Royal Aeronautical Society Flight Simulation Group

Newsletter

May 2011

New Readers – please register as FSG members on the FSG website (http://www.raes-fsg.org.uk/) to ensure that you receive this newsletter via the FSG mailing list.

Editorial

The well known statement attributed to Charles H Duell (A Commissioner in the U.S. patent office) in 1899 that 'Everything that can be invented has been invented[1]'has some resonance with modern flight simulation. The technology advances in the current generation of flight simulators reflect, for the most part, developments in the computer industry rather than improvements in the simulation industry. It can be argued that the technology used in a flight simulator has reached maturity and nowadays, manufacturers simply procure and assemble the components to meet the requirements of their customers.

That is not to say there are no challenges and the FSG sets aside a day every to review the challenges facing the simulation industry. But it is worth reflecting if the major problems have been solved and if so, whether attention should focus on the application of simulation rather than the underpinning technology. So, is there a need for research or is flight simulation just a discipline that needs to address regulations and standards?

As Editor of the FSG newsletter, I do try to encourage articles on contentious issues in flight simulation, and in this edition of the newsletter, I have used my privilege as Editor to pose the question 'Who needs research' in an article on page 3. As Mandy Rice-Davies once said "Well – he would say that wouldn't he?", so it is hardly surprising that an academic is advocating the case for research, hopefully, to provoke debate.

David Allerton

November 2010 Conference

The FSG's Autumn 2010 Conference was titled *The Challenges for Flight Simulation - the Next Steps*, and was held on the 17th-18th of November. One of the major challenges is simulation-based training for helicopter flight crews, and presentations by the International Working Group –Helicopters (IWG-H) featured prominently in the Conference.

[1] In fact, it is disputed that this remark was ever made.

Spring 2011 Conference

The FSG will be holding its spring flight simulation conference on Tuesday 8th and Wednesday 9th June. This year's conference is entitled "The World Outside the Aircraft (Simulating The Operational Environment)". This is a subject that was last covered by the RAeS FSG conferences in November 2003 and reviewing that conference it would seem that some of the same challenges remain.

The Royal Aeronautical Society Flight Simulation Group believes that there has been substantial focus recently in the media suggesting that aircrew need to be given more training and increased situational awareness skills to cope with operating today's advanced civil and military aircraft in an increasingly complex, busy and diverse airspace environment so it is definitely appropriate that as an industry and as a learned society that we review where we are today and what has changed. Our objective is to identify what is lacking, missing or needs to be improved and to propose some specific solutions.

Featuring keynote speeches from the Chief Scientific Directors of both CAE and Thales, a compelling programme has been produced featuring 18 different speakers over the two days in four sessions, covering:

- The Operational Environment
- The Sensor and Sensory Environment
- Radio & ATC Environment
- Visual Environment

Mark Dransfield

Annual International Flight Crew Training Conference - September 2011

The annual Royal Aeronautical Society International Flight Crew Training Conference is well established and highly successful. The 2011 Conference takes place over two and a half days starting Tuesday 27th September and aims to seek solutions on how best to consider flight crew training standards from an international perspective.

Safety data indicates that further improvements are needed in flight crew training, notably in airmanship, air traffic management and situational awareness, upset recovery, and human factors.

Training syllabuses need to reflect best practice, include new tasks and procedures, and exclude exercises no longer relevant.

The Conference will examine these issues, together with the latest thinking on competency-based training, recurrent training and certain initiatives currently under way. Moreover, whilst noting the different operational and training needs of the rotary wing community, the fundamental aspects that bear equally on rotary and fixed wing flight crew training will be discussed. The Conference will address improvements in national and international training programmes and, with wide variations in training syllabuses, whether more harmonisation in training and evaluation standards and processes might be beneficial, whether some form of global resource for the flight crew training community might be helpful, and the constraints in achieving such goals.

With J Randolph Babbit, Administrator from the FAA headlining eight Keynote Addresses, 24 additional papers and breakout sessions to discuss the issues, some 150 delegates are expected from over 20 nations. This Conference will provide a unique opportunity to become involved, discuss the issues and influence the work required to resolve them.

Mark Dransfield

The 2011 Edwin A Link Lecture

John Farley, former Harrier chief test pilot, has been invited to present the 2011 Edwin A Link Lecture on 8th June.

Captain Ray Jones Lecture

This year's lecture will be given by Dieter Harms, on Wednesday 28th September, after Day 1 of the Society's International Flight Crew Training Conference. The title is to be confirmed.

Gordon Woolley

Merlin Flight Simulation Competition

The first Merlin 'It Flies!' competition in the USA took place at the University of Dayton Ohio on April 2nd. Teams competing were 3 from the University of Dayton, 2 from Coventry University and I from Swansea University. Three USAF test pilots judged the flying. The overall winner was Dayton team with a C130 simulation. Second was Swansea University with a blended wing design and third was a Coventry Hawker Hunter entry.

There is great enthusiasm in Dayton for another competition next year. Meantime, some of the Dayton students are hoping to compete in the 2011 UK competition to be held at Coventry University. The latter are looking forward to reciprocating the hospitality extended to the UK teams by Dayton University.

Bethan Kenward, Team Leader for the Swansea students said: "The chance to attend this competition was very rewarding for us. We had an amazing time and are really grateful for the opportunity to see what American university life is like and to attend the competition. The other activities that were put on while we were there were an eye opener for us and were opportunities we would not get to do here, like visiting the research labs. We are also very pleased to have come second and are grateful for all the help we were given in getting out there."

Barry Swainston

Universities Seminar 2011

The 2011 FSG and AAU Universities Seminar was held at the MSHATF at RAF Benson on 19th April. These annual seminars provide a forum for the Group and for Universities to bring each other up to date with current issues and ongoing work, and to exchange ideas for further collaboration.

Representatives from the Universities of Swansea, Hertfordshire, and Liverpool, and from City University, described their current activities, and Chris Neal described the potential of Merlin-type simulators, mentioning use with Simulink at UWE and networking of multiple simulators at Coventry.

The Seminar discussed its 'Challenges', and agreed on some measures to link these to study and research topics at universities. The FSG is planning a research and development themed conference in autumn 2012, and intends to encourage the AAU and other interested universities to participate or contribute papers.

Gordon Woolley

FSG Conference November 2011

This year's Autumn Conference will be held on 9th and 10th November in London. Titled 'The Contribution of Flight Simulation to Aviation Safety', it will look at the safety role of simulation in both large transport aircraft, and for light and general aviation, fixed and rotary wing, where accident rates are higher, and where the steadily improving cost-effectiveness of lower-end simulators can play a significant part. The programme is being finalised, and will be published in the next few weeks.

Conferences 2012

Outline planning for the 2012 spring and autumn conferences is now underway, though somewhat complicated by the impact that the London Olympics will have on accommodation and travel in the capital between June and October.

The Spring Conference, likely to be held in late April or early May, will look at the role of flight simulation in mission training and rehearsal. This will address the 'Phase 2' aspect of the IWG-Helicopters in defining requirements and standards for mission and task training, such as search and rescue, air ambulance, and so on, primarily for helicopters. It will lean heavily on military experience in this type of training.

The Autumn Conference, probably in late November, will have a research and development theme, bringing together aspects of R&D in academia and industry

Gordon Woolley

Research - Who needs it? (An Occasional Article)

The period from 1960-1980 saw dramatic advances in simulation technology:

- Visual systems moved from model boards to digital image generators;
- Projection systems provided wide field-of-view with natural depth;
- Hydraulic actuation produced powerful smooth motion cues;
- Detailed models were developed for fixed wing and rotary wing aircraft.

Many of these developments were novel, with several simulator manufacturers developing their own visual systems and even computers. Since the 1980s, the developments have slowed and nowadays manufacturers assemble their flight simulators largely from bought-in items and some of the technology is even sourced from other technology sectors, for example, image generators are based on computer cards developed for the games market.

So, is there a case for researchers to shut up the shop – job done? Well, several big questions remain unanswered:

- How effective is a simulator?
- What is the relationship between fidelity and training effectiveness?
- What components are needed to achieve a specific transfer of training?
- To what degree is motion necessary?

If an aerodynamicist is asked to improve the lift or drag characteristics of a wing, there is a wealth of papers and textbooks providing the solution to this problem. However, there are no such papers or textbooks in flight simulation to understand the training a flight simulator can deliver and consequently, the simulation industry produces flight simulators without any proven understanding of their effectiveness. Moreover, the benefits from reducing the cost of a simulator are far from clear. The counter argument is that modern simulation works well – pilots trained in simulators perform acceptably well in the aircraft – so what's the problem.

Of course, the reason why there are no answers is that nobody has done any research; airlines sell tickets, aircraft manufacturers sell aeroplanes, simulator manufacturers sell simulators, regulators ensure the air space is safe and accident investigators study the cause of accidents. They understandably have no research agenda. On the other hand, the universities lack simulation facilities and even if they had them, would need access to hundreds of pilots to assess training transfer.

Where do we go from here? The research agencies do not see flight simulation as a pressing problem and universities with minimal facilities are somewhat restricted in the research topics they can address. With negligible funding opportunities, researchers will seek out more fertile research topics and many of these questions will remain unanswered. It just seems counter-intuitive to have a discipline and an industry underpinned by advanced technology which fails to grasp the need to fund and undertake research in flight simulation. Flight simulation has a lot to learn from the disciplines of aerodynamics, propulsion and structures where advances have come about as a result of collaboration between industry and the universities.

Dave Allerton

FSEMC
Together "We Set the Standard."

The last FSEMC Conference was held in Brighton in September 2010. The conference went well, and attendance was excellent. We had well over 350 attendees, and historically for a conference outside of North America that is a terrific figure. FSEMC's influence is growing and more people are realizing the value of attending and participating in the conference. Thales did a masterful job of hosting and everyone had a great time. Even the weather in southern England cooperated for most of the week.

The presentations and discussions from the last conference, as well as previous conferences, are available at the FSEMC website:
http://www.aviation-ia.com/fsemc/reports/index.html

There are a number of current and potential Working Groups addressing different concerns:

- Simulator Quality Management System: currently working on Part 60 to JAR comparison

- Guidance for Export Control: Draft Report close to being mature, should be finalized at the next meeting
- ATC Environment Working Group: Seeking collaboration with RAeS, not sure if the technology is mature enough yet
- Malfunction Standardization Working Group: Plan to set up an exploratory meeting to try to define how this should go.
- Simulator Field Loadable Software Working Group: Follow on from a similar AEEC working group for the associated aircraft software, how it is handled in FSTD's
- Standard for Cost Effective Acquisition Working Group: Chaired by AMC, but also affects the training device community. Provide guidelines to purchasing groups so that FSTD concerns can be covered in contracts.

The call for FSEMC discussion items will be upcoming. Be sure to start collecting suitable topics and ideas from your own work areas, as well as your colleagues and submit them.

During the last FSEMC there was discussion about a User Group for Thales C90 simulator users and operators. Operators of those devices expressed a desire to share experiences and solutions amongst themselves and with Thales. Thales has expanded the focus to include pre-C2000X devices to make it into a Pre-C2000X User Group. Thales will host the initial User Group meeting at their facility in Crawley UK on June 29th and 30th this year. Please contact Lin Colyer (lin.colyer@thalesgroup.com) directly to obtain further information.

One major change for this upcoming conference will be the pricing structure. In the past, there has never been a fee to participate in the conference. There will be no charge to attend the meeting if you are FSEMC-AMC-AEEC Members, Corporate Sponsors, or AAI Member Organizations. Also Regulatory Agency members, Speakers, Airlines, and media will be exempt. If you do not fall into one of the categories then an individual fee will be assessed.

Please consider participation in this year's conference to be held in Orlando in September. See http://www.aviation-ia.com/fsemc/index.html for more information.

Contacts

FSEMC Steering Committee Chairman, Mike Jackson (mdjackson5@fedex.com)

FSEMC Executive Secretary, Sam Buckwalter (sbuckwal@arinc.com)

FSEMC Member or Sponsor information, Vanessa Mastros (vam@arinc.com).

ICFQ Report

1 Regulatory Update

Whilst disappointed that the workload and bureaucratic process of EASA will delay their formal adoption of ICAO 9625 edition 3 until 2015, the ICFQ are at least encouraged that their Comment Response Document for CS-FSTD A & H was published on the EASA web site in mid-November 2010 and includes positive references to the content of ICAO 9625 edition 3

EASA have previously stated that adoption of ICAO 9625 ed.3 would be delayed until the volume II rotary wing work had been completed. This draft is now released with expected publication by ICAO later in 2011. This should now allow EASA to proceed with their revisions for the adoption of 9625 starting in 2012.

Despite earlier indications to the contrary, the FAA have decided, in a response to a letter from the RAeS President that they are, 'for now', not going to adopt 9625. This is obviously a great disappointment and we will be working hard to change their mind. The current status of the adoption of ICAO 9625 is set out on Page 7. The recent statement from the FAA may unfortunately slow down some of these NAA Plans.

Our positive relationship with ICAO continues with the rotary wing 9625 Volume II submitted in February. Approval and publication by ICAO is anticipated later this year,

2 ICAO Document 9625 Edition 3 Update

Aeroplanes – Volume I

The Motion Task Team has succeeded in obtaining the financial sponsorship necessary for them to undertake the testing necessary to complete the frequency domain objective Motion Cueing Tests. The first meetings have been held and testing is underway at several research and industrial sites. The Time Domain test will follow at a future date.

Further discussion has occurred on the subject of tolerances for the visual light point vertical axis and an amendment agreed which will be included in the next document update.

A spreadsheet has been prepared to record these and other changes.

The maturity of ATC simulation has not yet reached the stage where a further update to 9625 is thought appropriate.

Helicopters – Volume II

Volume II has now been passed to ICAO for their editing review. Publication is expected in the autumn.

This represents a massive achievement by the small and dedicated team – establishing the first set of technical criteria for rotary wing FSTDs backed

by an unique training analysis. Means of recognizing their achievement are being discussed.

Based on this information, the H-IWG developed five 'baseline' FSTD devices to serve as the foundation of the working group's recommendations for new ICAO standards:

Type V Type-specific trainer designed for "Zero-Flight-Time Type Training;"
Type IV Type-Specific Recurrent Trainer;
Type III Type-Specific Non-Motion Trainer;
Type II VFR Trainer
Type I IFR Trainer.

The first three (types V, IV and III) were derived from existing training needs and have essentially similar features, though with different motion system capabilities. The proposed Type V is comparable to an existing Level D Full Flight Simulator and is capable of "Zero Flight Time Training" if the national regulator permits it The Type IV has a lower performance motion system than Type V, but would still cover most type-specific recurrent training tasks and some training to proficiency. The Type II Trainer envisioned by the H-IWG is unlike any existing FSTD, and could be used for type-specific training for private and commercial plots, as well as non-type specific training such as aeronautical decision making. A good example of this would be how to deal with flight in degraded visual environments. The Type I, IFR Trainer, requires less in the way of a visual system but needs good navigation, navaid and weather simulation models.

From the start of the IWG-H work, operational mission training e.g. search and rescue was not included in the training tasks. Now the basic document is completed there is pressure on the FSG, through the ICFQ to establish a second phase to analyse basic operational mission training.

In addition, the requirement to update the FSG Document "Data Package Requirements for Design and Performance Evaluation of Rotary Wing Synthetic Training Devices" remains an open action as does the need to develop the rotary wing version of our Evaluation Handbook.

There are major challenges associated with all three of these objectives and these should not be underestimated.

As we have learned from Volume I, achieving NAA adoption for Volume II, which breaks new ground in establishing rotary wing FSTD technical standards, should not be underestimated and will require further education of the NAAs.

3 RAeS Evaluation Handbooks

The updated version of Volume 1 of the handbook has been published. This version now covers the objective testing methodology for the entire family of FSTDs as defined in Doc 9625.

A small team continues work on Vol. II which has not been updated since 1997. Progress is slow due to the very specialized nature of the task but we are targeting publication later in 2011.

As a result of the publication of 9625 Volume II, it is likely that the RAeS Rotary Wing Simulator Data Requirements Document will need to be updated in the future.

4 Future Plans

At the February 2011 ICFQ Meeting, the Master Plan (see Page 7) was developed and agreed. As can be seen updates to 9625 are planned for early 2012 (to accommodate Volume II) and early 2013 (to accommodate ICATEE and ITQI changes).

5 Conclusions

The challenges and issues facing the ICFQ for the next year show no sign of diminishing. Much has been achieved but much remains to do especially in conjunction with the National Authorities.

The IWG and the ICFQ have been led by Don Irving since their inception. We have all benefitted from his experience, commitment, patience and leadership. Don now feels sadly that it is time for him to stand down and we thank him most sincerely for his contribution as Chairman over the last four years

Peter Tharp

Regulatory Affairs Update

1 National Qualification Requirements

Applications for the qualification of Flight Simulation Training Devices (FSTDs) made before 8th April 2012 can be to the JAR-FSTD (A or H) requirements and standards. Applications received after 8th April 2012 will need to be compliant with the EASA Implementing Rules and Certification Standards.

The European National Aviation Authorities have agreed to continue the principles of mutual recognition until the EASA Implementing Rules become effective.

2 European Aviation Safety Agency

Basic Regulation 216/2008 sets the framework for the extension of EASA's remit to cover Operations, Personnel Licensing and Third Country Operators.

The draft FSTD related documentation was published for consultation in the form of NPA 2008-22 (a), (b), (c), (d) & (e).

The implementing rules (IRs) for FSTDs were originally published within the Authority

Requirements (Part-AR) and Organisation Requirements (Part-OR). However, the European Council's reaction to EASA's final decision or opinion was to require that Parts AR & OR (and others) are incorporated into existing articles. It has not been decided where they will reside or when they will be published. The intention is that the content of the original Parts AR & OR remain unchanged and that they are 're-packaged' to be consistent with related documentation standards. They remain binding.

The Basic Regulation and the Implementing Rules are supported by acceptable means of compliance (AMC) and guidance material (GM) and are non-binding. In addition, the technical standards for FSTDs, based on JAR-FSTD A & H, are contained in Certification Standards, CS-FSTD A & CS-FSTD H, and are non-binding. However, the expectation is that the vast majority of all FSTD qualification activity will demonstrate compliance to the AMC/GM, because alternative approaches have to be assessed and confirmed as meeting the essential regulations. This in itself has potential impacts on timeframes and costs to industry.

The comment review documents for CS-FSTD A & H are published on the EASA web site but the Certification Standards will not be published until the decision on the publication standard of the Implementing Rules has been made.

A new Certification Standard (CS-SIM), as a consequence of the 'type certificate' requirements being placed on aircraft manufacturers to provide data to support FSTDs, is being developed. It is understood that this document will contain the data requirements for aircraft manufacturers and will be derived from the existing requirements in JAR-FSTD A & H.

3 Federal Aviation Administration

As of May 30th 2008 14 CFR Part 60 became effective for FSTD initial (& continuing) qualification and use. The FAA is developing a process to initiate directives. Directive 1, which addresses visual airport model fidelity for training, testing and checking was published in change 1 to Part 60.

New Statements of Qualification (SOQ) are being issued for new FSTDs to meet Part 60 requirements. The SOQ includes a detailed configuration list and a list of qualified tasks.

FAA Guidance bulletins published in 2010 & 2011 (so far):

(10-01) NVG Evaluation for Helicopter FSTDs
(10-02) Request for Initial & Continuing Evaluation of a Level 4 or 5 FSTD
(10-03) Class II and class III Visual Airport Model Evaluation
(11-01) FSTD Qualification for Upset Recovery Training (previously published but now under review)

Peter Barrack

Cranfield University Course: Introduction to Flight Simulation

The FSG provides support to Cranfield University's annual Introduction to Flight Simulation course. This year's course will be held from 31st October to 4th November. The course is suitable for people from a range of backgrounds working (or planning to work) in the simulator industry, for members of national aviation authorities responsible for the effective use of simulators, for managers of simulator facilities and other operational staff, for those involved in simulator procurement in government agencies or in aviation organisations, and for anyone seeking an overview of modern flight simulation.

For further information please go to the website via https://webapps2.cranfield.ac.uk/webforms/page.jsp?formId=7579 or email shortcourse@cranfield.ac.uk

Gordon Woolley

Contact Us

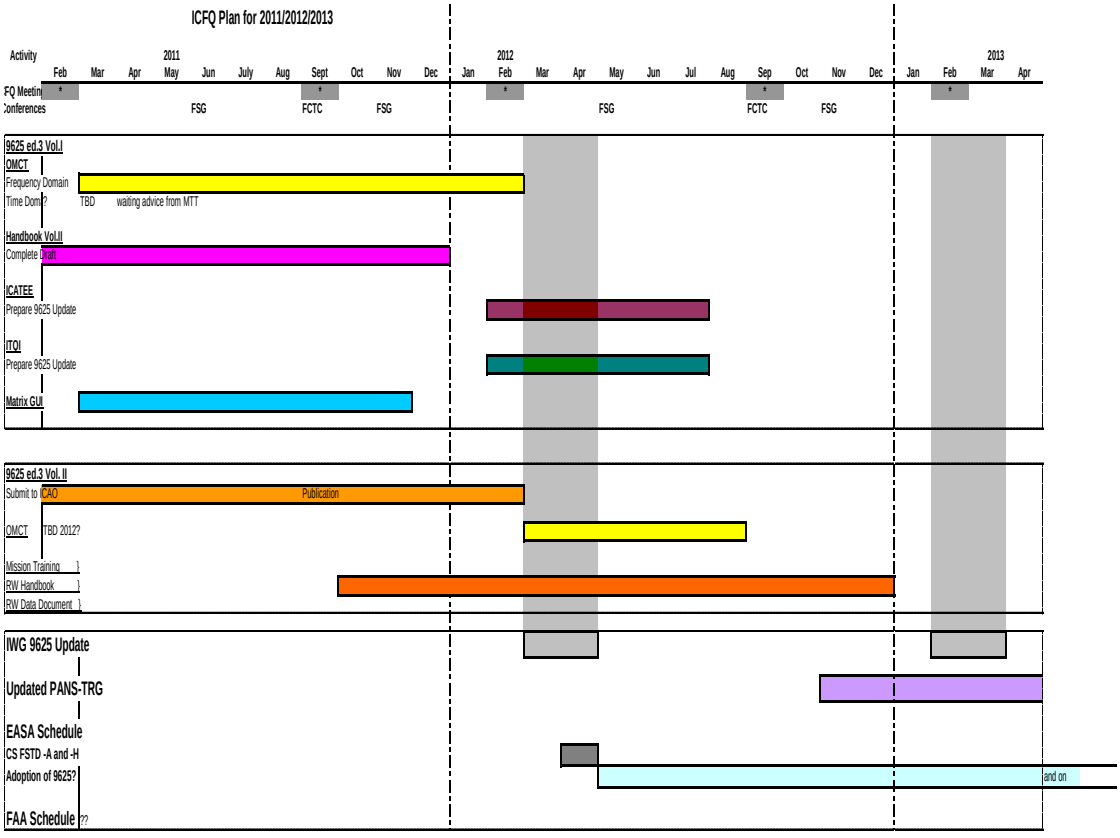
We would welcome feedback on this newsletter and contributions for future editions. Please feel free to contact us via the FSG Forum http://www.raes-fsg.org.uk/cgi-bin/yabb1/YaBB.pl

The FSG Forum provides opportunities to contribute to discussions on the major challenges facing the simulation and training community. You will be welcome to contribute.

If you are aware of anyone who might like to receive a copy of this newsletter, please forward their email address to the editor at d.j.allerton@sheffield.ac.uk?

IWG Adoption Status – February 2011

NAA-	Country	IWG Member	Formally Briefed ?	Supportive ?	Implementation Status
ICAO ANC	ICAO	□	YES	YES	Published 9625 Edition 3 in July 2009
EASA (UK CAA LBA, Fr DGAC)	EU	□	YES	YES	Rulemaking starts Q3 2012. Concludes Q3 2015/16
FAA	USA	□	YES	Varied	New CFR required?
CASA	Australia	□	YES	YES	Initial update stopped. Waiting for FAA/EASA
TC	Canada	□	YES	YES	Stated that they were adopting in full. Timescale not known.
CAAC HKCAD	China	□	YES	YES	Hopefully APATS 2011 will provide update
NZCAA	New Zealand	□	YES	YES	?
CAAS	Singapore		YES	YES	Have accepted as an alternate means of compliance
GCAA	Gulf States		YES	YES	Expected to follow EASA Compliance
JCAB	Japan			YES	?
KCAA Russia/TSAGI Brazil ANAC	Korea Russia South America South Africa	/		YES ? 	? ? ? Will probably follow EASA



ICFQ Master Plan