



EUR 324-22/WG110-27

RTCA Paper No.254-22/SC237-025

Summary of the

EUROCAE Working Group 110/ RTCA SC 237 (Meeting 14)

Helicopter Terrain Awareness Warning Systems (HTAWS) for Onshore Operations

DATE: 23rd – 25th August 2022

PLACE: Webex

CONTACT:

Brandi Teel BTeel@rtca.org

ATTENDEES:

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The following people attended all or part of the webex:

Organisation	First name	Last name	Email address
Airbus Helicopters Deutschland GmbH	Dietmar	Kleinitz	dietmar.kleinitz@airbus.com
Airbus Helicopter USA	Paul	Dunlap	paul.dunlap@airbus.com
Bell RTCA Chair	Michael	Deer	mdeer@bellflight.com
Collins Aerospace	Philippe	Salmon	philippe.salmon@rockwellcollins.com
EASA	Eric	Bennett	eric.bennett@easa.europa.eu
EASA	Raffaele	Di Caprio	raffaele.dicaprio@easa.europa.eu
FAA	Rich	Adler	Richard.Adler@faa.gov
Garmin	Duncan	Macklin	Duncan.macklin@garmin.com
Honeywell	Jim	Mulkins	Jim.mulkins2@honeywell.com
Honeywell EUROCAE Chair	Yasuo	Ishihara	yasuo.ishihara@honeywell.com
Leonardo	Luca	Savino	luca.savino@leonardocompany.com
RTCA	Brandi	Teel	bteel@rtca.org
Saab	Mikaela	Lokatt	mikaela.lokatt@saabgroup.com
Saab	Filip	Natvig	filip.natvig@saabgroup.com
Sikorsky	Bob	Endrizzi	robert.j.endrizzi.jr@lmco.com
Sikorsky	Jared	Kloda	jared.kloda@lmco.com
Sikorsky	Steve	Schellberg	steve.schellberg@lmco.com
UK CAA	Dave	Howson	dave.howson@caa.co.uk
UK CAA EUROCAE Secretary	Mark	Prior	mark@mpriorconsulting.com

1 Introductions

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

2 Membership Call-Out and Introductions

Filip Natvig (FN) representing Saab was introduced to the group.

3 Administrative Remarks/EUROCAE and RTCA Policy

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

4 Acceptance of Previous Meeting Minutes

The Minutes from Meeting 13 were accepted.

5 Review of Action Items

Actions arising from the previous meetings were reviewed.

Actions open after Meeting 13

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.	Airframe OEMs	Open
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	Open
12.4	Review the FLTA function and GCAS at the requirements level and report at the next meeting.	SAAB (Mikaela Lokatt)	Closed – see agenda item 11.
12.5	Review when an alert should be inhibited, after a correction has been made by the pilot, but the aircraft is still inside the alert envelope.	All Group Members	Closed – see below
12.6	Identify if S76 data is available for analysis.	Sikorsky (Bob Endrizzi)	Closed – see agenda item 8
13.1	Investigate Mode 1 alert envelopes based on rate of descent and vertical acceleration.	Saab (Mikaela Lokatt)	Closed – see agenda item 7
13.2	Review the Mode 1 envelopes, using Sikorsky onshore data, to identify alerting efficacy and the Nuisance Alert rate.	Sikorsky (Bob Endrizzi)	Closed – see agenda item 7
13.3	Identify if the Ketchikan accident data can be provided to the group for further analysis	FAA (Rich Adler)	Open
13.4	Review Chapters 1 and 2 to identify any changes required from the Offshore MOPS.	All Group Members	Closed – see agenda item 10
13.5	Investigate the performance of GCAS utilising worst case input	SAAB (Mikaela Lokatt)	Open

	parameters based on the ten DO-309 test scenarios.		
13.6	Provide the EASA HTAWS-related accident data.	EASA (Eric Bennett)	Open
13.7	Assess the likely benefit of GCAS in relation to the CFIT and LOC-I accidents identified in CAP 1864.	CAA (Dave Howson)	Closed - see agenda item 9

- Action 12.5 - Review when an alert should be inhibited, after a correction has been made by the pilot, but the aircraft is still inside the alert envelope. Following a discussion, it was agreed that the alert should remain active until the aircraft exits the alert envelope. The repetition rate of the alert should be at the discretion of the airframe OEM. **Action Closed**

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

6 Review of the 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 has been developed. A similar survey provided useful information for offshore HTAWS. The survey was reviewed, and some minor changes made. MD agreed to share the survey with HAI and EHA for their members to complete.

Action 14.1

Mike Deer to send the survey to HAI and EHA.

Date: 1 month

7 Review of Mode 1 and Mode 3, Flight Data and Envelopes

Mode 1

SAAB Presentation

Filip Natvig and Mikaela Lokatt (ML) presented their analysis of an alert envelope based on altitude and vertical velocity vertical, which also utilised two variables, vertical acceleration and pilot reaction time: this closes Action 13.1.

The presentation discussed how this methodology could be applied to provide a useful alert envelope whilst minimising nuisance alerts. The concept had previously been shared with Dave Howson (DH) who had applied the methodology to 4 offshore accidents where FDR data was available. DH presented the results and FN and ML agreed that the Saab methodology did not provide an improved alert envelope. However, the ability to fine tune the envelope using the variables of vertical acceleration and pilot reaction time might

provide a better trade-off between alert time and nuisance alert rate for onshore operations. Bob Endrizzi (BE) noted that vertical acceleration data tends to be noisy. The applicable pilot reaction time was discussed, with opinions varying between 3 seconds, as applied to autopilot certification and as recommended in CAA Paper 99001, to 1 second, typical of hands-on attentive operations. No conclusion was reached on pilot reaction time.

It was agreed that adjusting the variables might be useful for certain types of operation, where the current Mode 1 concept would either result in a short alert time or high nuisance alert rate, and that the methodology should be considered further.

Action 14.2

Saab (Filip Natvig) to share the presentation slides.

Date: Closed

DH had also evaluated a different approach to including an acceleration term in a Mode 1-style envelope against the same 4 offshore accidents which he presented. Although the alert times were greater than for the SAAB solution, the algorithm did not offer any significant advantage compared to the CAP 1519 envelopes.

Bell Presentation

MD presented a Bell analysis of the Mode 1 envelopes applying operational data from the Bell 429 and Bell 412. The presentation included Heat Maps showing incursions into the alert envelopes for different types of operations and for different operators. One major conclusion was that the type of operation and the operator are major factors when considering where to locate the envelope, as power line patrols and one operator had a disproportionate rate of alerts/nuisance alerts. A slide showing data after powerline operations had been removed resulted in a much lower nuisance alert rate.

A discussion followed on the types of operation which should be covered by the OnHTAWS MOPS as it was apparent that attempting to protect all onshore operations was not practical. Eric Bennet (EB) repeated the EASA ConOps where OnHTAWS should cover Day VFR, Night VFR and IFR. It was agreed that the OnHTAWS MOPS would only address:

- HEMS/Air Ambulance/Helicopter Medical Transport
- Passenger Transport
- Sightseeing Tour Flight

Action 14.3

Bell (Mike Deer) to share the presentation slides.

Date: By next meeting

Airbus Helicopter Comments

Dietmar Kleinitz (DK) informed the Group that the AH Helionix TAWS have been designed using a very conservative approach to minimise the nuisance alert rate, possibly resulting

in a short alert time. He stated that AH had operational HEMS data which could be used to investigate the optimum protection envelope which also minimised nuisance alerts.

Action 14.4

AH (Dietmar Kleinitz) to analyse the AH HEMS operational data against the DO376/ED-285 Mode 1 envelope, the current AH Mode 1 envelope, EASA “steep approach” envelope and Saab methodology to identify the alert time and nuisance alert rate for each.

Date: By next meeting

Sikorsky Presentation

Jared Kloda (JK) and BE presented an analysis of the Mode 1 alert and nuisance alert rates for S76D data. Applying the CAP 1519 Mode 1 envelope, gave an alert rate of circa 10% for the Caution Envelope and 1.4% for the Warning Envelope. This closes Action 13.2. JK and BE agreed to extend the analysis to other potential forms of the Mode 1 envelope.

Action 14.5

Sikorsky (Jared Kloda) to repeat the analysis using S76D data against the Saab and EASA “steep approach” envelope.

Date: By next meeting

Data

It was agreed that the OEM analysis using operational data is helpful in identifying where the alert boundaries should be located for optimum performance. As previously identified, the boundaries might have to be operation dependant, with the MOPS providing the OEMs a degree of flexibility in where boundaries are located. The flexibility is required to avoid the OEM having to seek a TSO Deviation when optimising the envelopes for different operational missions.

DH undertook to contact Babcock (a UK HEMS and Police operator) to seek further operational data for this study.

Action 14.6

UK CAA (Dave Howson) to contact Babcock Mission Critical Services to obtain operational (FDM) data.

Date: by next meeting

Mode 3

Offshore Mode 3 alerts are generated following a 20% loss of height in the take-off phase. A discussion followed on whether this figure was applicable for onshore operations. No conclusion was reached.

Mode 4

MD showed operational data for the Bell 429 and Bell 412 plotted against the Mode 4B envelope. Again the alert rate depended on the type of operation. However, overall the nuisance alert rate appeared to be acceptable.

8. Discussion of Inputs/Data Needed for Onshore Modes

It was agreed that this is an ongoing discussion item.

9. Review of HTAWS Related Accident Data

DH presented his review of the 8 CFIT/LOC-I accidents (out of a total of 81 accidents) covered by the CAA Onshore Review (CAP 1864). In most cases, it was not obvious that GCAS could provide any additional benefit. This closes Action 13.7.

A large number of accident reports are available, unfortunately very few accidents involved aircraft with FDRs installed and so flight data is rarely available. Many accidents are classed as CFIT but occur in degraded visual conditions, where it is probable that the true cause was LOC-I rather than CFIT.

It was agreed that any recommendations on the use of GCAS should be addressed in conjunction with any recommendations on updating the DO 309 FLTA function.

10. Review of General MOPS Section

Comments submitted on Chapters 1 and 2 were reviewed, and where accepted, incorporated into the draft MOPS. The terminology for Onshore HTAWS was agreed as OnHTAWS. The draft MOPS are the record of changes made. This closes Action 13.4.

11. Discussion of Possible Improvements to DO 309.

No discussions.

12. Dates and Location of Future Meetings

It was agreed to hold a 1-hour progress meeting on **17th November 2022**. Invitation sent by BT.

The next plenary session will be held as a virtual meeting. Initially 6th-8th December 2022 was agreed, but due to conflicting meetings this was changed to **5th-7th December 2022**. Invitation sent by BT.

13. AOB

CFIT due to mis-setting of baro altimeter:

DH explained how the mis-setting of the barometric reference pressure (QNH) could result in CFIT and highlighted the current lack of HTAWS protection. An Air France incident was cited as an example, where an A320 came within 6ft of terrain at 0.8nm from the runway. CAA Safety Notice, number SN-2019/001 and Maltese SIAN 06/22 were shared with the

Group. Modifying the classic mode alert envelopes is unlikely to be satisfactory due to the inability of HTAWS to discriminate between a normal landing and an undershoot. However, a technology has been developed and certified by Honeywell for addition to fixed wing TAWS which cross-checks the baro altimeter against geometric height and alerts the flight crew at the start of the approach. DH agreed to draft text to address this foreseeable CFIT scenario in the OnHTAWS MOPS. This might be located either in the system overview section or with the Mode 4 material.

Action 14.7

UK CAA (DH and MP) to draft text to address the CFIT scenario caused by the incorrect setting of the barometric reference pressure.

Time: by next meeting

Update on UK mandate of Offshore HTAWS:

DH reported that the wording proposed by CAA for the air operating rules (Part SPA.HOFO.160(c)) had been accepted by DfT (UK Govt.). The AMC and GM text was being finalised with CAA Legal Dept. and, so far, no significant changes to the text have been made. The impact assessment has been revised, reconfigured and resubmitted following formal feedback from DfT Better Regulation Unit (BRU), and still shows a significant positive cost/benefit. Progress with the UK TSO to cover ED-285/DO-376 is ongoing; Mode 7A will be required rather than optional but no other significant differences to the EASA ETSO are foreseen.

Close

The meeting closed at 16.02 UTC on 25th August 2022.

8 Decisions and Actions

The following actions were raised during the meeting:

Action Reference	Action	By Whom	By Date
14.1	Send the HTAWS pilot survey to HAI and EHA for onwards circulation	Bell (Mike Deer)	1 month
14.2	Share Saab presentation slides	Saab (Filip Natvig)	Closed
14.3	Share Bell Mode 1 and 4 slides	Bell (Mike Deer)	By next meeting
14.4	to Analyse the AH HEMS operational data against the DO376/ED-285 Mode 1 envelope, the current AH Mode 1 envelope, EASA “steep approach” envelope and Saab methodology to identify the alert	AH (Dietmar Kleinitz)	By next meeting

	time and nuisance alert rate for each.		
14.5	Repeat the Mode 1 analysis using S76D data against the Saab and EASA “steep approach” envelopes.	Sikorsky (Jared Kloda)	By next meeting
14.6	Contact Babcock Mission Critical Services to obtain operational (FDM) data.	UK CAA (Dave Howson)	By next meeting
14.7	Draft text to address the CFIT scenario caused by the incorrect setting of the barometric reference pressure.	UK CAA (DH and MP)	By next meeting

The following are open items from previous meetings.

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11.3	All airframe OEMs to review the ED-285/DO-376 Mode 1 Caution and Warning Envelopes against their product performance.	Airframe OEMs	By next meeting
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	By next meeting
13.3	Identify if the Ketchikan accident data can be provided to the group for further analysis	FAA (Rich Adler)	By next meeting
13.5	Investigate the performance of GCAS utilising worst case input parameters based on the ten DO-309 test scenarios	SAAB (Mikaela Lokatt)	By next meeting
13.6	Provide the EASA HTAWS-related accident data.	EASA (Eric Bennett)	By next meeting

Mark Prior
Secretary, SC 237/WG-110