



EUR 205-22/WG110-25

RTCA Paper No. 152-22/SC237-023

Summary of the

EUROCAE Working Group 110/ RTCA SC 237 (Meeting 13)

Helicopter Terrain Awareness Warning Systems (HTAWS) for Onshore Operations

DATE: 26th – 28th April 2022

PLACE: Webex

CONTACT:

Rebecca Morrison BTeel@rtca.org

ATTENDEES:

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
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1 Introductions

Yasuo Ishihara welcomed everyone to the meeting.

2 Membership Call-Out and Introductions

Duncan Maklin (DM) announced that he replaces David Goddard at Garmin who has retired. Rebecca Morrison advised that she would be handing over to Brandi Teel who is

on her second tour of duty at RTCA, this time as Programme Director. Alain Vallee has returned from retirement temporarily to cover while a replacement for Sebastian Reschenhofer is found at EUROCAE.

3 Administrative Remarks/EUROCAE and RTCA Policy

Rebecca Morrison (RM) and Alain Vallee (AV) 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 12 were accepted with one minor change to the 6th bullet of section 9.1.

5 Review of Action Items

Actions arising from the previous meetings were reviewed.

Actions open after Meeting 12

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
11.6	The Group to review the available accident data and assess the benefits of the alert envelopes.	All Group Members	Closed
12.1	Provide a copy of the GCAS presentation slides.	FAA (Rich Adler)	Closed
12.2	Clarify with NASA if there would be any costs or access restrictions concerning any GCAS data.	FAA (Rich Adler)	Closed – Rich Adler advised that there would be no costs

			and no access restrictions.
12.3	Provide a copy of the FLTA presentation slides.	SAAB (Mikaela Lokatt)	Closed
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	By next meeting
12.6	Identify if S76 data is available for analysis.	Sikorsky (Bob Endrizzi)	Closed – see agenda item 8

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

6 Review of comments on DO-376/ED-285 MOPS Change 1

RM advised that 4 comments had been received, three of which related to typographical errors (DO-367 referenced instead of DO-376). The fourth related to the inclusion of a membership appendix; RM clarified that this is standard policy and DM agreed to withdraw the comment.

7 Consider a motion to send DO-376/ED-285 Change 1 to the PMC and Council for publication

With the comments addressed, Change 1 was unanimously approved. RM undertook to submit the updated MOPS for publication which is expected by 16 May 2022.

8 Discussion of EASA Mode 1 proposal

Eric Bennet (EB) showed a selection of potential Mode 1 Caution envelopes. Initially he considered only IFR operations, using approach gradients defined by PANS OPS. Steep PinS approach were seen as the most demanding case, where glideslopes up to 13.2% were permitted with speed restrictions. Bob Endrizzi (BE) confirmed that the Sikorsky onshore data showed that rates of descent up to 1350 ft/min were standard, down to a height of 200ft above the surface. Luca Savino (LS) confirmed similar figures for Leonardo

products. There was a general concern that the Caution Envelopes proposed by EASA would result in a high Nuisance Alert rate. DH noted that the EASA envelopes would not have captured the G-REDU offshore accident and was concerned that shrinking the envelope too far would render Mode 1 ineffective. A modified definition including different or additional parameters may be required.

Mikaela Lokatt (ML) proposed that including vertical acceleration in the definition of the Mode 1 envelope could reduce nuisance alerts by anticipating level-off. There were several options which she was willing to investigate.

Action 13.1

Saab (Mikaela Lokatt) To investigate Mode 1 alert envelopes based on rate of descent and vertical acceleration.

Date: By next meeting

Action 13.2

Sikorsky (Bob Endrizzi) To review the Mode 1 envelopes, using Sikorsky onshore data, to identify alerting efficacy and the Nuisance Alert rate.

Date: By next meeting

9 Discussion of Inputs/data Needed for Onshore Modes

A discussion followed on the need for Onshore HTAWS Modes, the problem that Onshore HTAWS is intended to address and the types of operations that are being targeted by this capability and how to provide timely Cautions and Warnings whilst minimising Nuisance Alerts.

It was recognized that there was not an Onshore operator currently in the group to provide feedback on operator needs. EHA had identified a participant but they have not joined since the first meeting.

EB and Raffaella di Caprio (RdC) reminded the group of an earlier presentation they had given on the types of operation they consider should be covered by the MOPS. It was agreed that the onshore MOPS could not comprehensively address all types of onshore

helicopter operations, so should initially consider EMS and corporate operations (Part 135 in FAA terminology and HEMS, CAT and NCC in EASA terminology). The accident data showed that many accidents occurred during VFR operations in a degraded visual environment. So, both VFR and IFR flight profiles should be protected, which is difficult using a single Mode. Using a variable envelope, based on the type of operations is possible, for example by adjusting or inhibiting an envelope when an autopilot-coupled approach is flown. It was agreed that pilots should not be required to manually inhibit envelopes before a phase of flight.

EB Noted that for the maximum safety benefit, the core functions identified in the MOPS should be suitable for economic retrofit to existing aircraft.

For EASA, EB explained that once the MOPS are published a Rule Making Task (RMT) will follow to define what operations are covered, along with an implementation date. EASA has established a RMT, but it is currently dormant waiting for the MOPS. RdC said that there will need to be a parallel process to publish a TSO/ETSO.

Rich Adler (RA) stated the FAA might mandate based on passenger capacity rather than aircraft mass. He then showed a NTSB reconstruction of the Ketchikan CFIT accident, which compared Class B versus Class C TAWS alerts which would have been generated prior to the accident.

<https://www.nts.gov/investigations/AccidentReports/Reports/AAR1702.pdf>

Action 13.3

FAA (Rich Adler) To identify if the Ketchikan accident data can be provided to the group for further analysis.

Date: By next meeting

10 Review of General MOPS sections

The MOPS document was reviewed. The document is a record of the actual changes made, with a summary shown below.

10.1 Onshore HTAWS Name and Abbreviation

Offshore HTAWS was abbreviated to OHTAWS, which could be confused with Onshore HTAWS if abbreviated in the same manner. HTAWS cannot be used as it could be confused with the DO 309 HTAWS already in existence. It was agreed a new abbreviation must be agreed for Onshore HTAWS. One possibility suggested was Over Land HTAWS, i.e. OLHTAWS or another OnShore HTAWS i.e. ONHTAWS.

10.2 MOPS Sections

Chapters 1 and 2

Chapters 1 and 2 were reviewed briefly. YI requested all members review Chapters 1 and 2 and identify where changes are required to make the document suitable for onshore operations. YI undertook to circulate the text and/or arrange for it to be loaded onto AerOpus for members to access.

Action 13.4

All members to review Chapters 1 and 2 to identify any changes required from the Offshore MOPS.

Date: By next meeting

Chapter 3

Chapter 3 was reviewed and the following noted.

3.1.1.2 Onshore HTAWS Selection

- Offshore HTAWS needs to be activated when flying offshore and deactivated when returning onshore. It was considered that positive activation was not required for Onshore HTAWS as it was the default system. To permit another set of envelopes to be contained within the same overall HTAWS, for example Offshore HTAWS, Onshore HTAWS and DO 309 HTAWS, the following wording for Requirement 6 was agreed.

“REQ06 - Onshore HTAWS shall deactivate/activate Onshore HTAWS when another incompatible HTAWS application is activated/deactivated.”

- Activation of Onshore HTAWS should not result in a cockpit indication as it is the default regime, this is in keeping with the “dark cockpit” concept. Requirement 07 needed modification.

“REQ07 – Activation indication not required as onshore HTAWS is the default, so only needs a warning when it has a malfunction.”

- It was agreed that REQ08, paragraphs 3.1.2 and 3.1.3 did not need changing.

3.1.4 Mode 1: Excessive Rate of Descent

- It was agreed that the Mode 1 diagram needs adjusting to reflect onshore operations, as the current version shows a water surface.
- Paragraphs 3.1.4.2, 3.1.4.3, and 3.1.4.4 did not require changing.

Mode 2

Historically Mode 2 has been unreliable during low level helicopter operations, with a high Nuisance Alert rate. It was noted, however, that Mode 2 might only be provided as a back-up for FLTA modes when these are unavailable/degraded. The need for Mode 2 as part of the Onshore HTAWS MOPS was left open pending the review of other modes. If Mode 2 is retained, then consideration should be given to making it optional.

11 Discussion of possible improvements to DO-309

ML gave a presentation titled FLTA & GCAS Requirements and Recommendations. A wide-ranging discussion followed in which a number of points were raised:

- It was agreed that data base issues are out of scope for WG-110/SC-237.
- SAAB prefer the more general nuisance alert criterion (option 2 in their presentation), leaving the pilots to decide the acceptable nuisance alert rate. However, they do appreciate that it is a little vague. YI thought that testing using

predetermined scenarios would be necessary which, due to the small sample size, could not be used to demonstrate a nuisance alert rate/flight hour other than zero.

- PS considered that GCAS should only alert if there is no feasible flight path to avoid a collision. The definition of feasible would include an appropriate clearance margin, similar to DO-309 but in 3-D.
- DH noted that FDM data is unlikely to be available for onshore operations so it will be necessary to establish alert envelopes to provide adequate warning for the test scenarios and accept whatever nuisance alert rate resulted. It was suggested that alerts are only a nuisance if the pilot is flying normally and can easily confirm adequate separation from terrain/obstacles. It could be that a lower protection mode (with smaller, less conservative alert envelopes) might be provided for day VFR flight in order to reduce 'nuisance' alerts if/where appropriate.
- Alert envelopes would need to take account of aircraft performance which would vary with weight, altitude, OAT and aircraft type. This might result in unacceptable complication and it was suggested that the utility of adopting fixed, worst case alert envelopes should be investigated.

Action 13.5

SAAB (Mikaela Lokatt) to investigate the performance of GCAS utilising worst case input parameters based on the ten DO-309 test scenarios.

Date: By next meeting

- As regards alert time, the DO-309 times of 20 seconds for caution alerts and 10 seconds for warning alerts were considered to be reasonable.
- It was agreed that it would be important to define a representative set of test scenarios for the MOPS. These might be derived by studying flight plans and/or operators' SOPs. The current DO-309 scenarios should also be considered along with accident scenarios.
- Escape guidance would need to be provided to the pilot but it was not clear how this should be provided. If visual displays are used as in the FAA and SAAB demonstration videos, a head/helmet mounted display would be required to avoid the pilot focussing inside the cockpit instead of looking out (especially important with

single crew operations). Also, the pilot may not have time to interpret a head down display. Auditory alerts could be used but only basic escape guidance may be possible (e.g. “fly left/right”). It was also noted that vertical escape manoeuvres are not always appropriate, e.g. if it would result in the aircraft entering cloud.

- YI noted that pilots do not like ‘pop-up’ displays as they can interfere with/interrupt ongoing crew tasks. Full-time displays also provide situational awareness which, although beneficial, could encourage mis-use of the display as a navigation aid – the accuracy and integrity of the system is unlikely to be adequate, bearing in mind the target users and the need to minimise costs.
- In response to a query from BE, MD and YI confirmed that the current ToR for WG-110/SC-237 allowed for investigation and recommendation of changes to DO-309. If appropriate work on DO-309 could start in parallel with the work on the GPWS modes but a revision to the ToR would be required.
 - DH pointed out that WG-110/SC-237 was not compelled to propose new material for DO-309 and could determine not to if it is considered too difficult or of insufficient benefit. A useful exercise may be to review available accident cases and estimate what additional benefit GCAS functionality might provide. EB noted that EASA had compiled a list of HTAWS-related accidents which broadly divided into the two groups of UIMC and wire strike (some fell into both groups). EB presented a selection of relevant accident data. A discussion followed on types of accidents, LOC-I versus CFIT. For VFR rated pilots, a “Pull-Up” Warning might not be helpful as following it could result in inadvertent IMC and the consequent risk of LOC-I. Even for IFR rated pilot, the transition from VMC into IMC is difficult and has resulted in accidents. It was agreed that lateral evasion, as used by GCAS, could be helpful to a VFR rated pilot.
- DH advised that there was a list of CFIT and LOC-I accidents in the CAA’s onshore review (CAP 1864) and undertook to investigate. MD noted that MP had already provided a list of accidents which should be included.

Action 13.6

EASA (Eric Bennett) to provide the EASA HTAWS-related accident data.

Date: By next meeting

Action 13.7

CAA (Dave Howson) to assess the likely benefit of GCAS in relation to the CFIT and LOC-I accidents identified in CAP 1864.

Date: By next meeting

12 Interaction with SC 147 ACAS Xr Working Group

MD and YI had attended the ACAS Xr Working Group (SC 147). SC 147 wanted to understand the work done on HTAWS so that their system did not conflict. Advice was provided by YI and MD on the terrain avoidance functions.

Progress by SC 147 will be monitored, and additional input provided if necessary.

13 Dates and Location of Future Meeting

It was agreed the next meeting would be virtual and take place 23rd -25th August

14 Any Other Business

Charisse Green announced that she would be starting maternity leave, with RA substituting for her. The Group wished her well and looked forward to welcoming her back to the Group.

DH provided an update on the UK Offshore HTAWS mandate. It will now have a single implementation date of 1st Jan 2025, with Mode 7/7A required as part of the mandate. He provided an update on the processes being followed and progress to date. Post meeting a draft of the proposed rule, AMC and GM text covering the mandate was shared with the Group for comment by end May 2022.

15 Close

The meeting closed at 16.02 UTC on 28th April 2022.

16 Decisions and Actions

The following actions were raised during the meeting:

Action Reference	Action	By Whom	By Date
13.1	Investigate alert envelope based on rate of descent and vertical acceleration	SAAB (Mikaela Lokatt)	By next meeting
13.2	Bob Review Mode 1 envelopes and alerting rate using Sikorsky onshore flight data.	Sikorsky (Bob Endrezzi)	By next meeting
13.3	FAA to identify if the Ketchikan accident data can be provided to the group for further analysis.	FAA (Rich Adler or Charisse Green)	By next meeting
13.4	Review Chapters 1 and 2. Identify changes required.	All	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
13.7	Assess the likely benefit of GCAS in relation to the CFIT and LOC-I accidents identified in CAP 1864.	CAA (Dave Howson)	By next meeting

The following actions are still outstanding from Meetings 11 & 12

Action Reference	Action	By Whom	By Date
11.3	All airframe OEMs to review the ED-285/DO-376 Mode 1	Airframe OEMs	By next meeting

	Caution and Warning Envelopes against their product performance.		
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
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	By next meeting

Mark Prior

Secretary, SC 237/WG-110