EUR 23-89/WG110-33

RTCA Paper No.056-23/SC237-030

Summary of the

EUROCAE Working Group 110/ RTCA SC 237 (Meeting 16)

Helicopter Terrain Awareness Warning Systems (HTAWS) for Onshore Operations

DATE: 28 February 2023 – 2 March 2023

PLACE: EASA Cologne, with some attending by WebEx

CONTACT:

Brandi Teel BTeel@rtca.org

ATTENDEES:
The following people attended all or part of the meeting, in person or by webex:

Organisation	First name	Last name	Email address
Airbus Helicopters	Nicolas	Griselin (NG)	nicolas.griselin@airbus.com
Airbus Helicopters Deutschland GmbH	Dietmar	Kleinitz (DK)	dietmar.kleinitz@airbus.com
Bell RTCA Chair	Michael	Deer (MD)	mdeer@bellflight.com
Collins Aerospace	Philippe	Salmon (PS)	philippe.salmon@rockwellcollins.com
EASA	Eric	Bennett (EB)	eric.bennett@easa.europa.eu
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FAA	Rich	Adler (RA)	Richard.Adler@faa.gov
Garmin	Duncan	Macklin (DM)	Duncan.macklin@garmin.com
Honeywell EUROCAE Chair	Yasuo	Ishihara (YI)	yasuo.ishihara@honeywell.com
Leonardo	Luca	Savino (LS)	luca.savino@leonardocompany.com
RTCA	Brandi	Teel (BT)	bteel@rtca.org
Sikorsky	Bob	Endrizzi (BE)	robert.j.endrizzi.jr@lmco.com
Sikorsky	Steve	Schellberg (SS)	steve.schellberg@lmco.com
UK CAA	Dave	Howson (DH)	dave.howson@caa.co.uk
UK CAA EUROCAE Secretary	Mark	Prior (MP)	mark@mpriorconsulting.com

1 Introductions

Yasuo Ishihara (YI) and Mike Deer (MD) welcomed everyone to the meeting.

2 Administrative Remarks/EUROCAE and RTCA Policy

Brandi Teel (BT) and Esther Hoyas presented the mandatory slides which explain the obligations of members and covered administrative aspects of the meeting.

3 Acceptance of Previous Meeting Minutes

The Minutes from Meeting 15 were accepted.

4 Review of Action Items

Actions arising from the previous meetings were reviewed and updated during the meeting. The final status of the actions is shown in the tables below.

Open Actions

The following actions were open at the end of the last meeting.

Action Reference	Action	By Whom	By Date
11.3	All airframe OEMs to review the ED-285/DO-376 Mode 1 Caution and Warning Envelopes against their product performance.	Leonardo	Completed – see section 6
11.4	All airframe OEMs to review the ED-285/DO-376 Mode 3 Envelopes against their product performance and certified take-off profiles.	Airframe OEMs	Completed – see section 6
13.6	Provide the EASA HTAWS-related accident data.	EASA (Eric Bennett)	Ongoing
14.6	Contact Babcock Mission Critical Services to obtain operational (FDM) data.	UK CAA (Dave Howson)	Closed – DH advised that he had not received any response and it was now too late.
15.1	Analyse the HAI survey responses. Then compare the results with the offshore operators' survey	Mike Deer and Mark Prior Mark Prior	Closed – see section 5
15.2	OEMs to review the Mode 4 text and confirm the requirement for mode-specific visual alerts.	All airframe OEMs	Completed – see section 6

15.3	Re-present the Airbus data split by state/country of operation. Date: By next meeting	Nicolas Griselin	Completed – see section 6
15.4	Provide a copy of the AH presentation slides.	Dietmar Kleinitz	Completed
15.5	Provide data plots for the Mode 4 alert envelopes.	Nicolas Griselin	Completed – see section 6
15.6	Provide a copy of the Sikorsky presentation slides.	Bob Endrizzi	Completed
15.7	Update Sikorsky Mode 1 analysis using modified envelopes.	Bob Endrizzi and Jared Kloda	Completed – see section 6
15.8	Review the text proposed for the altimeter check function.	All	Closed – see section 8

Note: The following Minutes are recorded by topic and not necessarily in a chronological order.

5 Operators' Survey Questionnaire

In order to gather the operators' views regarding Onshore HTAWS, and where they believe improvements will provide the most benefits, an operator survey was developed (Action 14.1). The questionnaire was forwarded to HAI and distributed to their membership. At the time of the meeting only a limited number of responses have been submitted. Due to the time constraints on this project, it is probable that the survey results will not provide a useful input to defining the MOPS.

6 Mode Envelopes

The mode envelopes were reviewed.

Review of Mode 1

Leonardo (LS) presented their analysis of the Mode 1 alert rate. This covered the AW139, AW169 and AW189 operating in the EMS, Utility, VIP and law enforcement roles. The data

indicated average alert rates (“Sink Rate” + “Pull Up”) of 37% for the AW139 and AW 189, and 13% for the AW169. It was noted that the rates were based on the May Alert envelopes and not the Must Alert envelopes, so alerting based on the must Alert envelopes could be significantly lower than quoted. There was significant variation between types of operation with Utility and VIP having lower rates than EMS and law enforcement.

Airbus (DK and NG) presented their analysis of Mode 1. This covered the H134, H145 and H175. Again, the alert rate varied with the mission type, with business and oil & gas operations having lower rates than EMS and police. The EMS and police alert rates varied by region with Europe having higher rates than the USA. The alert rates shown appeared to be generally consistent with those previously presented by Bell and Sikorsky although the actual alert rates were not presented.

SS reported that the S92 was being certified for 7º approaches at up to 120kt, resulting in a 1200 ft/min rate of descent; this would infringe the proposed Mode 1 caution envelope. This led to a discussion on whether the Mode 1 envelopes required modification to accommodate steep approaches or whether inhibiting HTAWS for steep approaches was desirable. Shrinking the Mode 1 envelope to reduce nuisance alerts would also reduce the available warning time to the crew across all types of operation. YI advised that DO309 permitted the use of a Reduced Protection Envelope (such as Low Alt Mode) in some circumstances. This could enable steep approaches to be accommodated without affecting other types of operation. OEMs (Sikorsky and Bell) were of the opinion that Alert Envelopes should not overlap with the aircraft certified envelope.

> NB: It was noted that steep approaches would also trigger FLTA alerts if the approaches were not being made to recognised runways, and it was considered that this might explain the high alert rates reported by Norway.

It was agreed that an optional Reduced Protection Mode would be added to the MOPS. It would permit crew selection or automatic selection, but activation must be displayed to the crew. The RFM could be a suitable place to define when the Reduced Protection Mode could be activated.

In addition to the alert rate, and potential nuisance alert rate, the alerting time is of interest. DH undertook to calculate the warning times for each of the Mode 1 Envelopes under review.

Action 16.1
CAA (DH) to calculate the alert times for each of the Mode 1 caution and warning envelopes under review.
Date: By next meeting (24 April 2023)

If was proposed by DH that the MOPS could provide different envelopes based on the type of operation. Most OEMs were not in favour but bn order to optimise the Mode 1 envelope and to decide whether to specify more than one envelope to cover different types of operation, it was agreed that airframe OEMs would add 95% and 99% contours to their Mode 1 data, with the data divided by type of operation.

Action 16.2
OEMs to add 95% and 99% contours to their Mode 1 data, divided by type of operation.
Date: By next meeting (24 April 2023)

Review of Mode 3A

Mode 3A was discussed and agreed changes recorded in the draft MOPS.

LS presented Leonardo Mode 3A operational data, showing the alert rate for different aircraft types and types of operation. The average alert rates (potentially the nuisance alert rates) for the ‘May Alert’ envelope were 3% for the AW139 and 14.4% for the AW169, and less than 1% for the ‘Must Alert’ envelope. The alert rates were higher for utility and law enforcement operations. It was identified that short flights or hover taxis could generate a nuisance alert.

For all the OEM data provided, there was a higher incidence of alerts around the “nose” of the envelope. Notes were added to the MOPS, giving guidance on how to define the take-off phase, to aid a manufacturer in minimising nuisance alerts.
In order to optimise the Mode 3 envelope and to decide whether to specify more than one envelope to cover different types of operation, it was agreed that airframe OEMs would add 95% and 99% contours to their Mode 3 data, with the data divided by type of operation.

Action 16.3
OEMs to add 95% and 99% contours to their Mode 3 data, divided by type of operation.
Date: By next meeting (24 April 2023)

A discussion took place on the optimum repetition rate for Mode 3. The MOPS was modified to reflect the consensus view:

“OHTAWS_REQxx For a caution level Mode 3A alert, Onshore HTAWS shall repeat the aural message for the duration of the Mode 3A caution alert condition, or until silenced by the flight crew or a higher priority alert.”

Where relevant, similar text was applied to other modes.

DH advised that the UK’s SPA.HOFO Subpart K was being reviewed and the opportunity would be taken to improve the wording of AMC SPA.HOFO.160(c)(2)(c)(3) to clarify that, although alerts must be provided throughout the period that the corresponding parameters are within the alert envelope, there could be gaps between the repeats. The gaps will not be prescribed and need not be fixed but should be appropriate for the hazard to which the aircraft is exposed. He added that the same will be expected of upgrades compliant with ED-285 even though not explicitly stated in the MOPS; text will be added to the AMC to this effect.

Review of Mode 4

BE presented the Sikorsky analysis of Mode 4A and 4B for the S76D and S92A covering Corporate, VVIP, EMS and utility operations. The overall alert rates were acceptable. A discussion followed on the configurability of Mode 4 to allow it to be tailored to aircraft and mission requirements. It was agreed to remove Mode 4A Must Not Alert boundary and a recommendation was added to explain that the alert threshold could be either configurable or dynamic (e.g. driven by FMS). The 'Must Alert' envelopes for Mode 4A and 4B were reduced to 90ft. The resulting envelopes are presented in Figures 3-9 and 3-11.

Leonardo, Bell and Airbus provided inputs based on their analysis of flight data.

Action 16.4:
Sikorsky (BE), Leonardo (LS) and Airbus (DK) to provide copies of their presentations.
Date: By next meeting (24 April 2023)

Review of Mode 5

It was noted that approaches with linear guidance where 1 dot is 75ft and 150ft is two dots also needed to be covered. Changes to the wording of the MOPS were agreed and incorporated. It was agreed to standardise on "Glideslope" or "Glidepath" for the aural alert.

Review of Mode 7

It was noted that dynamic Mode 7 envelopes may be required for onshore operations. BE agreed to review the Mode 7A Guidance in Appendix B to ensure it remains valid for Onshore HTAWS, and propose any additional material required.

Action 16.5:
Sikorsky (BE) to review the Mode 7A Guidance in Appendix B and identify any changes/additions required.
Date: By next plenary meeting (16 May 2023)

7 Review of Accident Data & Operator Feedback

The NTSB had provided YI with 4 accident reports that had been classified as CFIT. The accident reports were reviewed, where it was believed that in some cases a loss of control (LOC-I) was the fundamental cause of the accident. In one case the HTAWS appeared to function correctly, providing a series of alerts until the final impact. It was agreed that the reports did not indicate that the proposed HTAWS functions and envelopes required revising.

It has been shown that frequent Nuisance Alerts will desensitize a crew and so they might not react appropriately to a valid alert. A Norwegian HEMS operator had provided data and a copy of their SOPs to the group. Their data and procedures, such as use of Low Alt, appeared to indicate that the main source of their Nuisance Alerts was the FLTA Mode.

DH advised that he had received FDR data for two UK accidents from the UK AAIB:

- G-LBAL – this was a take-off accident and the aircraft was not airborne for long enough for HTAWS to have been of any assistance.
- G-WIWI – the data had been provided in two sections and it had not been possible to merge them.

8 Baralt Mis-Setting

DH updated the group on the current industry concerns over the potential for CFIT following a mis-setting of the baralt when performing baro. VNAV approaches. This was in response to a near CFIT event where an aeroplane came withing 6ft of the surface during an IMC approach. He shared a CAA video and test report that demonstrated the issue. The issue is on the CAA Safety Plan for 2023/24 and is also under discussion at the ICAO European Aviation System Planning Group (EASPG). ICAO, EASA and DGAC are all producing safety notices.

During the following discussion, the group acknowledged the risk and the need for action but the consensus was that the issue should be addressed in other MOPS, such as DO 283 (Minimum Operational Performance Standards for Required Navigation Performance

for Area Navigation), as it was a generic aircraft issue and not specific to rotorcraft. During the discussions, it was identified that DO-283 was undergoing revision by RTCA SC-227 and EUROCAE WG-85. During the meeting RA contacted the FAA member on WG-85/SC-227 and made them aware of the issue. He advised that the FAA member had agreed to request that the SC-227 ToRs be modified to include the requirement for a means of identifying a baralt mis-setting.

Action 16.6:
FAA (RA) to provide an update on modifying the SC-227 ToRs to include baralt mis-setting protection.
Date: By the next meeting (24 April 2023).

9 Review of MOPS

The text in Chapters 4, 5 and 6 was reviewed. Where necessary the text was modified. YI undertook to review Section 5.3- Test Cases.

Action 16.7:
Honeywell (YI) to review Section 5.3, Test Cases.
Date: By next plenary meeting (16 May 2023)

10 Next Meeting

It was agreed that a short Webex update meeting would be held on 24 April 2023. The next plenary meeting would be held at the RTCA offices, Washington DC, 16-18 May 2023, with the option of attending by Webex.

11 AOB

- RDC advised that EASA expect to combine onshore & offshore HTAWS in a single ETSO.

- RDC advised that EASA is going to upgrade its offshore HTAWS mandate, but this is will take at least 1.5 years.

- The issue of whether the WG/SC should continue and address DO-309 was discussed briefly. No conclusion was reached but it was noted that it was an option for the WG/SC to enter active monitor status.

Close

The meeting closed at 13.30 on 2 March 2023.

12 Decisions and Actions

The following actions were raised during the meeting:

Action Reference	Action	By Whom	By Date
16.1	Calculate the alert times for each of the Mode 1 Caution and Warning Envelopes under review.	CAA (Dave Howson)	24 April 2023
16.2	Add 95% and 99% contours to Mode 1 data, divided by type of operation.	Aircraft OEMs	24 April 2023
16.3	Add 95% and 99% contours to Mode 3 data, divided by type of operation.	Aircraft OEMs	24 April 2023
16.4	Provide copies of their presentations shown during discussions.	Airbus, Leonardo, Sikorsky	24 April 2023
16.5	Sikorsky (BE) to review the Mode 7A Guidance in Appendix B and identify any changes/additions required.	Sikorsky (BE)	24 April 2023

16.6	Provide an update on modifying the SC 227 ToRs to include baralt mis-setting protection.	FAA (RA)	24 April 2023
16.7	Review MOPS Section 5.3, Test Cases.	Honeywell (YI)	16 May 2023

The following actions from previous meetings remain open:

Action Reference	Action	By Whom	By Date
13.6	Provide the EASA HTAWS-related accident data.	EASA (Eric Bennett)	By next meeting

Mark Prior
Secretary, SC 237/WG-110