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Summary of the  
EUROCAE Working Group 110/ RTCA SC 237 (Meeting 7)  
Helicopter Terrain Awareness Warning Systems (TAWS) for  
Offshore Operations

**DATE:** 26th-28<sup>th</sup> May 2020

**PLACE:** Webex

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**ATTENDEES:**

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## 1 Introductions

Yasuo Ishihara made a personal statement to inform the meeting that he had been laid off by Honeywell and so could not continue as EUROCAE WG 110 Chair and RTCA SC 237 Co-Chair. A number of people spoke outlining their sadness and thanking Yasuo for his excellent work and safety leadership over many years.

RM thanked Yasuo for his work on this WG/SC and his work on other committees over more than a decade. She informed the group as this was a plenary meeting members of the public could attend, so Yasuo could continue to participate as a general public volunteer. AC thanked Yasuo for his work chairing WG 110 and said that Yasuo could continue to attend under the EUROCAE Regulations, as a co-opted expert, even if he did not represent a EUROCAE member organisation. To continue as Chair, he would need to represent a EUROCAE member, e.g. be contracted to a member.

### 1.1 Mandatory Slides

Rebecca Morrison showed the mandatory slides which explain the obligations of members and covered administrative aspects of the meeting. Adrian Cioranu explained the additional requirements of EUROCAE.

## 2 Previous Meeting Minutes

Actions arising from the previous meetings were discussed and open items identified.

Action Reference	Action	By Whom	By Date
6.1	Share the Mode 1 slides used in the presentation	Sikorsky (Bob Endrizzi)	Closed
6.2	Provide a draft on the methodology to calculate a Mode 7A envelope.	Sikorsky (Bob Endrizzi)	Closed – provided during the meeting
6.3	Validate the proposed Mode 7B and 7C envelopes against their flight data to assess the timeliness of alerts.	Airframe OEMs	Closed – provided during the meeting
6.4	Assess the proposed Mode 7B envelope against flight data to assess the potential nuisance alert rate.	Airframe OEMs	Open
6.5	Confirm if the proposed Mode 7C envelope infringes the Airbus VRS patent application.	Airbus (Dietmar Kleinitz)	Closed – statement provided by email
6.6	Provide a draft on the methodology to calculate a Mode 7C envelope.	Bell (Erik Oltheten)	Closed – provided during the meeting
6.7	Review the MOPS Chapters 4 and 5. A nil return will show acceptance of these sections.	All	Closed
6.8	Cross check the MOPS against the DO 309 environmental testing requirements and revert with comments.	HTAWS equipment manufacturers	Closed
6.9	Check for consistent terminology when reviewing the MOPS.	All	Closed

6.10	Provide an updated set of MOPS to the group.	Co-Chair (Yasuo Ishihara)	Closed
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#### Open items from previous meetings

Action Reference	Action	By Whom	By Date
5.3	OEMs to assess the Mode 1 Caution envelope and report any conflicts with current and future offshore steep approach profiles.	Airbus, D Kleinitz Bell, E Oltheten Leonardo, F Ricciardi Sikorsky, B Endrizzi	Closed
5.7	Review if issuing a Mode 1 alert during offshore OEI conditions is compatible with FAR/CS 27/29.1309(c).	EASA, R Di Caprio	Closed – statement provide by email
4.7	Confirm the maximum rate of descent which will be required when conducting certified flight profiles.	All airframe OEMs	Closed

The minutes from the previous meeting were accepted.

### 3 Work Schedule

The future workload and publication date for the MOPS were discussed and it was agreed that the work is still on track to achieve the deadlines below:

- 3.1.1 An agreed draft will be delivered to the RTCA/EUROCAE in September 2020 for external review and comment.
- 3.1.2 The final meeting of the WG/SC will take place in December 2020 where external comments will be reviewed and processed.
- 3.1.3 The MOPS will be published in March 2021.

**Secretary's Note:** The following minutes group the discussions by topic rather than chronologically, as some items were discussed during more than 1 session.

### 4 Review of the MOPS

The MOPS had been updated following comments. The updated MOPS were reviewed and a number of changes made, whilst the majority of the MOPS were accepted. The draft MOPS held on the EUROCAE and RTCA sites are the complete record of the changes made. The following specific areas were discussed.

### 5 Feedback from OEMs on Mode 1 Caution Envelopes

An update was provided by RE on the Mode 1 analysis conducted by Sikorsky, in particular the possibility of nuisance alerts if the correct warning floor and means of calculating descent rate is not selected. During discussions on paragraph 2.3.3, DH explained how the descent rate source should be chosen to avoid nuisance alerts due to pitot-static errors at low airspeed and in ground effect when using baro. altitude as well as nuisance alerts due to deck edge crossing when using radio altitude. In CAP 1538 it is reported that

AltRate (generated by the aircraft's AHRS) was found to be the best descent rate parameter for the EC 225 below 350ft altitude. EO took an action to provide guidance on a descent rate source suitable for offshore HTAWS.

On the 28<sup>th</sup> the following guidance was provided to the group by email and the action closed:

*“A typical altitude rate source will employ a blended solution of inertial and barometric data, or a blended combination with GPS geodetic altitude rate to achieve an accurate source of altitude rate data. An altitude rate derived primarily from changes in barometric pressure altitude is typically inadequate due to errors created by main rotor downwash effects at the static port vents which tend to be particularly prevalent at lower airspeeds.”*

**Action 7.1 : Bell (EO) to provide guidance material on an altitude rate source suitable for offshore HTAWS. – Closed**

Post Meeting Note: DH proposes to add a sentence stating “Use of radio height for descent rate should be avoided due to the effects on this parameter of crossing the edge of the helideck.”

## **6 Mode 7**

### **6.1 Mode 7 General**

In response to Action 6.5 Airbus (DK) provided an email (22/05/2020 09:50) which stated:

*“Dear all,*

*I'm referring to the action 6.5 as listed in the summary of the EUROCAE Working Group 110/ RTCA SC 237 Meeting 6.*

*I confirm that the Modes 7A, -B or -C as they are currently defined in the Offshore HTAWS MOPS draft do not collide with the both patents FR3053025 resp. FR2921635 nor can they be mapped to the Airbus Helicopters (AH) VORTEX implementation.*

*In the following I would like to summarize the definition of the HTAWS GPWS Mode 7, as currently available in the Offshore HTAWS (OHTAWS) MOPS draft, and the related AH position:*

- *Mode 7A represents the TRQ vs. IAS concept as proposed by the CAA CAP1519. Under consideration of validation test results achieved with the Honeywell EGPWS v36 implemented on H225, AH decided to not to realize this concept on its H/C fleet.*
- *Mode 7B alert is provided as an alternate or addition to Mode 7A. 7B alerting correlates the rate of decent (RoD) with groundspeed/IAS, the (caution) alerting envelopes are H/C specific and represent different operationally approved glide path angles. Proposed aural message is “Power”. AH is convinced that the expected operational safety benefit can be achieved with the VORTEX implementation.*

- *Mode 7C is intended to provide a warning when the combination of RoD and IAS indicates that that rotorcraft is in danger of entering Vortex Ring State. The warning envelope is H/C specific, depends from the H/C gross weight range and considers a conservative prediction of the minimum rate-of-descent required for onset of vortex ring state VRS according to VRS onset boundary model (Newman). Proposed aural message is "Vortex".*

*AH is convinced that the expected operational safety benefit can be achieved with the VORTEX implementation.*

*Kind Regards, Dietmar"*

## **6.2 Mode 7A**

In response to Action 6.2 Sikorsky (RE) provided guidance material for Appendix B to the MOPS on how Mode 7A may be calculated from aircraft performance data. He was thanked for his excellent work and requested to expand the guidance material to include an explanation of how the power required for a 3 degree approach can be calculated using the level flight performance graphs in an RFM.

**Action 7.2 Sikorsky (RE) to provide guidance on how to calculate the power required for a 3 degree approach using RFM level flight performance graphs.**

## **6.3 Mode 7B**

Action 6.4 required OEMs to assess the potential nuisance alert rate for Mode 7B. Leonardo (FR) provided data from the AW189 which suggested that during certified steep approach profiles there would be a "significant number of nuisance alerts" . An assessment of the AW139 was to be performed. FR was not available to attend day 3, so the Secretary took an action to contact FR to request the full analysis.

DH undertook to identify the Mode 7B nuisance alerts rate and alert times using the accident cases in CAP 1538. The following was provided by email 26/5/2020 18:40

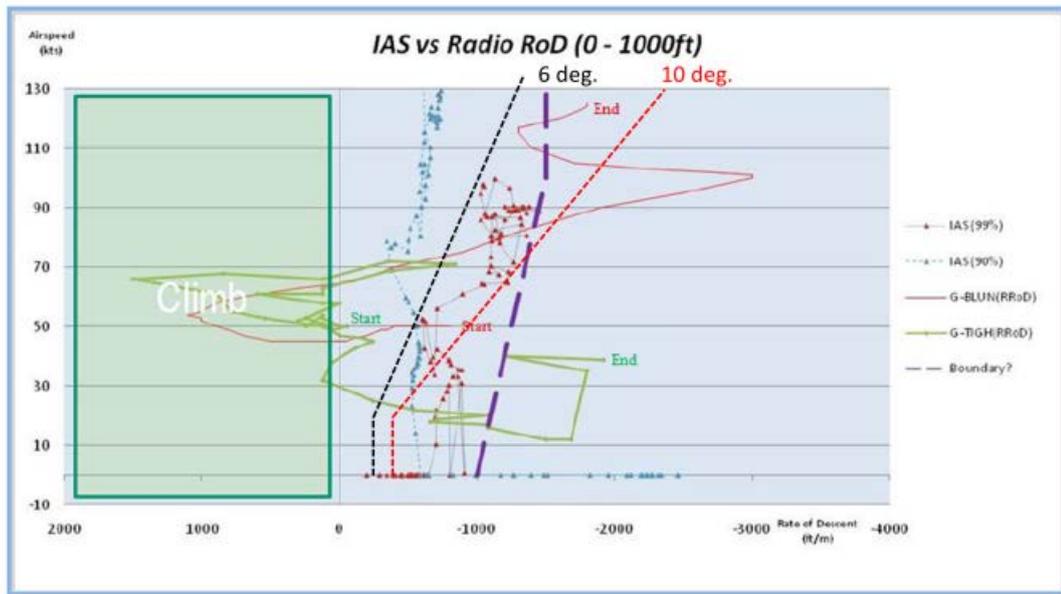
*"I have added the 6 deg. and 10 deg. lines to the airspeed vs RoD plot from CAP 1538 (Appendix B.2, page 55) below. (NB: To the extent that the resolution of PowerPoint will allow, but I don't think absolute accuracy is critical to the overall message here.)*

- *For the 6 deg. line, this implies that the alert rate would be >10% below 50kts and somewhere between 10% and 1% at higher airspeeds.*
- *For the 10 deg. line, the data implies alert rates in excess of 1% below 40kts and in excess of 10% below 20kts.*

*Note that this plot is airspeed and not "the lesser of airspeed and groundspeed". For into wind approaches (i.e. the vast majority of operations), groundspeed will be lower than airspeed. If it were possible to plot groundspeed instead of airspeed, the 90% and 99% data in the plot would move down towards the x-axis increasing the alert rates."*

Mode 7B – Radio RoD

Figure from CAP1538 Appendix B.2, page 55



In addition, the following was provided by email 27/5/2020 18:49

*“As promised I have estimated the warning times for Mode 7B (and also Mode 7C) for the five examples in my email of 03 Feb 2020 which are compared with the best achieved by other modes in the table below.*

Incident	Warning Time					
	Mode 7B		Mode 7C		Best other Mode	
	6 deg.	10 deg.	B429	B525	Mode	Time
G-REDU	22.0	13.0	2.5	4.0	Mode 1 'Sink Rate' Caution	21.4
G-BLUN	5.3	4.8	0.0	0.0	Mode 7A	35.0
G-WNSB	18.0	10.0	9.0	0.0	Mode 7A	13.5
G-TIGH	13.0	12.0	11.0	1.9	Mode 3B	17.0
C-GQCH	23.5	22.5	22.5	22.0	Mode 3B	32.0

\* The best alert time is in red.

*For 3 out of the 5 cases, the other HTAWS modes provide a longer warning time than Mode 7B. For one case, the warning time is approximately the same for both, and Mode 7B provides the longest warning time in one case. However, this only applies to the 6 deg. envelope which suffers from a high nuisance alert rate; the 10 deg. envelope has less nuisance alerts but under performs the other modes in all five examples.”*

It was agreed that a further review of Mode 7B was required. A mode 7B specific webex was arranged for 9<sup>th</sup> July 2020 at 10:00-12:00 Eastern Time and an invite sent to all members of the group.

**Action 7.3: Secretary to contact FR to request the full analysis from the AW139 and AW189. – FR contacted 29<sup>th</sup> May – Closed**

**Action 7.4: UK CAA (DH) to assess the Mode 7B and 7C warning times and nuisance alert rates using five accident cases shown in CAP 1538 - Closed**

#### 6.4 Mode 7C

Action 6.6 required Guidance material to be provided to the group on how to calculate a Mode 7C envelope. This was provided by Bell (EO) and included in the MOPS Appendix C.

The second part of DH's action on Mode 7B and 7C identified that:

*“Mode 7C also under performs the other modes [in terms of warning time] in all five cases analysed. The two envelopes have been added to the CAP 1538 plots below (pdf of all plots attached). The B525 does not generate significant nuisance alerts with the EC225 data, but the B429 envelope does. This appears to indicate that warning envelopes could be individually tailored for helicopters types such that excessive nuisance alert rates are avoided. However, based on the five examples reviewed, we do not have any evidence that Mode 7C would provide any benefit.*”

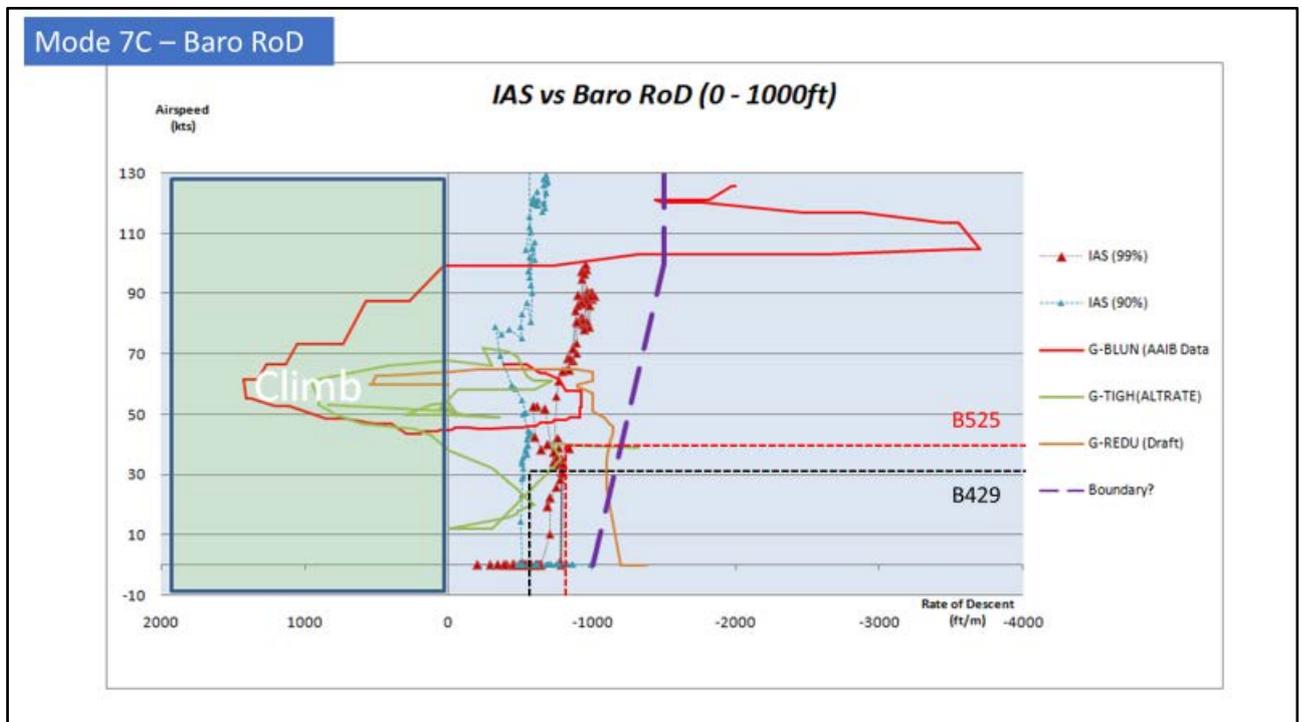
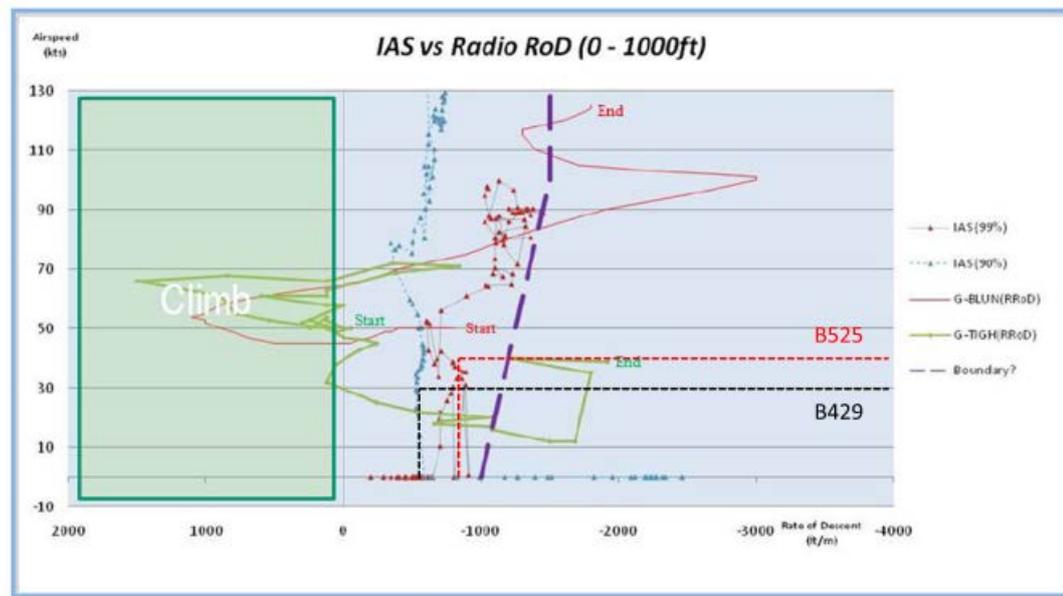


Figure from CAP1538 Appendix B.2, page 55



The group recognized that the proposed Mode 7C was not tailored for the EC225 which could change the results of the analysis. It was agreed that Mode 7C does provide an additional protection scheme which may optionally be used specifically for VRS protection.

## 7 Terminology

The terminology used in the MOPS was reviewed for consistency and clarity.

## 8 Aural and Visual Alerts

The aural and visual alerts requirements were discussed. It was agreed that the MOPS should take account of the research presented at Meeting 2 by Professor Dalton and Dr Greaves, and reported in CAP 1747.

The DO 309 MOPS already require that a “compelling and unique tone” may be used in conjunction with a voice alert. This terminology was added to REQ19 and REQ69.

The UK CAA (DH) took an action to review the MOPS and propose updated text which reflects the research findings. A summary of the research relating to aural alerts has been provided by Dr Greaves for inclusion in Appendix A to the MOPS.

**Action 7.5: UK CAA (DH) to review the MOPS and provide text which reflects the research findings from CAP 1747**

## 9 Review of Alert Periodisation

A number of responses were received in response to Action 5.7. which covered the prioritization of alerts, and in particular the integration of HTAWS alerts with other aircraft

system alerts. Based on the submissions received, agreed text was inserted into paragraph 6.1.11 Integration with other alerts.

## **10 Update on EASA Rule Making**

EASA (RDC) provided an update on EASA Offshore HTAWS activity. He stated that EASA was ready to issue an ETSO (2C522) covering the MOPS shortly after they are published. EASA is developing ConOps for HTAWS and intends to expand standards to onshore HTAWS. The Offshore HTAWS RMT 0708 has been delayed due to COVID 19 and is likely to slip into 2021.

## **11 Process for MOPS Review and Comments**

Recent RTCA best practice is to issue an Excel Comment Review Document alongside the Draft MOPS so that all comments can be tracked to closure. The meeting accepted this solution.

## **12 Future Meeting**

**12.1 Progress with Mode 7B** It was agreed to hold a separate webex covering Mode 7B on July 9<sup>th</sup> 2020 at 10:00 EST. An invitation has been sent by RM.

**12.2 Next Plenary Session.** If travel restrictions permit, the next Plenary Session is planned to be hosted at the Bell Dallas Fort Worth facility 16<sup>th</sup>-18<sup>th</sup> September. However, due to the COVID 19 pandemic, this decision will be reviewed by the management team by webex on the 18<sup>th</sup> August 2020 and if necessary alternative arrangements agreed.

## **13 Any Other Business**

Bell (MD) took an action to provide updated MOPS at the earliest opportunity.

**Action 7.6: Upload an updated set of MOPS to the EUROCAE and RTCA sites.**

## **14 Close**

The Chair closed the meeting on the 28<sup>th</sup> May and thanked all the attendees for their input.

## 15 Decisions and Actions

Action Reference	Action	By Whom	By Date
7.1	Provide guidance material on an altitude rate source suitable for offshore HTAWS	Bell (EO)	Closed
7.2	Provide guidance on how to calculate the power required for a 3 degree approach using RFM level flight performance graphs.	Sikorsky (RE)	June 5th
7.3	Contact Leonardo (FR) to request the full analysis from the AW139 and AW189.	Secretary	Closed
7.4	Assess the Mode 7B and 7C warning times and nuisance alert rates using five accident cases shown in CAP 1538	UK CAA (DH)	Closed
7.5	Review the MOPS and provide text which reflects the research findings from CAP 1747	UK CAA (DH)	June 5th
7.6	Upload an updated set of MOPS to the EUROCAE and RTCA sites.	Bell (MD)	ASAP

Mark Prior  
Secretary, SC 237/WG-110