 400/V$_{RO}$	**Application: Controller intervention, SATVOICE**		**Component: Aircraft system**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
A$_{AIR}$	N/A	0.999	Analysis, architecture, design, pre-implementation demonstration

RCP integrity criteria		
Specification: RCP 400/V$_{RO}$	**Application: Controller intervention, SATVOICE**	**Component: Aircraft system**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	Malfunction = 10^{-3} per flight hour	Design approval of aircraft system. Analysis, safety requirements, development assurance level (e.g. Level D software), commensurate with integrity level, pre-implementation demonstration. _Note.— RCP integrity criteria are specified by safety requirements allocated to the aircraft system for **SR-3** and **SR-4**._

RCP monitoring and alerting criteria		
Specification: RCP 400/V$_{RO}$	**Application: Controller intervention, SATVOICE**	**Component: Aircraft system**
Ref	**Criteria**	**Compliance means**
CMA-1 **CMA-2**	*Note.— RCP monitoring and alerting criteria are specified by safety requirements allocated to the aircraft system for **SR-6**.*	

RCP related safety requirements		
Specification: RCP 400/V$_{RO}$	**Application: Controller intervention, SATVOICE**	**Component: Aircraft system**
Ref	**Related RCP Parameter**	**Safety requirement**
SR-1	A, C	a) The aircraft SATVOICE system shall be properly maintained to receive calls with 2 / HGH / Q12 priority level and using the aircraft address represented in octal code.
SR-2	A, C	a) The aircraft SATVOICE system shall be operable prior to entering airspace where SATVOICE is used to meet LRCS requirements.
SR-3	I	a) The aircraft SATVOICE system shall provide a DRT score of at least 85 when measured in accordance with ANSI/ASA S3.2-2009 in a jet transport aircraft noise environment.
SR-4	A, C, I	a) The aircraft SATVOICE system shall detect logon failure and equipment failure and provide the appropriate indication to the flight crew.
SR-5	C, ET	[Not applicable]
SR-6	All	a) The aircraft SATVOICE system shall provide indication(s) for the flight crew to determine when the aircraft SATVOICE system or logon failures would cause the system to no longer comply with the RCP specification.

B.3.2.4   Aircraft operator

RCP communication transaction time and continuity criteria				
Specification: RCP 400/V$_{RO}$	**Application: Controller intervention, SATVOICE**		**Component: Aircraft operator**	
Transaction Time Parameter	**ET (sec) C = 99.9%**	**IT (sec) C = 99%**	**TT (sec) C = 95%**	**Compliance Means**
Operational Performance Time Allocations				
Call performance (H to J)	175	[Not defined]	163	Procedural capability, flight crew training and qualification in accordance with safety requirements.
RCTP Time Allocation				
RCTP$_{AS/AIR}$ (G to H)	[Not defined]	30	25	CSP/SSP contract/service agreement, aircraft type design approval and maintenance.

RCP availability criteria			
Specification: RCP 400/V$_{RO}$	**Application: Controller intervention, SATVOICE**		**Component: Aircraft operator**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
A$_{AIR}$	N/A	0.999	Aircraft type design approval, maintenance and properly configured user-modifiable software (e.g. ORT).
Service availability (A$_{CSP/SSP}$)	N/A	0.999	Contract/service agreement terms. *Note.— For guidelines to aid in the development of the contract/service agreement with the CSP/SSP, see **paragraph B.3.2.2**, RCP 400/D allocation to CSP/SSP for RCP availability criteria.*

RCP integrity criteria		
Specification: RCP 400/V$_{RO}$	**Application: Controller intervention, SATVOICE**	**Component: Aircraft operator**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	Malfunction = 10^{-5} per flight hour	Review of procedures, training programs, and qualification to meet safety requirements. Design approval of aircraft SATVOICE system. CSP/SSP contract/service agreement. *Note.— RCP integrity criteria are specified by safety requirements allocated to the aircraft operator for **SR-3** and **SR-4**. See also RSP integrity criteria for the aircraft system, **paragraph C.3.2.3**, and the CSP/SSP, **paragraph C.3.2.2**.*

RCP monitoring and alerting criteria		
Specification: RCP 400/V$_{RO}$	**Application: Controller intervention, SATVOICE**	**Component: Aircraft operator**
Ref	**Criteria**	**Compliance means**
CMA-1 **CMA-2**	*Note.— RCP monitoring and alerting criteria are specified by safety requirements allocated to the aircraft system for **SR-6**.*	

RCP related safety requirements		
Specification: RCP 400/V$_{RO}$	**Application: Controller intervention, SATVOICE**	**Component: Aircraft operator**
Ref	**Related RCP Parameter**	**Safety requirement**
SR-1	A, C	a) The aircraft operator shall file appropriate SATVOICE capability, the aircraft address and aircraft registration in the flight plan. b) The operator shall ensure that the phone number for the aircraft is activated by the CSP/SSP prior to return to service.
SR-2	A, C	a) The aircraft 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. b) The aircraft operator shall ensure the flight crew uses 2 / HGH / Q12 priority.
SR-3	I	a) The aircraft operator shall establish procedures that use RTF conventions and provide training for the flight crew. b) The aircraft operator shall ensure that its CSP/SSP maintains acceptable voice call quality for contracted SATVOICE services.
SR-4	A, C, I	a) The aircraft operator shall notify flight crew of service outages, degradation, or restoration.

RCP related safety requirements		
Specification: RCP 400/V$_{RO}$	**Application: Controller intervention, SATVOICE**	**Component: Aircraft operator**
Ref	**Related RCP Parameter**	**Safety requirement**
SR-5	C, ET	[Not applicable]
SR-6	All	a) The aircraft operator shall ensure that when the aircraft SATVOICE system fails such that it can no longer meet the RCP specification for the intended uses, the flight crew shall take appropriate action.

B.3.3 RCP 400/V$_{ATC}$ allocations

(reserved)

Appendix C   RSP specifications – allocations for SATVOICE communications

This appendix provides a supplement to the RSP 400 specification provided in the Global Operational Data Link Document (GOLD) and is applicable when SATVOICE is intended to be used to provide an intervention and/or surveillance capability in support of an ATS service that is subject to a specified RSP. The supplement includes the RSP allocations for SATVOICE communications, consistent with the RSP 400 operational performance specification provided in **paragraph C.3**. As it is difficult to compare the actual performance of different technologies, the RSP 400 operational performance specification provides a common basis for assessing SATVOICE capability or any new technology that may emerge, including data link capabilities such as ADS-C.

These specifications support:

   a)   Safety oversight of air traffic service provisions and operations;

   b)   Agreements/contractual arrangements that air traffic service providers and aircraft operators make with their respective CSP/SSP(s);

   c)   Operational authorizations, flight crew training and qualification;

   d)   Design approval of aircraft SATVOICE systems; and

   e)   Operational-monitoring, analysis, and exchange of operational data among regions and states.
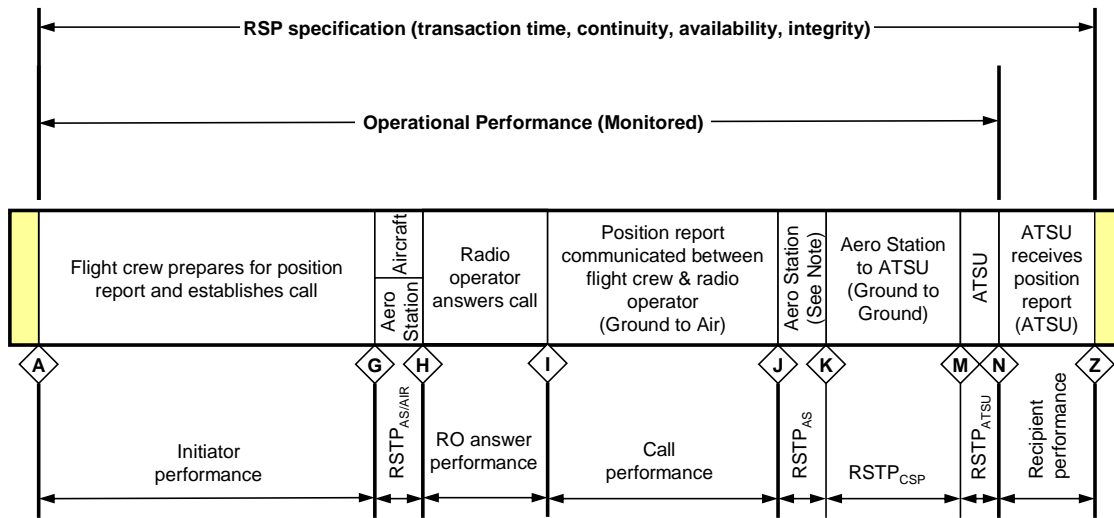
In situations where it has been determined to be beneficial, the RSP specifications may include criteria to support orderly flow of air traffic.

The specifications provide a means of compliance, in general. Additional guidance related to service provision, aircraft approval and operational authorizations can be found in **Chapter 3**. Guidance and requirements on post-implementation monitoring can be found at **Appendix D**.

The RSP specifications include allocations when using SATVOICE via a radio operator. The /V$_{RO}$ designator is used to indicate the RSP allocations associated with voice position reporting via a radio operator and /V$_{ATO}$ designator is reserved for RSP allocations associated with position reporting direct to the controller.

C.1   Terms and definitions

Refer to GOLD, Appendix B, paragraph B.1 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. **Figure C- 1** provides a model of a typical voice communication transaction allocation for a flight crew initiated position report via a radio operator using SATVOICE communication.

Figure C- 1.   Typical voice communication transaction allocation – flight crew initiated position report via a radio operator using SATVOICE communication

RSP specification	
Term	**Description**
ATS surveillance service	A term used to indicate service provided directly by means of an ATS surveillance system. (ICAO)
Surveillance data	Information pertaining to the identification of aircraft and/or obstructions for route conformance monitoring and safety and efficient conduct of flight. _Note_.— _In this document, surveillance data applies to voice position reports similar in nature to HF voice position reports, except it is conducted using SATVOICE._
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 surveillance performance (RSP)	A statement of the performance requirements for operational surveillance in support of specific ATM functions.

RSP specification	
Term	**Description**
RSP specification	A specification (e.g. RSP 400) that represents the values assigned to RSP parameters for communication transaction time, continuity, availability and integrity, and allocations to ANSP, aircraft, CSP/SSP and operator.
RSP overdue delivery time (OT)	The maximum time for the successful delivery of surveillance information after which the initiator is required to revert to an alternative procedure.
RSP nominal delivery time (DT 95%)	The maximum nominal time within which 95% of surveillance information is required to be successfully delivered.
RSP continuity (C)	The required probability that surveillance information can be delivered within the RSP delivery time parameter, either OT or DT 95%, given that the service was available at the start of delivery. Voice communications: This translates into 1 out of 1,000 calls or 5 out of 100 calls not being able to conclude their voice delivery within the allotted time (OT or DT 95%, respectively) or the call could be disconnected for any reason, including aircraft maneuvers, switching satellites or any loss of service while on the call.
RSP availability (A)	The required probability that surveillance information can be provided when needed. 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.

RSP specification	
Term	**Description**
RSP integrity (I)	The required probability that the surveillance information is delivered with no undetected errors. _Note._— _RSP 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._ Voice communications: This translates to the intelligibility of the voice transaction and the extent to which the parties could potentially misunderstand the communication.

RSP /V_{RO} transaction time	
Term	**Description**
Operational performance (monitored)	The portion of the transaction time (used for position reporting) that does not include the times for message composition or recognition of the operational response. Voice communications: Operational Performance (A to N) = RSTP + Initiator Performance (A to G) + Radio Operator Answer Performance (H to I) + Call Performance (I to J).
Required surveillance technical performance (RSTP)	The portion of the (position reporting) transaction time that does not include the human times for message composition, operational response, and recognition of the operational response. Voice communications: $RSTP = RSTP_{AS/AIR} + RSTP_{AS} + RSTP_{CSP} + RSTP_{ATSU}$

RSP /V$_{RO}$ transaction time	
Term	**Description**
RSP initiator performance	The operational portion of the transaction time to prepare the operational response, and includes the necessary flight deck tasks to compile the voice message position report, finding & selecting the SATVOICE number (e.g. short code) from the aircraft's telephone directory, confirming the correct priority for the call and pressing the "call/send" button. Voice communications: Initiator performance = (A to G), where "A" denotes when the flight crew has reached their designated reporting interval and "G" denotes when the last digit (call/send) button is pushed in the aircraft to initiate the call.
RSP answer performance	The operational portion of the transaction time to represent when the radio operator is able to answer the incoming call given the other duties that the radio operator may concurrently be performing. Voice communications: RSP answer performance = (H to I), where "H" denotes when the telephone at the radio operator indicates an incoming call and "I" denotes when the call is actually picked up.
RSP call performance	The operational portion of a communication from when the radio operator answers an incoming call to when the parties on the call have completed the communication and the radio operator sends the message to the ATSU. Voice communications: Call performance = (I to J), where "I" denotes when the radio operator picks up the phone to answer the incoming call from the aircraft. "J" denotes when the callers operationally completes the call (I to J) includes any tasks for the radio operator to send the message to the ATSU.
RSTP$_{ATSU}$	The overdue (OD) or nominal (DT) transit time for surveillance information from the CSP interface to the ATSU's flight data processing system. Voice communications: RSTP$_{ATSU}$ = (M to N)

RSP /V_{RO} transaction time	
Term	**Description**
RSTP$_{CSP}$	The overdue (OD) or nominal (DT) transit time for surveillance information allocated to the CSP. Voice communications: RSTP$_{CSP}$ = (K to M)
RSTP$_{AS/AIR}$	The overdue (OD) or nominal (DT) transit time for surveillance information allocated to the air-ground network and associated aircraft components to initiate an air-to-ground call. Voice communications: RSTP$_{AS/AIR}$ = (G to H), where "G" denotes when the last digit of the dialing sequence is finished (eg: "call/send" button onboard the aircraft) and "H" denotes when the radio operator receives an indication of an incoming call.

RSTP$_{AS}$	The overdue (OD) or nominal (DT) transit time for surveillance information allocated to the aeronautical station.
	
	Voice communications:
	    RSTP$_{AS}$ = (J to K), where (J to K) 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 ATSU via the ground-ground network; the performance is denoted by RSTP$_{AS}$.

RSP continuity	
Term	**Description**
C for operational performance	The proportion of position reports that can be delivered within the specified operational performance time. Voice communications: Continuity would take into consideration any dropped calls.

RSP continuity	
Term	Description
C for RSTP	The proportion of intervention messages and responses that can be delivered within the specified RSTP for intervention. Voice communications: Continuity would take into consideration any dropped calls.
C for RSTP$_{ATSU}$	The proportion of surveillance messages that can be delivered within the specified RSTP$_{ATSU}$.
C for RSTP$_{CSP}$	The proportion of surveillance messages that can be delivered within the specified RSTP$_{CSP}$.
C for RSTP$_{AS/AIR}$	The proportion of surveillance messages that can be delivered within the specified RSTP$_{AS/AIR}$. Voice communications: The proportion of calls that, once set up, are not dropped. The actual continuity measurement would exclude calls not set up owing to network congestion, aircraft busy conditions, faulty aircraft equipment, aircraft not in level flight, aircraft outside the coverage area, and aircraft not logged on. These conditions are considerations for assessing availability.
C for RSTP$_{AS}$	The proportion of surveillance messages that can be delivered within the specified RSTP$_{AS}$.

## C.2   RSP 180 specification

(reserved)

C.3   RSP 400 specification

RSP Specification				
RSP specification		**400**		
Airspace specific considerations				
Interoperability	Specify interoperability criteria (e.g. FANS 1/A or SATVOICE Iridium, Inmarsat, and/or MTSAT communications).			
ATS Function	Specify ATS function(s) (e.g. use or required for applicable separation standard).			
Application	Specify the required surveillance capability. For position reporting, specify the ATS function (e.g. periodic contract at [nn] min, waypoint change event contract, lateral deviation event contract at [n] NM).			
RSP parameter values				
Transit time (sec)	**Continuity (C)**	**Availability (A)**	**Integrity (I)**	
OT = 400	C(OT) = 0.999	0.999	**Navigation FOM**	*See Note 3*
DT 95% = 300	C(DT 95%) = 0.95		**Time at position accuracy**	+/- 30 sec (UTC)
			Data integrity	Malfunction = 10^{-5} per flight hour
RSP monitoring and alerting criteria				
Ref	**Criteria**			
SMA-1	The system shall be capable of detecting failures and configuration changes that would cause the SATVOICE service to no longer meet the RSP parameter values for the intended function.			
SMA-2	When the SATVOICE service can no longer meet the RSP 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 RSP 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 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 (reserved)

C.3.2 RSP 400/V_{RO} allocations

The RSP 400/V_{RO} allocations are applicable flight crew-initiated communications via a radio operator using SATVOICE communications to report position at compulsory reporting points. Figure C-2 provides an overview of the communication transaction time allocations.

RSP 400/V time allocations (OT = 400, DT = 300)								
OT	195	15	46	120	2	5	2	15	OT
DT	165	10	25	85	1	3	1	10	DT
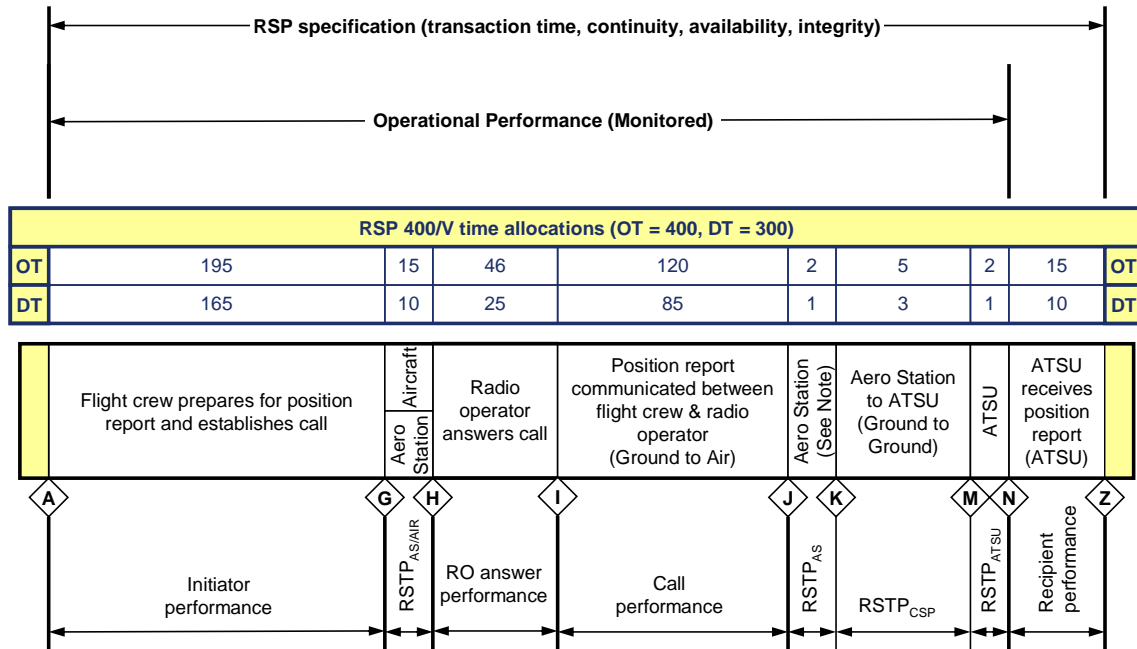
Notes
1) The (A to G) component includes time for flight crew duties at compulsory reporting points.
2) The (G to H) component is not defined at the continuity requirement for ET; however the operational performance specification assumes the total performance for technical components (C to F), (G to H) and (J to N) is 24 seconds.
2) The (J to K) component 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 network for delivery to the ATSU; its performance is denoted by RCTP$_{AS}$.

Figure C-2. Overview of RSP 400/V_{RO} time allocations

Reference	RSP safety requirements
All	Safety requirements for RSP 400/V_{RO} are the same as the safety requirements for RCP 400/V_{RO} (See Appendix B, **paragraph B.3.2**).

C.3.2.1   Air navigation service provider (ANSP)

RSP data transit time and continuity criteria			
Specification: RSP 400/V$_{RO}$	**Application: Position reporting via radio operator using SATVOICE**		**Component: ANSP**
Data latency parameter	**OT (sec) C = 99.9%**	**DT 95%(sec) C = 95%**	**Compliance means**
Radio operator answer performance (H to I)	46	25	Initially, by analysis, simulations, safety human factors assessments.
Call performance (I to J)	120	85	Initially, by analysis, simulations, safety human factors assessments.
Recipient performance (N to Z)	15	10	Initially, by analysis, simulations, safety human factors assessments.
RSTP (RSTP$_{AS/AIR}$ + RSTP$_{AS}$ + RSTP$_{CSP}$ + RSTP$_{ATSU}$)	24	15	Estimated, CSP/SSP contract/service agreement. See **paragraph C.3.2.2**.
RSTP time allocation			
RSTP$_{ATSU}$ (M to N)	2	1	Pre-implementation demonstration

RSP availability criteria			
Specification: RSP 400/V$_{RO}$	**Application: Position reporting via radio operator using SATVOICE**		**Component: ANSP**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Service availability (A$_{CSP/SSP}$)	N/A	0.999	Contract/service agreement terms. *Note.— For guidelines to aid in the development of the contract/service agreement with the CSP/SSP, see **paragraph C.3.2.2**, RSP 400/V$_{RO}$ allocation to CSP/SSP for RSP availability criteria.*

RSP integrity criteria		
Specification: RSP 400/V$_{RO}$	**Application: Position reporting via radio operator using 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). See related safety requirement **SR-3** and **SR-4** for the ANSP. CSP/SSP contract/service agreement. See RSP integrity criteria for CSP/SSP, **paragraph C.3.2.2**.

RSP monitoring and alerting criteria		
Specification: RSP 400/V$_{RO}$	**Application: Position reporting via radio operator using SATVOICE**	**Component: ANSP**
Ref:	**Criteria**	**Compliance means**
SMA-1 **SMA-2**	*Note.— RSP monitoring and alerting criteria are specified by safety requirements allocated to the ANSP for* **SR-6**.	Review.

RSP related safety requirements		
Specification: RSP 400/V$_{RO}$	**Application: Position reporting via radio operator using SATVOICE**	**Component: ANSP**
Ref	**Related RSP parameter**	**Safety requirement**
All	A, C, I, ET	*Note.— Safety requirements related to RSP 400/V$_{RO}$ are the same as those related to RCP 400/V$_{RO}$. See* ***Appendix B, paragraph B.3.2***.

C.3.2.2   Communication/satellite service provider (CSP/SSP)

RSP data transit time and continuity criteria				
Specification: RSP 400/V$_{RO}$	**Application: Position reporting via radio operator using SATVOICE**			**Component: CSP/SSP**
Data latency parameter	**OT (sec) C = 99.9%**	**IT (sec) C = 99%)**	**DT 95% (sec) C = 95%**	**Compliance means**
RSTP time allocation				
RCTP$_{AS/AIR}$ (G to H)	[Not defined]	15	10	Pre-implementation demonstration.
RCTP$_{AS}$ (J to K)	2	[not defined]	1	Pre-implementation demonstration.
RCTP$_{CSP/SSP}$ (K to M)	5	[not defined]	3	Contract/service agreement terms. Pre-implementation demonstration.

RSP availability criteria			
Specification: RSP 400/V$_{RO}$	**Application: Position reporting via radio operator using SATVOICE**		**Component: CSP/SSP**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
Service availability (A$_{CSP/SSP}$)	N/A	0.999	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.
Grade of service	N/A	1%	Contract/service agreement terms. *Note.— This value is the same as that defined Annex 10.*
*Note.— The RSP 400/V$_{RO}$ availability are the same as the for RCP 400/V$_{RO}$. See **Appendix B, paragraph B.3.2.2**.*			

RSP integrity criteria		
Specification: RSP 400/V$_{RO}$	**Application: Position reporting via radio operator using SATVOICE**	**Component: CSP/SSP**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	[not defined]	Pre-implementation demonstration and contract/service agreement terms. *Note.— RSP integrity criteria are specified by safety requirements allocated to the CSP/SSP for* **SR-3** *and* **SR-4**.

RSP related safety requirements		
Specification: RSP 400/V$_{RO}$	**Application: Position reporting via radio operator using SATVOICE**	**Component: CSP/SSP**
Ref	**Related RSP parameter**	**Safety requirement**
All	A, C, I	*Note.— Safety requirements related to RSP 400/V$_{RO}$ are the same as those related to RCP 400/V$_{RO}$. See* **Appendix B, paragraph B.3.2.2**.

C.3.2.3   Aircraft system

RSP data transit time and continuity criteria				
Specification: RSP 400/V$_{RO}$	**Application: Position reporting via radio operator using SATVOICE**		**Component: Aircraft system**	
Data latency parameter	**OT (sec) C = 99.9%**	**IT (sec) C = 99%**	**DT 95%(sec) C = 95%**	**Compliance Means**
Operational Performance Time Allocation				
Call performance (I to J)	120	[not defined]	85	Human-machine interface capability, pre-implementation demonstration
RSTP Time Allocation				
RCTP$_{AS/AIR}$ (G to H)	[not defined]	15	10	Pre-implementation demonstration

RSP availability criteria		
Specification: RSP 400/V$_{RO}$	**Application: Position reporting via radio operator using SATVOICE**	**Component: Aircraft system**
Availability parameter	**Efficiency**	**Safety**	**Compliance means**
A$_{AIR}$ (probability)	N/A	0.999	Analysis, architecture, design, pre-implementation demonstration
*Note.— The RSP availability criteria for type 400/V$_{RO}$ are the same as the criteria for RCP 400/V$_{RO}$. See **Appendix B, paragraph B.3.2.3**.*			

RSP integrity criteria		
Specification: RSP 400/V$_{RO}$	**Application: Position reporting via radio operator using SATVOICE**	**Component: Aircraft system**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	Malfunction = 10^{-3} per flight hour	Design approval of aircraft system. Analysis, safety requirements, development assurance level (e.g. Level D software), commensurate with integrity level, pre-implementation demonstration. *Note.— RCP integrity criteria are specified by safety requirements allocated to the aircraft system for **SR-3** and **SR-4**.*

RSP monitoring and alerting criteria		
Specification: RSP 400/V$_{RO}$	**Application: Position reporting via radio operator using SATVOICE**	**Component: Aircraft system**
Ref:	**Criteria**	**Compliance means**
SMA-1 **SMA-2**	*Note.— RSP monitoring and alerting criteria are specified by safety requirements allocated to the ANSP for **SR-6**.*	Review.

RSP related safety requirements		
Specification: RSP 400/V$_{RO}$	**Application: Position reporting via radio operator using SATVOICE**	**Component: Aircraft system**
Ref	**Related RSP parameter**	**Safety requirement**
All	A, C, I	*Note.— Safety requirements related to RSP 400/V$_{RO}$ are the same as those related to RCP 400/V$_{RO}$. See **Appendix B, paragraph B.3.2.3**.*

C.3.2.4   Aircraft operator

RSP data transit time and continuity criteria			
Specification: RSP 400/V$_{RO}$	**Application: Position reporting via radio operator using SATVOICE**		**Component: Aircraft operator**
Data latency parameter	**OT (sec) C = 99.9%**	**DT 95% (sec) C = 95%**	**Compliance means**
Initiator performance (A to G)	195	165	Procedural capability, flight crew training and qualification in accordance with safety requirements.
Call performance (I to J)	120	85	Contract/service agreement terms. Pre-implementation demonstration.
RCTP$_{AS/AIR}$ (G to H)	15	10	Pre-implementation demonstration.

RSP integrity criteria		
Specification: RSP 400/V$_{RO}$	**Application: Position reporting via radio operator using SATVOICE**	**Component: Aircraft operator**
Integrity parameter	**Integrity value**	**Compliance means**
Integrity (I)	Malfunction = 10^{-5} per flight hour	Review of procedures, training programs, and qualification to meet safety requirements. Design approval of aircraft SATVOICE system. CSP/SSP contract/service agreement. *Note.— RSP integrity criteria are specified by safety requirements allocated to the aircraft operator for **SR-3** and **SR-4**. See also RSP integrity criteria for the aircraft system, **paragraph C.3.2.3**, and the CSP/SSP, **paragraph C.3.2.2**.*

RSP monitoring and alerting criteria		
Specification: RSP 400/V$_{RO}$	**Application: Position reporting via radio operator using SATVOICE**	**Component: Aircraft operator**
Ref:	**Criteria**	**Compliance means**
SMA-1 **SMA-2**	*Note.— RSP monitoring and alerting criteria are specified by safety requirements allocated to the ANSP for **SR-6**.*	Review.

RSP related safety requirements		
Specification: RSP 400/V$_{RO}$	Application: Position reporting via radio operator using SATVOICE	Component: Aircraft operator
Ref	Related RSP Parameter	Safety requirement
All	A, C, I	*Note.— Safety requirements related to RSP 400/V$_{RO}$ are the same as those related to RCP 400/V$_{RO}$. See* **Appendix B, paragraph B.3.2.4**.

C.3.3 RSP 400/V$_{ATC}$ allocations

(reserved)

Appendix D   Post-implementation monitoring

This appendix is intended to provide guidelines on post-implementation monitoring when the specifications provided in **Appendix B** and **Appendix C** are applicable.

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 2.27.5 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 Doc 9883 Manual on Global Performance of the Air Navigation System.

This appendix contains the following guidance material:

    a)   ANSP 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 data collection and analysis

SATVOICE performance requirements are defined in Annex 10 and various ICAO documents. **Appendix B** and **Appendix C** provide these requirements in RCP specifications for controller intervention and RSP specifications for flight crew position reporting and provide the basis for post-implementation monitoring guidance provided in this appendix.

The ANSP data collection is intended to be executed at the ATSU. Data collection by the aeronautical stations, CSPs and SSPs may be necessary as determined by service agreements to support analysis of problems found on a case-by-case basis.

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

This section provides guidance on data collection and performance measurement for the communication application.

D.1.1.1   Measuring communication performance

Communication performance analysis is based on the calculation of actual communication performance (ACP) used to monitor RCP time allocation for communication transaction (TRN). The analysis uses the measurement of transit and response times related to clearance sent via SATVOICE, containing "ATCC" for ATC clears, that receive a single readback response. The rationale behind this is that the critical communications requirement is provided by intervention messages.

The ACP is calculated by taking the difference between the time that the clearance message is originated at the ANSP and the time that the corresponding response read-back is received at the ANSP.

D.1.1.2   Recording the data points for each clearance transaction

The data points listed in **Table D- 1** are recommended as the minimum set that should be extracted from ANSP system recordings to enable RCP analysis and provide sufficient information for problem analysis. This does not preclude individual ANSP from extracting additional data points for their own analysis requirements, some possibilities of which are listed below. ANSP should note that they may require additional database information to enable the aircraft type to be obtained by correlation to the aircraft registration extracted from the ANSP system recordings. All other data points can be extracted from either the ACARS header or the ACARS application message.

Table D- 1 Clearance transaction collection points

Ref	Label	Description and/or remarks
1	ANSP facility	The four letter ICAO designator of the FIR (e.g. NZZO).
2	Aircraft callsign	*Note.— Extracted from ACARS header or application message (e.g. UAL12).*
3	Operator designator	The ICAO designator for the aircraft operating agency (e.g. UAL). *Note.— Extracted from aircraft callsign.*
4	Aircraft type designator	The ICAO aircraft type designator (e.g. B744). *Note.— Extracted from ANSP database using aircraft registration as key. May not be possible if registration number is not available.*
5	Date	In YYYYMMDD format (e.g. 20081114). *Note.— Extracted from ANSP system data recording time stamp.*
6	Clearance media	Designator of the media type through which the clearance was sent (e.g. SAT Iridium, Inmarsat or MTSAT, or HF). *Note.— This is extracted from the ACARS header or application message.*
7	Clearance send time	The timestamp on the clearance message sent by the ANSP in HH:MM:SS format (e.g. 13:43:25). *Note.— Extracted from ANSP system data recording time stamp.*

Ref	Label	Description and/or remarks
8	ANSP timestamp on the receipt of the readback response	In HH:MM:SS (e.g. 13:44:45). *Note.— Extracted from ANSP system data recording time stamp.*
9	ACP	Actual communications performance in seconds measured as the difference between time the clearance is sent (#7) and time operational readback response is received (#8) (e.g. 80).

The ANSP may find that the following additional data may be useful for performance analysis:

    a)   The aircraft registration in ICAO Doc 4444 format (e.g. with no hyphens, packing dots, such as N104UA); and

    b)   The aircraft address in ICAO Doc 4444 format represented in hexadecimal code (e.g. C0173E)

D.1.1.3   Data record for each clearance transaction

If required for regional monitoring agency analysis clearance transaction data as described above may be sent to the regional/State monitoring agency at as a comma delimited text file. The format for each record will at minimum contain the 10 data points specified in **Table D- 1**. Using the examples in **Table D- 1**, the data record for the associated transaction in comma delimited format would be as follows:

NZZO,UAL12,UAL,B744,20081114,SAT,13:43:25,13:44:45,80

Guidance on the type of analysis carried out at an ANSP or regional level is provided later in **paragraphs D.1.3 and D.3**.

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

This section provides guidance on data collection and performance measurement for the surveillance application.

D.1.2.1   Measuring surveillance performance

The analysis of surveillance performance is based on the measurement of the transit times of the position reports sent from the aircraft to the ANSP ground system. This is measured as the difference between the time-over-position extracted from the decoded ACARS message, representing an estimation of when the message originated from the air and the time the message is received at the ANSP. Because the accuracy of the time-over-position within the ACARS position report message is only to the minute (e.g. 15:11) while the accuracy of the timestamp of receipt at the ANSP is to the second (e.g. 15:11:11) the accuracy of the measurement of the surveillance performance will be limited to the minute.

D.1.2.2   Recording the data points for each position report

The data points listed in **Table D- 2** are recommended as the minimum set that should be extracted from ANSP system recordings to enable an analysis of surveillance performance and provide sufficient information for problem analysis. This does not preclude individual ANSP from extracting additional data points for their own analysis requirements, some possibilities of which are listed below. ANSP should note that they may require additional database information to enable the aircraft type to be obtained by correlation to the aircraft callsign or registration extracted from the ANSP system recordings, as well as to enable decoding of the latitude and longitude from an airspace fix name. All other data points can be extracted from either the ACARS header or the ACARS application message.

Table D- 2 Position report collection points

Ref	Label	Description and/or remarks
1	ANSP	The four letter ICAO designator for the FIR of the reporting ANSP (e.g. NZZO).
2	Aircraft callsign	*Note.— Extracted from ACARS header or application message (e.g. UAL12).*
3	Operator designator	The ICAO designator for the aircraft operating agency (e.g. UAL). *Note.— Extracted from aircraft callsign.*
4	Aircraft type designator	The ICAO aircraft type designator (e.g. B744). *Note.— Extracted from ANSP database using aircraft registration as key. May not be possible if registration number is not available.*
5	Date	In YYYYMMDD format (e.g. 20081114). *Note.— Extracted from ANSP system data recording time stamp.*
6	Position report media	Designator of the media type through which the position report was sent (e.g. SAT Iridium, Inmarsat or MTSAT, or HF). *Note.— This is extracted from the ACARS header or application message.*
7	Report Type	The type of position report extracted from the ACARS header (e.g. POS or AEP).
8	Latitude	The reported latitude decoded from the ACARS position report message. The format is "+" for North or "-" for South followed by a decimal number of degrees (e.g. -33.456732).
9	Longitude	The reported longitude decoded from the ACARS position report message. The format is "+" for East or "-" for West followed by a decimal number of degrees (e.g. +173.276554).
10	Position Time	The time contained within the ACARS position report message that was sent from the aircraft in HH:MM (e.g. 03:44).
11	ANSP Receipt Time	The ANSP timestamp on the receipt of the ACARS position report message in HH:MM:SS (e.g. 03:44:45). *Note.— Extracted from ANSP system data recording time stamp.*
12	Transit Time	The transit time of the position report in seconds calculated as the difference between position time (#10) and ANSP Receipt Time (#11) (e.g. 45).

ANSP may find that the following additional data may be useful for performance analysis:

    a)   The aircraft registration in ICAO Doc 4444 format (e.g. no hyphens, packing dots, such as N104UA); and

    b)   The aircraft address in ICAO Doc 4444 format represented in hexadecimal code (e.g. C0173E).

D.1.2.3   Data record for each position report

If required for regional/State monitoring agency analysis position report data as described above may be sent to the regional/State monitoring agency at as a comma delimited text file. The format for each record will at minimum contain the 12 data points specified in table D-2. Using the examples in table D-2, the data record for the associated transaction in comma delimited format would be as follows:

NZZO,UAL12,UAL,B744,20081114,SAT,POS,-33.456732,+173.276554,03:44,03:44:45,45

Guidance on the type of analysis carried out at an ANSP or regional level is provided later in **paragraphs D.1.3 and D.3**.

D.1.3 ANSP performance analysis

It is recommended that the analysis of the communication and surveillance performance over SATVOICE be conducted by the ANSP on at least a monthly basis to enable adequate system performance monitoring. This will ensure that the system is meeting expected performance and facilitate continuous improvement in performance by aiding in the detection of specific aircraft or fleets not meeting the performance standards.

While it is possible for this analysis to be carried out by a regional monitoring agency, it will be more efficient if done by the ANSP. The operational expertise and local area knowledge of the ANSP will help with identifying problems in the data analysis. In addition, the ANSP already possesses the considerable amount of data required for the analysis.

It is more appropriate for a regional monitoring agency to manage problems reported from the ANSP analysis, and to develop regional performance figures from information supplied by the ANSP.

At least one region has had considerable success by using some of the regional ANSP to complete a monthly data analysis and reporting the identified problems to the regional monitoring agency for resolution.

D.1.3.1   Graphical performance analysis

It is recommended that ANSP begin with a graphical analysis of the collected performance data. Depicting the analysis results in graphical form has proven a useful technique for evaluating various aspects of performance and identifying problems.

Monitoring may be completed at several levels for both the communication and surveillance performance. The following structure is recommended:

    a)   Monitoring performance by communication media - an analysis of:

        1)   Voice data from all aircraft.

    2) Voice data from all aircraft via SAT (Iridium, Inmarsat and MTSAT).

    3) Voice data from all aircraft via HF, as appropriate.

  b) Monitoring performance by airline fleet - an analysis of:

    1) Observed performance of each type of aircraft operated by an operator for:

      i) All voice data.

      ii) Voice data via SAT (Iridium, Inmarsat and MTSAT).

      iii) Voice data via HF, as appropriate.

    2) Comparative analysis of the observed performance for an aircraft type used by different operators.

D.1.3.2   Data filtering

The performance specifications are intended to provide criteria for "operational" performance, so to not necessarily filter out failed attempts. However, in some cases filtering may be appropriate. It is important that consistent data filtering is employed to ensure that all ANSP measure against the same baseline.

Raw data obtained from the ANSP recordings will include delayed transactions, which are affected by conditions affecting availability, such as system outages and congestion. These transactions should not be used when assessing clearance transaction time or position report delivery time, as they will be considered when assessing the service availability. This data should be filtered from the raw data before any performance assessment is made.

When SATVOICE is used after failed attempts on HF, the observed performance may indicate excessive delays in the SATVOICE performance. The analysis should include these data to reflect actual operational performance from the controller perspective and then determine whether procedures could potentially mitigate the effects of these delays (e.g. the radio operator may consider using the SATVOICE directly when it can be determined to provide a more reliable communication than HF).

D.1.3.3   Communication analysis

Monitoring controller intervention (i.e. clearances) via radio operator using SATVOICE involves an assessment of ACP by a graphical analysis of data using the structure outline in **paragraph D.1.3.1**.

D.1.3.3.1   Monitoring communication performance

A graph illustrating the cumulative distribution of ACP is used to assess SATVOICE communication performance. The purpose of the graph is to depict measured performance against the RCP400 requirements at the 95% and 99.9% levels.

Figure D- 1 illustrates a typical graph of ACP constructed using a spreadsheet application. The observed performance of the 7,404 HF voice transactions in October 2011 is shown against the RCP400 performance measures.

Figure D- 2 illustrates an ACP chart showing the performance over a 12-month period. The tight spread of the data shows relatively stable performance in this example.
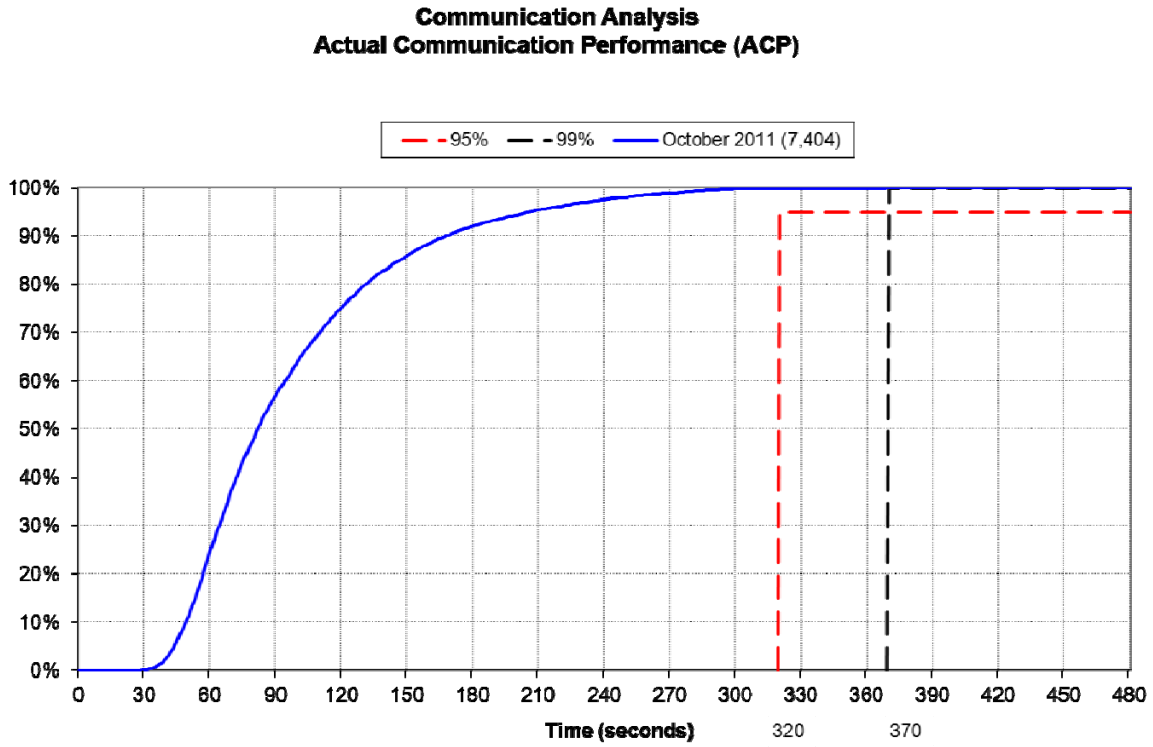
Communication Analysis
Actual Communication Performance (ACP)

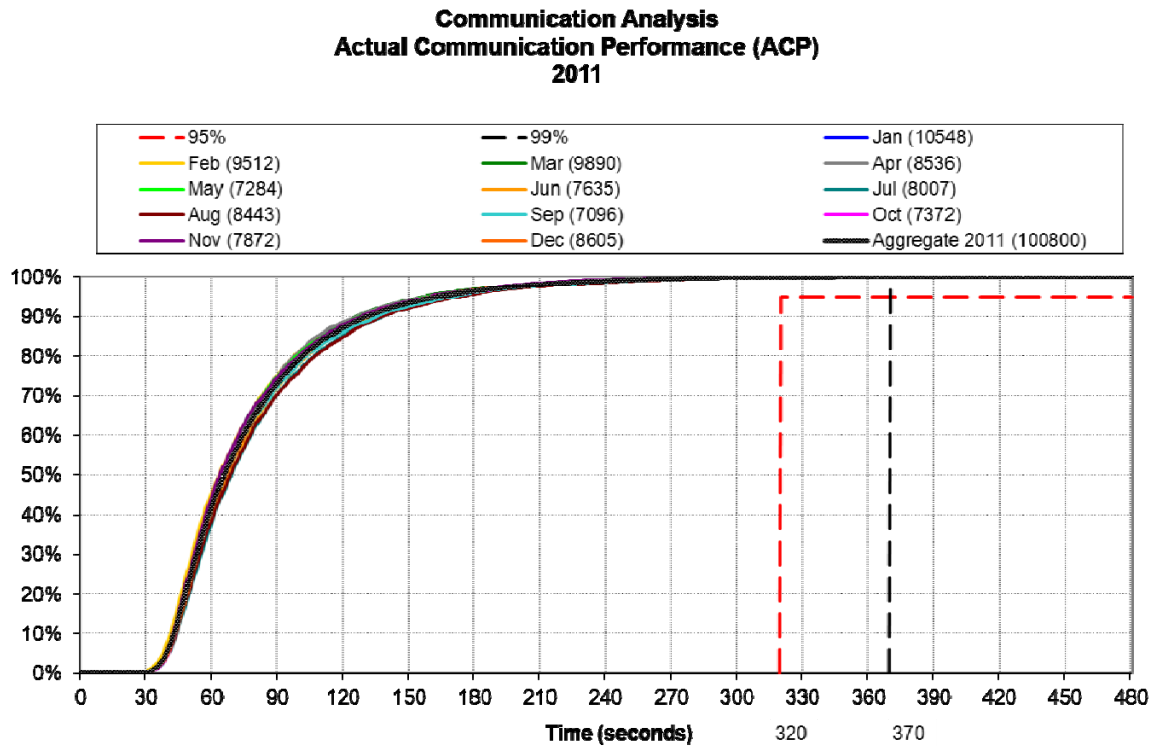**Figure D- 1   SATVOICE communication performance – ACP**

Figure D- 2   SATVOICE communication performance – ACP – 12 months

D.1.3.3.2   Monitoring aircraft operator fleet performance

Graphs illustrating ACP can be used to monitor the performance of each aircraft type in an operator's fleet. These should be generated on a monthly basis. Considerable performance variation may be seen month to month and significant degradation in any month may be the result of poor performance from an individual aircraft or may be the result of routes changing from the previous month with varying weather patterns. These may be investigated further using an analysis of individual tails in a fleet.

A comparative analysis of the performance of different fleets operating in an FIR, particularly fleets of the same type is useful. Poorly performing fleets can be identified for further analysis and a picture of typical performance from all fleets operating in a FIR can be shown in comparison. These can be compared with the same fleets operating in other regional FIR.

D.1.3.4   Surveillance analysis

Monitoring position report delivery via radio operator using SATVOICE involves an assessment of position report delivery times through a graphical analysis of data using the structure outline in **paragraph D.1.3.1**.

D.1.3.4.1   Monitoring surveillance performance

A graph illustrating the cumulative distribution of position report delivery times is used to assess surveillance performance over SATVOICE. The purpose of the graph is to depict measured performance

against the RSP400 requirements at the 95% and 99.9% levels. To account for the lack of resolution of the time at position in the report, the data is organized into bins of 60 seconds.

Figure D- 3 illustrates a typical graph of position report delivery times constructed using a spreadsheet application. The observed performance of the 10,217 voice position reports is shown against the RSP400 performance criteria.
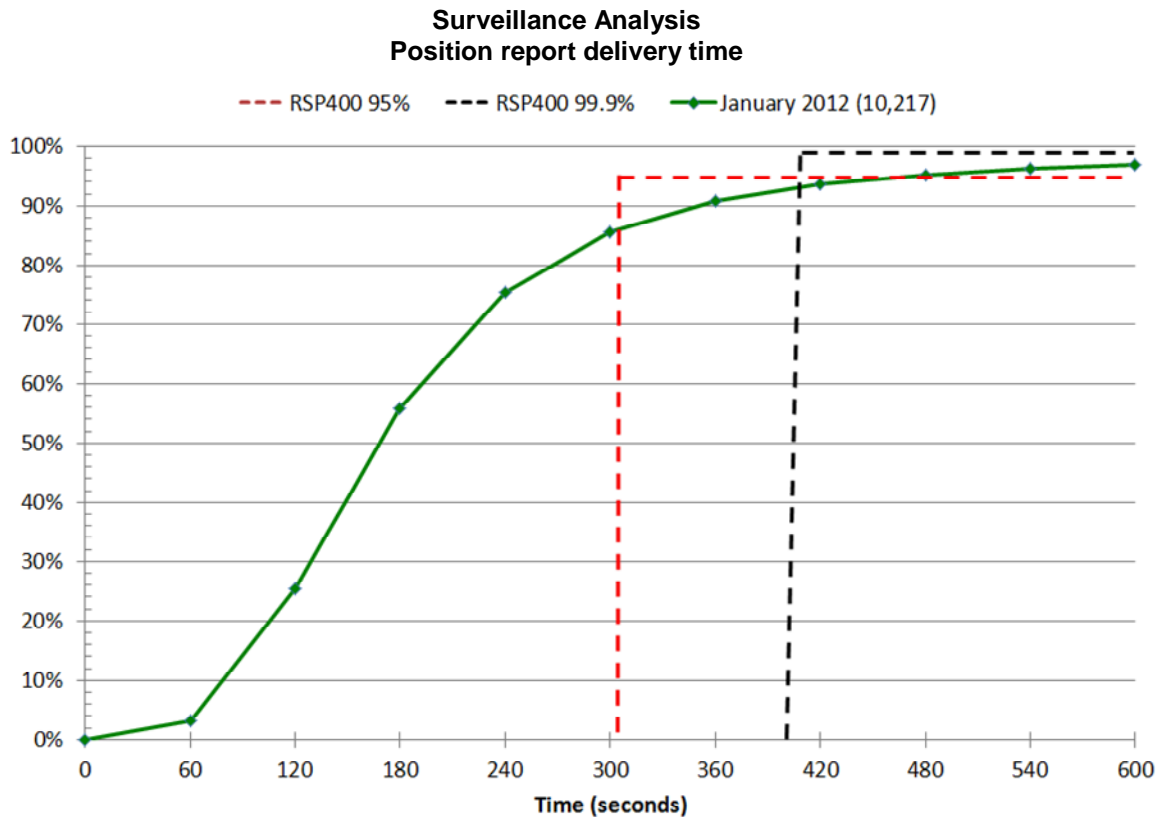

Figure D- 3   Position report delivery time

D.1.3.4.2   Monitoring operator fleet performance

Graphs illustrating observed surveillance data transit time can be used to monitor the performance of each aircraft type in an operator's fleet. These should be maintained on a monthly basis and can be used to observe the performance of each type when using different media.

Considerable performance variation may be seen month to month on some fleets and significant degradation in any month may be the result of poor performance from an individual aircraft or may be the result of routes changing month to month with varying weather patterns. These may be investigated further using an analysis of individual tails in a fleet as discussed in **paragraph D.1.3.5**. The fleet illustrated shows little variation between the months and for clarity only the high and low months are depicted.

A comparative analysis of the performance of different fleets operating in an FIR particularly of fleets of the same type is useful. Under performing fleets can be identified for further analysis and a picture of

typical performance from all fleets operating in a FIR can be built up. These can be compared with the same fleets operating in other regional FIR.

D.1.3.5   Identifying poor performers

The reasons behind degraded performance are many and varied. Considerable analysis may be required before the reasons behind poor performing fleets are identified and it is difficult to provide guidance for all situations.

On a number of occasions poor performance has been attributed to a specific aircraft in a fleet. Usually these poor-performing aircraft can be identified by the visual inspection of monthly data ordered in terms of transit time, or more accurately by graphing the monthly data for a fleet by aircraft registration.

Techniques such as graphing the positions of all delayed messages on a geographical display have identified areas for further investigation.

D.2   Problem reporting and resolution

D.2.1 General

Typically, aircraft operators and ANSPs that experience SATVOICE problems should contact their CSP that provides the SATVOICE service for investigation. However, many regions have a regional monitoring agency to manage the problem reporting and resolution process for components that support air traffic management. These regional monitoring agencies may also assist in resolving SATVOICE problems.

The problem identification and resolution process, as it applies to an individual problem consists of a data collection phase, followed by problem analysis and coordination with affected parties to secure a resolution, and recommendation of interim procedures to mitigate the problem in some instances.

D.2.2 Problem report form

The problem identification task begins with receipt of a report from a stakeholder, usually an operator or ANSP. Standard reporting forms should be developed and regions should investigate the use of a website to receive and store problem reports. The fields used in the form are as follows:

    a)   Originator's Reference Number: Originators problem report reference (e.g. ANZ_2009-23);

    b)   Title: A short title which conveys the main issue of the reported problem (e.g. SATVOICE connection);

    c)   Date UTC: Date in YYYYMMDD format (e.g. 20090705);

    d)   Time UTC: Time in HHMM (e.g. 2345);

    e)   Aircraft registration: ICAO flight plan aircraft registration (e.g. ZKADR);

    f)   Aircraft identification: ICAO flight plan call sign if applicable (e.g. NZA456);

    g)   Flight Sector: If applicable the departure and destination airfield of the flight (e.g. NZAA-RJBB);

    h)   Organization: Name of the originators organization (e.g. Airways NZ);

i)   Active Center: Controlling Centre at time of occurrence if applicable (e.g. NZZO);

j)   Next Center: Next controlling centre at time of occurrence if applicable (e.g. NFFF);

k)   Position: Position of occurrence (e.g. 3022S16345E);

l)   Problem Description: Detailed description of problem;

m)   Attach File: Originator and assigned stakeholders can attach data files or other detailed information such as geographic overlays; and

n)   Additional Data: Area set aside for feedback from stakeholders assigned by the regional/State monitoring agency. This will includes the results of the investigation and the agreed action plan.

Note.— A number of regional monitoring agencies may develop websites to manage the problem reporting process.

D.2.3 Problem assessment

D.2.3.1   Data collection

The data collection phase consists of obtaining operational data logs from the appropriate parties (which will depend on which ANSPs and CSPs/SSPs were being used and operator service contracts). This usually means obtaining operational data logs for the appropriate period of time from the ANSPs, CSPs and SSPs involved. Usually, a log for a few hours before and after the event that was reported will suffice, but once the analysis has begun, it is sometimes necessary to request additional data, (perhaps for several days prior to the event if the problem appears to be an on-going one).

Additionally, some aircraft-specific recordings may be available that may assist in the data analysis task. These are not always requested initially as doing so would be an unacceptable imposition on the operators, but may occur when the nature of the problem has been clarified enough to indicate the line of investigation that needs to be pursued. These additional records include:

a)   Aircraft maintenance system logs;

b)   Built-In Test Equipment data dumps for some aircraft systems;

c)   SATCOM activity logs; and

d)   Logs and printouts from the flight crew and recordings/logs from the ATS provider(s) involved in the problem may also be necessary. It is important that the organization collecting data for the analysis task requests all this data in a timely manner, as much of it is subject to limited retention.

D.2.3.2   Data analysis

Once the data has been collected, the analysis can begin. It may be necessary to use support tools to analyze operational data. The analysis requires a thorough understanding of the SATVOICE system and the situation in which it was used.

The analyst must also have a good understanding of how the aircraft systems operate and interact to provide the ATS functions, as many of the reported problems are aircraft system problems.

This information will enable the analyst to determine a probable cause by working back from the area where the problem was noticed to where it began. In some cases, it may require lab testing using the airborne equipment (and sometimes the ground networks) to reliably determine the cause of the problem.

Once the problem has been identified, then the task of coordination with affected parties begins. The stakeholder who is assigned responsibility for fixing the problem must be contacted and a corrective action plan agreed. The stakeholder who initiated the problem report shall be provided with regular updates on the progress and resolution of the problem.

This information (the problem description, the results of the analysis and the plan for corrective action) is then entered into a database covering SATVOICE problems, both in a complete form to allow continued analysis and monitoring of the corrective action and in a de-identified form for the information of other stakeholders. These de-identified summaries are reported at the appropriate regional management forum and made available to other regional central reporting/monitoring agencies on request.

D.2.4 Mitigating procedures – problem resolution

Because a considerable period may elapse while software updates are applied to all aircraft in a fleet, the regional monitoring agency in coordination with the relevant ANSPs may have to develop procedural methods to mitigate the problem until the solution is implemented. The regional monitoring agency may serve to identify the need for such procedures and develop recommendations for implementation by the ANSPs, CSPs/SSPs and operators involved.

D.3   Regional performance analysis and reporting

This section provides guidance on periodic reporting by individual ANSP of observed system performance in their FIR that will enable regional performance metrics to be developed for the availability, transaction time for interventions via SATVOICE and position report delivery time requirements specified in **Appendix B** and **Appendix C**.

These regional performance metrics should be made available to all interested stakeholders. The use of regional websites to enhance the distribution of these metrics for SATVOICE should be considered. For example, a website used for data link can be viewed at http://www.ispacg-cra.com.

D.3.1 Periodic reporting

It is recommended that regions implement monthly performance reporting to obtain system performance metrics. These reports will provide data on observed availability, transaction time for interventions via SATVOICE and position report delivery time.

   a)   The ANSP should report on CSP/SSP notified system outages and on detected outages that have not been notified as described in **paragraph D.1.3.2**. For each outage the following information should be reported:

       1)   Time of CSP/SSP outage notification: In YYYYMMDDHHMM format or "Not Notified" if no CSP/SSP notification received.

       2)   CSP/SSP Name: Name of CSP and SSP providing outage notification if applicable.

       3)   Type of outage: Report media affected SATCOM, VHF, HF, ALL.

       4)   Outage start time: In YYYYMMDDHHMM format

5) Outage end time: In YYYYMMDDHHMM format

6) Duration of outage: In minutes.

b) The ANSP should report observed ACP for controller intervention via the radio operator using SATVOICE as described in **paragraph D.1.3**.

c) The ANSP should report observed position report delivery time as described in **paragraph D.1.3**.

A tabular reporting format can be used to capture the observed performance at the 95% and 99.9% surveillance performance types 180 and 400 times.

In addition to the tabular performance reporting, regions should consider presenting performance data using graphical means, such as depicted in **Figure D- 1** and **Figure D- 2**. Performance graphs illustrating regional communications and surveillance performance for SATVOICE can be readily obtained by aggregating spreadsheet data from individual ANSP. The relevant data can be included in an ANSP monthly report to enable regional aggregation of agreed performance information to allow it to be presented in graphical form. Regions could present all or some of the data reported in tabular and graphical form, if desired. This method of reporting would also assist global aggregation.