EVSLG

Meeting of the eVTOL Safety Leadership Group (eVSLG)
10 November 2022 14:00-16:00 GMT
MINUTES

In attendance:

Matt Rhodes (MR)	Bristow Helicopters
Rick Newson FRAeS (RN)	Civil Aviation Authority
Frank Hitzbleck (FH)	Volocopter
Max Fenkell (MF)	Joby
Colin Russell (CR)	Lilium
Wg Cdr Ian Fortune (IF)	Military Aviation Authority (Rapid Capabilities Office)
Will Fanshawe (WF)	Flexjet
Mike O'Donoghue (MO)	GASCO
Sam Wright (SW)	NATS
Ray Forster (RF)	Civil Aviation Authority
Vicki Murdie (VM)	Future Flight Challenge – UKRI
Mark Brown (MB)	Virgin Atlantic Airways
Julian Firth (JF)	AAIB
Colin Gill (CG)	Isle of Mann Civil Aviation Authority
Ollie Dismore (OD)	British Helicopter Association
Chris Booth (CB)	Civil Aviation Authority
Michael Pryce (MP)	Civil Aviation Authority
Angela Lynch (AL)	Civil Aviation Authority (Secretariat)

TABLE OF ACTIONS

Section	Deadline	Action	Responsible
Personal Electronic Devices (PEDs)	Dec 2022	MR/ Secretariat to share the BP video with members in the group to support their internal risk discussions.	MR/ Secretariat
Personal Electronic Devices (PEDs)	Next meeting	At the request of members, RN to provide CAA collated safety data to look at current reporting trends on PEDs and identified issues as a result.	RN
Highlighting operational risks	Next meeting	Chairs to discuss potential new members, based on expressions of interest and other factors, and to propose an option for their inclusion or support to the group ahead of the next meeting.	Chairs
Safety Risks Management Approaches	Next meeting	Members who had circulated the draft bowtie internally to send further detailed comments to the Secretariat for continued learning and updating of the document (within the CAA).	Members who had circulated the draft bowtie internally
Safety Risks Management Approaches	Next meeting	Chairs and Secretariat to circulate further information on forming this sub-group and setting up an appropriate task for members to agree and volunteer.	Chairs and Secretariat

Introductions, Updates and Matters Arising

Introductions were made by all members reflecting the attendance of some new and different representatives.

Members were reminded of the antitrust and competition commitment for participants of the meeting. No objections or comments were raised.

The minutes of the last meeting were approved for publication on the CAA website.

UK Government and Regulatory updates

RN updated members on key initiatives and recent workshops in the UK that may have some synergies with eVSLG or may require input from members in due course.

This included a DfT-Warwick Manufacturing Group (WMG) workshop on future framework for oversight of autonomy across the transport sector. The CAA is also keenly interested in this topic and will hope to kick off some focused work relating to this topic and its own duties in due course.

DfT has established a Cross Whitehall Future Flight working group initiative. Whilst early days, it is understood it will seek to bring together different work strands under this topic through both cross-government and industry-government engagement and with other key stakeholders in the UK.

RN told members that a CAA roundtable and subsequent working group has been formed based on clarifying eVTOL Pilot licensing approaches for the UK. The initial roundtable included representatives from industry, including some eVSLG members. This work will include considerations for ensuring existing pilots can be trained to safely fly eVTOL aircraft as well as ab initio training courses for the longer term. Other organisations in the UK and globally are keen to coordinate work on this topic and the UK work will seek to support this aim through engagement and active monitoring. An example of one such group of wider interest was given as the SAE G35 group on Pilot licensing for AAM operations. A brief mention was made of the industry and regulators' interest in considering how developing technology such as advanced simulations and virtual reality may also play a role alongside more traditional techniques.

RN shared that the CAA is currently working on establishing an enhanced 'test and evaluation' function. As well as ensuring the avoidance of regulatory capture by separating test work carried out under the certification process, this will also help applicants with a more efficient end-end process and a higher degree of CAA transparency. This work is considering both RPAS and eVTOL operations and is likely to combine elements of the UK's existing national requirements (i.e. e-conditions and BCAR) as well as elements from regimes outside of the UK, like the FAA's experimental flying approval process.

Emerging Risks

Personal Electronic Devices (PEDs)

MR shared offshore experiences in mitigating safety risks related to PEDs. This recognises that as helicopters generally don't have ability to deal in-flight with severe effects (e.g. fire) there are strict processes on the ground aiming to prevent such events. However experience has also

shown that these processes are not always followed by passengers and if there is no evidence on the ground, such as during the pre-loading phase, events could occur. CAP 437 was noted as the CAA document that details what can and can't be carried and offshore loading procedures, but compliance is a challenge. Improvement has been seen by the oil industry coming together to address this. It was suggested this type of process may also evolve for eVTOL operations.

Members said that this is a topic of great significance for OEMs and eVTOL operators as well as existing aviation operations. It was agreed whilst there could be a higher level of risk for eVTOL operations re-evaluation of how the aviation industry deals with this safety risk will be important work to consider alongside the eVTOL-specific cases.

MR shared a video prepared by BP to help with accident prevention offshore. This was accompanied with a discussion including examples from operators on the safety processes and precautions they have in place. It was noted that for some of today's examples the processes only relate to the air crew, not passengers. It was also noted that the screening of PEDs needs the cooperation of safety and security representatives for success. Members asked that the link be shared so that they could present it internally as an example of a potential approach they could take in future. It was agreed that existing processes provide a useful starting point, but OEMs and operators will need to develop their own control measures that may be different based on the specific environment they chose to operate in, as well as how the services are managed and which stakeholders are accountable for these.

Action: MR/ Secretariat to share the BP video with members in the group to support their internal risk discussions.

Action: at the request of members, RN to provide CAA collated safety data to look at current reporting trends on PEDs and identified issues as a result.

It was agreed that eVSLG work in this area could also link to the approach or work of other Safety Leadership Groups (SLG): providing evidence of their benefit to the aviation sector as a whole.

Downwash/ Outwash and Vortex Ring State

Members noted the findings of the offshore and onshore rotorcraft sector in relation to downwash/outwash, building from the previous discussion started on this topic at the last meeting that noted this as an emerging risk for eVSLG.

Vortex Ring State was noted as another potential safety risk that if validated will need to be carefully managed by the eVTOL sector.

It was agreed that whilst there are current gaps in the data on eVTOL aircraft that make it challenging to create a robust picture for eVTOL operations, researchers in applying mathematical calculations based on aerodynamics and other expert knowledge are starting to deepen discussions in this area. For example, a presentation was made earlier in the week at the EASA Rotorcraft and VTOL Symposium on the topic. This confirmed discussions had in this group looking at similar work done (amongst others) by the Royal Aeronautical Society (RAeS), as well as informally by the CAA. It was suggested that eVTOL could hypothetically give rise to intense downwash/outwash/upwash, as well as intense and potentially non-linear or fragmented

Vortex Ring State. Further learning and consideration of these issues will be needed to provide a basis for developing safety mitigations for eVTOL operations.

MP briefed the group on current discussions and potential research on the parallels and potential differences in the effects of these risks between existing rotorcraft operations and the future eVTOL ones. There are some findings that suggest that due to aircraft differences – such as the disc loading and MTOM relationships and the specific way that eVTOL operations may work – current rotorcraft operations and test practices to mitigate these risks may not be effective. Similarly, the presence of multiple rotors may give rise to complex effects where wakes or jets interact with each other, as opposed to a single circular flowfield, may lead to complex forces and moments being experienced or required by air vehicles to remain in safe vertical flight. MP informed members that the CAA is considering this topic and would welcome input from OEMs on their own modelling or any data they have that could support its understanding. It was also noted that other regulators such as the FAA have kicked off work under this topic, underpinning the need for collaboration.

A potential benefit for the eVTOL sector is that they may be able to identify or monitor potential downwash or VRS scenarios in more detail due to their large-scale data capture through their use of state-of-the-art or novel onboard monitoring of aircraft responses.

With regards to regulation, it was suggested that there will not be a single way for all eVTOL operations to manage operational risks and therefore it is vital that both industry and the regulators look at multiple approaches to this. Whilst it is still early days, it was confirmed that some OEMs are looking into ground effects of their aircraft with a view to contributing to this topic. It was suggested that regulators will need to decide how they can implement certification requirements for OEMs to give them confidence that they are being provided with assured data and information to accept multiple approaches.

It was noted that whilst some in the eVTOL sector highlight a benefit as being simpler aircraft handling than for existing aircraft operations, although this may require more complex flight control systems with sophisticated internal digital models. Due to this conversation and other potential new or different methods of operations (e.g. specific interactions with new flight systems), initially there could be complexity for pilots who have been trained for conventional aircraft who may, in emergency situations, default to prior training rather than new eVTOL modes of operation. Individual OEM work on establishing what pilots need to anticipate and note from the systems onboard the aircraft will form the basis for some of the later discussions and considerations on this topic.

Conclusions were agreed that: OEMs need to consider VRS and down/out/upflows in detail; operators need to develop an understanding of the aircraft in order to establish what training and operational management is needed; and regulators need to consider what data, tests and risks they need to have confidence in for the certification process for new eVTOL aircraft.

CAA is engaging with academia to understand and validate the current science and research. This will be shared with the group in due course.

Highlighting operational risks

An example of collaborative work to highlight such dangers on offshore helidecks was shared in the form of a short video.[1] This is an example of a safety precautions campaign launched for offshore operations. It was noted as being a key point for consideration, particularly at a time when there are a wide variety of vertiport structures and designs being discussed.

Members agreed infrastructure considerations are key to developing safe operations. On this basis it was suggested that the eVSLG may want to bring in infrastructure experts to expand on this topic.

Action: Chairs to discuss potential new members, based on expressions of interest and other factors, and to propose an option for their inclusion or support to the group ahead of the next meeting.

A brief discussion was had on vertiports, considering existing requirements for aerodromes, such as heliports and the extent to which some of these may be reviewed against future vertiport cases. Recent accident reports can also provide some support to this topic, as well as highlighting how crucial it has that the eVTOL sector have these discussions. It was noted that current discussions on existing infrastructure – like at hospitals – also enable standards to develop and for multiple stakeholders to engage. MR noted that vertiport decision making can benefit from the lessons learned by others. It was agreed, the same is true for existing requirements around licensing and scheduled operations, which at least provide a basis for the eVTOL sector to consider and review in the first instance.

Safety Risks Management Approaches

Members discussed the CAA draft bowtie work circulated by the Secretariat in advance of this meeting. It was agreed that it provided useful insight from an OEMs perspective and that this type of exercise can be a means to identify and develop mitigations for evtol operational risks.

It was recognised that other software exists to support safety management within organisations and that some approaches to safety risk management also favour separating out different types of controls into regulatory, voluntary, etc.

RF volunteered to share the CAA's high level Key Risk Area BowTie templates that it has set up to replace earlier 'significant 7 risk profiles' as a starter.

Action: Members who had circulated the draft bowtie internally to send further detailed comments to the Secretariat for continued learning and updating of the document (within the CAA).

It was suggested that moving on from this discussion, a sub-group of the eVSLG should be set up and tasked with progressing a specific risk under the BowTie approach. This could be either an identified emerging risk logged already by the eVSLG, discussed today or a new one. Offshore and onshore rotorcraft sector representatives were asked to feed in their top current operational issues or risk(s), from which a first risk could be chosen for the eVSLG sub-group to develop against an eVTOL operation.

[1] Helideck Management - YouTube

Action: Chairs and Secretariat to circulate further information on forming this sub-group and setting up an appropriate task for members to agree and volunteer.

UPDATE: Colin Russell of Lilium has kindly volunteered to take the lead in setting up the group in what is anticipated to be a rotating position, similar to the EVSLG itself.

AOB

The presentation given on Safety Performance Indicators (SPIs) for Advanced Air Mobility (AAM) at the EASA Rotorcraft and VTOL Symposium this week was mentioned. The view was expressed that the core messages on how to interact with AAM use cases in safety risk terms is consistent with the approach and discussions of the eVSLG.

Next meeting date: TBC 2023