International Civil Aviation Organization

The Twenty-First Meeting of the APANPIRG ATM/AIS/SAR Sub-Group (ATM/AIS/SAR/SG/21)

Bangkok, Thailand, 27 June – 01 July 2011

Agenda Item 6: Provision of ATM/AIS/SAR in the Asia/Pacific Region, including associated CNS matters

GANIS, AN-Conf/12 AND NAT SPG/47 ON SATCOM VOICE

(Presented by the Secretariat)

SUMMARY

This paper provides briefly information on some related CNS developments.

This paper relates to –

Strategic Objectives:

*A: **Safety** – Enhance global civil aviation safety*

*C: **Environmental Protection and Sustainable Development of Air Transport** – Foster harmonized and economically viable development of international civil aviation that does not unduly harm the environment*

Global Plan Initiatives:

GPI-1 Flexible use of airspace
GPI-5 RNAV and RNP (Performance-based navigation)
GPI-7 Dynamic and flexible ATS route management
GPI-9 Situational awareness
GPI-12 Functional integration of ground systems with airborne systems
GPI-17 Data link applications

1. INTRODUCTION

1.1 Since APANPIRG/21, at global level, Global Air Navigation Industry Symposium (GANIS) is scheduled for 20 to 23 September 2011 in Montreal and Twelfth Air Navigation Conference (AN-Conf/12) is proposed for 19 to 30 November 2012 in Montreal. The objective, purpose, subjects and proposed theme are provided in Section Discussion of this paper.

1.2 At inter-regional level, the first meeting of ICAO Inter-Regional SATCOM Voice Task Force (IRSVTF) on SATCOM Voice was held on 25-27 January 2011, in Paris, France. It may be recalled that the IRSVTF was established by the North Atlantic Systems Planning Group (NAT SPG) and Asia-Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) with the objective to produce a globally applicable SATCOM voice guidance material (SVGM) for air traffic service (ATS) communications.

1.3 The Forty-Seventh Meeting of the North Atlantic Systems Planning Group (NAT SPG) was held in the European and North Atlantic (EUR/NAT) Office of ICAO from 13 to 16 June 2011. The NAT SPG/47 meeting reviewed the outcome of the IRSVTF/1 meeting and other related activities. A brief summary in this regard is provided in the Section Discussion of this paper.

2. DISCUSSION

GLOBAL AIR NAVIGATION INDUSTRY SYMPOSIUM (GANIS)

2.1 The Global Air Navigation Industry Symposium (GANIS) is being convened by the International Civil Aviation Organization (ICAO) from 20 to 23 September 2011 in Montréal. Alongside this three-day Symposium will be an industry exhibition/workshop of current and emerging technologies. ICAO is organizing this event in an effort to facilitate greater integration and harmonization of air navigation system improvement programmes of States and service providers. The Symposium, while emphasizing the need for global harmonization, will identify ways and means to ensure interoperability, to maximize utilization of available and emerging technologies and to support an ongoing global discussion.

2.2 ICAO has developed an approach to achieve this objective in the form of a series of "aviation system block upgrades" (ASBU), which will be introduced at the symposium. The "block" upgrades are based on clearly identified operational improvements; however, this new approach to improvements also includes the associated procedures for both air and ground to support the block upgrade, the identification of required technologies, the regulatory requirements and approvals process, evaluation of the business case and the carrying out of validation.

2.3 Details on this event are given in ICAO State letter Ref.: AN 7/59-11/15 dated 25 March 2011**.** All further information related to the Symposium, including agenda/programme, general information, registration fees and procedures, and hotels and rate will soon be available on the Symposium website at http://www.icao.int/ganis. Early travel arrangements and hotel reservation for the Symposium are recommended.

TWELFTH AIR NAVIGATION CONFERENCE

2.4 The Air Navigation Commission, at the fifth meeting of its 185th Session on 1 December 2010, agreed that Contracting States and appropriate international organizations be consulted on the convening of an air navigation conference to discuss subjects related to air navigation systems. This Conference to be held in Montréal from 19 to 30 November 2012, will address the aviation system block upgrades that will be introduced to the international community at the GANIS in September 2011 and will consider the communication, navigation, surveillance and avionics roadmaps for the Global Air Navigation Plan.

2.5 The purpose of the AN-Conf/12 is to gain consensus, obtain commitments and formulate recommendations to achieve a harmonized global air navigation system for international civil aviation. The objective is to optimize the opportunities in technology and maturing work programmes toward common global objectives. Special consideration would be given to utilization of existing capacity of enabling systems and planning for their expansion, taking into consideration user requirements.

2.6 The theme of the AN-Conf/12 is ONE SKY – *To achieve an integrated global ATM system in a progressive, cost-effective and cooperative manner*: The One Sky concept revolves around conceiving the notion globally, developing the implementation plans regionally, and implementing the infrastructure locally. It addresses international traffic flows from end to end with the purpose of increasing overall capacity, efficiency and improving safety, while also reducing the impact on the environment. The One Sky high-level global architecture should enable the digital environment, integrate aerodromes with a block-to-block strategy, facilitate trajectory-based ATM and support performance-based technologies.

2.7 An initial list of subjects, focusing on harmonization and efficiency leading to operational improvements, has been prepared which might be considered by the AN-Conf/12. Details on the proposal are given in ICAO State letter Ref.: ST 13/1-11/10 dated 31 March 2011 with a tentative list of subjects for inclusion in the Twelfth Air Navigation Conference (2012) agenda, background information on the origin and purpose of the subjects and a questionnaire on subjects for discussion by the Twelfth Air Navigation Conference.

THE FORTY-SEVENTH MEETING OF THE NORTH ATLANTIC SYSTEMS PLANNING GROUP (NAT SPG) AND ICAO INTER-REGIONAL SATCOM VOICE TASK FORCE (IRSVTF) ON SATCOM VOICE

2.8. The Forty-Seventh Meeting of the North Atlantic Systems Planning Group (NAT SPG) was held in the European and North Atlantic (EUR/NAT) Office of ICAO from 13 to 16 June 2011. The meeting reviewed SATCOM Voice related development and reviewed outcome of the IRSVTF meeting.

2.9. It was informed that the NAT SUPPs proposal for amendment on the use of SATCOM voice was formally approved by the President of the ICAO Council on 11 May 2011. It was emphasised that this was a very important milestone that would formally enable using the SATCOM voice in the NAT for all ATS communications. ANC requested that the EUR/NAT Regional Office include IFATCA and CANSO to the list of international organizations when circulating this type of amendment proposal, and also requested the Secretariat to develop related guidance material and to include the development of standards for the use of SATCOM voice in the agenda of the AN-Conf/12

2.10 In this respect it was noted the AIPs, NAT Doc 007 and NAT OPS Bulletins could serve as formal mechanisms for promulgating information on the use of SATCOM voice in the NAT. The NAT SPG also noted that all matters related to MEL associated with the use of SATCOM voice would be a national regulatory issue.

2.11 The NAT SPG was provided with information on the status of NAT SPG Conclusion 46/02 which had endorsed a draft proposal for amendment to the NAT SUPPs mandating Controller Pilot Data Link Communications (CPDLC) and Automatic Dependent Surveillance – Contract (ADS-C) in specified portions of the ICAO NAT Region. It was recalled that the draft proposal had been distributed for global consultation by the EUR/NAT Office of ICAO on 14 September 2010 (State Letter EUR/NAT 10-0691.TEC refers).

2.12 The NAT SPG was provided with an update on the ICAO Inter-Regional Satellite Communications (SATCOM) Voice Task Force (IRSVTF) work. It was recalled that the IRSVTF was established by the North Atlantic Systems Planning Group (NAT SPG) and Asia-Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) with the objective to produce a globally applicable SATCOM voice guidance material (SVGM) for air traffic service (ATS) communications. This work was scheduled for completion for December 2011.

2.13 The first meeting of IRSVTF was held on 25-27 January 2011, in Paris, France. 32 members from 11 States, 5 international organizations and industry, including an airline, aircraft manufacturers, communication service providers and satellite companies participated. The IRSVTF reviewed its terms of reference, status of implementation and available documentation and developed a work plan.

2.14 The latest revision of the SVGM (version 0.4) was provided to the NAT SPG. It was noted that the SVGM incorporated the NAT SATCOM voice trial guidance material, the material developed by the FAA PARC CWG SATCOM voice project, airworthiness certification and operational approval guidance by the FAA and the European Aviation Safety Agency (EASA).

2.15 The NAT SPG was informed that IRSVTF/1 reviewed a number of scenarios provided in its terms of reference (TORs), including:

a) Use of AMS(R)S voice for ATS communications via third party radio operator (No MEL relief considerations);

b) Minimum Equipment List (MEL) relief 1 HF + 1 SATCOM;

c) Use of portable SATCOM phones;

d) 1 or 2 portables or installed satellite phones and no HF radio at all; and

e) Use of SATCOM voice direct to controller communications.

2.16 The NAT SPG noted that in reviewing the scenarios described in the TORs, the IRSVTF concluded on the following principles:

a) the guidance material would remain neutral on these scenarios;

b) the guidance material would be developed within the global ICAO RCP framework to provide States with some flexibility to apply different standards for different uses, without implication to seamless operations;

c) the guidance material would provide a basis for determining acceptability of any implementation, taking into account routine and emergency use, provision and use of SATCOM voice for ATS communications, procedures for the radio operator, controller and flight crew, performance specifications and qualification;

d) the guidance on the use of portable SATCOM phones would merely indicate that their use was not advisable for ATS communications, as its use was not allowed by national regulations of many States, and any special applications on their use would not be addressed by this guidance material;

e) the guidance material would not specifically address MEL matters, but could serve to facilitate State regulatory authorities in establishing policies in such matters; and

f) the use of SATCOM technology alone (i.e. without any HF capability) would require study beyond the target date for completing the first edition of the guidance material. This scenario would therefore not be analyzed.

2.17 The NAT SPG agreed with the IRSVTF suggestion that the approval of the SATCOM voice as a long range communication system (LRCS) was instrumental to progress the implementation of SATCOM voice. It was felt that such recommendations could be a potential subject for discussion and decision at the ICAO Air Navigation Conference in 2012. The NAT SPG agreed to mandate the IRSVTF to prepare necessary input material to be presented at the GANIS in September 2011.

2.18 It was noted that the IRSVTF input might be useful by providing recommendations which may include proposed amendments to ICAO SARPS. The NAT SPG supported the idea that such proposal for amendments be presented to the next meeting of the NAT IMG prior to transmission to the OPLINKP or ACP.

2.19 The NAT SPG noted that the next meeting of the IRSVTF was scheduled on 12-16 September 2011, Seattle WA USA. The IRSVTF planned to complete its work by the end of 2011 and present the SVGM edition 1.0 to NAT SPG/48 for approval in June 2012.

2.20 The working version of Satellite Communications Voice Guidance Material (Version 0.4) dated 1 June 2011 is provided in **Attachment A** to this paper. CNS/MET SG/15 is also expected to review the document.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information provided in the paper; and

b) review the draft material and provide comments if any to the ICAO Regional Office for onward forwarding to next meeting of IRSVTF.

Working Draft

Satellite Voice Guidance Material (SVGM)

Version 0.4

Working Draft – 1-June 2011

International Civil Aviation Organization

Inter-Regional SATCOM Voice Task Force (IR-SVTF)

Revision History

Date	Description of changes	Version
13-Jul-10	Initial working draft	
26-Jan-11	Added Joint working relationship with ICAO SATCOM Voice TF, added version control.	0.1
27-Jan-11	Added material from IRSVTF/1 meeting. First TF baseline. no track changes.	0.2
31-Mar-11	Added inputs since IRSVTF/1 meeting (See comment matrix for specific changes)	0.3
1-Jun-11	Added inputs from review on v0.3 (See comment matrix for specific changes)	0.4

Editor's note 1. — While editor's notes appear throughout, the entire document is a working draft and should be treated as such. Refer also to the master comment matrix, which includes open comments that may not have been resolved in this version. Comments and contributory material can be submitted to "Elkhan NAHMADOV" enahmadov@paris.icao.int and "Tom KRAFT" tom.kraft@faa.gov.

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FOREWORD.

1. Historical background

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

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

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

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

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

1.6 In 2003, the 39th NAT SPG Meeting (17-19 June 2003) agreed that the NAT SUPPs needed to be amended to clearly state the conditions under which SATCOM voice could be used. In 2008, the 44th Meeting of the NAT SPG (17-20 June 2008) agreed that the authorization to use SATCOM voice for all ATS communications would permit reduction in risk of communications failure, improve safety of operations, and alleviate HF 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 MEL relief of one HF radio was subject to approval by the appropriate authority.

1.7 Some State authorities have granted some operators time-limited MEL dispatch relief of one HF radio whereby the aircraft may be dispatched for a limited period (5 or 10 days) with only a single operational HF radio system and a single operational SATCOM voice system. Operators are now seeking

permanent MEL dispatch relief of one HF radio by demonstrating that either the Iridium or Inmarsat SATCOM voice system meets the long range communication system (LRCS) requirements.

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

1.9 This edition of the Satellite Voice Guidance Material (SVGM) provides for a comprehensive update of various regional and State guidance material to use SATCOM voice for ATS communications. This includes the incorporation of performance-based specifications and associated guidance on data collection, monitoring, and analysis. This guidance material may facilitate the appropriate authority in establishing its policies on MEL for some dispatch relief. However, it assumes that sufficient HF voice infrastructure must remain in service and that the aircraft must be equipped with at least one operational HF voice system.

2. Scope and purpose

2.1 The SVGM provides guidance and information concerning SATCOM voice communications for aeronautical use and is intended to facilitate the uniform application of Standards and Recommended Practices 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 in SATCOM voice operations by promoting seamless and interoperable SATCOM voice operations throughout the world. This edition limits itself to current and near term operations. Future editions are expected to incorporate guidance that applies to the planned expansion of SATCOM voice capability in the high-density continental areas.

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

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

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

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

d) do not specifically address MEL matters, but serve to facilitate State authorities or Regional Safety Oversight Organizations (RSOOs) in establishing policies in such matters; and

e) do not address the use of SATCOM voice in isolation (i.e., HF voice capability remains available on board and in the ground infrastructure).

2.4 While directed primarily at air traffic services personnel and flight crews, the following personnel should be familiar with various aspects of its contents: regulators, airspace planners, aircraft operators, dispatchers, communication service providers and radio operators, training organizations,

central monitoring and reporting agencies, automation specialists at centers and radio facilities, and aircraft manufacturers and equipment suppliers.

2.5 The guidance will support the following activities:

a) the States' roles and responsibilities in relation to the following:

1) safety regulatory oversight of air navigation services;

2) operational approval, flight crew training and qualification;

3) airworthiness certification of aircraft SATCOM voice systems.

b) the development of agreements and/or contractual arrangements between air traffic service providers and aircraft operators and their respective communication service providers;

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 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 principles in the corresponding SARPs, and designed particularly to assist the user in the application of the SARPs and PANS.

4. Implementation

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

Editor's note 2. — Revised from GOLD, need further review of references for applicability to SATCOM voice. Add missing references. Probably need to add FAA, EASA, RTCA/Eurocae references too.

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 on Airspace Planning Methodology for the Determination of Separation Minima* (ICAO Doc 9689);

o) *Performance-based Navigation Manual* (PBN) (ICAO Doc 9613);

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

q) *Manual on the Aeronautical Mobile Satellite (Route) Service* (ICAO Doc 9925).

r) European Commission Regulation (EC) No 859/2008 of 20 August 2008 amending Council Regulation (EEC) No 3922/91 as regards common technical requirements and administrative procedures applicable to commercial transportation by aeroplane (so called "EU-OPS" having replaced the former JAR OPS-1)

7. Changes to the document

This document is maintained as a regional document in coordination with all ICAO planning and implementation regional groups (PIRGs) providing data link services within their region. Each participating PIRG establishes a mechanism for submitting and administering change proposals.

Change proposals (CPs) can be submitted by any stakeholder participating in data link operations. The stakeholder should submit a Change Proposal to their ICAO regional office (see **Error! Reference source not found.**). The ICAO regional office will coordinate the change proposal within its own region, other regions, 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 change is concluded by each of the PIRGs.

8. Amendments to the SVGM

Amendment	Source(s)	Subject(s)	Approved applicable
1st Edition (2011)	Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/22 – 2011) North Atlantic Systems Planning Group (NAT SPG/48 – 2012)	*Satellite Voice Guidance Material* (SVGM)	Applicable within participating Regions on 1 July 2012.

Chapter 1. Definitions

Editor's note 3. — To be administratively updated just prior to completion. Terms generally will only be included if used in the document.

When the following terms are used in the present document they have the following meanings. Where the term has "(ICAO)" annotated, the term has already been defined as such in SARPs and/or PANS.

Term

ACC. The symbol used to designate area control centre. (ICAO)

ACP. The symbol used to designate actual communication performance.

ACTP. The symbol used to designate actual communication technical performance.

Aeronautical fixed telecommunication network (AFTN). A worldwide system of aeronautical fixed circuits provided, as part of the aeronautical fixed service, for the exchange of messages and/or digital data between aeronautical fixed stations having the same or compatible communications characteristics. (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 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)

AFTN. The symbol used to designate aeronautical fixed telecommunication network. (ICAO)

AIDC. The symbol used to designate ATS interfacility data communications. (ICAO)

AIP. The symbol used to designate Aeronautical Information Publication. (ICAO)

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

Air traffic services provider (ATSP). An organization responsible for the provision of air traffic services.

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)

Term

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

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

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

Aircraft active flight plan. (See flight plan).

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

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

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

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

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

Note. Also referred to as registration marking.

Aircraft system availability ($A_{AIRCRAFT}$). The required probability of available capability on an aircraft with an average flight of 6 hours.

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

AIREP. The symbol used to designate an air-report. (ICAO)

Air-report. A report from an aircraft in flight prepared in conformity with requirements for position, and operational and/or meteorological reporting. (ICAO)

AMS(R)S. The symbol used to designate aeronautical mobile satellite (route) service. (ICAO)

ANSP. The symbol used to designate air navigation service provider. (ICAO)

AOC. The symbol used to designate aeronautical operational control. (ICAO)

Term

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. The symbol used to designate air traffic control. (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.

ATM. The symbol used to designate air traffic management. (ICAO)

ATS interfacility data communication (AIDC). Automated data exchange between air traffic services units, particularly in regard to co-ordination and transfer of flights. (ICAO)

ATSP. The symbol used to designate air traffic service provider.

ATS. The symbol used to designate air traffic service. (ICAO)

ATSU. The symbol used to designate ATS unit. (ICAO, sort of)

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

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

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

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

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

Term

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

CNS. The symbol used to designate communications, navigation and surveillance. (ICAO)

CNS/ATM. The symbol used to designate communications, navigation and surveillance/air traffic management. (ICAO)

COM. The symbol used to designate communications, (ICAO)

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

Note.— A radio facility is a CSP.

Communication services. Aeronautical fixed and mobile services to enable ground-to-ground and/or air-to-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)

CSP. The symbol used to designate communication service provider.

CTA. The symbol used to designate control area. (ICAO)

Current flight plan. (See flight plan).

EMERG. The symbol used to designate emergency. (ICAO)

ETD. The symbol used to designate estimated time of departure or estimating departure. (ICAO)

FANS 1/A. The symbol used to designate the initial future air navigation system, as defined by RTCA DO-258A/EUROCAE ED-100A, or previous standards that defined the FANS 1/A capability.

Note.— 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 AFN and ADS-C applications, but does not include the CPDLC application.

FANS. The symbol used to designate future air navigation system.

FDPS. The symbol used to designate flight data processing system. (ICAO)

Term

FIR. The symbol used to designate flight information region. (ICAO)

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 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)

HF. The symbol used to designate high frequency (3-30 Mhz). (ICAO)

ICD. The symbol used to designate interface control document.

Term

Maximum accumulated unplanned outage time (min/yr). Measured by accumulating ***only*** the duration times for unplanned outages greater than the unplanned outage duration limit during any 12-month period. The accumulation is performed separately for each relevant operational airspace or FIR.

Maximum number of unplanned outages. Measured separately for each relevant operational airspace or Flight Information Region (FIR) over any 12-month period.

MEL. The symbol used to designate minimum equipment list. (ICAO)

MET. The symbol used to designate meteorological or meteorology. (ICAO)

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

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

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)

PANS-ATM. The symbol used to designate Procedures for Air Navigation Services — Air Traffic Management (ICAO Doc 4444). (ICAO)

RCP. The symbol used to designate required communication performance.

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

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.

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 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.

Term

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

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

RCTP. The symbol used to designate required communication technical performance.

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

$RCTP_{ATSU}$. 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)

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.

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

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

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

RGS. The symbol used to designate radio ground station.

RNAV. The symbol used to designate area navigation.

RNP. The symbol used to designate required navigation performance.

SARPs. The symbol used to designate Standards and Recommended Practices. (ICAO)

Satellite service provider. 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.

Term

SATCOM. The symbol used to designate satellite communication. (ICAO)

SELCAL. The symbol used to designate selective calling system. (ICAO)

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

SSP. The symbol used to designate satellite service provider.

TRN. The symbol used to designate monitored operational performance.

Unplanned outage duration limit (minutes). Time after the unplanned outage begins at which there is an operational impact. Measured from when an unplanned outage begins to when the ATSU receives notification that the service has been restored.

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.

VHF. The symbol used to designate very high frequency (30-300 Mhz). (ICAO)

Chapter 2. Overview of satellite voice communications

2.1 General

Editor's note 4. — Text previously in 2.1 was moved to Foreword, rephrased to be globally applicable, and augmented. Chapter 2 is intended to provide an overview of satellite voice communications, including system architecture and components.

2.2 Satellite Industry Overview

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

2.2.2 Today there are two successful satellite systems servicing the aeronautical market. Inmarsat is a GEO and Iridium is a LEO satellite system. Both satellite systems use AMS(R)S L-band frequencies reserved for aeronautical safety services. Inmarsat is currently replacing their older generation I-3 satellites with new technology I-4 satellites providing advanced services. That project is nearly complete. The end of life for Inmarsat I-3's is 2018. Iridium satellites current system was launched in the late 1990's and became operational in early 2000. The original life expectancy of Iridium's satellites was calculated to be seven plus years. Iridium is planning to design, build and launch their next generation satellite system call "Iridium Next" by the end of 2017. A recent study of their current system indicates that the original satellite system should last through 2017.

2.2.3 In recent years a number of other companies attempted to enter the satellite phone market. Notably they were Globalstar (Loral Space & Qualcomm), ICO Global Communications (Craig McGaw/Nextel), Odyssey Worldwide Services (TRW & Teleglobe) and Teledisc (Bill Gates).

2.2.4 In November 2010 a new company, LightSquared, targeting the United States 4G market, launched their first satellite and positioned it over North America. LightSquared will be a combination of thousands of terrestrial 4G base stations deployed in heavily populated areas and the use of satellite coverage, providing seamless 4G coverage, in less populated areas. Even though they are not currently targeting the aeronautical market they are planning to use Inmarsat AMS(R)S L-band frequencies that are adjacent to frequencies used for GPS. A study has been commissioned to determine the possible effect on GPS receivers from the terrestrial component of the LightSquared 4G network within the United States.

2.2.5 The US Global Positioning System (GPS) is comprised of 24 operational satellites in six orbital planes at an altitude of 12,550 miles (20,200 km). At that altitude, four satellites minimum are normally in view at any location on earth, at any time. The civilian L1 frequency block is centered at 1575.42 MHz and augmentation for aeronautical is provided within the adjacent Inmarsat L-band spectrum. Each GPS satellite contains two Rubidium and one Cesium atomic clocks that synchronized

daily by the US Naval Observatory (USNO). Each satellite transmits ranging information based on its own atomic standard that allows a GPS receiver to solve its position. Augmentation is used to improve altitude determination and quality of the position determination.

2.3 Iridium

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

2.3.2 Iridium uses a combination of both frequency and time multiplexing along with 48 spot beams developed by the phased array antenna from each satellite. The frequency band used by subscribers are within L-band AMS(R)S 1616 MHz to 1626.5 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.

2.4 Inmarsat

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

2.4.2 There are three new I-4 and four older I-3 satellites providing aviation services, including PSTN voice. L-band frequencies allocated for aviation AMS(R)S are split between a transmit block and a receive block with a guard band in between.. 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.

2.4.3 Swift Broadband users of Inmarsat I-4 satellites have available Voice over Internet Protocol (VoIP) capability. The ground user network interface doesn't exist as yet but should evolve in time. Iridium's Next satellite system has indicated the possible availability of these VoIP services.

2.4.4 MTSAT is a GEO satellite system. The specification is equivalent to that of I-3 except for the footprint which is limited to the Asia and the Pacific Ocean. MTSAT is interoperable with I-3 so that

the subscriber unit can seamlessly carry out the handover between MTSAT and I-3 (and legacy communication module of I-4).

2.5 Public Switched Telephone Networks and Dialing Systems Used

2.5.1 Current offerings by both Inmarsat and Iridium for voice communication services use the Public Switched Telephone Network (PSTN) or leased telephone lines from the appropriate gateway to the ground party. In instances where the reliability of the ground telephone network is poor consideration should be given for a satellite link to the ground party. The telephone number country codes for both satellite systems are provided by the ITU and are designated as Global Mobile Satellite Systems (GMSS). Inmarsat uses a Single Network Access Code (SNAC) and switches the call automatically to the correct Inmarsat earth station where the aircraft is logged into. Iridium employs telephone number ITU sub-blocks and optionally a US-based telephone number. The various options available can have significant cost incurred to the ground calling party due to various tariffs applying.

Chapter 3. Administrative provisions related to satellite voice operations

3.1 ATSP and aero radio service provision

3.1.1 When providing SATCOM voice services, ANSPs and aero radio facilities should provide these services consistent with voice communication procedures, regardless of the technology used.

3.1.2 System validation

3.1.2.1 Provide updated aircraft SATCOM telephone lists to ANSP.

3.1.2.2 Provide a reliability and availability factor of at least 99.9%.

3.1.2.3 Provide security provisions IAW SVTF findings (ie - CLI/PIN).

3.1.2.4 Provide service outage/return to service reports.

3.1.2.5 Provide ATSP priority level.

3.1.2.6 Provide acceptable timely call establishment and connectivity (Current connection times exceed 1 minute)

3.1.3 Aeronautical information, notifications, and interfacility agreements

3.1.3.1 The ATSP should notify operators of SATCOM voice services using the AIP or NOTAM. Notification includes:

a) Procedures for publishing contact information, that is associated with current airspace boundaries, e.g. specific SATCOM voice numbers for applicable facilities; and

b) Requirements for use, e.g., criteria for when to contact the ATC facility or aero radio; and

c) Flight plan form and submission requirements.

3.1.4 Requirements, privileges and obligations of communication service provider (CSP)

Editor's note 5. — Need definition for CSP (Chapter 1). CSP is considered to include both satellite and network service providers.

Editor's note 6. — The following areas need to be addressed.

1. Approval by whom?

2. It's envisioned that each state would not need to approve every CSP.

3. Current EASA rules imply that a state of residence of the CSP (in this case a satellite) is to be responsible for its approval and certification, as well as on going oversight and audits. (check IMO approval processes for CSP). This is just an example.

4. Are the current Annex 10 provisions adequate? Additional questions relating to Annex 10 and other guidance material.

a) Do they ensure inoperability?

b) Will the interface to the end users be the same regardless of which CSP is used?

c) Compatible and interoperability security requirements and automation.

d) Questions were raised about the OPLINKP and SARPS amendment timeframes and processes to allow progressing upgrade of SATCOM voice.

3.1.4.1 Requirements for CSP

3.1.4.1.1 The CSP should ensure that the SATCOM voice service meets the performance criteria, in **Appendix A**. (i.e. RCP 400 with a safety objective of 10^{-3} per flight hour).

Editor's note 7. — MM - Ch 2/Ch 4 Group - These times in Appendix A were challenged in Paris and are still questionable and need agreement.

3.1.4.1.2 For those situations when a CSP cannot continue to provide SATCOM voice communications, it should inform the involved ATSPs and operators and/or, if appropriate, the providers of Aeronautical Information Services, in accordance with coordination procedures established in writing.

3.1.4.1.3 The CSP shall be under safety oversight either by:

a) an air traffic service provider (ATSP) or a commercial air operator, when contracted by at least one of them; or

b) directly by the competent aviation authority established by the State on a national or regional basis, when allowed or prescribed by applicable law.

3.1.4.1.4 In the case of provision of additional SATCOM services, e.g. as those which may be required by NextGen or SESAR, for which a safety objective more severe than 10E-3 is postulated, an authorized service provider should demonstrate to the competent authority the compliance with the applicable requirements. Additional guidance on the establishment of the safety objectives for SATCOM is provided in Appendix D.

3.1.4.2 Contracted COM services

3.1.4.2.1 The principle of certification and subsequent continued surveillance (or "oversight") of aviation operators is established in two Annexes to the Chicago Convention: Annex 6 Part I for Commercial Air Transport operators and 14 for aerodrome operators.

3.1.4.2.2 Annex 11 (Air Traffic Services) does not necessarily require certification of the air traffic service provider (ATSP) but requires States to establish a State Safety Programme (SSP) further described in Attachment D therein, which clarifies that States shall establish effective mechanisms to inspect and audit ATSPs in order to ensure effective safety oversight. In other words the requirement for States to oversee safety exists even in the absence of certification or approval of a certain type of aviation operators or service providers.

3.1.4.2.3 Chapter 2 (i.e. Administrative provisions for the international telecommunication service) of Volume II of Annex 10 also contains standards for the "supervision" of the COM service by a responsible authority designated by the State. Note 2 to par. 2.27.4 of Annex 11 clarifies that, when COM services are directly provided by an ATSP, their oversight is through the SSP and the Safety Management System (SMS) established by the ATSP. Same Note clarifies that if COM services are contracted to an entity other than the ATSP, the SMS requirement still applies, but only to those services with direct operational implications (e.g. communications used for ATS purposes).

3.1.4.2.4 In any case therefore, an aviation organization (commercial air transport operator, aerodrome operator, ATSP) shall be, according to specific ICAO standards, under safety oversight by the competent aviation 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 . 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 ATSPs.

3.1.4.2.5 In this possible business model (e.g. an ATSP or air operator contracting COM services from a different organisation), depicted in Figure 3.X below, the contracting organization does not only take responsibility to demonstrate to the competent authority that proper mechanisms exist to oversee the contracted CSP, but also inevitably attracts on itself some liability also for the contracted COM service.

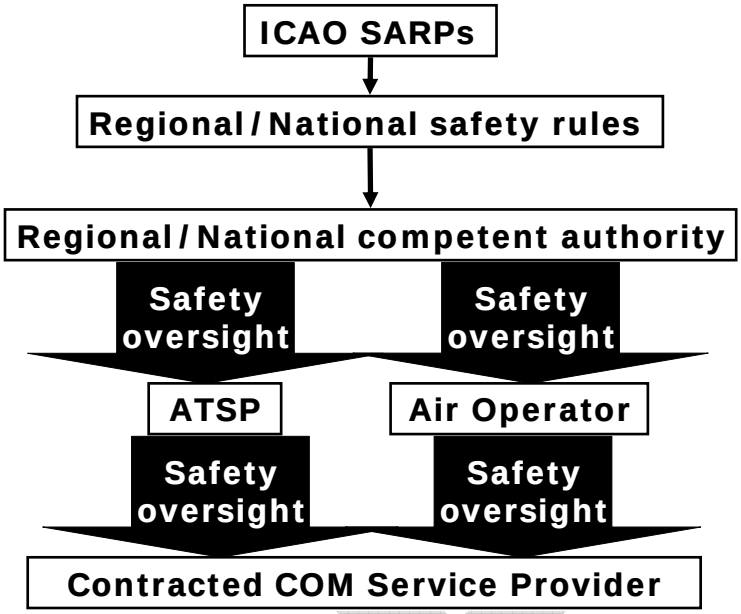


Figure 3-1. Radio operator contracted by organizations (e.g. ATSP or commercial air operator) under oversight by a competent authority

3.1.4.3 Direct certification of the CSP

3.1.4.3.1 Present wording of paragraph 2.4.1 in Volume II of Annex 10, leaves open the possibility of direct oversight by the competent authority of the communication service provider (CSP). This possibility, in fact applied e.g. in the European Union (EU), where CSPs "unbundled" from ATSPs can be certified , is illustrated in Figure 3.Y.

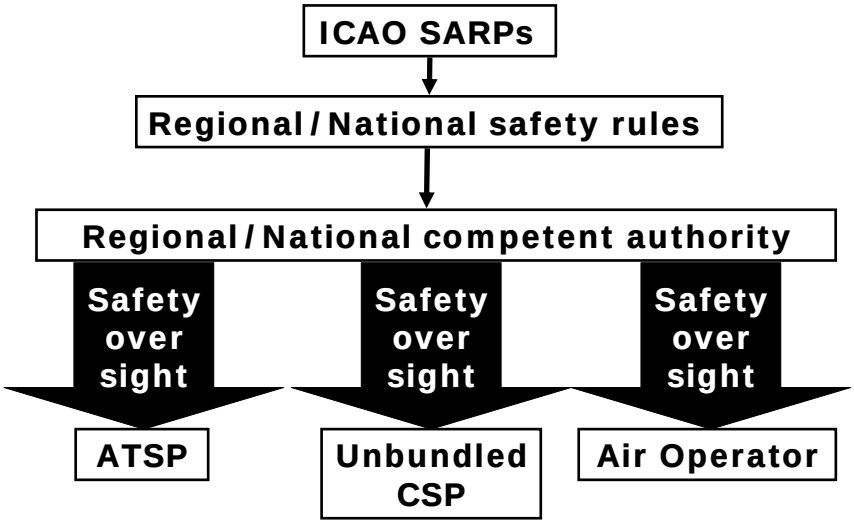


Figure 3-2. Unbundled communication service provider (CSP) directly under oversight by a competent authority

3.1.4.3.2 Even in this case agreements for the quality of the COM service (e.g. Service Level Agreements) and other contractual arrangements can be established between the ATSP (or the air operator) and the CSP, but the contracting entity takes no responsibility for safety oversight of the CSP. Such a responsibility, and therefore the corresponding liability, is transferred to the competent authority.

3.1.4.4 Privileges and obligations of authorized CSPs

3.1.4.4.1 Law applicable in the States should establish which organizations are eligible to be authorized as SATCOM CSPs (either directly by law or through a process of acceptance or certification or approval by a competent authority). For instance, in the EU, the Regulations of the "single European sky " and the EASA Basic Regulation require SATCOM and all other mobile or fixed aeronautical COM services, to be under the managerial responsibility of a certified CSP (bundled or unbundled). In the USA the FAA, as ATS provider, is authorized to contract third parties providing communication services.

3.1.4.4.2 Law adopted on a regional or national level should specify the privileges and obligations of the authorized CSPs.

3.1.4.4.3 Typical privileges may include, but are not limited to:

a) offer SATCOM services within the limits of the authorization;

b) sign declarations or statements of conformity or of verification ;

c) operate and maintain the SATCOM system;

d) release to service new or repaired constituents of the system;

e) restore the service after any outage;

f) manage any change, including development of associated risk assessments and possibly direct approval of minor changes.

3.1.4.4.4 Typical obligations may include, but are not limited to:

a) work according to the terms of authorization, contract, certification or approval and possibly to accepted manuals or procedures;

b) verify the system or constituents prior to signing any declaration, statement or release to service;

c) maintain records;

d) establish an internal scheme for occurrence reporting and analysis, including reporting to other involved stakeholders (e.g. manufacturers of avionics) and competent authority;

e) impose requirements on contractors and verify their actual implementation.

3.1.5 Radio facility considerations

3.1.5.1 To provide SATCOM voice radio services at a full operational level, the radio facility should be able to accept or place a SATCOM voice call given the necessary infrastructure to handle the expected SATCOM voice traffic demand and in accordance with prescribed performance specifications. Additionally, radio facility providers must ensure that adequate resources are available in the event that SATCOM voice services are disrupted.

3.1.5.2 When supporting satellite voice communications, radio facilities should establish procedures that:

a) Enable operators to register SATCOM voice capabilities and means to contact the aircraft. (only applies to MEL relief)

b) Ensure ANSPs and radio operators receive the relevant information needed to establish two-way communications with the aircraft.

c) Maintain, on a 28-day update cycle, INMARSAT's and Iridium's master aircraft phone number list as new SATCOM radio facilities become operational.

d) Ensure users are notified when service conditions change, i.e., service outages, degraded performance, restoration of service.

3.1.5.3 When supporting satellite voice communications, radio facilities should provide automation support that allow the radio operator to provide SATCOM voice services for the intended operations in accordance with performance specifications provided in **Appendix A**. The automation support should include capabilities that allow the radio operator to:

a) Place and receive SATCOM telephone calls to either the INMARSAT or Iridium access points.

b) Obtain the correct authorization Personal Identification Number (PIN) for both INMARSAT and Iridium networks to place authorized ATC calls.

c) Answer and route incoming SATCOM voice calls to the appropriate SATCOM/radio operator.

d) Auto-dial capability to enable faster call setup times.

e) Accept a new call from a flight crew as a participant of an existing SATCOM voice communication already in progress, e.g., the new caller should be able to hear the transmission already in progress and standby for an opportunity to intervene. (This is an example of "Conference", …)

f) To exchange air traffic control information with ATC.

g) Provide for the ability to prioritize, preempt and establish precedence on outgoing calls.

3.1.6 Satellite voice service

3.1.6.1 The following criteria apply to the voice satellite service:

a) The ground earth station should be capable of preventing unauthorized calls to aircraft;

b) The satellite service should enable ATS access to the aircraft voice channel when required regardless if the flight crew are engaged in another call of a lower priority. If passenger services are also provided on the same system used by the flight crew, passenger calls should be preempted if calls of a higher priority are placed to the flight deck.

c) The SATCOM voice system should provide Caller ID with PIN security information for display to the receiving party.

Editor's note 8. — The note that follows contains "must" and "will require," which is not appropriate for notes. Furthermore, the guidance material should be performance-based and not based on any specific technology. Description of operation should be considered for inclusion in Chapter 2. Guidelines should be provided to support requirements of Annex 10 or elsewhere. Reference comment SV3-0100.

Note.— This guidance material supports both Iridium and INMARSAT communications. INMARSAT systems typically support several levels of SATCOM voice communications. Iridium systems are typically single channel or dual channel voice systems dedicated for flight deck communications. Iridium based systems will require additional infrastructure in the Ground Earth Station to implement the necessary priority services needed for ATC voice communications.

3.1.7 Monitoring system operations

3.1.7.1 The ATSP and its CSP(s) should retain records for at least 30 days to allow for accident/incident investigation purposes. The ATSP and CSPs should make these records available for air safety investigative purposes on demand. These recordings should allow replaying of the situation and identifying the SATCOM voice communications between the radio operator/controller and the flight crew.

3.2 Operator eligibility

3.2.1 Operational authorization to use satellite voice communications

3.2.1.1 If changes to the Minimum Equipment List (MEL) are desired to allow dispatch with one satellite voice communication system and only one HF radio system, the operator should obtain operational authorization from the State of the Operator or State of Registry.

Editor's note 9. — What about CPDLC for MEL considerations? MM - This is for another forum and out of scope of this Task Force.

3.2.1.2 Aircraft operators should meet the following criteria:

a) Distribute advisory information within the flight operations department to ensure that all personnel concerned are aware of SATCOM concepts and procedures associated with the use of SATCOM for routine ATC communications (i.e. phraseology).

b) Assess operational requirements, establish policy and procedures, and incorporate them in appropriate documents, including:

1) Procedures to ensure that each participating aircraft is registered with their communication service provider;

2) Flight crew responsibilities for establishing and maintaining HF/VHF voice communications (SELCAL) with the appropriate OCA/FIR's;

3) Procedures on use of SATCOM voice in accordance with ATC communication procedures and guidance material provided in **Chapter 5**, including its use in relationship to other means of communication on the specific aircraft, e.g., CPDLC/ADS-C, FMS WPR, Oceanic clearance;

4) Contact information for the Aero Radio/ATS unit;

Editor's note 10. — For contact information, change to read ANSP. Just an idea. MM - No leave as is. Some use different ATC and Comms providers.

5) Procedures when SATCOM voice fails;

6) Procedures for reporting problems associated with SATCOM voice to appropriate monitoring agencies.

3.2.2 Aircraft equipage

Editor's note 11. — Need to remove FAA-specific references.

3.2.2.1 The installations should be approved by the State of Registry or State of the Operator in accordance with FAA AC 20-150 (or equivalent), and verified to comply with the following:

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) ARNIC 761(Iridium & Inmarsat-2G)

e) ARINC 781 (Inmarsat-3G)

Note.— The above criteria apply only to the SATCOM voice installation when used for ATC communications. The communication equipment requirements as prescribed for the airspace operated in or by the State of Registry or State of the Operator are beyond the scope of this document.

3.2.3 Maintenance and in-service difficulties

3.2.3.1 The operator should establish procedures to report any problems its flight crews and dispatchers have with SATCOM voice operations in accordance with normal reporting practices.

3.2.3.2 The operator should establish procedures to ensure its flight crews and dispatchers are notified of significant degradation of SATCOM service, e.g., outage.

Editor's note 12. — Maybe include some guidance on managing SIM cards during maintenance and other relevant information

3.3 Flight planning

3.3.1 The operator should ensure that the proper information is included in the ICAO flight plan. Until Amendment 1 to the PANS/ATM becomes valid in November 2012 the following procedures should be followed.

a) Insert in item 10, Equipment, the letter "Z" to denote "other equipment".

b) Insert in item 18, Other information, the text "COM/" followed by the word SATVOICE, followed by further identification of the type of equipment such as INMARSAT or IRIDIUM.

Example:

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

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

Example:

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

3.3.3 When the necessary information for establishing contact with the aircraft can be derived from the ICAO 24-bit address, that information should be included in item 18 using the "CODE/" indicator as shown in the above examples.

Chapter 4. Controller and radio operator procedures

Editor's note 13. — Text taken from Kevin Stevens and Radio Operator – Aero radio procedures2 documents. Needs work, some inconsistencies and overlap.

4.1 General

4.1.1 The underlying SATCOM voice technology (duplex mode/open mic) lends itself to a conversational mode of communications. Therefore, such use can create misunderstanding and confusion. When using SATCOM voice, normal RTF conventions must be followed in accordance with standard ICAO phraseology, as defined in Annex 10, Volume II, Chapter 5 and Doc. 8400.

4.1.2 On establishing SATCOM voice contact, care should be taken to ensure positive identification of the aircraft.

4.1.3 If unable to contact the aircraft via SATCOM voice then reversion to any alternative means of communication medium should be followed, including HF, VHF, and Datalink.

4.1.4 Even if there is an automated identification capability, the radio operator or controller must address the aircraft by its identification code Reg # and/or Flight ID for flight safety reasons. Additionally, manufacturers must take into account the human factors elements for ease of use when designing systems.

4.2 Controller procedures

Editor's note 14. — To be updated after the next version of Radio Operator procedures is finalized. We will either create a complementary procedure for Controllers or integrate it into the Radio Operator procedures.

4.3 Radio operator procedures

4.3.1 Outgoing calls – Radio operator initiated (ground-to-air)

4.3.1.1 **Figure 4-1** provides a flow chart for SATCOM voice calls initiated by the radio operator to the flight crew. **Table 4-1** provides descriptions associated with each number flowchart item.

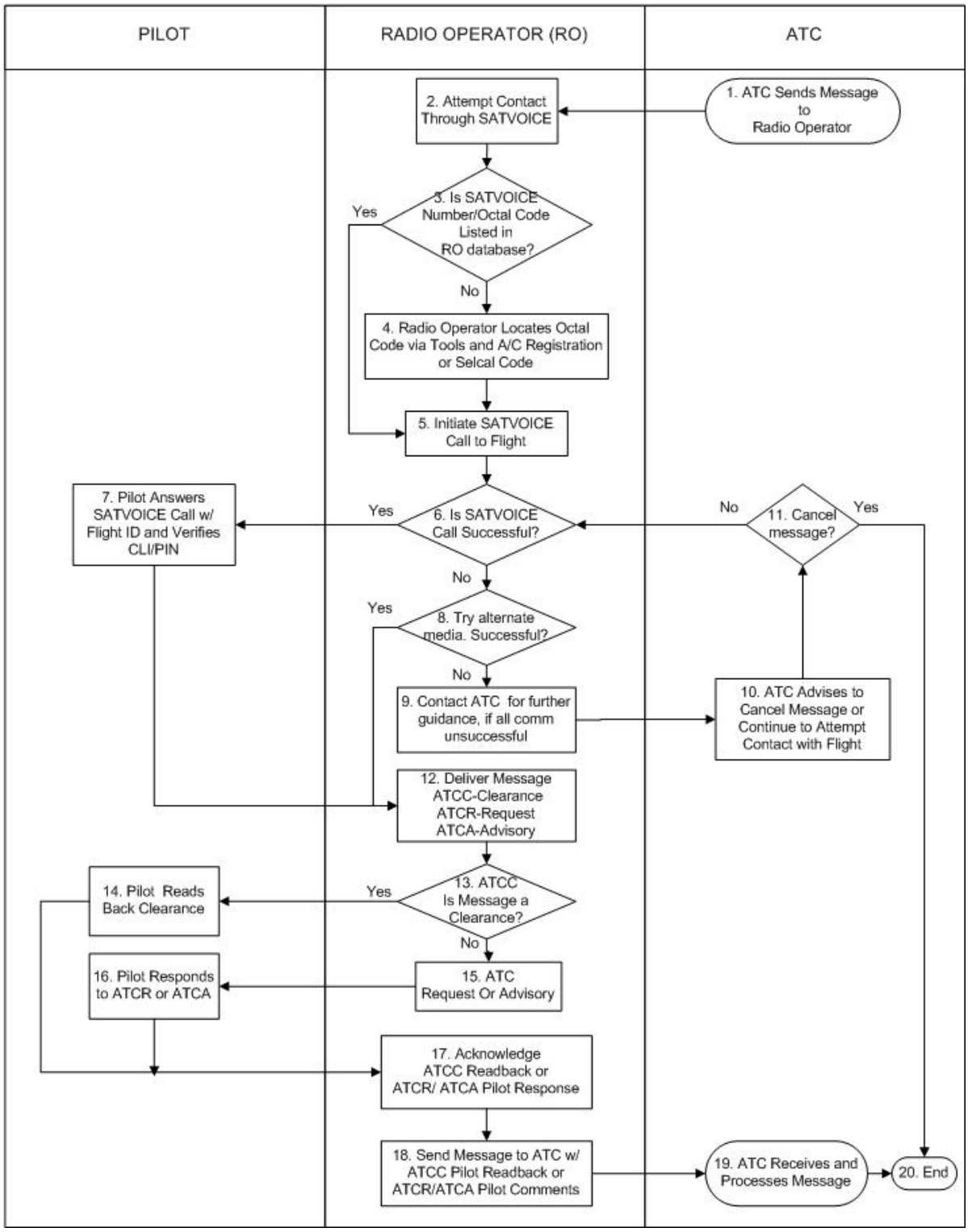


Figure 4-1. Ground to air (radio operator to flight crew) SATCOM voice flowchart

Table 4-1. Ground to air (radio operator to flight crew) SATCOM voice flow chart descriptions

Ref	Ground to Air Communication Process	What is done
1	ATC sends message to Radio Operator	ANSP/ATC inputs a message via ground network to Radio Operators within ATC agency or to their CSP.
2	Attempt contact through SatVoice	Radio Operator attempts SatVoice call if numbers are quickly available.
3	Is SatVoice number/octal code listed in RO database?	If SatVoice number is not previously available to Radio Operator, then he/she checks database for octal code or SatVoice number.
4	Radio Operator locates octal code via tools and A/C registration or Selcal code.	If SatVoice number is not readily available, other tools may be queried to cross reference Aircraft registration number and/or Selcal code.
5	Initiate SatVoice call to flight	Once the Satcom number is available, the Radio Operator will initiate a call to the aircraft.
6	Is SatVoice call successful?	Decision point – is the SatVoice call to the aircraft successful?
7	Yes: Pilot Answers SatVoice call w/ Flight ID and Verifies CLI/PIN.	This branch indicates that the SatVoice call was successfully answered by the pilot, stating the Flight ID and verifying the CLI and PIN, which is displayed to the pilot.
8	No: Try alternate media. Successful?	Decision Point - Radio Operator tries another means of communication (such as reattempting SatVoice, trying HF, VHF, or other means). Is it successful now?
9	No: Contact ATC for further guidance, if all comm unsuccessful	If other means of communication are unsuccessful, then the Radio Operator will contact ATC to report failed communication attempt and obtain further ATC guidance.
10	ATC advises to cancel message or continue to attempt contact with flight.	Given previous status report to ATC by the Radio Operator, ATC will provide additional guidance on message delivery – either to cancel the message or to continue attempted delivery.
11	Cancel message?	Decision Point - Did ATC advise the Radio Operator to cancel any further message attempts? Continue through Yes (End Message) or No (Reattempt Delivery) options.
12	Yes: Deliver Message: ATCC – Clearance ATCR – Request ATCA - Advisory	With the successful contact either via SatVoice or alternate media, the Radio Operator will deliver one of the 3 types of messages – clearance, request or advisory.
13	ATCC – Is message a clearance?	Decision Point – Is the current message a Clearance message?
14	Yes: Pilot reads back clearance	If the current message is a Clearance, then the pilot will readback the Clearance verbatim to the Radio Operator. The Radio Operator is closely monitoring to ensure pilot readback is correct.
15	No: ATC Request or Advisory	Since the current message is not a Clearance, then it is determined to be a Request or Advisory.

Ref	Ground to Air Communication Process	What is done
16	Pilot responds to ATCR or ATCA	Since the current message is a Request or Advisory, it is not necessary for the pilot to read it back; therefore, he simply responds to it.
17	Acknowledge ATCC Readback or ATCR/ATCA Pilot Response.	The Radio Operator will acknowledge the message as appropriate. If it is a Clearance, the RO acknowledges the pilot's readback. However, if it is a Request or Advisory, the RO will just acknowledge the pilot's response for documentation back to ATC.
18	Send message back to ATC w/ ATCC Pilot Readback or ATCR/ATCA Pilot Comments.	Since this message activity started with an ATC Clearance, Request or Advisory, the Radio Operator is completing the communication back to ATC with the pilot's response – either documenting the pilot's readback to the Clearance or providing any comments from the pilot to the Request or Advisory.
19	ATC receives and processes message.	ATC receives the message sent from the Radio Operator with the pilot's response. ATC processes the message/information as appropriate.
20	End	End communication either due to successful delivery or cancellation direction by ATC.

4.3.1.2 The method of establishing ground initiated calls will be dependent on the technical/operational implementation at each one of the radio stations. However, some steps should be common to each station regardless of the technical/operational methodology employed. These are:

a) Identify the Inmarsat 8 digits short code of the aircraft from radio operator database;

b) Initiate the dialing sequence ensuring CLI/PIN and security measures are in place;

c) Wait for the flight crew to answer the call;

d) confirm the aircraft call sign prior to delivering the clearance or message;

e) Initiate the conversation; and

f) Terminate the call after the dialog is finished.

Example:

Radio operator	<Initiates call and line rings in flight deck>
Flight crew	Gander Radio, Air France 465 go ahead. *Note.— The pilot will be able to identify the caller and address the facility accordingly.*
Radio operator	Air France 465, Gander Radio, <message>
Flight crew	Gander Radio, Air France 465, <read back message>
Radio operator	Air France 465, Gander Radio, readback correct, out

4.3.1.3 In cases where an ATC message is urgent or delivery time is critical, the most expeditious means of communications should be utilized.

4.3.2 Incoming calls – radio operator receives calls (air-to-ground)

4.3.2.1 **Figure 4-2** provides a flow chart for SATCOM voice calls received by the radio operator from the flight crew. Table x-x provides descriptions associated with each number flowchart item.

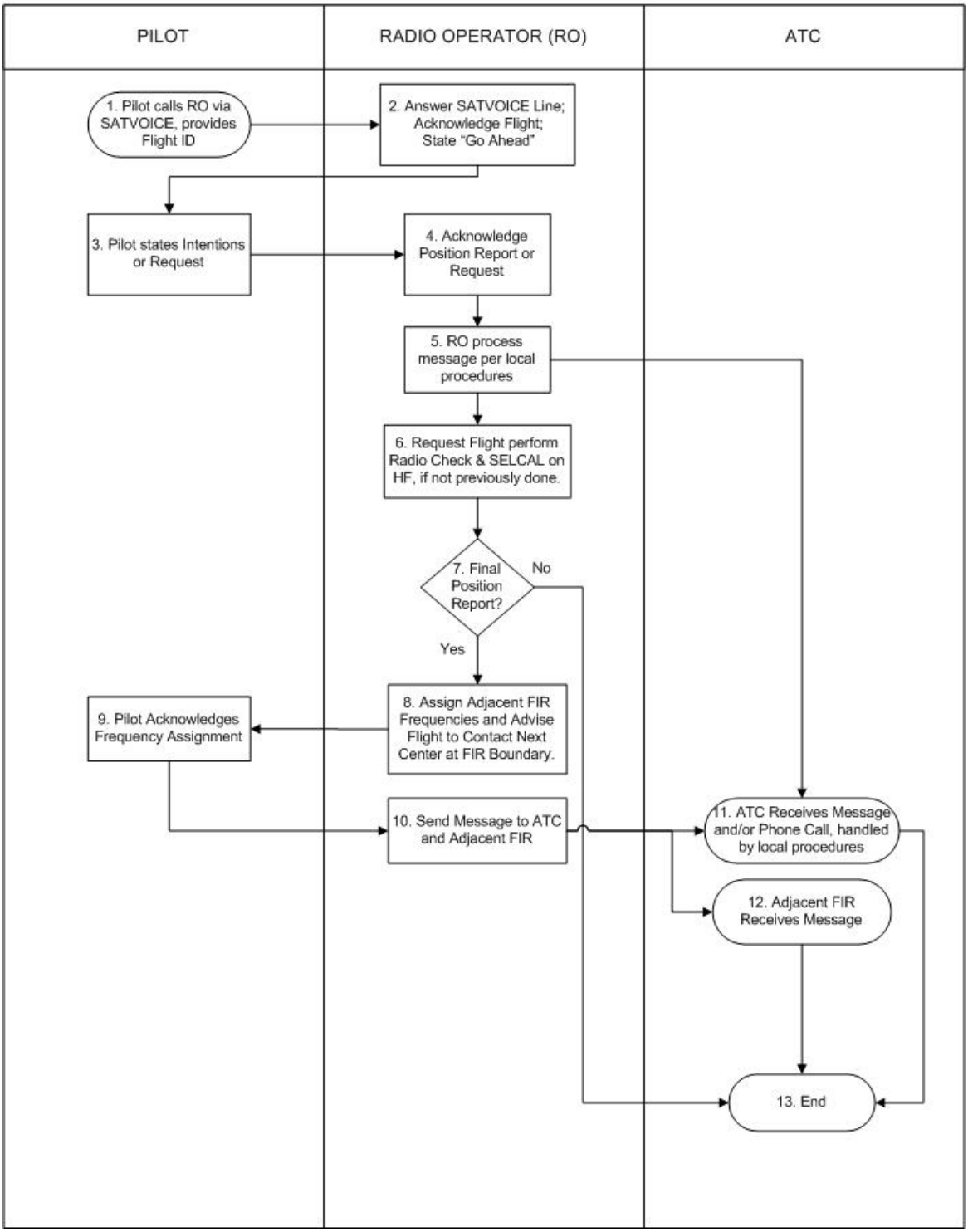


Figure 4-2. Air-ground (flight crew to radio operator) SATCOM voice flowchart

Table 4-2. Air-ground (flight crew to radio operator) SATCOM voice flowchart descriptions

Ref	Ground to Air Communication Process	What is done
1	Pilot calls RO via SatVoice, provides Flight ID	Pilot from an oceanic flight calls the Radio Operator via SatVoice. Pilot provides Flight ID.
2	Answer SatVoice line; acknowledge Flight; State "Go Ahead"	Radio Operator answers the SatVoice line and acknowledges the flight's call, stating "Go Ahead".
3	Pilot states intentions or Request	Pilot states his/her intentions for placing the SatVoice call, which could be an Initial Check-in, a Guard Change, a Pilot Request, or provides a Position Report
4	Acknowledge Position Report or Request	Radio Operator acknowledges the pilot's Position Report or his/her Request
5	RO process message per local procedures	Radio Operator relays Position Report or Request to ATC per local procedures.
6	Request Flight perform Radio Check & SELCAL on HF, if not previously done	After obtaining flight information for a new flight contact, the Radio Operator will request an HF Radio Check and SELCAL with the aircraft, which they will perform as soon as possible. Depending upon the configuration of communications assets within the Radio room, the SELCAL could be with the same Radio Operator who is on the SatVoice call, or the pilot could be transferred to another Radio Operator, handling those HF frequencies and radio assets.
7	Final Position Report?	Decision Point – Is this the pilot's final Position Report? This may determine activity with an adjacent FIR.
8	Yes: Assign Adjacent FIR Frequencies and advise Flight to contact next center at FIR Boundary.	When this is the pilot's final Position Report in the Radio Operator's FIR responsibility, then the Radio Operator provides the adjacent FIR frequencies to the pilot and advises the aircraft to contact the next center at the FIR boundary.
9	Pilot acknowledges Frequency Assignment.	Pilot acknowledges the HF or VHF Frequency Assignment for the next FIR boundary from the Radio Operator.
10	Send Message to ATC and Adjacent FIR	Radio Operator sends a message to ATC and the Adjacent FIR about flight status and/or pending entry into next FIR.
11	ATC Receives message and/or phone call, handled by local procedures	ATC will receive the Position Report or the Pilot Request from the Radio Operator. The Radio Operator may also call ATC depending upon local procedures.
12	Adjacent FIR Receives Message	The Adjacent FIR will receive the Position Report and flight status, in preparation of handling the flight as it enters their FIR.
13	End	End communication flow due to completion of communications activities, such as delivery of pilot Position Report or Request, and handoff to adjacent FIR, if appropriate, and/or updating of Radio Operator's flight information database.

4.3.2.2 For SATCOM voice calls made to a radio station, the radio operator should:

a) confirm the identification of the calling flight;

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

c) if not already completed, provide primary and secondary HF frequencies and ensure flight establishes HF/VHF and SELCAL check, where required by the regulatory authority

Example:

	<line rings at aero radio>
Flight crew	<Initiates call and line rings at aero radio>
Radio operator	Flight calling Shanwick Radio, GO AHEAD *Note.— Radio operator does not need to know who is calling.*
Flight crew	Shanwick Radio, Speedbird 255, <message>
Radio operator	Speedbird 255, Shanwick Radio <read back message>
Flight crew	Shanwick Radio, Speedbird 255, ROGER
Radio operator	Shanwick Radio OUT

4.3.2.3 If the initial call from the flight crew to a radio station is made on SATCOM, the radio operator should:

a) receive and read-back the message, if required; and

b) allocate the primary and secondary HF frequencies and perform a SELCAL check on HF.

Editor's note 15. — (input from Guidance Material for SATCOM Voice Trial in NAT Airspace, May 2007) follows:

Editor's note 16. — TK – This text may be duplicate of text in Chapter 5 for flight crew procedures.

4.4 (Deleted)

4.5 Communication failures and emergencies

4.5.1 Loss of SATCOM Voice Connection

4.5.1.1 If the SATCOM voice connection is lost during a communication, the radio operator should:

a) attempt to contact the aircraft on HF (SELCAL) or VHF or relay through another flight;

b) deliver the clearance or receive the message as appropriate; and

c) if connection fails advise the aircraft to revert to HF voice procedures.

4.5.2 Airspace emergencies – loss of controller or radio facility capabilities

4.5.2.1 In situations where the controller or radio facility loses capabilities, then the radio operator should use whatever means are available to provide information on the emergency situation and any directives, for example:

a) HF broadcast capability – Radio operators will transmit a voice broadcast on HF radio of emergency situation and any directives.

b) SATCOM voice broadcast capability – future development; and

c) Volmet broadcasts, if available.

Chapter 5. Flight crew procedures

5.1 General

5.1.1 Operators 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 their normal means of communications. The flight crew may use SATCOM voice at their discretion, for ATC communications, including position reports, negotiations and requests, when deemed appropriate.

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

5.1.3 On initial contact with a radio station, the flight crew should provide flight identification and request frequency assignment and perform a SELCAL check on HF. After a successful SELCAL check, all subsequent communications with that radio station may be performed via SATCOM Voice or HF voice based on regulatory requirements and company policies.

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

5.1.5 If a HF SELCAL check is required before or after entering a FIR, the flight crew should contact the radio operator and complete a HF SELCAL check. A check of the SATCOM voice system similar to a HF SELCAL is not required because the system will alert the crew if the system is not working properly.

5.2 Flight crew initiated

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

5.2.2 When contacting ATC crews should utilize the appropriate safety priority.

Example:

	<line rings at aero radio>
Flight crew	Arctic Radio, Continental 99, position report
Radio operator	Continental 99 Arctic Radio, go ahead
Flight crew	Arctic Radio, Continental 99, <message>
Radio operator	Continental 99, Arctic Radio, <read back message>
Flight crew	Arctic Radio, Continental 99 out

5.3 Flight crew receives call

5.3.1 The flight crew should visually confirm the priority of the incoming call and verify that it is an ATC priority call. Reply to calls utilizing standard phraseology (see **paragraph 5.1.2**)

5.3.2 The flight crew should not act on ATC instructions from SATCOM calls with other than ATC priority calls, and if in doubt terminate the call and initiate a new call for confirmation.

5.4 Oceanic clearances

5.4.1 Coordination of oceanic clearances should be in accordance with state AIPs.

5.5 Contingencies

5.5.1 SATCOM busy signal or no answer

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

5.5.2 SATCOM Failure

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

a) revert to an alternate means of communication; and

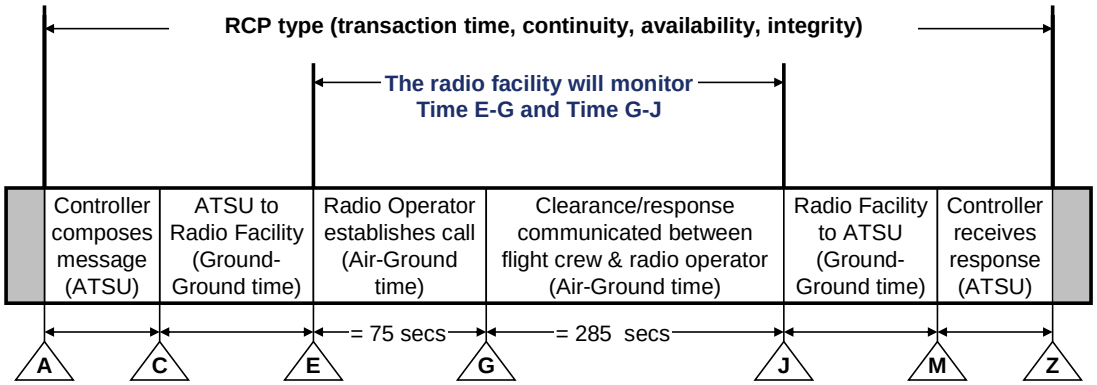
b) notify the radio station of the SATCOM voice failure.

Appendix A – RCP 400 specification – allocations for radio operator satellite voice

This appendix provides a supplement to the RCP 400 specification provided in the First Edition of the Global Operational Data Link Document (GOLD). The supplement includes the RCP allocations for radio operator satellite voice communications, consistent with RCP 400 "top sheet."

A.1 Terms and definitions

Refer to GOLD, Appendix B, paragraph B.1 for general terms and definitions applicable to RCP specifications. This section provides additional terms and definitions to describe the RCP allocations for radio operator satellite voice communications.



E-G = Time it takes for queuing and the radio operator to establish voice communications
G-J = Time it takes for flight crew and radio operator to communicate the clearance/response

C-E + J-M = 10 sec – assumed time it takes to transit the ground-ground communication link between the radio facility and the ATSU

A-C + M-Z = 30 sec – assumed time for controller/HMI to compose clearance and acknowledge response from flight crew

Total Voice Time (TVT) for RCP 400/V allocation (TVT = A-C + C-E + E-G + G-J + J-M + M-Z)

Figure A- 1. Typical voice communication transaction – controller initiated radio operator satellite voice communication allocation

A.2 RCP 240 specification

Refer to GOLD, Appendix B, paragraph B.2 for RCP 240 specification.

A.3 RCP 400 specification

RCP Specification			
RCP type		**RCP 400**	
Airspace specific considerations			
Interoperability	Specify interoperability criteria, e.g. FANS 1/A		
ATS Function	Specify ATS function(s), e.g. applicable separation standard		
Application	Specify controller-pilot ATC communication intervention capability, e.g. CPDLC application per ICAO Doc 4444, and RTCA DO-306/EUROCAE ED-122, Annex A		
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:	**<u>Criteria</u>**		
MA-1	The system shall be capable of detecting failures and configuration changes that would cause the communication service to no longer meet the RCP type for the intended function.		
MA-2	When the communication service can no longer meet the RCP type for the intended function, the flight crew and/or the controller shall take appropriate action.		
Notes			
<u>Note 1</u>.— 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. *<u>Note 2</u>.— 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 aircraft identification.* *<u>Note 3</u>.— 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 type, this would be considered a change in system configuration.*			

A.3.1 RCP 400/D allocations

Refer to GOLD, Appendix B, paragraph B.3.1 for RCP 240/D allocations applicable to CPDLC.

A.3.2 RCP 400/3V allocations

The RCP 400/3V allocations are applicable to radio operator satellite voice communications.

A.3.2.1 Air traffic service provider (ATSP)

A.3.2.2 Communication service provider (CSP)

A.3.2.3 Aircraft system

A.3.2.4 Aircraft operator