EUROCONTROL Guidelines on 8.33 kHz Channel Spacing for Military Operators

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EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION

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Abstract

This EUROCONTROL Guideline document provides technical guidance to Military Operators and ATM planners on the implementation and use of VHF 8.33 kHz channel spacing in the ICAO European Region. It addresses decisions of the ICAO European Air Navigation Planning Group (EANPG), European Commission Implementing Regulation (EU) No 1079/2012 laying down requirements for voice channels spacing for the single European sky and the radio frequency function of Commission Regulation (EU) No 677/2011 performed by the Network Manager.

This document compiles technical and legislative requirements and other relevant information supporting the harmonisation of the ATC air-ground voice communications service using VHF 8.33 kHz channel spacing. It describes best practices, procedures and implementation options concerning: aircraft equipage, provision of UHF to handle non-8.33 kHz State aircraft flying as GAT/IFR, flight planning, frequency management, use of 8.33 kHz for military aircraft operating as GAT and OAT and civil-military coordination mechanisms.

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CONTENTS

EXECUTIVE SUMMARY

Air-ground voice communications supporting Air Traffic Control (ATC), in the context of General Air Traffic (GAT) operations, traditionally rely on instantaneous voice communications between pilots and controllers using an infrastructure based on VHF line-of-sight radio transmissions.

Air Traffic Control will continue to use the International Telecommunication Union (ITU) allocated VHF band (117,975-137 MHz) to support voice exchanges with pilots for the foreseeable future. In addition to air-ground voice communications, this band also supports air-ground controller/pilot data link communications and aircraft communications.

To support the continued demand for additional voice channels and avoid frequency congestion in the ICAO EUR region, several ICAO decisions and European Union (EU) legislation have led to the implementation of 8.33 kHz (instead of 25 kHz) channel spacing between assigned frequencies.

Frequency congestion demands more efficient solutions to make better use of the available VHF band (e.g. better frequency re-use) but also more efforts to ensure aircraft equipage and ground ATS system implementation of 8.33 kHz capable radios. Alternative digital voice technologies are not expected to be introduced before 2035; consequently, analogue VHF voice will remain as a fundamental enabler of routine and tactical air-ground ATC communications.

In October 1999, the carriage and operation of VHF 8.33 kHz channel spacing radio communication equipment was introduced in 7 states of the European core area for GAT/IFR operations above Flight Level (FL) 245. In October 2002, the area of applicability was expanded horizontally. In October 2007, Single European Sky (SES) Commission Regulation (EC) No 1265/2007 on air-ground voice channel spacing was published, mandating the carriage of 8.33 kHz radios for GAT/IFR operations above Flight Level (FL) 195 and the provision of ground services by Air Navigation Service Providers (ANSPs).

Subsequently, Commission Implementing Regulation (EU) No 1079/2012 of 16 November 2012 on voice channel spacing below FL195 was published in the Official Journal of the European Union repealing the previous Regulation (EC) No 1265/2007. The regulation requires that the manufacturers of radios intended to operate in the VHF band are 8.33 kHz channel spacing capable. Article 9 of this Regulation details specific requirements on ANSPs in accommodating 8.33 kHz non-equipped State aircraft on UHF or on VHF 25 kHz channels.

During the last 10 years military authorities have made significant efforts to migrate towards VHF 8.33 kHz channel spacing. More than 1000 State aircraft[1] were equipped. Based on information provided by the States to the EUROCONTROL in 2016, the 8.33 kHz equipage rates of the European State aircraft fleet in 2020 will be around 88% for transport-type State aircraft, 78% for fighters and 68% for light aircraft/trainers.

The continued deployment of VHF 8.33 kHz operations throughout Europe calls for close stakeholder support and harmonization at technical level. EUROCONTROL remains committed to continue to produce technical guidance and to support military authorities in their efforts to comply with Regulation (EU) No 1079/2012. This effort entails civil-military coordination actions within the context of the Network Manager Radio Frequency Function (RFF).

The application or implementation of the guidance proposed within this document should be preceded by local safety assessments.

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[1] Military, customs and police aircraft

1. Introduction

1.1 Background

1.1.1 In the context of the European ATM Network (EATMN) supporting General Air Traffic (GAT) operations, air-ground voice communication between air traffic controllers and pilots is based on an Air Navigation Service Provider (ANSP) VHF infrastructure operating in the (117,975 - 137 MHz) band.

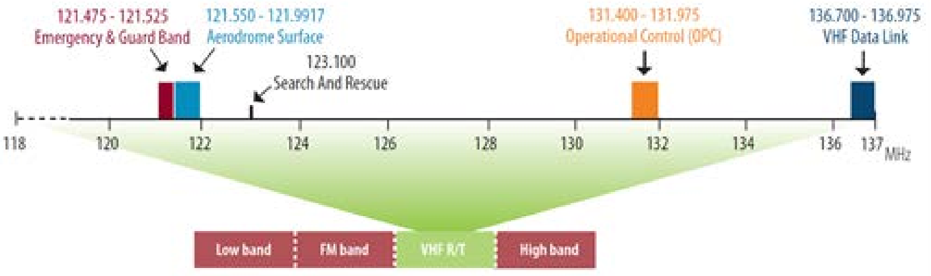

Figure 1 – VHF COM Band

1.1.2 Although this VHF band is primarily used for civil ATC air-ground voice radio purposes, the band also supports frequency assignments for air-ground data link[2]. It is to be noted that within this band, the same frequency can be reassigned provided that there is no radio interference. In the International Civil Aviation Organization (ICAO) European (EUR) Region there are currently more than 10,000 frequency assignments in this band, documented in the ICAO COM2 Table.

1.1.3 In 1994, it was decided to reduce channel spacing between adjacent frequencies from 25 to 8.33 kHz as a means to reduce/mitigate the growing VHF congestion in Europe. By October 1999, the use of VHF with 8.33 kHz channel spacing was first introduced above FL245 in the ICAO/EUR Region.

1.1.4 European Union Commission Regulations No 1265/2007 [Ref [2]] and No 1079/2012 [Ref [3]] on voice channel spacing (VCS) were published, respectively on 26/10/2007 and 16/11/2012. These regulations mandated the carriage of 8.33 kHz radios and channel spacing for GAT/IFR operations, initially above Flight Level (FL) 195 and subsequently expanded into the lower airspace.

1.1.5 In the medium/long term, civil ATC air-ground voice is expected to be superseded by air-ground data link as the prime means for air-ground ATC communications. Analogue VHF voice is expected to remain in service only to sustain safety-critical communications and until alternative digital voice solutions become available around 2035.

1.1.6 In oceanic and remote areas, civil ATC air-ground voice communication is expected to migrate from High Frequency (HF) to appropriate and protected Satellite Communications (SATCOM) (e.g. INMARSAT), providing increased throughput, transmission quality and increased performance (guaranteed connection). HF voice services would be retained for backup purposes only.

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[2] ACARS/FANS, VHF Data Link (VDL) Mode 2, VDL Mode 4

1.1.7 The majority of European civil ANSPs provide UHF air-ground communication services to handle non-8.33 kHz State aircraft that occasionally operate as GAT/IFR in 8.33 kHz designated airspace. Some ANSPs make use of VHF 25 kHz frequencies in the absence or unavailability of UHF radio coverage. EUROCONTROL has published guidance material on the use of UHF for ATC [Ref [5]].

Note - For ATM purposes and with reference to Article 3(b) of the Chicago Convention, only aircraft used in military, customs and police services shall qualify as State aircraft. Accordingly:

- Aircraft on a military register, or identified as such within a civil register, shall be considered to be used in military service and hence qualify as State aircraft.

- Civil registered aircraft used in military, customs and police service shall qualify as State aircraft.

- Civil registered aircraft used by a State for other than military, customs and police service shall not qualify as State aircraft.

1.1.8 To comply with EU regulatory 8.33 kHz carriage requirements, State aircraft need to be equipped with 8.33 kHz capable radios. It is of utmost importance that military aircraft operators use the appropriate technical references (e.g. EUROCAE ED 23 B/C) and follow the necessary certification practices.

1.1.9 The deployment of 8.33 kHz operations has a direct impact on VHF (117,975-137 MHz) frequency management activities. As the military also operate specific frequencies within this band, civil-military coordination is essential to ensure that all allocations remain free of (harmful) interference. Such civil-military coordination shall also take place within the Radio Frequency Function (RFF) as detailed in the network functions Regulation [Ref [8]].

1.1.10 The operational use of 8.33 kHz communications within the GAT environment also requires adequate flight planning practices. Indeed, State aircraft operators must insert the appropriate indicators in GAT flight plan fields, identifying non-8.33 kHz State aircraft that need to be accommodated on UHF or VHF 25 kHz air-ground radio communication services.

1.2 EUROCONTROL Guidelines

1.2.1 EUROCONTROL guidelines, as defined in EUROCONTROL Regulatory and Advisory Framework (ERAF), are advisory materials and contain:

“Any information or provisions for physical characteristic, configuration, material, performance, personnel or procedure, the use of which is recognised as contributing to the establishment and operation of safe and efficient systems and services related to ATM in the EUROCONTROL Member States.”

1.2.2 Therefore, the application of EUROCONTROL guidelines document is voluntary.

1.2.3 In addition, EUROCONTROL Regulatory and Advisory Framework specifies that:

“EUROCONTROL Guidelines may be used, inter alia, to support implementation and operation of ATM systems and services, and to:

- *complement EUROCONTROL Specifications;*
- *complement ICAO Recommended Practices and Procedures;*
- *complement EU legislation;*

- *indicate harmonisation targets for ATM Procedures;*
- *encourage the application of best practice;*
- *provide detailed procedural information."*

1.2.4 These EUROCONTROL Guidelines have been developed under the EUROCONTROL Regulatory and Advisory Framework (ERAF) and are maintained by EUROCONTROL in accordance with this Framework.

1.3 Applicability and Scope

1.3.1 This document compiles technical and legislative requirements and other relevant information supporting the harmonisation of the ATC air-ground voice communications services using VHF 8.33 kHz channel spacing. It describes best practices, procedures and implementation options concerning: aircraft equipage, provision of UHF to handle non-8.33 kHz State aircraft flying as GAT/IFR, flight planning, frequency management, use of 8.33 kHz for military aircraft operating as GAT and OAT and civil-military coordination mechanisms.

1.3.2 The document also addresses some certification issues and the technical support that is available at EUROCONTROL, both through the civil-military working arrangements and the 8.33 kHz Implementation Support Group (ISG).

1.3.3 This document does not supersede national legislative material (e.g. AICs) on the same subject and does not cover military-military interoperability requirements.

1.3.4 Service providers and/or aircraft operators that decide to apply or implement this guideline document must undertake the necessary safety assessments as required by Article 10 the VCS regulation [Ref [3]].

1.3.5 The guidance described in this document aims at harmonising the European military 8.33 kHz environment. The proposed guidance should be applied when compatible with the local conditions for ATC provision, military aircraft equipage and operational constraints.

1.4 Conventions

a) "Shall" – indicates a required element that is necessary to meet or satisfy identified objective(s).

b) "Should" – indicates a recommendation which is not specifically required to meet or satisfy the identified objective(s).

c) "May" – indicates an optional element.

d) [GUID-X] – labels a best practice within the scope of this guideline (where 'X' is a sequential number).

Italics ARE used to highlight text extracted from the referenced documents.

1.5 Objective

1.5.1 This EUROCONTROL Guideline document provides (technical) guidance to military operators and ATM planners on the implementation and use of VHF 8.33 kHz channel spacing in the ICAO European Region. It addresses decisions of the ICAO European Air Navigation Planning Group (EANPG), legislative requirements of the

European Commission Implementing Regulation (EU) No 1079/2012 on laying down requirements for voice channels spacing for the single European sky and the radio frequency function of the of Commission Regulation (EU) No 677/2011 performed by the Network Manager.

1.6 Glossary

1.6.1 A glossary of abbreviations and definitions is included in Annex A.

2. Regulatory Environment

2.1 Single European Sky

2.1.1 The Single European Sky (SES) is a legislative package launched by the European Union to reform European Air Transport to meet future capacity and safety needs, organizing airspace and air navigation services.

2.1.2 EU Member States adopted, in parallel with the first SES package, a general statement on military issues related to the Single European Sky. According to this statement, attached to Regulation (EC) No 549/2004, Member States should, in particular, enhance civil-military cooperation and, to the extent deemed necessary by all Member States concerned, facilitate cooperation between their armed forces in all matters of ATM to address relevant needs in the implementation of SES.

2.1.3 The SES basic regulations include Regulation (EC) No 552/2004 of the European Parliament and of the Council of 10 March 2004 on the interoperability of the European ATM network (the interoperability Regulation) [Ref [1]]. It defines a harmonised regulatory framework in which the detailed implementing rules for interoperability refine essential requirements supported by voluntary technical and operational specifications.

2.1.4 Civil-military coordination is an essential requirement of the SES interoperability Regulation which may result in regulatory measures detailed in implementing rules for interoperability or be supported by SES voluntary specifications or guidance material.

2.2 EASA Basic Regulation

2.2.1 Article 1(2) of the EASA Basic Regulation (EC) No 216/2008 on common rules in the field of civil aviation (as amended by Regulation (EC) 1108/2009) states that it does not apply to products, parts, appliances, personnel and organisations carrying out military, customs, police, search and rescue, firefighting, coastguard or similar activities or services. As a result, EASA regulatory material, including certification specifications, does not directly apply to military systems.

2.2.2 However, Article 1(2) also states that the Member States shall undertake to ensure that such activities or services have due regard as far as practicable to the objectives of that Regulation. EASA Certification Specification and Acceptable Means of Compliance (CS-ACNS) contains relevant voice channel spacing requirements to support civil certification.

2.3 Voice Channel Spacing (VCS) Implementing Rule (No 1079/2012)

2.3.1 Article 2 of the Regulation states[3]:

The conversion requirements shall not apply to frequency assignments:

(a) that will remain in 25 kHz channel spacing on the following frequencies:

(i) the emergency frequency (121,5 MHz);

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[3] Italic text is extracted from the Regulation, refer to [Ref [3]] for the full regulatory text.

(ii) the auxiliary frequency for search and rescue operations (123,1 MHz);

(iii) the VHF digital link (VDL) frequencies (136,725 MHz, 136,775 MHz, 136,825 MHz, 136,875 MHz, 136,925 MHz and 136,975 MHz);

(iv) the aircraft communications addressing and reporting system (ACARS) frequencies (131,525 MHz, 131,725 MHz and 131,825 MHz);

(b) where offset carrier operation within a 25 kHz channel spacing is utilised.

2.3.2 It is important to highlight that Regulation (EU) No 1079/2012 also contains a provision (Article 4(1)) applicable to the manufacturers by stating:

Manufacturers of radios intended to operate in the VHF band, or their authorised representatives established in the Union, share ensure that from 17 November 2013 all radios placed on the EU market, are 8,33 kHz channel spacing capable.

2.3.3 In accordance with Article 6, service providers are obliged to ensure, by the 31 December 2018, the conversion of all frequency assignments (including on their VHF ground receiver sites) to 8.33 kHz channel spacing, with the exception of assignments staying in 25 kHz due to safety reasons or used to accommodate non-equipped State aircraft.

2.3.4 Article 9 of Regulation (EU) No 1079/2012 details the 8.33 kHz channel spacing regulatory provisions applicable to State aircraft and measures applicable to Air Traffic Service (ATS) Providers to accommodate non-equipped State aircraft as follows:

<u>Above FL 195</u>:

1. *Member States shall ensure that transport-type State aircraft operating flights above FL 195 are equipped with radios having the 8.33 kHz channel spacing capability.*

2. *Where procurement constraints prevent compliance with paragraph 1, Member States shall ensure that transport-type State aircraft operating flights above FL 195 are equipped with radios having the 8.33 kHz channel spacing capability by 31 December 2012 at the latest.*

3. *Member States shall ensure that non-transport-type State aircraft operating flights above FL 195 are equipped with radios having the 8.33 kHz channel spacing capability.*

4. *Member States may allow non-compliance with paragraph 3 due to:*

    (a) compelling technical or budgetary constraints;

    (b) procurement constraints.

5. *When procurement constraints prevent compliance with paragraph 3, Member States shall ensure that non-transport- type State aircraft operating flights above FL 195 are equipped with radios having the 8.33 kHz channel spacing capability by 31 December 2015 at the latest.*

<u>Above and below FL 195</u>:

6. *Member States shall ensure that new State aircraft entering into service from 1 January 2014 are equipped with radios having the 8.33 kHz channel spacing capability.*

7. *Member States shall ensure that from 1 January 2014, whenever the radios installed on-board the State aircraft are subject to radio upgrades, the new radios have the 8.33 kHz channel spacing capability.*

8. *Member States shall ensure that all State aircraft are equipped with radios having the 8.33 kHz channel spacing capability by 31 December 2018 at the latest.*

9. *Without prejudice to national procedures for the communication of information on State aircraft, Member States shall communicate to the Commission by 30 June 2018 at the latest the list of State aircraft that cannot be equipped with radios having the 8.33 kHz channel spacing capability in accordance with paragraph 8 due to:*

   (a) compelling technical or budgetary constraints;

   (b) procurement constraints.

10. *Where procurement constraints prevent compliance with paragraph 8, Member States shall also provide to the Commission by 30 June 2018 at the latest the date by which the aircraft concerned will be equipped with radios having the 8.33 kHz channel spacing capability. That date shall not be later than 31 December 2020.*

11. *Paragraph 8 shall not apply in respect of State aircraft that will be withdrawn from operational service by 31 December 2025.*

12. *Air traffic service providers shall ensure that State aircraft not equipped with radios having the 8.33 kHz channel spacing capability can be accommodated, provided that they can be safely handled within the capacity limits of the air traffic management system on UHF or 25 kHz frequency assignments.*

13. *Member States shall publish procedures for the handling of State aircraft which are not equipped with radios having the 8.33 kHz channel spacing capability in their national aeronautical information publications.*

14. *Air traffic service providers shall communicate to the Member State that has designated them on an annual basis, their plans for the handling of State aircraft which are not equipped with radios having the 8.33 kHz channel spacing capability, taking into account the capacity limits associated with the procedures referred to in paragraph 13.*

2.3.5 In January 2015 the European Commission (EC) organised an interoperability workshop on Air Ground Voice Channel Spacing, with the objective of assessing the current implementation of Regulation (EU) No 1079/2012, to identify existing issues or areas of concern and to discuss the potential evolutions of the Regulation. The conclusion was that the Regulation is being implemented with good progress for ground implementation by the ANSPs, for State aircraft equipage by the military community and for civil aircraft equipage by commercial airlines.

2.3.6 During the last 10 years military authorities have made significant efforts to migrate towards VHF 8.33 kHz channel spacing. More than 1000 State aircraft[4] were equipped. Based on information provided by the States to the EUROCONTROL in 2016, the 8.33 kHz equipage rates of the European State aircraft fleet in 2020 will be around 88% for transport-type State aircraft, 78% for fighters and 68% for light aircraft/trainers.

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[4] Military, customs and police aircraft

2.4 Certification

2.4.1 Certification of military systems is performed in accordance with the national certification framework designed for those assets. Certification of military aircraft voice communication system installations should be performed on the basis of applicable military acceptable means of compliance (AMC) and guidance material.

2.4.2 **[GUID-1]** In the absence of military AMCs, the EASA Certification Specification and Acceptable Means of Compliance for Airborne Communications, Navigation and Surveillance (CS-ACNS Book 2), or any relevant AMC, **should** be used to support such certification activities. This is valid even when not mandatory for military aircraft. Such choice remains at the discretion of the national certification authorities empowered to certify those assets and at the discretion of the national military certification authorities.

3. Aircraft Equipage

3.1 Introduction

3.1.1 This section applies to State aircraft that intend to equip with 8.33 kHz capable radios and operate as GAT. They do not apply to State aircraft operating as OAT, nor to State aircraft operating as GAT accommodated on UHF or VHF 25 kHz. Suitable civil technical references that military organisations may wish to use are identified.

3.1.2 With regard to 8.33 kHz radio standards, recitals (11) and (12) of Regulation (EU) No 1079/2012 identify EUROCAE ED 23 B/C standards as being suitable. From a regulatory perspective, it should be noted that these technical standards are deemed suitable and are non-binding.

3.1.3 ICAO Annex 10, EASA CS-ACNS, Joint Aviation Authorities (JAA) documents and EUROCAE ED-23 B/C all provide technical means and certification requirements for civil aircraft to support compliance with the Regulation.

3.1.4 **[GUID-2]** In the absence of specific military technical standards on 8.33 kHz voice channel spacing radios and their equipage, these guidelines recommend that 8.33 kHz radio equipage **should** be based on the EUROCAE documents used for civil aircraft (ED-23 B or ED-23 C).

3.1.5 The technical criteria set out for civil aircraft in EUROCAE ED 23 B/C are considered to be the most suitable means to comply with Regulation (EU) No 1079/2012. However, as these standards were developed for civil aircraft only, national military certification authorities may find alternative means to certify 8.33 kHz airborne radio compliance. Regardless of the selected standards to support certification activities, safety requirements must be ensured in all cases.

3.1.6 Regulation (EU) No 1079/2012 concerns the channel spacing between frequency assignments and does not mandate the number of airborne radios.The number of required radios is driven by Regulation (EU) No 965/2012 (Air Operations), in respect to civil aircraft. Dual equipage of independent 8.33 kHz airborne radios is a means to mitigate VHF radio failure and may be required by Regulation (EU) No 965/2012.

3.1.7 Operating with single VHF and/or UHF radio configurations, can be hazardous in areas without UHF coverage. Indeed, in the event of a VHF radio failure, some countries have full-, partial- or no UHF coverage and alternative handling on a safely manner can only be ensured on VHF 25 kHz. National authorities may introduce procedures to mitigate these risks.

3.2 References Relating to Civil Equipage

3.2.1 SES

3.2.1.1 Concerning the number of on-board radios, the EUROCONTROL Implementation Support Group (ISG) concluded on the following [Ref [9]]:

Regulation (EU) No 1079/2012 there is no reference to the amount of airborne radios needed. The Regulation requires, in its Article 5, that the aircraft radio equipment must have 8.33 kHz channel capability.

Regulation 923/2012 which concerns the Standardised European Rules of Air (SERA) considers equipage requirements to be airspace-rule based.
Regulation (EU) No 965/2012, concerning Commercial Air Transport (CAT),

determines the equipage requirements when engaged in CAT IFR operations in CAT.IDE.A.345, subparagraph (b). For non-CAT operations such as most General Aviation flights, the non-commercial operations rules found in Regulation 800/2013 are more appropriate (EASA, Certification Specifications and Acceptable Means of Compliance for Airborne Communications, Navigation and Surveillance CS-ACNS, 17 December 2013).

3.2.2 EASA Certification Specifications - Aircraft Voice Communication Systems

3.2.2.1 EASA CS-ACNS (CS ACNS.B.VCS.020) [Ref [4]] states:

The voice communication systems conforms to the performance requirements of the following sections of ICAO Annex 10, Volume III, Part 2 (Second Edition — July 2007 incorporating Amendment No 85), Chapter 2 'Aeronautical Mobile Service':

(a) Section 2.1 'Air-ground VHF communication system characteristics'.

(b) Section 2.2 'System characteristics of the ground installations' of ICAO.

(c) Section 2.3.1 'Transmitting function'.

(d) Section 2.3.2 'Receiving function' excluding sub-section 2.3.2.8 'VDL — Interference Immunity Performance'.

3.2.2.2 EASA CS-ACNS (CS ACNS.B.VCS.010) states:

(a) The voice communication system is capable of 8.33 kHz and 25 kHz channel spacing

(b) Voice communication system is capable of operating with off-set carrier frequencies on 25 kHz channel spacing.

3.2.2.3 EASA CS-ACNS (AMC1 ACNS.B.VCS.010) states that airborne equipment for VHF 8.33 kHz communications must be compliant with Minimum Operational Performance Specification for Airborne VHF Receiver-Transmitter operating in the frequency range 117,975-137 MHz in document EUROCAE ED 23B (ETSO-2C37e, ETSO-2C38e) or EUROCAE ED 23C (ETSO-2C169a).

3.2.2.4 EASA CS-ACNS (CS ACNS.B.VCS.040) on flight deck interface requires:

A means to provide:

(a) select the voice communications channel;

(b) display the selected voice communications channel to the flight crew;

(c) indicate the non-operational status or failure of the system without undue delay.

3.2.2.5 EASA CS-ACNS (AMC1 ACNS.B.VCS.010) also states:

In airspace where 8.33 kHz channel spacing communication equipment is mandatory and the carriage of two radios is required, both radios should be 8.33 kHz capable (as opposed to one 8.33 kHz system and one 25 kHz system).

3.2.2.6 In August 2017, EASA provided further clarification to EUROCONTROL on the number of radio equipment required on board. The contents of such clarification are quoted in Annex C.

3.2.3 JAA

3.2.4 Existing airborne 8.33 kHz radios may have been certified on the basis of former JAA TGL 7. Although TGL 7 has been transposed to the EASA CS-ACNS [Ref [4]], such radios are not required to be re-certified in accordance with EASA CS-ACNS. The certification of new civil airborne radio installations is based on the EASA CS-ACNS.

3.3 State Aircraft Equipage Considerations

3.3.1 For State aircraft, specific VHF 8.33 kHz equipage aspects like the required number of independent radio sets for fighters are airspace driven and not harmonised at international level. Some military operators continue to raise questions to EUROCONTROL on the possibility to claim compliance when a State aircraft is only equipped with one VHF 8.33 kHz radio (able to tune 25 kHz as well) and one independent UHF transceiver (which could serve as a “back up” where coverage exists). Indeed, in such cases, military stakeholders would prefer to flight plan as “8.33 kHz compliant” and not as “Exempted State aircraft” to avoid potential operational restrictions (e.g. re-routing, delays).

3.3.2 Best of class military airborne transceivers are multi-band radios and integrate aeronautical VHF (8.33 and 25 kHz) and UHF capabilities (voice and data), provide 121.5 MHz and 243.0 MHz guard channel monitoring functions, have modular upgradeable construction with remote control and may also be multimode and software programmable. These characteristics would enable State aircraft to be in a better position to claim compliance based on the use of their available capabilities (e.g. use of UHF as back up to VHF 8.33 kHz).

3.3.3 **[GUID-3]** For State aircraft, to cope with safety issues in the case of radio failure, these guidelines recommend that if a State aircraft is operated in airspace controlled by a civil ANSP it **should** be equipped with two independent VHF radios[5] unless specific conditions apply: e.g. UHF as a backup if the flight is operated in areas in which UHF ATC communication shall be provided. This guidance does not exempt the need for local safety assessments.

3.3.4 **[GUID-4]** EASA CS-ACNS is not directly binding for State aircraft, therefore the competent authorities need to decide on the applicable airworthiness requirements for State aircraft. The national (military) regulators are the competent authorities to decide on the applicable requirements and could select the EASA CS-ACNS for that purpose.

3.3.5 In the absence of national military certification procedures for 8.33 kHz equipage, military aircraft operators can make use of civil certification specification material. When the 8.33 kHz airspace equipage requirements are fully met, the military authority must indicate 8.33 kHz compliance when filling and submitting GAT/IFR flight plans.

3.3.6 **[GUID-5]** For cases of non-compliance with the VCS regulation in terms of airborne equipage dates, operators **should** comply with Article 9 of the regulation which states: “*Where procurement constraints prevent compliance with paragraph 8, Member States shall also provide to the Commission by 30 June 2018 at the latest the date by which the aircraft concerned will be equipped with radios having the 8.33 kHz channel spacing capability. That date shall not be later than 31 December 2020.”*

3.4 FM Immunity

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[5] Please consider clarifications on radio equipage provided by EASA in Annex C

3.4.1 Since 1 January 2001, VHF FM (30 - 300 MHz) broadcasting stations in Europe have been allowed to operate with reduced restrictions and increased transmitter power levels. This has significant implications for aircraft with VHF receivers. It impacts particularly navigational VHF Omnidirectional Range (VOR) and Instrument Landing System (ILS) equipment.

3.4.2 Consequently, for safety reasons, VOR and ILS receivers in aircraft were required to be protected against potential interference from VHF FM broadcast transmissions. This entails the use of FM (Frequency Modulated) immune VHF airborne equipment through the modification of existing equipment or re-equipage. Some States have mandated the carriage of FM Immune VHF NAV avionics for en-route and at airports.

3.4.3 A similar requirement applies to VHF communication resources. The applicability of FM immunity to VHF COM transceivers was first recognised in the former JAA Temporary Guidance Leaflet (TGL) Nr 7 where it is stated that compliance with the standards for immunity against interference from FM radio broadcast stations will need to be met.

3.4.4 The referenced EUROCAE 23 B/C specifications are consistent with this objective which remains applicable.

Note: EASA certification is based on EUROCAE ED-23C. When applying for ETSO-2C169a authorisation, the applicant is also recommended to apply for ETSO-2C128 “Devices that Prevent Blocked Channels Used in Two-Way Radio Communications due to Unintentional Transmission” authorisation.

3.4.5 **[GUID-6]** State aircraft operators and aircrew **shall** refer to national aeronautical publications (Aeronautical Information Publication/AIP, Aeronautical Information Circular/AIC) for current official policy and procedures on FM immunity in particular to determine the airspaces/airports where FM Immunity is a mandatory requirement.

4. Ground Systems

4.1 Regulation (EU) No 1079/2012 applies to all radios operating in the VHF 117,975-137 MHz band allocated to the aeronautical mobile route service, including systems, their constituents and associated procedures (Article 2). The regulation applies also to flight data processing systems serving ATC units and providing services to GAT, their constituents and associated procedures.

4.2 As described before, service providers have a regulatory obligation to convert to 8.33 kHz channel spacing all frequency assignments of ground receiver sites that operate within the VHF band from 117,975 to 137 MHz by 31/12/2018. The exceptions to this obligation are the emergency frequency (121.5MHz), the auxiliary frequency for search and rescue (123.1MHz), data link frequency assignments, and frequency assignments where offset carrier operation with 25 kHz channel spacing is utilised. For NATO Member States the frequency 122.100MHz is to be maintained in the 25 kHz channel spacing. (Article 2).

4.3 Depending on State conversion implementation plans, this conversion requirement may impact military VHF ground systems operating in that band. When the majority of military State aircraft become 8.33 kHz-equipped, it can be expected that military ANSPs will provide air-ground voice communications services on 8.33 kHz capable channel spacing infrastructure. Recital (14) of the regulation states that military operations and training should not be covered in accordance with Article 1(2) of Regulation (EC) 549/2004. Hence, it will be up to national authorities to regulate the military ANSPs ground systems.

5. Flight Planning

5.1 General

5.1.1 This section provides guidance to State aircraft Operators for filling GAT/IFR flight plans (FPL). It contains information which is consistent with the latest editions of the Network Manager (NM) 8.33 VCS User Handbook [Ref [10]] and section 47 of the Integrated Initial Flight Plan Processing System (IFPS) Users Manual [Ref [11]] which can be accessed through the web site:

www.eurocontrol.int/lists/publications/network-operations-library/

Note: The IFPS Users Manual may be subject of amendments not yet reflected in the present edition of this Guideline.

5.1.2 The specific FPL procedures described in the current edition of the IFPS Users Manual in relation with 8.33 kHz channel spacing reflect the information published in national AIPs. Such information derives from an obligation of VCS regulation Article 9.13, which requires Member States to publish procedures for the handling of State aircraft that are not equipped with radios having the 8.33 kHz channel spacing capability.

5.1.3 The procedures included in the IFPS User Manual reflect, to a certain extent, the past organisation of 8.33 operations introduced by the first VCS I regulation (Regulation (EC) No 1265/2007 of 26 October 2007 [Ref [2]]) with progressive updates to reflect the AIP information published by the Member States in the sequence of VCS II obligations. It considers known constraints like UHF radio coverage (namely in the lower airspace). This is a continuous process and, as the Member States publish more up to date information, that must be reflected in subsequent IFPS User Manual revisions.

5.1.4 **[GUID-7]** State aircraft operators shall consult the national AIP and IFPS Users Manual instructions before filing the flight plan.

5.1.5 The FPL instructions in the IFPS User Manual State assume that State aircraft that are not equipped with an 8.33 kHz capable radio are allowed to operate in the airspace designated for 8.33 kHz channel spacing operations **provided that they are UHF equipped but also VHF 25 kHz equipped**. That ensures consistent operations in the whole 8.33 airspace of Europe mitigating particular cases where there is a lack of UHF coverage.

5.1.6 The IFPS does not process messages relating to flights operating completely under VFR conditions. However, those flights planning to operate under mixed IFR/VFR conditions within the IFPZ (Integrated Initial Flight Plan Processing System Zone) shall submit any flight plan and associated messages to the IFPS. In this case the IFPS will process only those parts of that flight operating under IFR conditions. It shall remain the responsibility of the FPL message originator to ensure distribution of the flight plan and any associated messages (e.g. change (CHG), delay (DLA) messages) for those parts of that flight operating under VFR conditions.

5.1.7 The IFPS does not (yet) process messages relating to flights operating under completely Operational Air Traffic (OAT) conditions. However, those operators planning flights under mixed OAT/GAT conditions within the IFPZ shall submit any flight plan and associated messages to the IFPS. In this case the IFPS will process only those parts of that flight operating under General Air Traffic (GAT) conditions. It shall remain the responsibility of the message originator to ensure distribution of the flight plan and any associated messages for those parts of that flight operating under OAT conditions.

5.1.8 **[GUID-8]** The State aircraft operator **shall** ensure that the information provided in the flight plan (i.e. 8.33 kHz equipage information or the presence of the exemption indicator) is consistent with the aircraft to be used and airspace with applicability of GAT/IFR 8.33 kHz requirement.

5.1.9 The pilot-in-command is ultimately responsible for ensuring that the radio communication equipment appropriate for the flight to be conducted is available and operational on board the aircraft.

5.2 Filing GAT/IFR Flight Plans for State Aircraft

5.2.1 The IFPS User Manual describes the flight planning procedures applicable to State aircraft flying GAT/IFR as follows.

5.2.1.1 Whenever a State aircraft is equipped with 8.33 kHz radios, the letter Y shall be inserted in Item 10a: Equipment, of the filed flight plan.

5.2.1.2 Whenever a State aircraft is NOT equipped with 8.33 kHz radios, the letter Y shall NOT be inserted in Item 10a: Equipment, of the filed flight plan.

5.2.1.3 State aircraft that are NOT equipped with 8.33 kHz capable radios but are equipped with UHF (and VHF 25 kHz), shall be permitted to fly in 8.33 kHz airspace where UHF coverage is provided or special procedures are implemented (see the national AIP of the State concerned). In this case the letters ‘U’ and ‘Z’ shall be inserted in Item 10a Equipment and ‘COM/EXM833’ shall be inserted in Item 18 of the filed flight plan.

5.2.1.4 State aircraft that are NOT equipped with 8.33 kHz capable radios and NOT equipped with UHF, when flying only in the airspace of EU Member States (plus Switzerland and Norway) below FL195 can be accommodated with VHF 25 kHz. In this case the letters ‘Y’, ‘U’, or ‘Z’ shall NOT be inserted in Item 10a Equipment and ‘STS/STATE’ shall be inserted in Item 18 of the filed flight plan.

5.2.2 Whenever the status of the 8.33 kHz radio capability changes prior departure, the change shall be notified to the IFPS by means of a modification message (CHG) or by filing a new flight plan.

5.3 IFPS System Processing

5.3.1 For all submitted flight plans containing ‘COM/EXE833’ in item 18 of the flight plan, the IFPS will include in the acknowledgement message (ACK) transmitted to the flight originator the following comment:

‘THIS FLIGHT MAY REQUIRE SPECIAL HANDLING BY ATC DUE TO 8.33 kHz CARRIAGE REQUIREMENTS’

6. UHF Provision

6.1 Context

6.1.1 The ultra-high frequency (UHF) radio infrastructure (225 MHz - 400 MHz) is used by most air navigation service providers (ANSPs) as a fundamental alternative to ensure ATC communications with non-8.33 kHz equipped State aircraft[6] operating GAT/IFR and, in some cases to support OAT flights.

6.1.2 These ATC-related UHF services can be provided by civil and military ANSPs. Depending on the State's local arrangements, military ANSPs normally provide UHF support for OAT flights whilst civil ANSPs can offer this service for State aircraft operating as GAT/IFR and OAT.

6.1.3 The provision of UHF or VHF 25 kHz to communicate with non-8.33 kHz equipped State aircraft is a regulatory obligation. As transcribed in section 2.3, Article 9 (12) of the SES Regulation (EU) No 1079/2012 states:

Air traffic service providers shall ensure that State aircraft not equipped with radios having the 8,33 kHz channel spacing capability can be accommodated, provided that they can be safely handled within the capacity limits of the air traffic management system on UHF or 25 kHz frequency assignments.

6.1.4 Member States are also required to publish the procedures to handle non-equipped State aircraft in their national aeronautical information publications (AIP).

6.2 Requirements

6.2.1 To establish the appropriate level of UHF provision by civil and military ANSPs for the safe handling of non-equipped 8.33 kHz State aircraft, a number of requirements need to be fulfilled such as:

- Availability and geographic coverage of the UHF service
- Improved civil-military frequency management coordination when allocating UHF frequencies (in particular when civil ANSPs need to obtain UHF assignments in a band managed by national military frequency managers and/or NATO)
- Establishment of operating procedures related with the use of UHF to handle flights commonly agreed between civil ANSPs and military operators
- Availability of recognised technical standards (as UHF is a military specific requirement)
- Optimal/full system integration and lack of cross-coupling with VHF channels
- Local safety cases

6.2.2 Most of these requirements have been subject of specific guidance contained in the document: EUROCONTROL Guidelines on the Use of UHF for ATC, GUID-138-2009, Edition 1.0, 2 June 2010 [Ref [5]]. Additional details can be found in the EUROCONTROL UHF web page:

http://www.eurocontrol.int/services/uhf

6.3 UHF Coverage Considerations

6.3.1 Military UHF infrastructure was implemented by the initial NATO Western Europe

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[6] State aircraft encompasses military, police and customs aircraft.

Member States to fulfil specific NATO military requirements. Eastern and Central European States that joined NATO at a later stage did not have such UHF infrastructure in place. The improvement of such UHF infrastructure is still on-going in the entire ECAC area.

6.3.2 In the States where a UHF infrastructure is not available for civil ANSPs, or where the coverage is insufficient, the alternative is to retain a residual number of VHF 25 kHz channels. As a consequence, these 25 kHz frequencies cannot be converted into 8.33 kHz channels and frequency conversion benefits are not fully achieved. Hence, the lack of UHF can be indirect obstacle to 8.33 kHz implementation.

6.4 UHF Frequency Management Aspects

6.4.1 The 225-400 MHz band is historically known as the “NATO UHF Band”. In fact, UHF frequencies are mainly used by military Air Defence to control aircraft flying within segregated airspace and when conducting specific military air operations (e.g. air policing, air interception) and by military ATC to control military traffic operating as OAT. This UHF band is also shared with other services like ILS, Digital Audio Broadcast etc.

6.4.2 In each NATO Member State, the management of this UHF band is delegated by spectrum regulators to military frequency management agencies designated National Allied Radio Frequency Agencies (NARFA). NATO Member States have delegated the coordination/management activities for this portion of the frequency spectrum to the NATO Committee that deals with frequency management matters.

6.4.3 The NATO Spectrum and C3 Infrastructure Branch (SC3IB), at NATO Headquarters, responds to UHF frequency requests and coordinates the air-ground and air-air frequency assignments to civil and military ANSPs. This branch supports the abovementioned Committee during the periodic reorganisations of the UHF band leading to a more efficient utilisation. This is a prerequisite to be able to meet the UHF growing demand since the band is already relatively congested.

6.4.4 The procedures for obtaining UHF frequency allocations for ATC are described in the ICAO Frequency Management Manual (Doc. EUR-011 Part IV - Frequency Co-ordination and Registration Procedures) [Ref [6]].

6.5 UHF Technical Integration

6.5.1 The minimal performance requirements for radio transmitters receivers and transceivers at ground-based aeronautical stations operating in the UHF band used by ATC are standardised in the European Telecommunications Standards Institute (ETSI) EN 302 617 [Ref [7]]. NATO STANAG 4205 includes also relevant technical details.

Note: On the ETSI webpage http://www.etsi.org search for the standards EN 302 617-1 and EN 302 617-2. At the time of publication of this document, a new edition of the ETSI standards are being approved.

6.5.2 Most of the hazards associated with the use of UHF to handle too many non-8.33 kHz State aircraft entering a sector can be mitigated if UHF and VHF channels are appropriately cross-coupled.

6.5.3 Some Voice Communication Systems may constrain the implementation of cross-coupling. In fact, the way cross-coupling is implemented is manufacturer-dependent. However, the extent of the cross-coupling (two or more frequencies) will be specified by the ANSP. The means of selection and control of cross-coupling will also be specified by the ANSP but the following are typical options: 1) at any controller working position, 2) at a specified supervisor working position, 3) by means of a system management terminal.

6.5.4 **[GUID-9]** Whatever means of cross-coupling[7] is selected, it is extremely important that the user (or users) **should** be given clear indications as to which frequencies are in a cross-coupled mode. Operational safety hazards, particularly during busy/heavy traffic situations, may arise due to cross-coupling where the likelihood of missed or disturbed radio transmissions increases significantly.

6.5.5 In view of the hazards outlined above, consideration should be given to restricting the extent of cross-coupling as follows:

- limiting the number of frequencies that shall be cross-coupled.
- limiting the number of cross-coupling sessions at a controller working position.
- limiting the number of cross-coupling sessions for the whole voice communication system.

It is also important, in order to prevent coupling chains, to ensure that a particular frequency can only be included in one cross-coupling session.

6.5.6 **[GUID-10]** The following guidelines identify some important human operating aspects that **shall** be considered at the level of Human Machine Interfaces (HMI). Irrespective of cross-coupling being present or not it **shall** be guaranteed that:

- The interaction between a controller and the HMI should leave the controller in no doubt about the next action to be taken in performing the current function.
- The indicator associated with the aircraft call should be distinctive to enable active frequencies to be easily identified.
- A distinctive and clear indicator showing any frequencies that have been cross-coupled should be provided.

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[7] Sometimes referred as cross-banding

7. Communication Procedures and Phraseology

7.1 The radiotelephony communication procedures are established in accordance with ICAO Annex 10, Volume II, Chapter 5. It is essential, in the context of 8.33 kHz VCS deployment that all flight crews, ATS personnel and other ground personnel are thoroughly familiar with the appropriate radiotelephony procedures.

7.2 The introduction of 8.33 kHz voice channel spacing has resulted in a 6-digit channel numbering scheme, where the 8.33 kHz channel designators differ from the actual frequency; e.g. 8.33 kHz channel 132.035 tunes the frequency 132.0333 MHz.

7.3 The ICAO Annex 10 VII prescribes the procedure for a 6-digit pronunciation of both 8.33 kHz and 25 kHz channels in VHF radio telephony communications, except in the case of both the fifth and sixth digits being zeros, in which case only the first four digits should be used. The following examples illustrate the application of this procedure:

Channel (8.33 kHz/25 kHz)	Transmitted as
118.000 (25 kHz)	ONE ONE EIGHT DECIMAL ZERO
118.005 (8.33 kHz)	ONE ONE EIGHT DECIMAL ZERO ZERO FIVE
118.010 (8.33 kHz)	ONE ONE EIGHT DECIMAL ZERO ONE ZERO
118.025 (25 kHz)	ONE ONE EIGHT DECIMAL ZERO TWO FIVE
118.100 (25 kHz)	ONE ONE EIGHT DECIMAL ONE

7.4 However, caution must be exercised with respect to the indication of transmitting channels in VHF radiotelephony communications when all six digits of the numerical designator are used in airspace where communication channels are separated by 25 kHz, because on aircraft installations with a channel separation capability of 25 kHz or more, it is only possible to select the first five digits of the numerical designator on the radio management panel. Additional training may be required for pilots to cover for the use of the radio equipment in such situations.

7.5 ATS should maintain in addition to the VHF 2-way radio communications, a continuous watch on the appropriate VHF emergency channels and, if available, UHF, in order to ensure that air traffic controllers are informed about distress transmissions in the area of responsibility

7.6 Also for the handling of State aircraft operating in 8.33 kHz airspace, consistent use of the correct radiotelephony phraseology procedures shall be observed in all cases on the basis of ICAO Annex 10, Volume II, Chapter 5.

7.7 The table below describes some 8.33 kHz-related phraseology procedures relevant for the handling of State aircraft.

Circumstance	**Phraseology**
To request confirmation of 8.33 kHz capability	CONFIRM EIGHT POINT THREE THREE
To indicate 8.33 kHz capability	* AFFIRM EIGHT POINT THREE THREE
To indicate lack of 8.33 kHz capability	* NEGATIVE EIGHT POINT THREE THREE
To request UHF capability	CONFIRM UHF
To indicate UHF capability	* AFFIRM UHF
To indicate lack of UHF capability	* NEGATIVE UHF
To request status in respect of 8.33 kHz exemption	CONFIRM EIGHT POINT THREE THREE EXEMPTED
To indicate 8.33 kHz exempted status	*AFFIRM EIGHT POINT THREE THREE EXEMPTED
To indicate 8.33 kHz non-exempted status	* NEGATIVE EIGHT POINT THREE THREE EXEMPTED
To indicate that a certain clearance is given because otherwise a non-8.33 equipped and/or non-exempted aircraft would enter the airspace of mandatory carriage	DUE EIGHT POINT THREE THREE REQUIREMENT

* Denotes pilot transmission.

8. VHF Frequency Management

8.1 General

8.1.1 Military operators provide Air Traffic Services using aeronautical spectrum bands that are not under ICAO coordination to sustain military operations (e.g. harmonised military bands UHF (225 MHz – 400 MHz) and VHF Aeronautical Mobile (Off-Route) Service (138 MHz – 144 MHz) for Operational Air Traffic – OAT).

8.1.2 Nevertheless, there are particular military missions, tasks and services that require the availability on the military side, of additional VHF assignments in the ICAO VHF COM (117,975 - 137 MHz). Namely when military organisations provide Air Traffic Services[8] to civil airspace users. The type of service, airspace volume and phase of flight where such services are provided may vary depending on local arrangements in each State.

8.2 Military use of VHF COM

8.2.1 The cases where ATS provision or other missions or tasks do justify the assignment to or the use by the military of VHF COM frequencies (from the ICAO COM2 table) include:

- Military ATC can have the responsibility for the provision of ATS services to any airspace user, either civil or military, as OAT or GAT, in a designated part of the national airspace. For example, there are multiple cases in Europe where the military are in charge of controlling all the traffic in the lower airspace of a particular area

- Military ATS units (Approach Control and Aerodrome Control, including Ground) may be designated by States to provide ATS within airspace structures (ATZ, CTR and TMA) associated with a military aerodrome

- Most military aerodromes have to provide ATC support to any airspace user crossing its area of responsibility. VHF communications is the means to provide such ATC support when handling civil traffic crossing terminal airspace

- The safe and efficient conduct of flights requires the availability of information services. For example, in specific circumstances it is possible to allow the crossing of a restricted area where military activity is performed. Any airspace user not involved in this activity has the obligation to contact and to request a clearance to the appropriate responsible ATC unit

- The responsible ATC unit can be military but flights to be supported can be civil airspace users flying GAT, hence the only interoperable means to support the required ATC information exchanges are VHF radio frequencies within the aeronautical VHF band (117,975 - 137 MHz).

- Flight Information Services (FIS) will have to be equally available to civil and military traffic

- Special aeronautical events like air shows, dedicated military exercises organised in non-permanent airspace structures and training involving less-

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[8] In compliance with ICAO Annex 11 or equivalent as determined by the national regulations

capable flying units (e.g. military aircraft from Eastern countries unable to tune military bands) are examples of activities that may entail the need to use VHF COM resources

- Search and Rescue (SAR) is a national responsibility with associated activities very often performed by the military. Nevertheless, SAR activities can also involve civil aircraft. The same applies to emergency, distress, medical and hospital flights. Air-ground voice communications are vital for these missions

- Calibration flights are conducted to check the performance of ground-based and airborne ATC systems including surveillance, navigation, and approach and landing aids for civil and military use. Required VHF COM frequencies are in some cases assigned to the military entities that organise such activities

- Test and functional check flights can be conducted by/for military and civil aircraft. In many States the military organise all or some of these activities and have VHF COM frequencies assigned for the required support

- In some States, the training of military pilots is conducted by civil aircraft operators using aircraft not equipped with military communications enablers. Military ATC units providing a service to this traffic will need dedicated ICAO VHF COM assignments.

8.3 Best Civil-Military Practices

8.3.1 The norms and rules guiding frequency management are defined at national level. However, the shared use of VHF COM band recommends some best practices to be taken into account. Those best practices should include:

- the regular review of assignments and the need to avoid old assignments being maintained when there is no operational justification

- use temporary assignments when the justifying mission or task has a short duration

- communicate to the national frequency manager coordinating with the network manager radio frequency function (RFF) any modification to the Designated Operational Coverage (DOC) requirement so that the database can be updated (see section 9.1)

- employ shared assignments when civil and military ATC units are integrated or, at least, co-located

- monitor and react immediately in case of harmful interference.

9. Stakeholder Support

9.1 The Role of the Network Manager (NM)

9.1.1 Through Regulation (EU) No 677/2011 of 07 July 2011, the European Commission created the Network Manager (NM) function so as to optimise the aviation network's performance by performing ATFM, designing the European route network and coordinating scarce resources. The European Commission has designated EURCONTROL as the Network Manager.

9.1.2 The Network Manager addresses performance issues strategically, operationally and technically. Its overarching mission is to contribute to the delivery of air traffic management's (ATM) performance in the pan-European network in the areas of safety, capacity, environment / flight efficiency and cost effectiveness.

9.1.3 One of the NM functions is to provide a central function for Frequency Allocation designated as Radio Frequency Function (RFF). The main purpose of the Radio Frequency Function (RFF) is to mitigate the network impact of the limited aeronautical radio spectrum which is recognized as a scarce resource. The RFF will coordinate all frequencies used within the aviation spectrum for communication, navigation and surveillance (CNS) systems in the ICAO EUR/NAT Region.

9.1.4 The RFF is conducted together with ICAO and States. One of the first priorities is to address the VHF congestion and maximise the benefit of the 8.33 kHz conversion.

9.1.5 The RFF provides frequency management support to States in the following areas:

- managing the block planning process to find effective frequency shifts to satisfy frequency requirements;
- assisting States in finding appropriate frequencies and maximising the use of the available spectrum;
- assisting States in finding suitable frequencies in cases of urgency (e.g. interferences);
- providing training and support for the frequency management software systems.

9.1.6 RFF contributes to network performance by assigning VHF frequencies which don't create critical delay for airspace improvements. Additionally, it will ensure that the appropriate channels are available for the deployment of new applications (VHF Data Link Mode 2 for instance) and that congestion for navigation aids frequencies is also reduced.

9.1.7 To support the RFF processes a European Aviation Frequencies Central Register based on the SAFIRE (Spectrum And Frequencies Information REsource) system is in place to:

- Store the operational information required by the ATM network functions regulation to support the enhanced frequency management processes.
- Support the complete life-cycle of a frequency assignment, providing suitable support to the assessment of the network impact and the prioritisation of new requests.

9.1.8 Related working arrangements comprise the Network Manager's Radio Frequency Function (RFF) group (RAFT). The RAFT is the managing body of the RFF. It is composed of the National Frequency Managers (NFM) nominated by the European States, ICAO and the NM.

9.2 The 8.33 kHz Implementation Support Group (ISG)

9.2.1 To support 8.33 kHz implementation, an 8.33 kHz Implementation Support Group (8.33 ISG) was established within the Network Manager.

9.2.2 The remit of the 8.33 ISG is to provide a direct channel of communication between the Network Manager and its stakeholders on activities related to implementation of 8.33 kHz voice channel spacing (VCS).

9.2.3 Within the aforementioned framework, the main purpose of the 8.33 ISG is to ensure the proper planning, implementation and performance of the 8.33 kHz VCS in the entire EU area. Link with the NM-RFF is established to measure the benefit that 8.33 kHz will bring on frequency congestion.

9.2.4 Participation at 8.33 ISG is open also to military aircraft operators. The 8.33 ISG tasks, inter alia, include to:

- Coordinate the implementation of 8.33 kHz VCS as prescribed by Regulation (EU) No 1079/2012.
- Ensure technical support for the potential evolution of the 8.33 VCS implementing rule as required.
- Provide common focal point for any planning issues (with special attention to possible adverse impact on network management) and other issues such as system impacts.
- Identify and plan changes to supporting European procedures, such as LoAs, to support stakeholders in implementing frequency assignments.
- Identify and plan changes to supporting European-wide engineered systems, such as IFPS, to support stakeholders in implementing frequency assignments effectively.
- Coordinate states, Airspace users, ANSPs, Military, General Aviation, Airports, and other stakeholders in preparation for future conversions.
- Ensure technical support to stakeholders when and if required.
- Disseminate information on best practices with reference to the 8.33 VCS implementation.

9.2.5 The 8.33 ISG is available to support military aircraft operators on their 8.33 kHz implementation activities.

ANNEX A: GLOSSARY

Abbreviations

ACARS	Aircraft Communication and Reporting System
AIP	Aeronautical Information Publication
ANSP	Air Navigation Service Provider
ATC	Air Traffic Control
ATM	Air Traffic Management
ATS	Air Traffic Services
CLIMAX	Carrier Off Set System
CNS	Communications, Navigation and Surveillance
COM	Communications
CS-ACNS	Certification Specifications – Acceptable Means of Compliance for Airborne Communications, navigation and Surveillance
DOC	Designated Operational Coverage
EANPG	European Air Navigation Planning Group (ICAO)
EASA	European Aviation Safety Agency
EATMN	European Air Traffic Management Network
ECAC	European Civil Aviation Conference
EU	European Union
EUROCAE	European Organisation for Civil Aviation Equipment
FIS	Flight Information Service
FL	Flight Level
FM	Frequency Modulation
FPL	Flight Plan
GAT	General Air Traffic
HF	High Frequency
HMI	Human Machine Interface
ICAO	International Civil Aviation Organisation
IFPS	Initial Flight (Plan) Processing System
IFR	Instrument Flight Rules
IR	Implementing Rule (EU Regulation)
ISG	Implementation Support Group
NATO	North Atlantic Treaty Organisation
NFM	National Frequency Manager
NM	Network Manager
OAT	Operational Air Traffic
RFF	Radio Frequency Function
SAR	Search and Rescue
SARPS	Standards and Recommended Practices (ICAO)
SERA	Standardised European Rules of Air

SES	Single European Sky
TGL	Temporary Guidance Leaflet
TMA	Terminal Manoeuvring Area
UHF	Ultra High Frequency
VCS	Voice Channel Spacing
VDL	VHF Data Link
VFR	Visual Flight Rules
VHF	Very High Frequency

Definitions

Coverage	The coverage provided by a radio-navigation system is that surface area or space volume in which the signals are adequate to permit the user to determine position to a specified level of accuracy. Coverage is influenced by system geometry, signal power levels, receiver sensitivity, atmospheric noise conditions and other factors which affect signal availability.
Forward fit	Forward fit means new aircraft, not yet in service (or suffering a major mid-life overhaul), due for delivery already fitted with the capability implemented prior to delivery. A shorter notice period can also be given to operators for the equipage of new aircraft than that provided for retrofits. In aviation, when an aircraft is made and delivered with all agreed Supplier Furnished Equipment (SFE) equipment it may be considered forward fitted. The opposite of SFE is buyer-furnished equipment (BFE), which is purchased by the buyer and given to the aircraft manufacturer to be installed before delivery by the aircraft manufacturer. SFE is alternatively referred to as forward fit, while BFE is referred to as retrofit. Typically the SFE is elegantly integrated appearing as a natural part of the original system. BFE in contrast often appears to be a late 'bolt on' that interrupts the smooth lines and operations of the original system. BFE also includes preferred galley equipment. In many cases the aircraft is designed to accommodate the BFE during the initial engineering phase.
General Air Traffic	Encompasses all flights conducted in accordance with the rules and procedures of ICAO.
Operational Air Traffic	Encompasses all flights which do not comply with the provisions stated for GAT and for which rules and procedures have been specified by appropriate national authorities.
Retrofit	Retrofit means to install (new or modified parts or equipment) in something previously manufactured or constructed system or a newly-designed piece of equipment added to an older airplane. It may be to fix an older version (older versions) as part of the same process of fixing the newest version
State aircraft	For ATM purposes and with reference to article 3(b) of the ICAO Chicago Convention, aircraft used in military, customs and police services shall qualify as State Aircraft.

ANNEX B: REFERENCES

[1] Regulation (EC) No 552/2004 of the European Parliament and of the Council of 10 March 2004 on the interoperability of the European Air Traffic Management network (the interoperability Regulation) (as amended)

[2] Regulation (EC) No 1265/2007 of 26 October 2007 laying down requirements on air-ground voice channel spacing for the Single European Sky

[3] Regulation (EC) No 1079/2012 of 16 November 2012 laying down requirements for voice channel spacing for the Single European Sky

[4] EASA Certification Specification and Means of Compliance for Airborne Communications, Navigation and Surveillance (CS-ACNS), 17 December 2013

[5] EUROCONTROL Guidelines on the Use of UHF for ATC, GUID-138-2009, Edition 1.0, 02 June 2010

[6] ICAO Frequency Management Manual (Doc. EUR-011)

[7] ETSI EN 302 617-1 V1.1.1 (2009-01) Electromagnetic compatibility and Radio spectrum Matters (ERM); Ground-based UHF radio transmitters, receivers and transceivers for the UHF aeronautical mobile service using amplitude modulation; Part 1: Technical characteristics and methods of measurement

[8] Regulation (EC) 677/2011 of 7 July 2011 laying down detailed rules for the implementation of air traffic management (ATM) network functions

[9] EUROCONTROL 8.33 Implementing Support Group (8.33 ISG) “Frequently Asked Questions and Answers” Edition 1.1, 28 April 2015

[10] Network Manager (NM) 8.33 VCS Implementation Handbook, Edition 1.1, July 2017

[11] IFPS Users Manual, Edition 22.0, 8 May 2018

ANNEX C: EASA CLARIFICATION ON CIVIL EQUIPAGE

Ref: EASA response letter NDU/aco/CT.0.1 dated 14 August 2017 to Director Network Manager Directorate 8.33 kHz Voice Channel Spacing below FL195 EUROCONTROL questions to EASA, letter NMD/NS/CFC/005-2017 dated 27 April 2017. (To be read in conjunction with EASA CS-ACNS).

[Quote]

First question:

The number of radio equipment required on board depending on the operating rules (IFR/VFR), airspace class and aircraft category

To answer this question, initial airworthiness, air operations and airspace regulatory material is assessed in the following sections.

Certification specification	Number of required radios
CS-25 Large Aeroplanes (refer to 25.1307)	2 independent radios
CS-29 Large Rotorcraft (refer to 29.1307)	1 radio
CS-23 Normal, Utility, Aerobatic and Commuter Aeroplanes	No requirement
CS-27 Small Rotorcraft	No requirement
CS-LSA Light Sports Aeroplanes	No requirement
CS-VLA/CS-VLR Very Light Aeroplanes/Rotorcraft	No requirement
CS-22 Sailplanes	No requirement
CS-31GB/CS-31HB/CS-31TGB (CS-31)Balloons	No requirement

In addition, except for CS-LSA/CS-VLR, CS-22, CS31-GB/CS-321HB/CS-31TGB (day VFR only), each CS contains a requirement asking for conducting a safety analysis. Refer to the following requirements of the respective CS: 25.1309, 29.1309, 27.1309, 23.2510, CS-VLA 1309 or CS VLR-1309 at latest amendment.

This safety analysis leads the applicant to consider the typical failure condition: “total loss of voice communication”.

Common result agreed by EASA as regards to this failure condition is provided below:

- When flying in IFR: MAJOR effect
- When flying in IFR with Class I aeroplane: MINOR effect
- When flying in VFR (in an airspace where voice communication is required): MINOR effect

As per AC 23.1309-1E, Class I aeroplane are defined as being Single Reciprocating Engine (SRE) aircraft with a Maximum Certificated Gross Take-off Weight of less than 6,000 pounds (2721 kg).

Besides, as per AMC and AC 25.1309, MAJOR effect can be converted into a maximum 10-5/FH failure rate and MINOR into a maximum 10-3/FH failure rate.

Considering the usual equipment MTBF (around 10000 (104) FH translating), the table above can be refined into:

Certification specification	Number of required radios	
	VFR	IFR
CS-25	2 independent radios	
CS-23 Class I	1 radio when a radio is required either by OPS or airspace requirements	1 radio
CS-29 / CS-27 / other CS-23	1 radio when required either by OPS or airspace	2 independent radios
CS-LSA / CS-VLA/CS-VLR/CS-31	1 radio when required either by OPS or airspace	N/A

Air operations (OPS) rule:

The regulation for air operations (EU) No 965/2012 only applies to European operators and not all airspace users.

Following review of requirements CAT.IDE.A/H.330, CAT.IDE.A/H.340, CAT.IDE.A/H.345, NCC.IDE.A/H.245, NCO.IDE.A/H.190, SPO.IDE.A/H.215, NCO.IDE.S.1451, NCO.IDE.B.1451, SPO.IDE.S.1451 and SPO.IDE.B.1451, the following table can be set:

OPS part	VFR	IFR or VFR with no visual landmarks
CAT[2]	1 radio required	2 independent radios required
NCC[2]	According to airspace If 2 radios required[3], independency is required	1 radio required If 2 radios required[3], independency is required
NCO[2]	According to airspace If 2 radios required[3], independency is required	According to airspace If 2 radios required[3], independency is required
SPO[2]	According to airspace If 2 radios required[3], independency is required	1 radio required If 2 radios required[3], independency is required
NCO/SPO Sailplane	According to airspace	According to airspace
NCO/SPO Balloon	According to airspace	According to airspace

1: European states can opt out from the current rule for balloons and sailplanes until 8. April 2018 from the applicability of the regulation and maintain current national rules. Only Poland has not used that provision. Further, to ease readability of the rule and to reply to the request of the community, specific OPS regulation for balloons and sailplanes are under development and will replace the current rule, while maintaining the current requirements for communication equipment. The new regulation, which is under publication preparation, may change the opt out provisions.

2: The following acronyms stand for:

- CAT: commercial air transport
- NCC: non-commercial operations with complex motor-powered aircraft4

- NCO: non-commercial operations with other-than-complex motor-powered aircraft4

- SPO: Specialised operations, ‘specialised operation’ means any operation other than commercial air transport where the aircraft is used for specialised activities such as agriculture, construction, photography, surveying, observation and patrol, aerial advertisement;

3: This “2 radios requirement” can only come from initial airworthiness requirements as airspace rules do not have such prescriptive requirement.

Additionally, as per CAT/NCC/NCO/SPO.IDE.A/H/S/B.100, the required radios need to be airworthiness approved. When a radio is not required (e.g. by the airspace or initial airworthiness), this one does not need to be airworthiness approved when not installed (handheld radios).

4 Regulation (EU) No 216/2008 defines in article 3 (j) complex motor powered aircraft as

(i) an aeroplane:

— with a maximum certificated take-off mass exceeding 5 700 kg, or

— certificated for a maximum passenger seating configuration of more than nineteen, or

— certificated for operation with a minimum crew of at least two pilots, or

— equipped with (a) turbojet engine(s) or more than one turboprop engine, or

(ii) a helicopter certificated:

— for a maximum take-off mass exceeding 3 175 kg, or

— for a maximum passenger seating configuration of more than nine, or

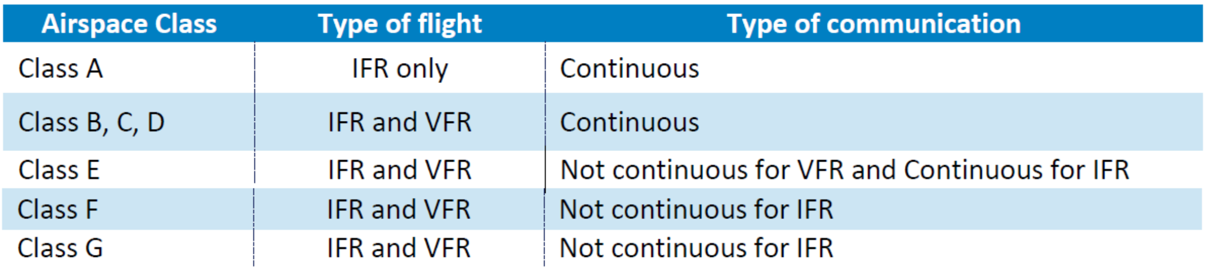
— for operation with a minimum crew of at least two pilots, or

(iii) a tilt rotor aircraft;

This means CS-25, CS-29 and some but not all CS-23 aircraft are complex motor powered aircraft.

Airspace requirements

Section 6 (Airspace classification) / SERA.6001 of COMMISSION IMPLEMENTING REGULATION (EU) No 923/2012 provide information about airspace communication requirements.



Airspace Class	Type of flight	Type of communication
Class A	IFR only	Continuous
Class B, C, D	IFR and VFR	Continuous
Class E	IFR and VFR	Not continuous for VFR and Continuous for IFR
Class F	IFR and VFR	Not continuous for IFR
Class G	IFR and VFR	Not continuous for IFR

Additionally, as per SERA.6005 (a) Radio mandatory zone (RMZ), “[…] airspace designated as a radio mandatory zone (RMZ) by the competent authority shall maintain continuous air-ground voice communication watch and establish two-way communication […]”.

Consequently, the airspace class A, B, C and D and those designated as RMZ would require at least one radio on board the aircraft.

Nevertheless, the SERA.6001 and SERA.6005 of COMMISSION IMPLEMENTING REGULATION (EU) No 923/2012 does not impose a prescriptive required number of radio on-board the aircraft.

Synthesis

The number of required radios on-board the aircraft to comply with the European airspace, initial airworthiness and operational rules can be summarised as:

- A CS-25 aircraft shall be fitted with at least 2 independent radios whatever the intended operation and airspace flown into.
- When flying in IFR or CAT VFR with no visual landmarks:
    - 1 radio is required for CS-23 Class I aeroplane;
    - For all the other aircraft category, 2 independent radios are required
- When flying in VFR only:
    - CAT operation: 1 radio is required;
    - In the following specific airspaces: B, C, D or RMZ: 1 radio is required;
    - In all other cases, no radio is required.

Note: this synthesis does not apply to “third country operator” (TCO) aircraft referred to in Article 4(1) (d) of Regulation (EU) No 216/2008. Those aircraft need to comply with ICAO Annex 6 and 8 requirements, not addressing VHF radio carriage explicitly, and the applicable airspace requirements.

In a letter to EASA member states TCO focal points EASA clarified that TCO aircraft need to carry the number of radios specified in the AIP for the affected airspace.

Second question:

In case of two radios existing on board the possibility of having one radio with 8.33VCS capability and one radio in 25 kHz

The following rule should be applied when flying into 8.33 kHz VCS airspace:

- When 2 radios are required (refer to answer to first question):
    - Both shall be 8.33 kHz VCS as per AMC1 ACNS.B.VCS.010 [R5].
- When 1 radio is required (refer to answer to first question):
    - A least 1 radio shall be 8.33 kHz VCS. It is possible to have further radio(s) that is (are) 25 kHz VCS only;
    - Upon failure of the 8.33 kHz VCS radio:
        - ☐ 25 kHz VCS only radio shall only be used on emergency frequency (121.5 MHz) or on 25 kHz frequencies assigned by ATS
- When no radio is required (refer to answer to first question):

- Aircraft can be fitted with 25 kHz VCS only radio(s) on the condition that:
    - 25 kHz VCS only radio shall only be used on emergency frequency (121.5 MHz) or on 25 kHz frequencies assigned by ATS

Note: this synthesis does not apply to “third country operator” (TCO) aircraft referred to in Article 4(1)(d) of Regulation (EU) No 216/2008. Those aircraft need to comply with ICAO Annex 6 and 8 requirements and the applicable airspace requirements.

In a letter to national TCO focal points EASA clarified that TCO aircraft need to carry the number of radios specified in the AIP for the affected airspace.

[Unquote]

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