



Safety-Critical Systems Club

Seminar Information

7th December 2017

Hilton London Euston Hotel, London

Drones and Unmanned Aerial Systems: How Can We Ensure Safe Flight?

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Hilton London Euston, 17-18 Upper Woburn Place, London, WC1H 0HT

Programme

09:30 **Registration and coffee**

09:55 **Introduction**

10:00 **Will Coldwell**
Consortiq

"Why Safety Management Systems will be a Key Element in Advancing the Drone Industry"

10:45 **Dewi Daniels/David White**
Callen-Lenz Ltd

"Putting the Man in Unmanned"

11.30 **Phil Binks**
NATS

"Ensuring Safe Integration of Unmanned Aviation into UK Airspace"

12:15 **Lunch**

13:05 **SCSC update**

13:10 **Martyn Clarke**
SCSS

"Remotely Piloted Aircraft Systems (RPAS): Controlling Risks by Systems Engineering"

THE WATCHKEEPER JOURNEY TO SAFETY

13:55 **Simon Scutt**
Thales

"Introduction & Design Philosophy"

Rob Mountjoy-Row
Thales

"Flight Operations (for Trials & Evaluation)"

Gavin Ward
Thales

"Project Claire and the Way Forward"

15:25 **Tea**

15:50 **Gerry Corbett**
CAA

"Regulatory Update"

16:35 **Panel Session**

A wrap-up session at the end of the day chaired by Tim Kelly. It also gives the delegates a further opportunity to put questions to the speakers.

17:15 **Close and opportunities for networking**

Why Safety Management Systems will be a Key Element in Advancing the Drone Industry

Will Coldwell
Consortiq

ABSTRACT

There are many barriers to the progress of the operational capabilities of drones. One of those is regulatory limitations. Regulatory limitations are set to be a protection against incidents and are essential as a risk mitigation to drone ops. The only way we can break this barrier down is proving to the regulators that the reduction in limitations isn't accompanied by an unacceptable increase in risk. We have to prove safe operations at every level and use that historical data as leverage as we look to reduce the limitations.

Safety Management Systems is a catch-all description of a continuous quality and safety improvement loop, in which operations are conducted, then analysed, and effective change is then implemented based on the analysed data. There are many software platforms on the market today that allow for the collection of the operational data surrounding drone operations, but the key is what is done with that data, how is it translated into safer and more efficient operations.

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Will worked as an airline pilot, flying four years with Easyjet and five years with British Airways on the Airbus A320 series aircraft prior to joining Consortiq. During that time, he gained a nuanced understanding of the process behind the development of compliant procedures through his involvement in the design and testing of fuel saving procedures that were eventually rolled out company-wide. During his military service, he designed and delivered high-quality training courses to address the changing dynamics of the modern-day British Army Officer. Due to his engagement with CAA regulators and aviation bodies, he has become a notable voice of the industry speaking at The Emergency Services Show (2016) and the Energy Drone Coalition Summit 2017's panel of experts discussing Safety Management System Implementation. Will also sits on the UK Government Drone Industry Action Group.

Putting the Man in Unmanned

Dewi Daniels, David White
Callen-Lenz

ABSTRACT

More and more often these days, one sees press releases concerning aerial taxis, sky motorcycles and other types of Personal Aerial Vehicle (PAV). Typically, their designs seem to be based on a scaling up of small drone technology, and in many ways this can make sense; the flight control solutions used for small drones, especially of the multirotor type, lend themselves to relative systems simplicity along with the implementation of autonomous functionality and non-traditional control methods.

However, some concepts that have evolved from upscaled drone designs appear not to consider holistically the potential for faults to result in loss of life.

Non-traditional autopilots have much potential in new generation PAVs since, as well as re-defining the pilot cockpit controls (or doing away with a pilot altogether), the autopilot can be designed to autonomously detect and respond to a system failure or degradation and fly the PAV to a safe landing with minimal (or no) human intervention.

Callen-Lenz has been working on the design, including the criticality of software, that would be necessary to develop a safety case for a system capable of reliably detecting a failure, safely reacting to it without causing further major issues and finally controlling the PAV to a safe arrival on the ground. This presentation describes some of the issues that have been identified and some potential solutions that have been prototyped using methods suitable for implementation in a DO-178C Level A compliant solution.

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Dewi Daniels is a chartered engineer with over 35 years' experience of high integrity software development. He has worked on a number of civil and military aircraft programmes, including Airbus A380 and Boeing 787. He was one of the developers of the SPARK Examiner and a member of the committee that wrote DO-178C.

David White is Engineering Director for Callen-Lenz Limited. A Chartered Engineer with a background in flight test, safety and airworthiness he has worked on programmes involving many of the aircraft used by the UK military from the late 80s until present as well as several civil programmes.

Ensuring Safe Integration of Unmanned Aviation into UK Airspace

Philip Binks
NATS

ABSTRACT

This talk will consider some of the issues with drones and UAS, not just in terms of safety to other airspace users, but also the disruption that is caused to airline and business operations. It will highlight some of the mitigations already in place and being proposed, both at a national and international level.

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Philip Binks joined NATS in 2010 after serving 16 years in the Royal Air Force as an Air Traffic Control Officer. Since working for NATS Philip has had several roles within the business including ATC Specialist, Defence ATC Strategy Lead and now as a Consultant and RPAS Expert. As an RPAS Expert, Philip has been involved in a number of projects, ASTRAEA and Claire, which looked into the safe introduction of drones into UK and European airspace. In addition, Philip also sits on the ICAO RPAS Panel, supports the DfT Pathfinder Programme and represents NATS on the Drone Industry Action Group.

Remotely Piloted Aircraft Systems (RPAS): Controlling Risks by Systems Engineering

Martyn Clarke
SCSS

ABSTRACT

The rate of enormous growth in the RPAS market, as seen in recent years, shows no sign of abating. In fact, every day sees equipment innovations, new types of operational use and innovative manipulation of operational products. It is reasonable to expect societal concerns about safety (personnel and infrastructure) and the infringement of privacy and security in the personal and commercial space. It is incumbent upon legislators, OEMs and operators to allay these concerns by placing requirements and implementing reasonable and demonstrable controls to provide societal confidence in RPAS within societal space. System engineering, appropriately implemented and documented, can provide a significant contribution to the evidence that reasonable and reliable controls are in-place. This presentation considers systems engineering solutions:

- *Incorporated within RPAS designs;*
- *External to an RPAS system boundary,*

which provide controls and protections from RPAS safety and security risks during use.

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Martyn Clarke has been an avionics engineer for 42 years, a software engineer for 37 years, a course designer and developer for 17 years and a lead auditor for 12 years. In 2006 Martyn began an engagement with MOD UAS Project Team (PT), (then known as Tactical UAS PT) which continues to this day (11 years), providing systems safety and security assurance, engineering process assurance and audit services for military UAS design, trials, training, test and evaluation, certification and release to service.

Since 1993 Martyn has contributed to software and safety Defence Standards and more recently has contributed to EASA RPAS documentation and to CAP 722 while being a contributing author to the GSN Standard and the Safety Critical Systems Club Data Safety Guidance.

In 2016 Martyn incorporated SCSS Limited to focus on providing and assuring Safety Critical Software Solutions to Defence and Commercial interests. Currently Martyn is the RPAS/Drone lead for the voluntary Air Safety Group (ASG) and has briefed the Parliamentary Advisory Council on Transport Safety (PACTS) on several occasions.

Martyn remains concerned that an appropriate level of formal (auditable) system safety and security analysis and control is not being applied to RPAS safety and security risks. As a result, Martyn has regularly written, published and lectured on safety and security management in the hope that greater awareness can be fostered, increasing the prospect of safer and more secure RPAS use.

**The Watchkeeper Journey to Safety:
Introduction
Flight Operations (for Trials & Evaluation)
Project Claire and the Way Forward**

Simon Scutt, Rob Mountjoy-Row, Gavin Ward
Thales

ABSTRACT

The Thales Watchkeeper WK450 is an Unmanned Aerial Vehicle System (UAVS) for all weather, intelligence, surveillance, target acquisition, and reconnaissance (ISTAR) in use by the British Army. It was the first UAVS to be awarded a full Release To Service (RTS), and is the only UAVS of its type allowed to fly in UK airspace.

This presentation will provide an overview of aspects of the design philosophy that support the safety position for RTS, and the safety management in place to support Flight Operations for Trials & Evaluation (T&E).

It will also provide information on Project CLAIRES, which examined the challenges of operating a UAVS in non-segregated airspace. As a result of the project Watchkeeper was successfully flown alongside manned aircraft in controlled civil airspace, including handover between Air Traffic sectors.

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Simon's early career in real-time and safety-critical software engineering included projects from the fields of Air Traffic Control, Avionics, and Global Navigation Satellite Systems (GNSS). It was while working on the Galileo GNSS at Logica that he had the opportunity to move into safety engineering, and has since worked on various projects, most notably in Healthcare and the Watchkeeper UAVS.

Rob left the Navy in 2009, and since then has endeavoured to remain an enigma...

Gavin is privileged to have contributed to safety assessment, safety case development and risk & business continuity management for a number of the UK's flagship projects: Sizewell B PWR, Heathrow's Terminal 5, Columbus (the European module of the International Space Station), Swanwick Air Traffic Centre, QEC Aircraft Carrier and the Watchkeeper Remotely Piloted Air System amongst others.

Having worked for the UK Atomic Energy Authority and its privatised fission product AEA Technology, Gavin now works for Thales Cyber & Consulting on the safety and risk management of complex systems. Gavin is also an Instrument-rated pilot.

Regulatory Update

Gerry Corbett
CAA

ABSTRACT

This talk covers the basic principles that are involved for UAS operations within UK airspace and summarises the current regulatory set up. It will also look towards the future and how the UK, EU and International regulations are moving. Some elements surrounding aviation risks and what the statistics seem to be currently telling us will be considered.

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Gerry Corbett joined the CAA's Safety and Airspace Regulation Group in June 2012, where he is the CAA's focal point for all matters associated with the operation of Unmanned Aircraft Systems in UK airspace. He is also the sponsor for Civil Aviation Publication 722, the primary guidance document for Unmanned Aircraft System Operations in UK Airspace. Immediately prior to this he undertook a similar role whilst working as a serving Royal Naval officer on a 3-year secondment to the CAA's Directorate of Airspace Policy (DAP). During this period, the focus of the UAS 'portfolio' moved from being purely an airspace issue to more one of Operations and Airworthiness.

He has been a member of the ICAO (International Civil Aviation Organisation) UAS Study Group since 2009 and led the working group that drafted the Command and Control, ATC Communications and Remote Pilot Station related sections of the RPAS Manual. He is now the Working Group Co-Lead for the Operations Working Group within the RPAS (Remotely Piloted Aircraft Systems) Panel which is developing the RPAS Operations Standards and Recommended Practices Annex 6 of the ICAO Convention.

He has a background as a military Air Traffic Control Officer and has served airfield and Area Radar units ashore in the UK and at sea worldwide from the RN's Aircraft Carriers. He has also held a number of staff posts with the RN and RAF in the maritime air safety, aviation incident investigation and ATC equipment procurement roles.