Summary – EASA Fuel Quality Seminar 24 November 2015

All participants of EASA's Fuel Quality Seminar were welcomed by Markus Görnemann. In his introductory speech he explained the background for this seminar: Field occurrences – e.g. one inflight shutdown and three ground starting problems – caused by operation of engines with contaminated fuel which triggered Rolls-Royce to take the initiative and propose it to EASA's former Certification Director, Dr. Norbert Lohl. The support was continued by his successor Trevor Woods.

Mark Wainwright, Rolls-Royce's Chief Engineer on the Trent XWB, presented the point of view (RR_Presentation_EASA_Fuel_Quality_Seminar_2015.pdf) of an engine manufacturer regarding fuel as a multifunctional fluid which is not only energy source for the combustion but also used for heat exchange, hydraulic operation as well as lubricant. He highlighted the key properties of fuel, and its impact on different aspects of engine design and operation. The fuel specification is important for definition of fuel properties, performance, composition and the related limitations on source materials and processes. Similar to other engine manufacturers, Rolls-Royce's contaminated fuel test exceeds the minimum requirements of the certification specifications to ensure safe operation. In-service contaminants from aircraft sources are mainly metal debris that is caught in the filters before the engine. Problematic are non-aircraft contaminants like super absorbent polymers (SAP) that pass the aircraft filters and can cause problems in the fuel metering units (e.g. at Cathay Pacific A330 Surabaya event in 2010). In the discussion after the presentation, it was mentioned that also other engine manufacturers have problems due to fuel quality. The investigation of fuel contamination events is often very difficult due to legal and commercial challenges (indemnification) between the various parties involved in the production, distribution, storage and handling of aviation fuel.

In the next presentation, Shell Aviation's Global Technical & Quality Manager Rob Midgley reminded the audience that fuel is one of the few single failure modes that could lead to unsafe aircraft conditions. Compliance with the specification Table 1 properties is only one aspect of fuel manufacturing because it does not cover all the requirements. The specification imposes additional limitations on materials and manufacture, such as no coprocessing of bio-components or no reprocessing of chemical slops. Interesting video animations showed the mixing of products in a transition phase in multi-product pipelines, the "Transmix" which needs to be extracted and redistilled for usage on other products. Nevertheless, recertification (comparison testing) of fuel batches becomes difficult because the testing is limited to the Table 1 properties of the fuel spec. The fuel supply chain from refinery to the airport is self-regulated by the industry. The newly developed EI/JIG 1530 shall be the industry standard for aviation fuel production and supply. Filter monitors – when being properly operated – are one of the best available ground devices for extracting water and contaminates from the fuel. The challenge is its proper operation at all the fuel depots/ airports around the world. Rob raised the question whether or not self-regulation is giving a consistent approach across the whole industry. And if something is self-regulated, how the compliance is ensured (considering that not enough auditing staff is currently available).

Ken Fontaine, Civil Aviation Authority UK, gave an overview about the Fuel Contamination Bowtie (-> see the presentations in the 'bowtie' folder) exercise that CAA UK carried out recently. CAA has been using bowties for risk analysis in aviation in the frame of its Safety Management System (SMS) because it identifies causal relationships in high risk scenarios. This method starts with a definition of

hazard(s) and top event(s) and continues with threats and consequences, as well as barriers. More details can be found on CAA's website
http://www.caa.co.uk/Safety-Initiatives-and-Resources/Working-with-industry/Bowtie/
The resulting bowtie diagrams (-> see Fuel%20Contamination%20Final%20V2.pdf in the bowtie folder) were shown. CAA is asking for the feedback of the aviation fuel community especially regarding threats and barriers – the feedback shall contribute to further updates of the bowtie diagrams.

In the following discussion panel, Conor Doheny of Cathay Pacific, Graham Osborn and Ross Walker of Airbus, and Mark Rumizen of Federal Aviation Administration, commented on the fuel contamination problem from the own point of view. In the further discussion, it was pointed out that the SAP contamination is different to the contamination with FAME (biodiesel). Conor Doheny explained what action Cathay Pacific has been taken after the Surabaya event. He mentioned that the situation at certain airport in developing countries remains challenging, as local law is not always reflecting the latest changes in fuel specifications and fuel manufacturing/handling standards. The ICAO document 9977 does not solve all these problems. Ross Walker mentioned the increasing risk due to new players in the fuel production/supply chain (new players that don't have be part of the aviation system in the past), and due to increased changes in the industry. A representative from CAA Croatia informed that they require operation in accordance to JIG 1/JIG 2 and they are issuing special certificates to the operators.

In the first afternoon session, KLM's Marco Schaefers, Chairman of the IATA Fuel Quality Pool (IFQP), presented IATA's extensive activities in this field (-> see IFQP_Presentation_EASA_Fuel_Quality_Seminar_2015.pdf). 154 airlines are participating in the IFQP, around 1500 airports around the globe are audited in accordance with IATA's Fuel Quality Manual, usually in a 24 month interval. As fuel is one of the most important parts of an airline's operating costs, not also the Technical Fuel Group, but also the Commercial Fuel Group is supporting IATA's member airlines in all fuel related topics, a.o. with regard to a Quality program that is required by the aviation authorities and that covers refuelling, fire prevention and fuel contamination. Following the FQP inspection of the aerodrome fuel facilities, around 900 reports per year (and per supplier at the airport) are issued. Findings are categorised in different levels. Level 1 findings are the most critical ones, e.g. missing certification at airfield storage, not calibrated pressure gauges, improper hose end pressure control valves (HEPCV) and in-line pressure control valves (ILPCV), failed fuel samples. Level 2 findings are non-compliances that lower the safety standard and hazard possibly the flight safety. Each year, the inspections result in around 5000 findings and 7000 observations . The top 5 findings are related fuel vehicles (filter types, interlocks, bonding cables etc.), test rigs, inlet/outlet filters, quality/safety management, and records. Remarkably fuel contamination is not among the top 5. IFQP is providing support e.g. in technical training and global harmonisation of fuel supply requirements. A new quality manual (3rd edition) is in preparation for release in 2016.
In the discussion, the activities of IFQP were very welcomed by the audience. The question was raised how the fuel quality can be ensured at airports that are not inspected by IFQP or JIG.

FAA's Senior Technical Specialist Mark Rumizen presented the current ASTM aviation fuel activities (-> see FAA_ASTM_Fuel_Specs_MRumizen_EASA_Fuel_Quality_Seminar_2015.pdf), like the increase of the FAME limit to 50 ppm with the intent to go to 100 ppm, coprocessing of conventional and

renewable components in the refining process, viscosity limits at low temperatures and additives like metal deactivating agents (MDA) or drag-reducing agents (DRA). He explained FAA's regulatory oversight of aviation fuel in the frame of Part 21 and Part 91, as well as indirect oversight via airlines in the frame of Part 121. Fuel is not certified as such, but as operating limitation for aircraft, engines, or APUs. For drop-in fuels, the operating limitations are unchanged, and the approval process is based on industry's qualification as described in ASTM D4054. Last part of Mark's presentation was an overview about the different alternative jet fuel pathways and its approval status in the ASTM process.

Lars Hjelmberg of Hjelmco Oil explained in a short presentation the specific situation for fuel supply in remote areas (-> see Hjelmco_Oil_Presentation_EASA_Fuel_Quality_Seminar_2015.pdf). In his opinion – which is based on several decades' experience – JIG4 is too heavy for such kind of operation. He sees the need for a "very light" JIG4 for smaller airfields and remote helicopter sites.

Due to time constrains, a general discussion took place instead of the planned afternoon panel discussion. The topic »SAP contamination« sparked several comments. There is no problem when the equipment is properly operated. Additional safe guards have been implemented (e.g. improved filter-monitor elements). A working group (led by Rob Midgley) is looking into the details of SAP migration. Another discussion point was about the best options for further improvements of fuel quality and for further harmonisation. One good option seems to be the direct reference of fuel supply standards (like JIG/EI 1530) in the fuel specifications. Work at ICAO level will still be continued. More EASA guidance was requested by some of the attendees. At the end of the Fuel Seminar, Markus Görnemann gave his thanks to all speakers and to all participants for their contribution that made the EASA Fuel Quality Seminar to be an successful event.