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Electromagnetic compatibility and Radio spectrum Matters (ERM); System Reference document (SRdoc); Surveillance Radar equipment for helicopter application operating in the 76 GHz to 79 GHz frequency range

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Contents

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

Executive summary

The helicopter's unique hover and vertical take-off/landing capabilities make it ideally suited for transport in difficult access areas, take-off and land in confined areas (Figure 1) and perform hoisting operations (Figure 2). In these frequently encountered and demanding mission elements the pilot faces an increase in workload when scanning for obstacles and monitoring helicopter state. Especially in degraded visual conditions and unknown or confined areas, there is an imminent danger of collision with all kinds of obstacles, which continues to be among the top causes of civil helicopter accidents.

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Figure 1: Operations in confined areas

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Figure 2: Hoisting operations close to obstacles

The present document describes the heliborne application of 76 GHz to 79 GHz radar technology, in a near environment obstacle warning system. The application here used the benefit that automotive radar made the technology available but the technical parameters and sensor architecture for helicopter are different. The intended function of this system is to detect and inform the flight crew of obstacles in the direct vicinity of the helicopter environment. The surround coverage of the radar system will aid the crew in the obstacle detection task while manoeuvring at low airspeeds typically close to the ground. The system will help and improve the probability of detection of obstacles thereby increasing situational awareness and flight safety. It will reduce pilot's workload and can save time in critical flight phases, which is important especially for safety of life services.

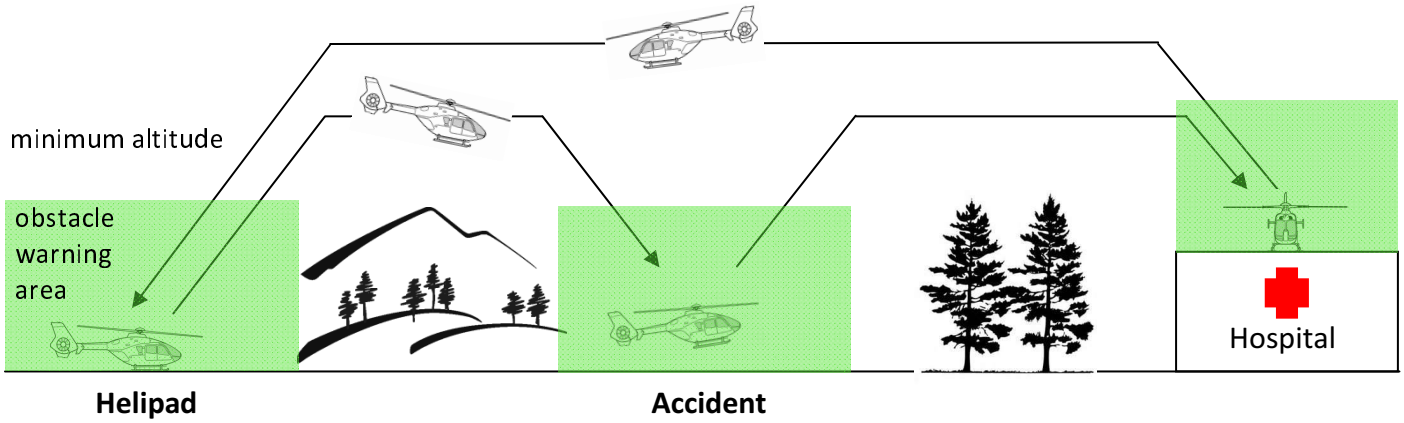

Figure 3: Typical operational profile for helicopter emergency medical service

Figure 3 shows a typical HEMS (helicopter emergency medical service) mission. The helicopter takes off from the helipad/airfield using the obstacle warning system until it rises out of the obstacle scene. After arriving at the accident site, the helicopter descends to the landing zone and picks up the person injured. During landing, hover and take-off, the obstacle warning system inform the flight crew of obstacles in the direct vicinity of the helicopter environment. The helicopter flies in cruise altitude to the hospital. During landing and take-off at the hospital, the flight crew again is informed of obstacle by the obstacle warning system. The system will be switched off during cruise flight back to the helicopters air base but will be active during the landing phase at the air base.

Minimum flying altitudes and off-field landing are regulated for each state.

Examples of regulation:

- Germany:
  - Landing outside of airfield (off-field landing) is only allowed after permission from authority. Exceptions are e.g. emergency landing and helicopter emergency medical service.
  - Minimum altitude is 300 m (1 000 feet) above residential area, production plants, gatherings and accident sites above the highest obstacle in an area of 600 m. For all other areas it is 150 m (500 feet) above ground and water.

    For cross-country flights, a minimum altitude of 600 m (2 000 feet) is applicable.
- France:
  - Landing outside of airfield (off-field landing) is only allowed after permission from authority. Exceptions are e.g. emergency landing and helicopter emergency medical service.
  - Minimum altitude is 300 m (1 000 feet) above residential area, production plants, gatherings and accident sites. For all other areas it is 150 m (500 feet) above ground and water.

The Size, Weight and Power (SWaP) characteristics of 76 GHz to 79 GHz sensors make them ideally suited for use on smaller H/C types typically being used by civil operators. Due to the short wavelength and high bandwidth the precise measurement (in range and doppler) enables an accurate and reliable detection of those obstacles posing a threat to safe helicopter operations. The fact, that the automotive radar technology is proven and readily available makes it the only affordable sensor technology for a short-term market entry for this novel kind of application.

The aim is to enable the usage of already existing technology available e.g. in the automotive area for helicopter applications.

In the introduction of ERC Recommendation 70-03 [i.10], the following is stated:

"The CEPT has considered the use of SRD devices on board aircraft and it has concluded that, from the CEPT regulatory perspective, such use is allowed under the same conditions provided in the relevant Annex of Recommendation 70-03. For aviation safety aspects, the CEPT is not the right body to address this matter which remains the responsibility of aircraft manufacturers or aircraft owners who should consult with the relevant national or regional aviation bodies before the installation and use of such devices on board aircraft."

Introduction

The present document has been developed to support the co-operation between ETSI and the Electronic Communications Committee (ECC) of the European Conference of Post and Telecommunications Administrations (CEPT).

1 Scope

The present document describes the radar based surveillance applications in the 76 GHz to 79 GHz frequency range for a helicopter obstacle warning system. The 76 GHz RTTT Standard EN 301 091 [i.5] and the 77 GHz to 81 GHz RTTT Standard EN 302 264 [i.8], could be used as a baseline to defines the technical characteristics and test methods for this new radar equipment operating in the 76 GHz to 79 GHz range.

It includes in particular:

- Market information.
- Technical information (including expected sharing and compatibility issues).
- Regulatory issues.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

Not applicable.

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] EASA: "Annual Safety Review 2010", 2011.

[i.2] ITU Radio Regulations (Edition of 2012).

[i.3] ERC Report 25: "The European table of frequency allocations and utilisations in the frequency range 9 kHz to 3000 GHz".

[i.4] CEPT/ERC/Recommendation 74-01: "Unwanted Emissions in the Spurious Domain".

[i.5] ETSI EN 301 091 (Parts 1 and 2): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices; Road Transport and Traffic Telematics (RTTT); Radar equipment operating in the 76 GHz to 77 GHz range".

[i.6] Commission Implementing Decision 2011/829/EU of 8 December 2011 amending Decision 2006/771/EC on harmonization of the radio spectrum for use by short-range devices.

[i.7] Commission Decision 2004/545/EC of 8 July 2004 on the harmonization of radio spectrum in the 79 GHz range for the use of automotive short-range radar equipment in the Community.