

Session 1

Jeff Canclini FTE Fellow Emeritus, Lockheed Martin	
The Evolution of Risk Mitigation in Flight Test for Complex Systems	
<p>The increasing complexity of software intensive systems and the multi-faceted organizations responsible for their design and test pose major challenges for flight test risk management. This presentation will overview some key developments in the evolution of flight test risk management. The author will use his four decades in aerospace and flight testing to assess strengths and weaknesses of traditional and emerging risk management strategies and methodologies. The intent is to highlight opportunities for teams to better confront these challenges.</p>	
<p>Jeff Canclini has accumulated 42 years in the aerospace industry supporting the F-35, F-16, F-14, F-4, and other classified programs for the USAF, USNR, and NASA flight test programs as a FTE, aviator, and engineer. Most recently he served as Lockheed Martin's F-35 International Flight Operations Manager from 2016 to 2021. This assignment included standing up test operations and overseeing the first F-35 acceptance flights in Italy and Japan. Jeff served as a Lockheed Martin FTE Fellow from 2018 to 2021. Previous assignments with Lockheed Martin include F-35 Flight Test Mission Systems lead, F-16 Flight Operations Lead for the MMRCA (India Air Force) flight evaluations and lead test WSO for development of the F-16 Block 60 SuperViper. Jeff served two tours as a NAVAIR Reserve Commanding Officer. He is a USAF Test Pilot School graduate of class 86A and recipient of the "R.L. Jones Trophy" as the top FTE/Navigator graduate. As a WSO and Naval Flight Officer, Jeff has accumulated 3300 hours in 26 fixed and rotary wing aircraft. He is a FAA commercial multi-engine pilot. Jeff was inducted as an SFTE Fellow in 2015 and is currently serving his 2nd term on the SFTE board of directors as Treasurer. Jeff holds a Masters of Engineering, B.S. Mechanical Engineering, and B.A. Economics from the University of California, Davis. He is the author of 11 technical publications. His current focus areas include risk mitigation for software intensive systems, FTE education and mentoring. Jeff is the proud father of four children including two US Naval academy graduates (one Marine and one naval aviator).</p>	

Bill Dean Air Safety Lead, Boeing Test & Evaluation UK	
Boeing Test & Evaluation UK Air Safety Risk Management	
<p>An overview of Boeing Test & Evaluation UK's updated Safety Risk Management products, including Air System Safety Case format, and where they fit into the different risk perspectives –Strategic, Operational, Tactical</p>	
<p>Bill Dean spent the majority of his childhood in Africa and USA before a family move back to the UK aged 17. He went on to study Pure Mathematics at London School of Economics and Political Science before joining the Royal Navy. He flew a variety of operational roles in the RN, firstly as a search and rescue helicopter pilot from Prestwick, Scotland and then, after fast jet training, the majority of his operational service was spent as a Sea Harrier pilot operating from HMS INVINCIBLE including two years as Senior Pilot 800 NAS for air defence operations over Iraq, Bosnia and Kosovo. He then worked as an exchange pilot in the USA from 2001 until 2006 in various roles flying F/A18C Hornet and AV-8B Harrier with USN, including two years at China Lake Weapons Test, before transferring to the F35 project team in Washington D.C. as UK Mission Systems Lead. Bill finished his military service in 2008 as Deputy Force Commander, Joint Force Harrier. Bill then worked as an independent aerospace consultant before joining Rolls-Royce plc in 2011 initially in Flight Ops Support and finishing as Chief Pilot (Defence Aerospace). In 2020, Bill joined Boeing Test & Evaluation as the primary aviation safety focal for flight test operations in UK. Bill stays current on a variety of fixed wing, and when able rotary wing, aircraft and displays the Seafire MkXVII with Navy Wings Heritage Flight, having previously flown the Spitfire Mk XIX with Rolls-Royce plc.</p>	

Stuart Rogerson Chief Pilot Safety, Standardization and Training, Engineering and Defense Flight Test, Textron Aviation.	
Textron Safety Risk Management	
<p>Textron Aviation has an incredibly diverse fleet of aircraft, ranging from a Cessna 172 to the Citation Longitude business jet and defense products like the T-6 and the Scorpion. Textron Aviation, as an Organization Designation Authorization (ODA) is required to comply with FAA Order 4040.26 Aircraft Certification Service Flight Test Risk Management for all certification test flights. Not surprisingly though, Textron Aviation's risk management program, that is compliant with 4040.26, is applied to all Engineering and Defense flight test operations. This brief presentation will outline our Risk Management program as well as discuss the use of Standardized Test Hazard Analysis (THA) worksheets and our THA review committee. A brief discussion of Operational Risk Management will also be included.</p>	
<p>Stuart Rogerson - Graduating from Royal Roads Military College with a Bachelor of Science in Computer Science and Earth Observational Sciences and then the University of Toronto with a Master Applied Science in Aerospace, Stuart spent 20 years in the RCAF as a fighter then test pilot on the CF-18. Stuart attended USNTPS Class 127 and worked at AETE testing the CF-18 on various upgrades to the avionics, landing gear and flight control software. After a short stint as an CF-18 instructor pilot, Stuart served as an exchange officer with the 416 FLTS, Edwards AFB flying the F-16. Projects included EW, avionics, first flight of the GBU-50, airstarts and numerous radar and targeting pod programs. Stuart was also a designated High AOA instructor on the F-16 and F-18. In 2011, Stuart started at Textron Aviation on the 680+ program working as the lead pilot on the prototype aircraft for certification. After becoming a Flight Test Pilot UM, Stuart worked on the 750+ and the 680A. Next, Stuart was assigned to the 700 Longitude where he was both the lead Flight Test Pilot UM and PIC for the first flight of the prototype aircraft completing all initial stall, stability and control and envelope expansion testing. He was also a demonstration and mission systems development pilot for the Scorpion jet. While working these programs, Stuart was the Test Safety Officer for Textron Aviation. and is a designated flight test instructor.</p> <p>Currently Stuart serves as the company's Chief Pilot, Safety, Standardization and Training for Engineering and Defense Flight Test. In this role, Stuart is responsible for the Safety Review Board of all engineering flight test activity. As well, Stuart maintains responsibility for any flight safety investigations that involve Engineering or Defense operations. In addition to safety, he remains responsible for both initial and recurrent Pilot and FTE training which includes Textron Aviation's own in-house training program. Stuart is also the lead instructor for the company wide Upset Prevention and Recovery Training Program on the T-6. Finally, Stuart is responsible for all policies and procedures that impact engineering and defense flight operations. Outside of his Chief Pilot role, Stuart remains an active test pilot at Textron Aviation supporting test programs on both Part 23, Part 25 and defense aircraft. Stuart is an Associate Fellow in SETP and has previously served as the Chairman of the West Coast and Central Sections. Stuart has also served on the Membership committee and the National Board, most recently as a Technical Advisor. In 2019, Stuart was the Symposium Chairman for the Annual S&B in Anaheim. He has presented numerous papers to the Central and West Coast sections and the Annual Symposium.</p>	

Sarah Price Flight Test Analysis Engineer (Stability and Control), Boeing Test and Evaluation.	
An Intropective of Boeing Test & Evaluation Commercial Transport's Safety Risk Management Process	
<p>A robust Safety Risk Management (SRM) process is a critical component for all flight test organizations. In order to successfully ensure the safety of flight test crews and aircraft, SRM processes must be able to evolve as best practices, requirements, and organizations change over time. As such, SRM processes require continual refinement and re-assessment of their effectiveness. This presentation provides an overview of the current Safety Risk Management process for Boeing's Commercial Jet Transport testing as well as a look into how the process has been refined in recent years through improvement initiatives in test plan quality, training, and organizational safety culture. Three case studies will be examined - the Flight Test Plan Quality project, a data system troubleshooting workshop, and a Psychological Safety awareness effort - to highlight the latest successes in Boeing's SRM process.</p>	
<p>Sarah Price is a Flight Test Analysis Engineer for The Boeing Company where she is responsible for planning and conducting data analysis during flight tests which support the certification of new commercial aircraft derivatives. A dual-citizen of South Africa and America, Sarah was born and raised in Johannesburg, South Africa. She emigrated to the United States in 2015 to study at the University of Southern California, where she received her Bsc. in Mechanical Engineering. She began her Boeing career as an intern in the Stability and Control Flight Test Analysis group and rejoined the same team full-time in 2020. She is also passionate about fostering training and development opportunities within the company and leads the Boeing Test & Evaluation Learning and Development team. Sarah is currently based out of Seattle, Washington.</p>	

Session 2

<p>Harry Boden - Team Leader (Aviation Trials), QinetiQ UK. Jim Horton - Test Pilot , Royal Navy</p>	
<p>UK Ship Helicopter Operating Limits Testing</p> <p>After briefly describing what Ship Helicopter Operating Limits (SHOL) Testing is about and the basic risk assessment process used, this presentation will focus on some examples of safety lessons learnt from a number of recent UK helicopter trials from the past 5 years. SHOL Trials are relatively complex to organise, have elevated trials risks and involve many organisations. Furthermore, the regulatory oversight has been increased leading to a significant increase in the approvals process and documentation. Overall, the planning and conduct of SHOL trials are often rich with unexpected problems to be solved and therefore lessons to be learnt. Many of these safety lessons apply equally to other kinds of trials activity.</p>	
<p>Harry Boden has worked in aircraft Test and Evaluation for the past 22 years, and since 2016 has been the Team Leader of the Aviation Trials team for QinetiQ. He started his career with the Defence Evaluation and Research Agency (DERA) at MOD Boscombe Down as a Junior Trials Officer for Rotary Wing Performance and Flying Qualities. DERA soon became QinetiQ and after several years doing experimental flight trials on the naval variant of the Merlin helicopter he went to the Empire Test Pilots' School (ETPS) in 2004 as a Fixed Wing Flight Test Engineer (FTE). After completing the course he returned back to Rotary Wing flight trials and logged a total of nearly 400 flight test hours. In 2008 he moved into a role as a Project Engineer leading multi-disciplinary teams, including 3 years as the Technical Lead for in-service Chinook. This was followed by a role at ETPS as the course development tutor before joining an Australian flight test organisation focused on international Ship-Helicopter trials. He returned to QinetiQ in 2014 as a Principal FTE providing oversight and approval to a wide range of fixed and rotary wing trials. To date he has participated in 13 ship flight trials ranging from small off shore patrol vessels to aircraft carriers.</p> <p>Lt Cdr James Horton RN – is an experimental test pilot on the rotary test squadron at MOD Boscombe Down. With a pedigree in both maritime attack, 2003-2009, and battlefield light utility, 2009-2012, he participated in operations and exercises throughout Europe, the Arabian Gulf, Africa and North America. As a graduate of ETPS in 2013 he joined the rotary test squadron in 2014 and was involved in projects on Lynx, Sea King, Wildcat Puma HC2 and Merlin over a range of trials including low speed, HMI, ERGA, performance, handling and SHOL – including first of class to HMS Queen Elizabeth. An instructional assignment teaching ab-initio Wildcat in 2019 was combined with the Naval T&E Flight for operational T&E – this included DAS effectiveness, weapon tracking and the first target designation of a Paveway IV by a maritime Wildcat. A return to rotary test in 2022 started with a SHOL trial for the Wildcat with weapon wings and included all weapon loads, symmetric and asymmetric.</p>	

<p>Tim Butler Chief Test Pilot, Nova Systems International</p>	
<p>Three Point Airliner Landings</p> <p>Three point airliner landings, with an unfamiliar aircraft, utilising a new crew, tested to EASA certification standards, but under FAA regulation in the states, during a worldwide pandemic...<i>SIMPLES!!!!</i></p> <p>The presentation explores those challenges beyond the flight test risk assessment, all of which need careful management for a safe and successful flight test campaign.</p>	
<p>Tim Butler has over 7500 hours of flight experience, the majority of which is in multiengine aircraft of which some 2000 hours have been during flight test programmes. Tim served 20 years in the Royal Air Force flying Victor K2 tankers and Sentry E3-D in exercises and operations around the world. After completing ETPS Tim was the UK MoD project test pilot for the Sentry AEW Mk 1 and the Sentinel R Mk 1(ASTOR) a highly modified Bombardier Global Express. Tim worked extensively with L3 Com in Greenville Texas on development, performance and systems test for UK Military certification. In 2006, after a short time at Raytheon SL UK flying the Global Express and HS125 for post maintenance flight test Tim joined EADS CASA (Now Airbus Defence and Space) as the project test pilot for the A330MRTT (Multi Role Tanker Transport). As an Airbus Senior Manager and Project TP Tim was part a multinational team of pilots and engineers conducting design, development, certification and qualification of the aircraft to military and civil standards. This involved cockpit redesign, military avionics integration, FBW flight protection upgrades, flight control law enhancements for new electronic tail bumper protection and air to air refuelling receiver aircraft handling improvements. Working with the Australian, UK and French military airworthiness authorities Tim oversaw test activities for both military and civil certification for the militarised A330 which leading to the issue airworthiness certificates by the Australian airworthiness agency, DASA, and Saudi Air Force via the French DGA. As part of the UK PFI contract with AirTanker he was part of the team that gained an STC for the UK Voyager aircraft. The MRTT project lasted over 7 years and some 2,500 hours of test flying. Tim also flew production acceptance and first flight test profiles for the A320 and A330 series aircraft and conducted flight test and customer acceptance test on behalf of Airbus SAS from Toulouse during this time. Tim moved to the UAE in 2013 where he was employed as the Project Lead and Chief Instructor/Examiner for the A330MRTT programme for GAL. Tim flew over 1200 hours in training and operational roles with the 10th Sqn working for the Sqn Cdr to ensure that a training programme was in place and that the Sqn Standards flight was set up. Since joining Nova Systems Tim has worked on a wide range of civil and military certification programmes and has been involved test flying for civil certification of a converted Global 6000 ISR aircraft for a ME customer, B737-800 for an FAA project as well as providing CVE expertise of a range of civil aircraft modifications and flight test campaigns. As the CTP for Nova Systems Tim is responsible for the safe and effective operation of the Nova Systems and GVH FTOs for both fixed and rotary wing aircraft.</p>	

<p>Adrian Neve Head of Flight Test Organisation, QinetiQ UK.</p>	
<p>Helicopter low speed testing</p> <p>The presentation will describe the typical risks associated with helicopter low speed performance testing, initially with reference to the pace vehicle technique. An alternative technique will then be described which has the potential to reduce the risk associated with helicopter low speed testing. This technique has also been shown to allow more rapid data gathering and has the potential to improve the accuracy of the data.</p>	
<p>Adrian Neve is Head of the QinetiQ Flight Test Organisation, which undertakes Part 21 flight test for QinetiQ and customer design organisations. Adrian has been involved in the flight test and evaluation of helicopters for over 25 years and has over 500 experimental flight test flying hours as a Flight Test Engineer. He has led major flight test programmes of new and significantly modified aircraft in Europe and the USA. He has a B.Eng(hons) degree in Aeronautics and Astronautics, is a Chartered Engineer, a QinetiQ Fellow in helicopter performance and flying qualities and flight test and is a Fellow of the Royal Aeronautical Society.</p>	

Session 3

Ben Luther Senior Test and Evaluation Engineer, Nova Systems Australia / New Zealand.	
Safety Domains in Flight Test	
<p>Evolution in technology is delivering increasingly complicated systems for which the concept of safety is also evolving. Now we are on the cusp of the next evolution with complex systems, defined at an even higher level and differentiated from the merely complicated. With the advent of complex systems for which the expected system performance isn't knowable in advance, the differences in safety frameworks across the different safety domains becomes stark. What's in it for a flight test safety officer? Since flight test is one of the few undertakings to sit across all three domains, being able to recognise the domain you are operating in ensures that the work of a safety officer is effective. It avoids the eye-rolling response when aircrew just know that the approach being imposed is not relevant. It avoids safety theatre. Not all safety is the same and knowledge of safety domains focuses effort on tools that work in each domain.</p>	
<p>Ben Luther - After two tours as a P-3 Tactical Commander in the Australian Air Force, Ben was selected for flight test training at the National Test Pilot School. Serving with the Australian Defence Force's flight test squadron, he completed assignments on the F/A-18, P-3 Orion, C-130J, PC-9, USAF RC-135 and Army Blackhawks before being posted to Madrid, Spain for the development of the A330 AAR tanker. In 2014, Ben was recruited to Gulfstream as part of the initial cadre in the newly established Aviation Safety Office where his work in Safety Management Systems for experimental flight test was later awarded the Tony LeVier Trophy. Ben worked at Gulfstream Flight Test as part of the G500, G600 and G700 certification efforts and taught engineers to be aircrew upon assignment to Flight Test. Today he works for Nova Systems on assurance projects for complex systems and researches the management of complex risk at the University of Adelaide.</p>	

Glenn Graham Director, Safety & Mission Assurance, NASA Armstrong Flight Research Center.	
NASA Flight Test Risk Management	
<p>NASA Armstrong's vision is to 'separate the real from the imagined through flight,' and our mission is to 'advance technology and science through flight.' With a fleet of 21 unique aircraft that cover the flight envelope from small UAS aircraft to Mach 2.5 and from the surface to greater than FL700, and with more than 70 projects in various stages of development and flight testing on our books, from the X-57 Maxwell electric aircraft and the X-59 Quiet Supersonic Technology aircraft, to airborne science aircraft that fly all over the globe, our hazard/risk identification, assessment, mitigation, and management processes are critical to the preservation of human life, resources and public safety. We partner with all the NASA Centers and many US Federal Agencies, including the FAA, DOD and NOAA, as well as international partners and large aerospace corporations, as well as small start-up companies. NASA Armstrong is unique from many similar organizations in that our airworthiness process allows us to self-certify our projects and programs. Additionally, we have clear lines of technical authority relating to safety, engineering, and medical that flow from projects up to the Center Director and to NASA headquarters. This allows for local decision making and risk acceptance, while providing channels for dissenting opinions all the way to the Agency's Administrator, if needed. Armstrong's Hazard and risk identification/mitigation process underpins everything stated above and begins at the project level via system safety working groups (SSWGs). These groups of project managers, project engineers, and System Safety Engineers, convene regular meetings throughout a project's lifecycle to talk about hazards and risks as they are identified and try to mitigate them as they are able. They are tracked and scored for severity and likelihood of occurrence. Periodically, they are briefed to the Center's Airworthiness body for disposition or acceptance. This continues through the project's life cycle to include flight readiness reviews. Depending on the outcome of those reviews, either a flight clearance is issued or mission restrictions (based on the hazard severity) are levied. Each project / mission is unique.</p>	
<p>Glenn Graham is an Associate Fellow and graduate of USNTPS Class 111 in 1997, with over 4,700 hours in more than 75 aircraft types. He is currently a research test pilot and the Director for Safety and Mission Assurance at NASA Armstrong Flight Research Center (AFRC). In this capacity he is responsible for AFRC's safety and mission assurance programs. Additionally, he provides independent risk assessment and analysis for all Armstrong flight science and research projects, and he serves as a guest instructor pilot for the USAF Test Pilot School. He is current in F-15A-Ds, T-38Cs, T-34Cs, and TG-14s. Glenn served 28 years active duty in the US Air Force, including three command tours. He has a BS in Engineering Sciences from the Air Force Academy and a MS in Engineering Mechanics from Columbia University, as well as two other Masters' degrees from the Air University in Montgomery, Alabama. He flew F-15s operationally and logged over 150 combat hours while stationed at Langley AFB, Virginia, and he instructed German aircrews in the F-4E at Holloman AFB, New Mexico. He is an active GA pilot and holds CFI, ATP and B-737 type ratings. Glenn has had three test tours at Edwards AFB, one at Eglin AFB, and one with the Missile Defense Agency in Huntsville, Alabama. His test experience includes airframe, systems and propulsion testing on F-15, F-16, RU-38, T-38 and RQ-4 aircraft, plus conventional weapons testing and test support for numerous programs, including, the B-2, F-22 and F-35 developmental test programs. He was the AFMC F-15 Demo pilot, and he served as the Air Force Test Center's Chief of Safety, where he oversaw all test safety planning and execution activities at Edwards AFB. Glenn supports STEM activities in the greater LA area and is a mentor for FIRST robotics high school team 399 at Lancaster High School. He is an active member in the Order of Daedalians. He has co-authored and presented 2 technical papers at SFTE and IEEE symposia, served as Secretary for SETP's West Coast Section and as part of the Los Angeles County Airshow planning and support team.</p>	

Arun Karwal - Research Test Pilot, NLR. Martine Hakkeling - NLR.	
Flight Test Safety Management in a small test group	
<p>NLR, together with Delft University, operates two (civil registered) aircraft for basic and applied scientific research and SPO operations. To meet customers needs, the aircraft may be modified through an in-house Part 21 Design Organisation, and flights may include Category I flight tests. This means the scope of operations is wide. Specific challenges exist to meet regulatory compliance, quality requirements and training needs in a small flight test group.</p>	
<p>Arun Karwal is a Research Test Pilot, Senior Scientist and Flight Validation and Flight Inspection Pilot. At NLR Arun is responsible for preparing and flying experimental test flights with NLR's research aircraft and as expert on flight operations and flight safety part of R&D teams involved in design and testing of new concepts or procedures. As a part-time assignment, Arun is a Captain flying mixed fleet Boeing 777 and 787 intercontinental commercial flights with a major airline. Previous line experience includes flying Fokker and Airbus aircraft on European and intercontinental routes. Arun has over 15,000 flight hours on a wide range of aircraft, including over 1,000 hours in flight test or flight inspection and is a Member of the Society of Experimental Test Pilots (SETP).</p> <p>Martine Hakkeling-Mesland is the Safety and Quality Manager of the shared NLR and TU Delft Flight Test group that holds EASA Part 145 and Part CAMO and national approvals. Martine has a master in Aerospace Engineering from TU Delft and has since been working for NLR in various positions. Starting from research positions on the topics of Human Factors in maintenance and the cockpit, she became more involved in the NLR Flight Test organisation over the years and has been fulfilling management functions there since 2015.</p>	

Session 4

<p>Andrew Wardle - Flight Test Engineer, Gulfstream Aerospace. Eric Tondreau - Principal Engineer and Flight Analyst, Gulfstream Aerospace. Ben Luther - Flight Test Engineer, (formerly) Gulfstream Aerospace.</p>	
<p>Gulfstream FTE Aircrew Skills Training</p>	
<p>Finding and retaining top tier talent of flight test engineering professionals is an industry wide challenge. There are a limited number of candidates with commercial flight test experience and/or TPS training. Further, the competition for experienced flight test professionals is intense with the autonomous vehicles, EVTOL urban mobility, and supersonic industries drawing from the same talent pool as established industries. Consequently, at Gulfstream Flight Test, you will find excellent engineering talent inducted into the organization with little to no operational aviation experience. Gulfstream FT recognizes that the role of the Flight Test Engineer is integral to the safety of the experimental flight test crew. Therefore, it is imperative that a baseline skillset be defined, and a training regimen be established. The presentation will discuss how Gulfstream FT defined our requirements, designed our training program, how we maintain our training records, and sustain an instructor cadre (train the trainer).</p>	
<p>Andy Wardle serves as Technical Specialist III within the Flight Test Engineering organization of Gulfstream Aerospace. He has worked in the Aerospace Industry in the UK and USA for over 20 years and has been involved in many military and civilian airplane programs. This includes Gulfstream, G650, G500, G600, G700 & G800, Lockheed Martin F-35B, BAE Systems Harrier, Panavia Tornado, BAe 146/Avro RJ, and BAE Systems Nimrod MRA4. Andy is also a FAA/EASA CRM and Aviation Physiology trainer for Gulfstream Aerospace. Outside of work Andy is an FAA Instrument Rated Private Pilot and President of the Coastal Empire Chapter of the Society of Flight Test Engineers.</p> <p>Eric Tondreau serves as both a Principal Engineer within the Flight Test Engineering organization of Gulfstream Aerospace and Flight Analyst Engineering Authorized Representative of the Gulfstream ODA. He has had the privilege to work in the aerospace industry for the past 20 plus years and to be involved in many development and certification programs. These include The Boeing 777-200LR, 787-9, and 747-8. And more recently, the Gulfstream GVII (G500 and G600) and GVIII (G700 and G800) family of airplanes. This past summer, Eric had the honor of serving as 1 of the 3 crew members for the first flight of the GVIII-G800.</p> <p>Ben Luther. After two tours as a P-3 Tactical Commander in the Australian Air Force, Ben was selected for flight test training at the National Test Pilot School. Serving with the Australian Defence Force's flight test squadron, he completed assignments on the F/A-18, P-3 Orion, C-130J, PC-9, USAF RC-135 and Army Blackhawks before being posted to Madrid, Spain for the development of the A330 AAR tanker. In 2014, Ben was recruited to Gulfstream as part of the initial cadre in the newly established Aviation Safety Office where his work in Safety Management Systems for experimental flight test was later awarded the Tony LeVier Trophy. Ben worked at Gulfstream Flight Test as part of the G500, G600 and G700 certification efforts and taught engineers to be aircrew upon assignment to Flight Test. Today he works for Nova Systems on assurance projects for complex systems and researches the management of complex risk at the University of Adelaide.</p>	

<p>Justin Paines, Chief Test Pilot, Vertical Aerospace. Dean Moore, Lead FTE, Vertical Aerospace</p>	
<p>Developing Flight Test Safety in a Startup</p>	
<p>The paper will look at the development of safety risk management within Vertical Aerospace as it developed the VX4 electric Vertical Take-Off & Landing (eVTOL) aircraft. The paper will look at the evolution of the Safety Culture within the organization, the input Flight Test had on the concept of operations & design and some of the unique challenges this provided. The paper will conclude with a summary of where Vertical Aerospace is in progress towards pioneering electric aviation.</p>	
<p>Justin Paines was educated at Oxford University before gaining a Masters' in Aeronautics and Astronautics at MIT. He joined the Royal Air Force 1988. After training, he was posted to No 1 (Fighter) Squadron, flying Harrier V/STOL aircraft. He attended USAF Test Pilot School in 1995, graduating as Distinguished Graduate, before commencing his test flying career in V/STOL flight control research and development. He led the VAAC Harrier experimental fly-by-wire programme for a total of 8 years, flew all marks of the X-35 as part of the Joint Strike Fighter Joint Test Force, and completed 2 tours as an ETPS Tutor and 4 years with 2Excel Aviation. Justin joined Joby Aviation as Chief Test Pilot in 2018. After 3 amazing years with Joby, Justin returned home to take up his current position as Chief Test Pilot of Vertical Aerospace in Bristol.</p> <p>Dean Moore has worked for Vertical Aerospace since June 2020 as a Flight Test Specialist and the Lead Flight Test Engineer for the VX4 programme, developing the companies flight test approach. Before joining Vertical Aerospace he developed the flight test and flying organisation approvals in the UK for Boeing between 2013 and 2019 including Chinook, C-17, remote piloted air systems and future projects. Prior to employment with Boeing, he worked at QinetiQ, including being the Principal Flight Test Engineer Tutor at the Empire Test Pilots' School (ETPS), Project Technical Manager for the Puma Life Extension Programme and leading a wide range of flight test activities on both rotary and fixed wing aircraft. Dean has over 24 years of flight test experience, graduated from the No.25 Flight Test Engineers Course at ETPS, is a Fellow of the RAeS and a Chartered Engineer.</p>	

<p>Dave Blair Chief Pilot for Safety, Sikorsky, A Lockheed Martin Company.</p>	
<p>Sikorsky's Flight Test Safety Risk Management</p>	
<p>Improving Flight Test Safety through Enhanced Safety Risk Management. Infusing a renewed and intensive focus on SRM as an effective means to reduce test risk.</p> <p>Certainly, improving our SRM process and procedures is a key to improving our flight test safety. SRM provides a deliberate framework for capturing and mitigating risks. However, SRM cannot anticipate, capture and mitigate all risk. Therefore, the people operating our flight test processes must be spring loaded to recognize and respond to unanticipated events and associated risks. This response, fixed deeply in the culture of a flight test organization, must be coupled with SRM to manage safe flight test operations most effectively. The engrained response of every flight test team member to do what is right and safe, when nobody is looking, is perhaps more important than all the processes and procedures an organization can muster. As Peter Drucker said, "Culture eats strategy for breakfast" (2006). Checklists and procedures while flying are somewhat akin to SRM process and procedures on the ground. But SRM alone can only take us so far. Just as experienced aircrews handle situations that are not covered by checklists, safety minded risk managers fill the gaps where procedures fail to cover all situations. A culture of safety in flight briefings and telemetry rooms identify and mitigate risks in a flight test organization. This analogy is a useful guide to explore culture vs process and procedures of SRM for flight test. Some cultural features of a test team include risk tolerance and management, communication, and team orientation. Mature flight test organizations have distinct cultural characteristics which help define them as risk managing – they are risk averse (in economic terms, they prefer predictability over profit), safety oriented, trusting, learning and humble. An organization's founder is the ultimate source of culture and provides the vision for the organization. Igor Sikorsky set the tone for our flight test safety when he said, "In those early days, the Chief Engineer was almost always the Chief Pilot as well. This had the automatic result of eliminating poor engineering very early in aviation." Although formal SRM was not envisioned when Mr. Sikorsky was overseeing flight test, his work displayed many of its hallmarks and bred a culture of safety.</p> <p>Without safety being engrained in every person, at every level of the process, flight test will not manage risk well. The proposed presentation will give an example of SRM that failed and will illustrate gaps that existed in Sikorsky's SRM. Ultimately, we can't see or fill all the gaps, so a robust culture of safety is vital to safe flight test. Sikorsky's company culture influences many of our core functions including flight test. Additionally, we will discuss risk barriers that support our safety culture and important factors in managing and maintaining that culture.</p>	
<p>Dave Blair is Sikorsky's Chief Pilot for Safety, responsible for enterprise-wide flight operations safety. He is an engineering and production test pilot. He served in the U.S. Navy flying Special Operations, Combat Search and Rescue, Anti-Submarine and Anti-Surface Warfare missions. Other roles included Operational Test Director for the MH-60S helicopter and the HH-60H Hellfire missile integration. Dave is a rotary wing ATP with CFI, CFI with NVG Instructor privileges and a fixed wing Commercial and Instrument pilot. He is qualified in more than 15 rotary-wing aircraft including all Sikorsky executive transport models with type ratings in the S-61, S-70, S-70M and S-92.</p>	