

**Twenty Ninth Meeting of the
Informal South Pacific ATS Co-ordinating Group
(ISPACG/29)**

**Santiago, Chile
4-6 March 2015**

Agenda Item 4: Review Open Action Items (ISPACG/28 Appendix A)

**Satellite Voice (SATVOICE) Capability in Flight Plan (FPL) and in the Aeronautical
Information Publication (AIP)**

Presented by Federal Aviation Administration (FAA)

SUMMARY

This paper provides background and an update on the status of satellite voice (SATVOICE) for air traffic services (ATS) communication. Refer to the following action items:

AI 27-1	SATCOM Voice Capability in Flight Plan
AI 27-2	SATCOM Voice Capabilities in AIP

1. INTRODUCTION

- 1.1. At ISPACG/28, in response to action item AI 27-1, the FAA provided information on current activities concerning the provision and use of satellite voice (SATVOICE) for ATS communication. The information included a review of the following activities:
- a) *SATVOICE guidance material (SVGGM)* developed by the Inter-Regional SATCOM Voice Task Force (IRSVTF), established by the North Atlantic Systems Planning Group (NAT SPG) and the Asia-Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG), at the request of the Air Navigation Commission (ANC);
 - b) Proposals for amendments to ICAO Annexes and Procedures for Air Navigation Services (PANS) and supporting guidance material, referred to as the *Satellite Voice Operations Manual (SVOM)*, based on SVGGM and developed by the Operational Data Link Panel (OPLINKP); and
 - c) SATVOICE evaluation being conducted by the FAA-sponsored Performance Based Operations Aviation Rulemaking Committee's Communication Working Group (PARC CWG).
- 1.2. This paper reacts further to AI 27-1, concerning SATVOICE equipment and capability in the FPL, and AI 27-2, concerning SATVOICE services provided by air navigation service providers (ANSPs) as stipulated in the AIP.

2. DISCUSSION

2.1. Highlights from discussions at previous ISPACG meetings

- 2.1.1 In 2012, the Asia Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) and the North Atlantic Systems Planning Group (NAT SPG) adopted the SVGM developed by the IRSVTF. The IRSVTF was disbanded at that time since its work had been completed (Refer to APANPIRG Conclusion 23/25, NAT SPG Conclusion 48/8 and Implementation Management Group Decision 41/11).
- 2.1.2 In June 2013, the APANPIRG adopted a revised aeronautical mobile service (AMS) strategy, which expanded scope to include the use of SATVOICE within a performance-based communication and surveillance (PBCS) framework. The APANPIRG AMS strategy called for planning and implementation of new communication technologies and applications to meet the demands of aviation in the ASIA/PAC Region. The planning and implementation will need to involve all stakeholders and take into account costs and benefits (Refer to APANPIRG Conclusion 24/35).
- 2.1.3 The APANPIRG AMS strategy is consistent with the ICAO *Global Air Navigation Plan* (Doc 9750). Doc 9750 recognizes advances and benefits from data link implementation, such as controller-pilot data link communications (CPDLC) and automatic dependent surveillance – contract (ADS-C). However, it also identifies the need for research and development in the Block 1 (2018-2023) and Block 2 (2023-2028) timeframes to study the role of voice communication technologies and applications in the long-term concept. The plan foresees implementation of SATVOICE services that will eventually replace high frequency (HF) voice services in the Block 3 timeframe (beyond 2028).
- 2.1.4 Plans and strategies concerning SATVOICE have been documented within the aviation community. This paper presents OPLINKP and PARC CWG work, which contributes to the planning and implementation of global SATVOICE services for ATS and aeronautical operational control (AOC) communications.

2.2. Status of OPLINKP work on ICAO SATVOICE material

Proposals for amendments (PfAs) to Annexes and PANS

- 2.2.1 The Second Meeting of OPLINKP (OPLINKP/2), held in Montréal, from 6 to 17 October 2014, agreed to the following recommendation concerning proposals for amendments (PfAs) to include provisions for SATVOICE in Annexes and PANS:

RSPP	Recommendation 3/1— Amendment to Annex 4, Annex 10 (Volumes II and III), Annex 15, PANS-ATM and PANS-ABC concerning satellite voice communications
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RSPP	That Annex 4, Annex 10 (Volumes II and III), Annex 15, PANS-ATM and the PANS-ABC be amended as shown in Appendices B through G to the Report.
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Note 1.— Recommendations annotated “RSP” relate to proposals for amendment of Standards, Recommended Practices and Procedures for Air Navigation Services or guidance material in an Annex.

Note 2.— Appendices B through G to the Report are summarized in this paper. The actual PfAs can be provided upon request.

2.2.2 **Table 1** provides an overview of the PfAs to Annexes and PANS concerning SATVOICE.

Table 1. Overview of proposed amendments to Annexes and PANS concerning SATVOICE

Reference	Description of proposed amendment to Annexes and PANS
Annex 4	<p>Aeronautical Charts</p> <ul style="list-style-type: none"> Added definition for the term “SATVOICE number.” Added provision to include SATVOICE number on aeronautical charts.
Annex 10, Volume II	<p>Aeronautical Telecommunications, Communication Procedures including those with PANS status</p> <ul style="list-style-type: none"> Added the definition for the term, “SATVOICE number.” Added, “Note.— The term “frequency” is used generally to include VHF, HF, UHF and SATVOICE number.” Added a reference to Doc [SVOM] and Doc 9869. Indicated that OVER and OUT are not normally used in SATVOICE communication.
Annex 10, Volume III, Part II	<p>Aeronautical Telecommunications, Communication Systems, Voice Communication Systems</p> <ul style="list-style-type: none"> Added the definition for the term, “SATVOICE number.” Added, “Note 2.— The term “frequency” is generally used to include VHF, HF, UHF and SATVOICE number.” Added references to <i>Manual on the Aeronautical Mobile Satellite (Route) Service</i> (Doc 9925), Doc [SVOM] and Doc 9869. Added a new provision for SATVOICE systems. For ground-to-air calls, the SATVOICE system shall provide secure calling, priority level and aircraft SATVOICE number, which is a coded form of ICAO aircraft address (often referred to as ICAO 24-bit address). For air-to-ground calls, the SATVOICE system shall provide the capability for flight crew to contact the ATS unit or aeronautical station based on the assigned SATVOICE number (short code and/or direct dial number), and allow the flight crew and/or aircraft system to specify the priority level. The priority level definitions are included in the Annex.
Annex 15	<p>Aeronautical Information Services</p> <ul style="list-style-type: none"> Added definition for the term “SATVOICE number.” Added provision to include SATVOICE number in AIP.

Reference	Description of proposed amendment to Annexes and PANS
Doc 4444	<p>Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM)</p> <ul style="list-style-type: none"> • Terms in Appendix 2 and Appendix 3 were revised from “RTF SATCOM” and “RTF” to “SATVOICE.”
Doc 8400	<p>Procedures for Air Navigation Services – ICAO Abbreviations and Codes (PANS-ABC)</p> <ul style="list-style-type: none"> • The term SATCOM was clarified so that it would be used only when referring generally to both voice and data satellite communication or only data satellite communication. • A new term, SATVOICE, was added, which provides an efficient means in phraseology when needed to instruct the party to use SATVOICE rather than SATCOM, SATCOM voice or RTF SATCOM.

- 2.2.3 The PfAs to Annexes and PANS are intended to promote global harmonization of SATVOICE services, aircraft SATVOICE capability and use for air traffic service (ATS) communication. Harmonization of SATVOICE systems and procedures, the associated equipment for the ATS provision, as well as the aircraft equipment, are crucial to ensure cost-effective solutions to advance air traffic management (ATM), which is supported by both ATS and AOC communications.
- 2.2.4 SATVOICE complements CPDLC and ADS-C, both which use satellite data communications in airspace where procedural separations are applied. Therefore, it is only natural for an operator that equips with CPDLC and ADS-C to also equip with SATVOICE owing to the negligible additional non-recurring cost when compared against the benefits. Some operators are already seeking relief of HF radio equipment on the minimum equipment list (MEL) based on SATVOICE to reduce weight, save fuel, reduce greenhouse gas emissions and allow greater payload. Additionally, some States require operators to be equipped with SATVOICE for operations, such as extended diversion time operations (EDTO)—also referred to as ETOPS—beyond 180 minutes.
- 2.2.5 SATVOICE services complement existing HF voice services. ATS units and aeronautical stations are already providing or are planning to provide SATVOICE services to improve voice communication services. These investments are based primarily on operational trials completed in 2007 in the NAT Region. The trials proved SATVOICE for ATS was useful in situations such as poor HF propagation conditions and emergencies. Currently, controllers are using SATVOICE for direct controller pilot communication at their discretion even in normal situations because it is more convenient and cost effective than the alternatives. In the longer term, SATVOICE could be a viable complement to automatic dependent surveillance – broadcast (ADS-B) to enable reduced separations between aircraft pairs that are not CPDLC and ADS-C capable in airspace that otherwise would not be possible.
- 2.2.6 The *2013–2028 Global Air Navigation Plan* (Doc 9750) includes satellite data and voice communications as enabling technologies to advance ATM operations. For

airspace where procedural separations are being applied, it is expected that migration from HF voice to SATVOICE will be completed in the Block 3 (2028 onward) timeframe. To achieve this milestone, the plan recognizes that research, planning and development are essential in the Block 1 (2018-2023) and Block 2 (2023-2028) timeframes to maximize benefits and recover costs.

- 2.2.7 The earlier timeframes will need to involve all stakeholders to coordinate on regional and global plans that transition investments from HF voice to SATVOICE. For example, as SATVOICE infrastructure is implemented, there may come a time to move traffic from using HF voice to SATVOICE rather than invest in changes needed to implement additional HF selective calling system (SELCAL) codes. Aircraft manufacturers will need to decide when to offer HF voice equipment as optional rather than basic on newer aircraft models. State MEL policies will need to depend on reliable infrastructure that will require a sufficient number of lines to ATS units and aeronautical stations with capabilities to effectively and efficiently contact aircraft and receive calls via safety SATVOICE service switches. Users will need to be notified of available SATVOICE services in AIPs or other equivalent publications. A proper transition will be essential to realize expected benefits and recover costs.
- 2.2.8 The PfAs to include SATVOICE provisions in the Annexes and PANS are planned for adoption in November 2016. They will:
- a) Ensure a globally standardized approach and provide a cost-effective pathway for ANSPs to contract and implement SATVOICE services in the Block 1 and Block 2 timeframes and to prepare for migration from HF voice to SATVOICE in the Block 3 (beyond 2028) timeframe;
 - b) Ensure reliable SATVOICE services to advance ATM operations and meet the increasing demands on our global air transportation system; and
 - c) Support the use of different commercial satellite companies and network service providers within a common architecture, and allow operators to choose from a variety of aircraft systems available that are interoperable with SATVOICE services.

Satellite Voice Operations Manual (SVOM) (Doc [SVOM])

- 2.2.9 OPLINKP/2 also agreed to the following recommendation concerning guidance material to support the Annex and PANS provisions for SATVOICE:

Recommendation 3/2— Satellite Voice Operations Manual

That the *Satellite Voice Operations Manual* (First Edition, Doc XXX), as a matter of urgency, be published in all ICAO languages when the final draft is provided by the panel.

Note.— The panel provided the ICAO Secretariat the final draft of the Satellite Voice Operations Manual (SVOM), dated 13 December 2014, and is summarized in this paper. The final draft SVOM can be provided upon request.

2.2.10 In developing the *Satellite Voice Operations Manual (SVOM)* (Doc [SVOM]), the OPLINKP based its work on the regional SVGGM. **Table 2** provides an overview of the changes from the regional SVGGM to the final draft Doc [SVOM].

Table 2. Overview of changes from Regional SVGGM to ICAO Doc [SVOM]

Reference	Description of changes from Regional SVGGM
Foreword	<p>Foreword</p> <ul style="list-style-type: none"> Updated historical background, scope and purpose, status, implementation, and amendments to Doc [SVOM] Foreword is consistent with the Forewords provided in <i>Global Operational Data Link (GOLD) Manual</i> (Doc [GOLD]) and <i>PBCS Manual</i> (Doc 9869).
Chapter 1	<p>Definitions</p> <ul style="list-style-type: none"> Terms, definitions and acronyms not used were deleted. Terms refined to align with ICAO definitions.
Chapter 2	<p>Overview of aeronautical SATVOICE system</p> <ul style="list-style-type: none"> Section 2.1 (General) and 2.2 (Aeronautical SATVOICE system overview) were merged.
Chapter 3	<p>Administrative provisions related to SATVOICE operations</p> <ul style="list-style-type: none"> Deleted PBCS related material (Moved to Doc 9869 (PBCS Manual) and revised references, accordingly). General guidance was revised to refer to Annex 19 (Safety Management). Combined 3.3.1 (Operational authorization to use SATVOICE communications) and 3.3.2 (Long range communication systems (LRCS) to be carried on board) to clarify operational approval requirements.
Chapter 4	<p>Controller and radio operator procedures</p> <ul style="list-style-type: none"> Introduced the term “ground user” and combined controller and radio operator procedures.
Chapter 5	<p>Flight crew procedures</p> <ul style="list-style-type: none"> No significant changes
Appendix A	<p>Future of SATVOICE concept of operation and considerations</p> <ul style="list-style-type: none"> No significant changes
Appendices B, C and D	<p>Required communication performance (RCP) and required surveillance performance (RSP) specifications – allocations for SATVOICE communications, and Post-implementation monitoring</p> <ul style="list-style-type: none"> Deleted. Material moved to PBCS Manual (Doc 9869).

2.2.11 While the SATVOICE PfAs to the Annexes and PANS are planned to be adopted in November 2016, the *Satellite Voice Operations Manual (SVOM)* is planned to be published by mid-2015, together with the *GOLD Manual* and the *PBCS Manual*. These three manuals are being expedited so that they can supersede the two regional guidance documents, GOLD and SVGM, in a timely manner. Once published, OPLINKP may amend the ICAO manuals prior to or concurrent with the planned adoption date for the PfAs.

Status of SATVOICE PfAs and Doc [SVOM]

2.2.12 The SATVOICE PfAs and Doc [SVOM] are currently under review and coordination by the Secretariat in preparation for presentation to the ICAO Air Navigation Commission (ANC) in April 2015. The Secretariat will request the ANC to approve the action to distribute the PfAs under a State letter for review and comment. This review period is expected to occur sometime between April and August. Doc [SVOM] will be provided to the ANC and as part of the State letter for the PfAs as supporting material. Minor changes to the PfAs and Doc [SVOM] can be expected prior to presenting the package to the ANC and issuing the State letter.

2.3. PARC CWG

- 2.3.1 In March 2008, the PARC CWG initiated a project to investigate the use of SATVOICE for ATS communication. The goal of the project is to conclude on recommendations to the FAA that would allow one HF communication system to be permanently replaced with a SATVOICE system in cases where two long range communication systems (LRCSs) are required.
- 2.3.2 The recommendations would concern FAA policies and practices that are applied to the master minimum equipment list (MMEL) for a specific aircraft model and the minimum equipment list (MEL) for a specific operator or in cases where LRCSs are required by regulation. The PARC CWG is not considering SATVOICE as a means to completely remove the carriage of HF voice communication equipment at this time.
- 2.3.3 Under SATVOICE project, the PARC CWG has accepted the ICAO material that has evolved in the regions and by OPLINKP as a basis for evaluating SATVOICE technologies. While much of the work has been focused on Iridium, the project includes Inmarsat and MTSAT. The evaluations are intended to determine the viability of SATVOICE as an FAA-approved LRCS that can be used in tandem with HF voice communication via a radio operator and/or directly with a controller.
- 2.3.4 The SATVOICE project is supported by six airlines (Hawaiian (HAL), UPS, Delta, United, Sun Country and Southwest), two satellite service providers (Iridium and Inmarsat), two communication service providers (Rockwell Collins and SITA), Boeing, two avionics manufacturers (Avionica and ICG) and the FAA.
- 2.3.5 In January, 103 aircraft were identified for participation in the evaluation. 92 aircraft are equipped with Iridium ATS SIM cards. UPS completed 83 of 85 aircraft installations. HAL has offered nine B767 Iridium equipped aircraft and 11 Inmarsat equipped aircraft to participate.



- 2.3.6 Actual data collection began in September 2014 with HAL aircraft in the Oakland Oceanic flight information region (FIR) to measure against the RCP 400 specification. HAL and Rockwell Collins (RC) Comm Centers execute live performance test calls. HAL's dispatch office sends a ground message to the RC Comm Center. The radio operator receives the message in queue, which is prioritized below ATC clearances. The radio operator calls the aircraft via SATVOICE and documents clarity, attempts, and other information. The radio operator then sends a message back to HAL's dispatch office. Some issues are being worked; however the evaluation is expected to continue in Oakland Oceanic FIR and expand into New York Center's airspace.
- 2.3.7 RC is also parsing FAA FPL data for the hexadecimal (hex) code for the aircraft address filed in Item 18 following CODE/. This code is translated into an octal code, which populates the RC Comm Center voice switch, and is used to call an aircraft. RC has created monthly reports that track FPL volume and proportion of FPLs that include CODE/[aircraft address in hex code] in Item 18. RC is communicating with individual airlines on their current status. **Table 3** and **Table 4** show examples of the FPL 2012 hex code compliance report summary for December 2014 for HAL and all operators, respectively. While HAL's FPLs are 100% in compliance, only 46% of all operators that include M1, M2 or M3 in FPL Item 10 also include CODE/[aircraft address in hex code] in FPL Item 18.

Table 3. FPL 2012 hex code compliance report (December 2014 HAL)

SATCOM FPL 2012 COMPLIANCE REPORT					
HAWAIIAN AIRLINES, INC.					
DECEMBER 2014					
Agency	Provider	FPL Filed	% of total FPL by provider	FPL in compliance	
				FPL with octal	%
HAL	M1 Inmarsat	160	32%	160	100%
HAL	M3 Iridium	291	58%	291	100%
Subtotal		451	89%	451	100%
HAL	No Provider Listed	53	11%	9	
TOTAL		504	100%		

Table 4. FPL 2012 hex code compliance report (December 2014 ALL)

SATCOM FPL 2012 COMPLIANCE REPORT					
ALL OPERATORS					
DECEMBER 2014					
Agency	Provider	FPL Filed	% of total FPL by provider	FPL in compliance	
				FPL with octal	%
ALL	M1 Inmarsat	19,816	27%	8,876	45%
ALL	M2 MTSAT	2,549	3%	1,586	62%
ALL	M3 Iridium	2,933	4%	1,293	44%
Subtotal		25,298	34%	11,755	46%
ALL	No Provider Listed	49,272	66%	3,161	
TOTAL		74,570	100%		

- 2.3.8 In June 2014, the FAA issued Policy Letter PL-106, Rev 5, concerning High Frequency (HF) Communications. Its purpose is to provide standardized Master Minimum Equipment (MMEL) requirements for HF communication systems.
- 2.3.9 The Rev 5 changes include recognizing SVGM as basis for evaluating SATVOICE systems as a long range communication system (LRCS). It states that SATVOICE systems that receive direct dial ground-to-air calls are not secured via Iridium Safety Voice service and must be upgraded if credit is sought for MMEL. It also requires the FPL to identify the SATVOICE equipment and capability as follows:
- a) Item 10 – M1 (Inmarsat), M2 (MTSAT) or M3 (Iridium); and
 - b) Item 18 – CODE/[aircraft address in hex code].
- 2.3.10 PL-106 also indicates that CPDLC is not suitable for emergency and non-routine communications.
- 2.3.11 The FAA continues to support the ICAO *Global Air Navigation Plan*, the work of PARC CWG and OPLINKP to advance SATVOICE technology for aviation. It is currently considering preparing an Information Notice to operators to raise the awareness of FPL requirements and upgrades necessary to Iridium installations as described above if credit is sought for MMEL or to meet regulations for LRCS.
- 2.3.12 PARC CWG has taken an action to begin collecting information from AIPs to develop a world map of SATVOICE services and identify intended uses and any restrictions (e.g., for non-routine and emergency use only).

2.4. Challenges for SATVOICE implementation - Conclusion

- 2.4.1 Since ISPACG/28, much work has been accomplished to overcome challenges for SATVOICE implementation. However, more work is needed. The following provides updated information on the challenges that were presented at ISPACG/28.
- 2.4.2 OPLINKP has agreed to SATVOICE PfAs to Annex 4, Annex 10, Volumes I and II, Annex 15, Doc 4444 and Doc 8400, which are targeted for adoption in November 2016. Doc-[SVOM] is targeted for publication by mid-2015. These new provisions should facilitate SATVOICE implementation in ICAO regions.
- 2.4.3 FAA has issued revisions to its MMEL policy to allow one HF communication system and one SATVOICE system. Other States may also be reviewing their MMEL policies. However operators would still be bound by airspace requirements as provided in Regional Supplementary Procedures (Doc 7030) and State AIPs applicable on the route of flight. AIPs that place restrictions on the use of SATVOICE would need to be amended to remove the restrictions before operators can benefit from aircraft configurations that rely on a SATVOICE system for relief of one HF communication system.
- 2.4.4 While State AIPs may indicate the availability of SATVOICE service in applicable airspace, the relevant ARTCCs and aeronautical stations may have limitations on the associated infrastructure. ANSPs may need to upgrade infrastructure to provide the appropriate level of SATVOICE service consistent with MMEL policy and dispatch reliability requirements for voice communications. For example:
- a) Ground-to-air and air-to ground calls may be limited by the number of lines available;
 - b) Ground-to-air dialing capability and access to aircraft SATVOICE numbers may be limited;
 - c) Incoming air-to-ground calls may be answered by the site supervisor, who in turn takes a remote phone to the appropriate controller to complete the communication, or incoming calls may not be answered at all because they are unattended, which may limit the efficiency of the SATVOICE service; and
 - d) Ground-to-air calls to aircraft logged onto MTSAT are possible only using dedicated lines, such as Fukuoka ATC, or by obtaining a SATVOICE service account with SITA. Oakland Center currently accesses the satellite network using a Rockwell Collins (RC) SATVOICE service account. The FAA would need to change or obtain a separate SITA SATVOICE service account to be capable of contacting aircraft logged on to MTSAT. Similarly, the RC San Francisco Comm Center is currently not capable of contacting aircraft logged onto MTSAT using SATVOICE. (Refer also to ISPACG/28 WP/3, presented by New Zealand).
- 2.4.5 ICAO should consider development of policies and guidance on the assignment and management of short codes for ARTCCs and aeronautical stations. The short codes should be independent of technology. Currently, it is uncertain whether the AIPs and aeronautical charts provide the short codes in all cases of available SATVOICE

service. The PfAs planned for adoption in November 2016 to Annex 4 and Annex 15 will require short codes and/or PSTN number to be provided in AIPs and published on aeronautical charts. The applicability date is yet to be determined. Avionics suppliers are also looking for a single source that can be used to support speed dial capabilities on the flight deck. The list of known short codes, dated September 2013, is provided in Attachment A, which is the same as the list provided at ISPACG/28. This list is expected to be updated by Inmarsat in the next few months.

- 2.4.6 Concerning the use of Iridium Safety Voice service, the service has been ready for use. Under the PARC CWG SATVOICE project, suppliers have begun providing service bulletins to update avionics and some operators have begun to incorporate these service bulletins into their fleets (e.g. HAL and UPS). Other operators seeking credit for SATVOICE capability will need to upgrade their fleets (Refer also to ISPACG/28 WP/3, presented by New Zealand).

3. ACTION BY THE MEETING

- 3.1. The meeting is invited to:
- a) Note the information provided.



Attachment A. SATVOICE Short Code Directory – 10 September 2013

STATE	FIR	Contact	SHORT CODE
AFGHANISTAN	KABUL	Kabul ACC (mobile number)	440101
ALBANIA	TIRANA	Tirana ACC	420101
ALGERIA	ALGIERS	Algiers ACC	460501
ANGOLA	LUANDA FIR	Luanda ATC/FIS	460301
AUSTRALIA	ADELAIDE TCU	Adelaide Approach/Radio	450301
AUSTRALIA	BRISBANE CENTRE	Brisbane ATC	450302
AUSTRALIA	MELBOURNE CENTRE	Melbourne ATC	450303
AUSTRALIA	PERTH TCU	Perth Terminal Control	450304
AUSTRALIA	SYDNEY	Sydney TCU	450305
BAHAMAS	NASSAU	Nassau Approach Control	430802
BAHAMAS	NASSAU	Nassau Flight Service Station	430801
BAHRAIN	BAHRAIN	Bahrain ACC/FIS/Approach	440802
BAHRAIN	BAHRAIN	Bahrain ACC/FIS/Approach	440801
BANGLADESH	DHAKA	Dhaka ACC	440501
BELGIUM	BRUXELLES	Brussels ACC	420501
BENIN	ACCRA	Cotonou ATC	460106
BOTSWANA	GABORONE	Gaborone ACC	460107
BRAZIL	ATLANTICO FIR	Atlantico ACC	471001
CANADA	ARCTIC RADIO	Arctic Radio	431610
CANADA	EDMONTON	Edmonton ACC	431601
CANADA	GANDER DOMESTIC	Gander Domestic	431602
CANADA	GANDER OCEANIC	Gander Oceanic	431603
CANADA	GANDER RADIO	Gander Radio	431613
CANADA	MONCTON	Moncton ATC	431604
CANADA	MONTREAL	Montreal ATC	431605
CANADA	NORTH BAY	North Bay ATC/Radio/Flight Service centre	431609
CANADA	TORONTO	Toronto ACC	431606
CANADA	VANCOUVER	Vancouver ACC	431607
CANADA	WINNIPEG	Winnipeg ATC	431608
CANARY ISLANDS	CANARIES FIR	Canaries ACC	424201
CAPE VERDE ISLANDS	SAL OCEANIC	Sal Oceanic ATC	461701
CHAD	N'DJAMENA (EAST)	N'Djamena ACC (East Sector)	467002
CHAD	N'DJAMENA (WEST)	N'Djamena ACC (West Sector)	467001
CHILE	PUERTO MONTT	Puerto Montt ACC	472503
CHILE	PUNTA ARENAS	Punta Arenas ACC	472504
CHILE	SANTIAGO	Santiago ACC	472505
CHINA	CHENGDU	Chengdu ACC	441202
CHINA	HONG KONG	Hong Kong ATC	441299
CHINA	KUNMING	Kunming ATC	441204
CHINA	LANZHOU	Lanzhou ACC	441205
CHINA	URUMQI	Urumqi ATC	441208
COLOMBIA	BARRANQUILLA	Barranquilla ACC	473001
COLOMBIA	BOGOTA	Bogota ACC	473002
CONGO	BRAZZAVILLE	Brazzaville Control	467602
CYPRUS	NICOSIA	Nicosia ATC	420901
DEMOCRATIC REPUBLIC OF THE CONGO	KINSHASA	Kinshasa ACC	467601
DENMARK	COPENHAGEN	Copenhagen ACC/APP	421901
DENMARK	SONDRESTROM up to FL195	Sondrestom FIS Centre	421902



STATE	FIR	Contact	SHORT CODE
DOMINICAN REPUBLIC	SANTO DOMINGO	Santo Domingo ACC	432702
ECUADOR	GUAYAQUIL	Guyaquil Center	473501
EQUATORIAL GUINEA	MALABO FIR	Malabo ATC	460109
ESTONIA	TALLINN	Tallinn ACC	427387
ESTONIA	TALLINN	Tallinn ATC	427388
ETHIOPIA	ADDIS ABABA	Addis Ababa ACC	462401
ETHIOPIA	ADDIS ABABA	Addis Ababa ACC	462402
FIJI	NADI	Nadi ACC/ Radio	452001
FRANCE	BORDEAUX	Bordeaux ATC	422701
FRANCE	BREST	Brest ATC	422702
FRANCE	MARSEILLE	Marseille ACC	422703
FRANCE	PARIS	Paris ACC	422704
FRANCE	REIMS	Reims ACC	422705
FRENCH GUIANA	CAYENNE-ROCHAMBEAU	Non-routine Flight Safety calls only	463101
FRENCH POLYNESIA	TAHITI	Tahiti ATC/Tower	422790
GERMANY	BREMEN	Bremen ATC/FIS/ALRS	421102
GERMANY	DUSSELDORF	Dusseldorf ACC	421103
GERMANY	FRANKFURT	Frankfurt ACC	421104
GERMANY	MUNICH	Munich ATC	421105
GERMANY	RHEIN	Karlsruhe Upper Airspace Centre	421106
GHANA	ACCRA	Accra ATC	462701
GREECE	ATHINAI	Athinai/ Makedonia ACC	423701
HONDURAS	CENTRAL AMERICAN	Honduras ATC	433401
HUNGARY	BUDAPEST	Budapest ACC	424301
ICELAND	ICELAND RADIO	Iceland radio	425105
ICELAND	REYKJAVIK (OAC Supervisor)	OAC (alternate sectors) Flight Safety Calls	425101
ICELAND	REYKJAVIK (OAC)	OAC (alternate sectors) Emergency Calls Only	425103
INDIA	AHMEDABAD	Ahmedabad ACC	441906
INDIA	BOMBAY (Mumbai)	Mumbai ATC	441901
INDIA	BOMBAY (Mumbai)	Mumbai ATC (Satphone)	441920
INDIA	CHENNAI FIR	Chennai Oceanic Control	441904
INDIA	DELHI	Delhi ACC	441903
INDIA	HYDERABAD	Hyderabad ACC	441909
INDIA	KOLKATA	Kolkata ACC	441902
INDIA	MADRAS (Chennai)	Chennai ACC	441905
INDIA	NAGPUR	Nagpur ACC	441907
INDIA	TRIVANDRUM	Trivandrum ACC	441908
IRELAND	SHANNON	ATC Shannon Control	425001
IRELAND/UNITED KINGDOM	SHANWICK AERADIO	Shanwick Radio	425002
ITALY	BRINDISI	Brindisi ACC	424701
ITALY	MILAN	Milan ACC	424702
ITALY	PADUA	Padua ACC	424703
ITALY	ROME	Rome ACC	424704
JAMAICA	KINGSTON	Kingston ACC	433901
JAPAN	FUKUOKA	Fukuoka Air Traffic Management Centre	443101
JORDAN	AMMAN	Amman Centre	443801
LIBYAN ARAB JAMAHIRIYA	TRIPOLI	Tripoli Centre	464201



STATE	FIR	Contact	SHORT CODE
LITHUANIA	VILNIUS	Vilnius ACC	427389
MADAGASCAR	ANTANANARIVO	Antananarivo Control /Antananarivo Information	464701
MALAWI	LILONGWE	Lilongwe ACC	465501
MALAYSIA	KOTA KINABALU	Kota Kinabalu ATC/FIS	453301
MALAYSIA	KUALA LUMPUR	Kuala Lumpur ACC	453302
MALDIVES	MALE	Male ATC	445501
MALTA	MALTA	Malta ACC	425601
MYANMAR	YANGON	Yangon ACC	450601
NAMIBIA	WINDHOEK	Windhoek ACC	465901
NAMIBIA	WINDHOEK	Windhoek ACC	465902
NEW ZEALAND	AUCKLAND OCEANIC	Auckland Oceanic Control	451201
NEW ZEALAND	NEW ZEALAND Domestic	New Zealand ATC Domestic	451202
NIGER	NIAMEY	Niamey ACC	465601
NIGERIA	KANO	Kano Control	465701
NIGERIA	LAGOS	Lagos Control	465702
NORWAY	BODO	Bodo ACC (Supervisor)	425705
NORWAY	BODO OCEANIC	Bodo ACC (Oceanic Controller)	425701
NORWAY	BODO OCEANIC	Bodo Radio (HF)	425702
NORWAY	OSLO	Oslo ATCC	425703
NORWAY	STAVANGER	Stavanger ACC	425704
PAKISTAN	KARACHI	Karachi ACC	446301
PAKISTAN	LAHORE	Lahore ACC	446302
PAPUA NEW GUINEA	PORT MORESBY	Port Moresby ATC	455301
PHILIPPINES	MANILA	Manila ACC	454801
PORTUGAL	LISBON	Lisbon ACC	426301
PORTUGAL	SANTA MARIA OCEANIC	Santa Maria Oceanic/Radio	426302
PORTUGAL	SANTA MARIA RADIO	Santa Maria Radio/Oceanic	426305
ROMANIA	BUCHAREST	Bucharest ACC	426401
RUSSIAN FEDERATION	BARNAUL	Barnaul ACC	427308
RUSSIAN FEDERATION	CHITA	Chita ACC	427313
RUSSIAN FEDERATION	CHULMAN	Chulman ACC	427315
RUSSIAN FEDERATION	KOLPASHEVO	Kolpashevo ATC/Radio	427328
RUSSIAN FEDERATION	MAGADAN	Magadan ACC	427336
RUSSIAN FEDERATION	MIRNY	Mirny ACC	427339
RUSSIAN FEDERATION	MOSKVA	Moskva ACC	427340
RUSSIAN FEDERATION	MURMANSK	Murmansk ACC	427341
RUSSIAN FEDERATION	NORILSK	Norilsk ACC	427343
RUSSIAN FEDERATION	NOVOSIBIRSK	Novosibirsk ACC	427344
RUSSIAN FEDERATION	OMSK	Omsk ACC	427348
RUSSIAN FEDERATION	PETROPAVLOSK-KAMCHATSKY	Petropavlosk-Kamchatsky ATC	427354
RUSSIAN FEDERATION	TIKSY	Tiksy ACC	427368
SAUDI ARABIA	JEDDAH	Jeddah ATC	440301
SAUDI ARABIA	JEDDAH	Jeddah ATC	440302
SENEGAL	DAKAR OCEANIC	Dakar ATC/FIS	466301
SEYCHELLES	SEYCHELLES	Seychelles ACC/FIS/Altering	466401
SINGAPORE	SINGAPORE	Singapore ATC/HF	456301
SOMALIA	MOGADISHU	Mogadishu FIS centre	466601
SOUTH AFRICA	BLOEMFONTEIN	Bloemfontein ATC	460101
SOUTH AFRICA	CAPE TOWN	Cape Town ATC	460102
SOUTH AFRICA	DURBAN	Durban ATC	460103



STATE	FIR	Contact	SHORT CODE
SOUTH AFRICA	JOHANNESBURG	Johannesburg Oceanic ACC	460104
SOUTH AFRICA	PORT ELIZABETH	Port Elizabeth ATC	460105
SRI LANKA	COLOMBO	Colombo ACC	441701
SRI LANKA	COLOMBO	Colombo FIC	441702
SUDAN	KHARTOUM	Khartoum ACC	466201
SURINAME	PARAMARIBO	Paramaribo ATC/FIS/ Alerting	476501
SWEDEN	MALMO	Malmo ACC	426501
SWEDEN	STOCKHOLM	Stockholm ACC	426502
SWITZERLAND	SWITZERLAND FIR	Geneva ACC	426901
SWITZERLAND	SWITZERLAND FIR	Zurich ACC	426902
TAIWAN	TAIPEI	Taipei ACC	441290
THAILAND	BANGKOK	Bangkok ACC	456702
TOGO	ACCRA	Lome ATC	460108
TRINIDAD & TOBAGO	PIARCO	Piarco ACC	436201
UKRAINE	KIEV	Kiev ACC	427396
UKRAINE	LVOV	Lvov ACC	427397
UKRAINE	ODESSA	Odessa ACC	427398
UKRAINE	SIMFEROPOL	Simferopol ACC	427399
UNITED ARAB EMIRATES	EMIRATES	Dubai Approach	447002
UNITED ARAB EMIRATES	EMIRATES	Emirates ATC	447001
UNITED KINGDOM	LONDON	D&D London Cell (military)	423202
UNITED KINGDOM	SCOTTISH	D&D Scottish Centre (military)	423203
UNITED KINGDOM/IRELAND	SHANWICK	Shanwick Oceanic	423201
USA	ANCHORAGE - ARTCC	Anchorage Aero Route Traffic Control Centre	436602
USA	NEW YORK - NAT	New York NAT Flight Safety calls	436695
USA	NEW YORK - WATRS	New York WATRS Flight Safety calls	436696
USA	NEW YORK OCEANIC - ARINC	ARINC HF Operator - NYC	436623
USA	OAKLAND OCEANIC - ARINC	ARINC HF Operator - SFO	436625
USA	OAKLAND OCEANIC - ATCC	Oakland Oceanic ATCC	436697
UZBEKISTAN	SAMARKAND	Samarkand ACC	427358
VIETNAM	HO CHI MINH	Ho Chi Minh ACC	457402
YEMEN	SANA'A	Sana'a ACC	447302
ZIMBABWE	HARARE	Harare ACC/FIS Approach	467902
ZIMBABWE	HARARE	Harare Tower	467901

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