

Aeronautical Spectrum Sharing with Audio PMSE in 960 to 1164MHz band

Update on Baseline safety case development

8th June 2017



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Introduction

Helios is a business and technical consultancy, with a core focus on **aviation**, and in particular **air traffic management**. We are **independent** of any ANSPs or manufacturers. Owned by EGIS (a French engineering firm).



The aviation consultancy of Egis

Senior consultant ~11 years at Helios initial focus on **surveillance** (for example Eurocontrol's SASS-C 'Predict' tool), moving to **safety** (for example Avinor's NORWAM safety case), and **GNSS** (numerous projects for the European GNSS Agency).

Responsible for developing the Baseline Safety Case for PMSE in the 960 to 1164MHz band

Baseline Safety Case

Objective: a baseline safety case which demonstrates (for the approval of the CAA) that the generic concept of PMSE use of spectrum within the ARNS band is tolerably safe for users of civil aeronautical CNS systems.

Premise of our work:

- the interference testing has been performed and documented sufficient to provide suitable data
- the approach taken in the JTIDS/MIDS baseline safety case is relevant, particularly with regard to analysis of the effect of interference on aeronautical CNS systems
- the core focus is therefore, the success and failure modes associated with the assignment and implementation of ARNS band frequency by Ofcom and PMSE users.

In other words, we are organising existing analysis and data, together with an assessment of the assignment process, into a suitable safety case rather than performing a complete safety assessment from the ground up.

Baseline safety case (2)

My objective to day:

Present the approach we are taking for the baseline safety case

Garner feedback, particularly on the assumptions

De-risk the submission and approval process (I want to know if we are missing anything!)



Overview – Safety case remit

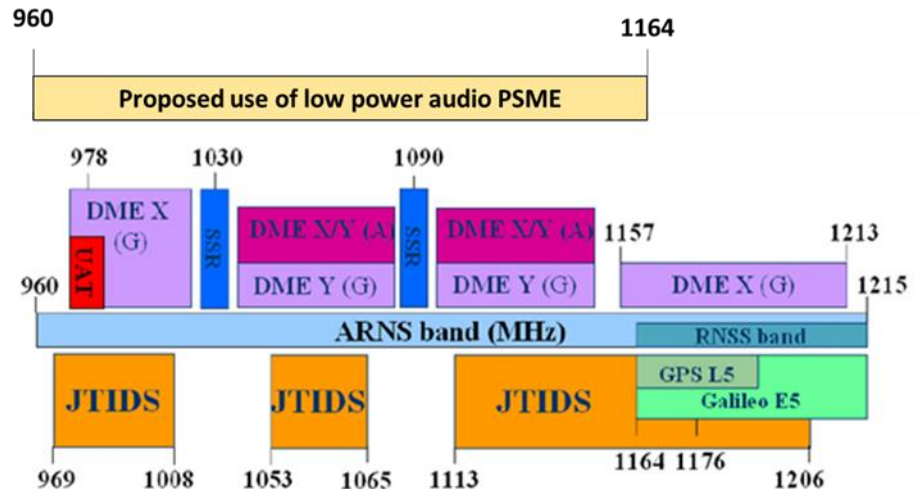
Type of operation	Handling method
<p>Normal operation with a PMSE operating in accordance with a licence from Ofcom.</p>	<p>Covered by spectrum management rules which plans for positive margins in favour of protecting aeronautical systems with worst-case geometries and conservative planning factors.</p>
<p>Accidental misuse regarding any arbitrary channel. e.g. PMSE user with wrong channel configured.</p>	<p>Covered by a risk assessment formed of event probabilities and mitigating factors being formalised in a safety case.</p>
<p>Deliberate misuse with harmful intent. e.g. jammer in the band (whether PMSE equipment or other).</p>	<p>Covered by Ofcom's 24 hr interference team (existing enforcers of law regarding <u>all</u> harmful interference to safety of life systems).</p>

Following CAP 760 approach

Overview – core assumptions

1 The broad analysis on the potential for ARNS systems' to be effected is very similar to the JTIDS safety case:

- GNSS
 - (protected by a guard band)
- SSR/ADS-B/WAM/MLAT/ACAS/TCAS
 - (protected by guard bands)
- UAT (not in use in UK)
- DME (see below)
- JTIDS/MIDS and TACAN
 - (effect on military systems out of scope)



2 The values for permissible Loss of DME calculated in the JTIDS safety case are a suitably conservative input for the PMSE safety case:

Given that PMSE equipment transmits at a much lower power than JTIDS/MIDS terminals, the geometries and associated chronologies should be much more forgiving.

3 PMSE users/equipment manufacturers of ARNS band will be professional organisations with awareness of spectrum issues

Overview – core assumptions (2)

3 Conservative approach taken on the basis that PMSE should be a good neighbour, rather than relying on the robustness of ARNS. For example:

- Assignment tool assumes a/c at 100m altitude (regardless of LoS horizon and distance from beacon)
- PMSE transmitter is not always on, mostly indoors in a cluttered environment and radiates less than 17 dBm due to body losses and battery saving – not modelled
- JTIDS actually mostly not present – not modelled

Overview – initial findings

Built in mitigation – PMSE users likely to detect interference from ARNS if they are in the wrong channel and avoid it

Likely to recommend mitigations around protecting the 1030/1090MHz guard bands (note: these are not decided, but are representative of the types of mitigations which could be required):

- For example, PMSE equipment could block selection of frequencies within guard bands

Likely to recommend procedural controls around assignment tool management and assignment implementation by PMSE users:

- Cross check of indicated venue location
- Confirmatory steps (that the user has configured equipment in line with licence)
- Additional steps to check guard bands are observed
- Controls/tests around the assignment tool (ARNS data import or parametric changes)

Overview – current direction

Modelling the success and failure case with input from Ofcom/CAA (and yourselves through previous consultations and today)

Contacting PMSE stakeholders to validate assumptions and build confidence in the models

Identifying the proposed controls and mitigations Ofcom are developing to apply the Spectrum Management Rules as explicit safety requirements