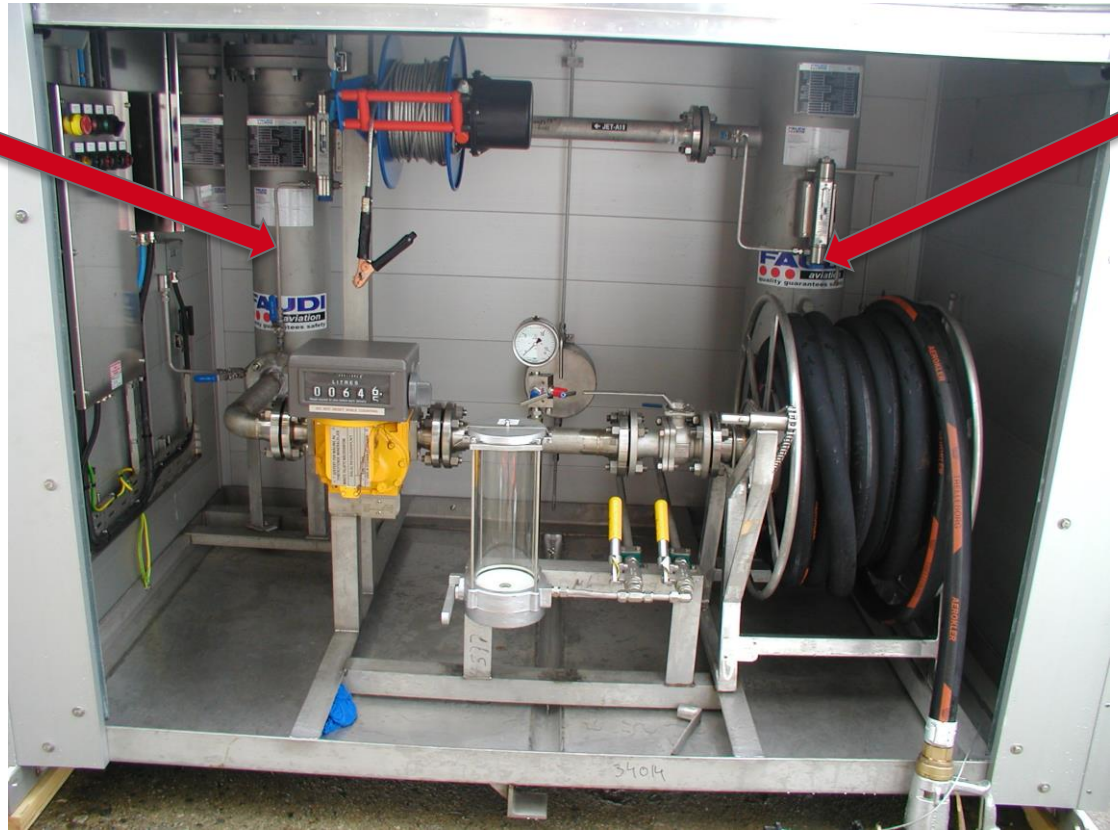
HELICOPTER FUELLING: FILTRATION

Purpose of this presentation

- Information about typical filtration solutions used offshore today.
- Information about industry changes related to filtration for offshore fuelling.
- Special focus on changes related to the withdrawal of EI 1583 - Monitor elements.
- Information on replacement technologies for Monitor elements.
- Current status in GOM?

Typical Helicopter fuel filtration

Filter Monitor
EI 1583

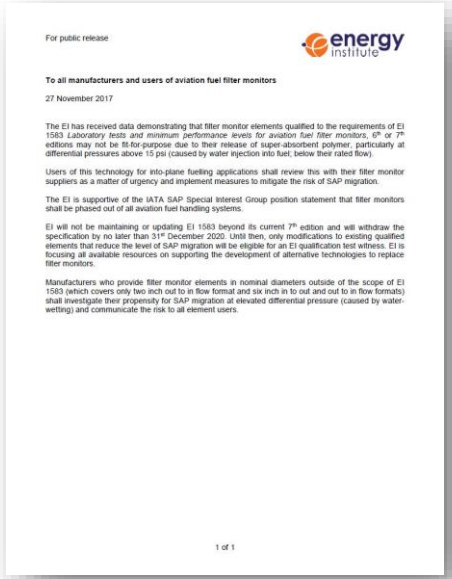


Filter Water
Separator
EI 1581

Withdrawal of Monitor Elements (EI 1583)

- Monitor Elements are manufactured with **Super Absorbent Polymers (SAP).**
- Under certain process conditions **SAP** has been found to **migrate** into the aircraft from these elements.
- SAP migration can cause **engine control issues** on aircrafts.
- As a result, in November 2017, the Energy Institute (EI) decided to withdraw their specification EI 1583 by **the end of 2020.**
- EI 1583 monitor elements are currently approved for use up until **June 2023.**
- However, some manufacturers have already **stopped producing** EI 1583 monitor elements after consultation with lawyers to avoid litigation.
- The Industry filtration companies have worked to develop **new types of technologies** to replace the EI 1583 Monitor Elements without potential of SAP migration.

Industry Information



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energy institute

To all manufacturers and users of aviation fuel filter monitors

27 November 2017

The EI has received data demonstrating that filter monitor elements qualified to the requirements of EI 1583 *Laboratory tests and minimum performance levels for aviation fuel filter monitors*, 6th or 7th editions may not be fit-for-purpose due to their release of super-absorbent polymer, particularly at differential pressures above 15 psi (caused by water injection into fuel, below their rated flow).

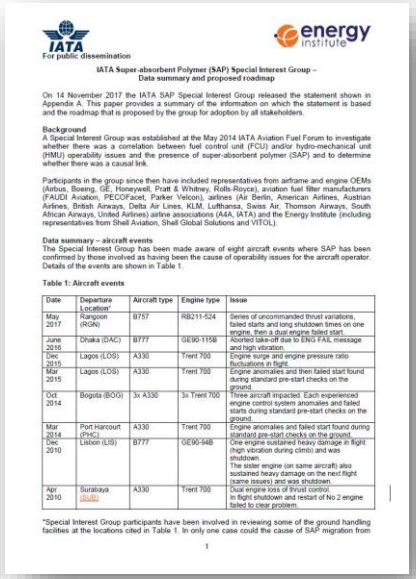
Users of this technology for into-plane fuelling applications shall review this with their filter monitor suppliers as a matter of urgency and implement measures to mitigate the risk of SAP migration.

The EI is supportive of the IATA SAP Special Interest Group position statement that filter monitors shall be phased out of all aviation fuel handling systems.

EI will not be maintaining or updating EI 1583 beyond its current 7th edition and will withdraw the specification by no later than 31st December 2020. Until then, only modifications to existing qualified elements that reduce the level of SAP migration will be eligible for an EI qualification test witness. EI is focusing all available resources on supporting the development of alternative technologies to replace filter monitors.

Manufacturers who provide filter monitor elements in nominal diameters outside of the scope of EI 1583 (which covers only two inch out to in flow format and six inch in to out and out to in flow formats) shall investigate their propensity for SAP migration at elevated differential pressure (caused by water-wetting) and communicate the risk to all element users.

1 of 1



IATA

For public dissemination

energy institute

IATA Super-absorbent Polymer (SAP) Special Interest Group – Data summary and proposed roadmap

On 14 November 2017 the IATA SAP Special Interest Group released the statement shown in Appendix A. This paper provides a summary of the information on which the statement is based and the roadmap that is proposed by the group for adoption by all stakeholders.

Background

A Special Interest Group was established at the May 2014 IATA Aviation Fuel Forum to investigate whether there was a correlation between fuel control unit (FCU) and/or hydro-mechanical unit (HMU) operability issues and the presence of super-absorbent polymer (SAP) and to determine whether there was a causal link.

Participants in the group since then have included representatives from airframe and engine OEMs (Airbus, Boeing, GE, Honeywell, Pratt & Whitney, Rolls-Royce), aviation fuel filter manufacturers (FAUDI Aviation, PECO/Facet, Parker Velcon), airlines (Air Berlin, American Airlines, Austrian Airlines, British Airways, Delta Air Lines, KLM, Lufthansa, Swiss Air, Thomson Airways, South African Airways, United Airlines) airline associations (AEA, IATA) and the Energy Institute (including representatives from Shell Aviation, Shell Global Solutions and VITOL).

Data summary – aircraft events

The Special Interest Group has been made aware of eight aircraft events where SAP has been confirmed by those involved as having been the cause of operability issues for the aircraft operator. Details of the events are shown in Table 1.

Table 1: Aircraft events

Date	Departure Location*	Aircraft type	Engine type	Issue
May 2017	Rangoon (RGN)	B757	RB211-524	Series of uncommanded thrust variations, failed starts and long shutdown times on one engine, then a dual engine failed start.
June 2016	Dhaka (DAC)	B777	GE90-115B	Aborted take-off due to ENG1 FAIL message and high vibration.
Dec 2015	Lagos (LOS)	A330	Trent 700	Engine surge and engine pressure ratio fluctuations in flight.
Mar 2015	Lagos (LOS)	A330	Trent 700	Engine anomalies and then failed start found during standard pre-start checks on the ground.
Oct 2014	Bogota (BOG)	3x A330	3x Trent 700	Three aircraft impacted. Each experienced engine control system anomalies and failed starts during standard pre-start checks on the ground.
Mar 2014	Port Harcourt (PHC)	A330	Trent 700	Engine anomalies and failed start found during standard pre-start checks on the ground.
Dec 2010	Lisbon (LIS)	B777	GE90-94B	One engine sustained heavy damage in flight (high vibration during climb) and was shutdown. The sister engine (on same aircraft) also sustained heavy damage on the next flight (same issues) and was shutdown.
Apr 2010	Surabaya (SUB)	A330	Trent 700	Dual engine loss of thrust control in flight shutdown and restart of No 2 engine failed to clear problem.

*Special Interest Group participants have been involved in reviewing some of the ground handling facilities at the locations cited in Table 1. In only one case could the cause of SAP migration from

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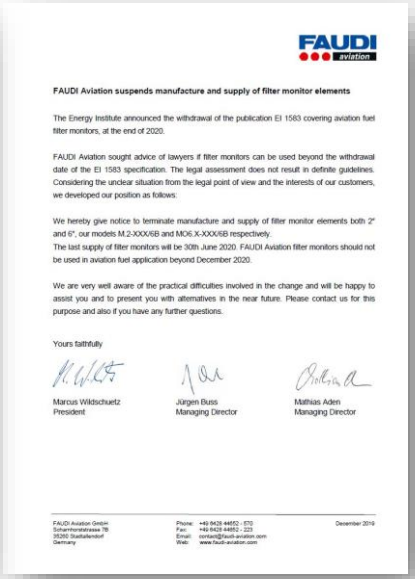

FAUDI aviation

FAUDI Aviation suspends manufacture and supply of filter monitor elements

The Energy Institute announced the withdrawal of the publication EI 1583 covering aviation fuel filter monitors, at the end of 2020.

FAUDI Aviation sought advice of lawyers if filter monitors can be used beyond the withdrawal date of the EI 1583 specification. The legal assessment does not result in definite guidelines. Considering the unclear situation from the legal point of view and the interests of our customers, we developed our position as follows:

We hereby give notice to terminate manufacture and supply of filter monitor elements both 2" and 6", our models M.2-XXX/6B and MO6.X-XXX/6B respectively.
The last supply of filter monitors will be 30th June 2020. FAUDI Aviation filter monitors should not be used in aviation fuel application beyond December 2020.

We are very well aware of the practical difficulties involved in the change and will be happy to assist you and to present you with alternatives in the near future. Please contact us for this purpose and also if you have any further questions.

Yours faithfully

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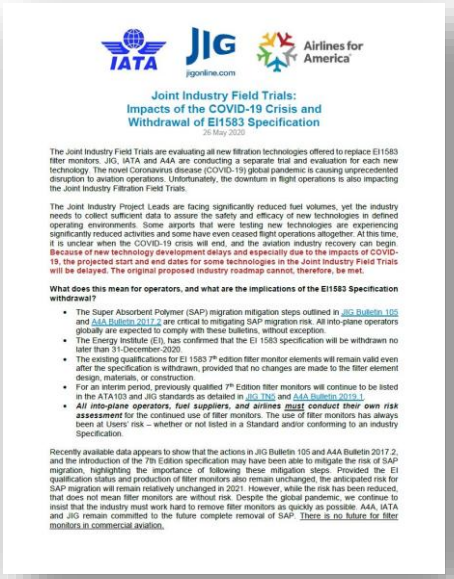
December 2019



IATA JIG jigonline.com Airlines for America

Joint Industry Field Trials: Impacts of the COVID-19 Crisis and Withdrawal of EI1583 Specification

26 May 2020

The Joint Industry Field Trials are evaluating all new filtration technologies offered to replace EI1583 filter monitors. JIG, IATA and A4A are conducting a separate trial and evaluation for each new technology. The novel Coronavirus disease (COVID-19) global pandemic is causing unprecedented disruption to aviation operations. Unfortunately, the downturn in flight operations is also impacting the Joint Industry Filtration Field Trials.

The Joint Industry Project Leads are facing significantly reduced fuel volumes, yet the industry needs to collect sufficient data to assure the safety and efficacy of new technologies in defined operating environments. Some airports that were testing new technologies are experiencing significantly reduced activities and some have even ceased flight operations altogether. At this time, it is unclear when the COVID-19 crisis will end, and the aviation industry recovery can begin. **Because of new technology development delays and especially due to the impacts of COVID-19, the projected start and end dates for some technologies in the Joint Industry Field Trials will be delayed. The original proposed industry roadmap cannot, therefore, be met.**

What does this mean for operators, and what are the implications of the EI1583 Specification withdrawal?

- The Super Absorbent Polymer (SAP) migration mitigation steps outlined in JIG Bulletin 105 and A4A Bulletin 2017.2 are critical to mitigating SAP migration risk. All into-plane operators globally are expected to comply with these bulletins, without exception.
- The Energy Institute (EI), has confirmed that the EI 1583 specification will be withdrawn no later than 31-December-2020.
- The existing qualifications for EI 1583 7th edition filter monitor elements will remain valid even after the specification is withdrawn, provided that no changes are made to the filter element design, materials, or construction.
- For an interim period, previously qualified 7th Edition filter monitors will continue to be listed in the ATA103 and JIG standards as detailed in JIG TN5 and A4A Bulletin 2019.1.
- ***All into-plane operators, fuel suppliers, and airlines must conduct their own risk assessment*** for the continued use of filter monitors. The use of filter monitors has always been at Users' risk – whether or not listed in a Standard and/or conforming to an industry Specification.

Recently available data appears to show that the actions in JIG Bulletin 105 and A4A Bulletin 2017.2, and the introduction of the 7th Edition specification may have been able to mitigate the risk of SAP migration, highlighting the importance of following these mitigation steps. Provided the EI qualification status and production of filter monitors also remain unchanged, the anticipated risk for SAP migration will remain relatively unchanged in 2021. However, while the risk has been reduced, that does not mean filter monitors are without risk. Despite the global pandemic, we continue to insist that the industry must work hard to remove filter monitors as quickly as possible. A4A, IATA and JIG remain committed to the future complete removal of SAP. There is no future for filter monitors in commercial aviation.

HSAC RP 163 (Appendix 4 – section 19.3):

- Requires all systems to include Filter Water separator (FWS) – EI 1581.
- Requires all systems to include Filter Monitor – EI 1583.

CAP 437 (Version 8.2 – Chapter 7):

- Will allow for only Filter Water Separator (FWS) EI 1581 to be used.
- Replacement technology EI 1598 + EI 1599 (EWS + Dirt Defence) accepted.
- Monitor elements allowed till maximum July 2023.
- Replacement technology EI 1588 (Water Barrier) – Pending adoption to JIG Standards.

NOG Guideline 074 (Norway):

- Replacement technology EI 1598 + EI 1599 (EWS + Dirt Defence) accepted.
- Monitor elements allowed till 30th of June 2022
- Replacement technology EI 1588 (Water Barrier) - Pending adoption to JIG Standards.

Replacement Technologies

Faudi Aviation	Parker Velcon	Facet
EI 1598 – AFGUARD Water Sensors EI 1599 – Dirt Defence Elements	EI 1588 – CDF-X Water Barrier Element	EI 15xx – Water Containment Element
Status: Adopted to JIG and ATA103 standards. Approval for use given in August 2020. Ref JIG Bulletin 130	**Status**: 2'' elements adopted in US. Ref: A4A Bulletin 2022.1 JIG will not adopt into standards at this time. Ref: JIG Bulletin 143	**Status**: Facet have withdrawn their water containment element technology until further notice

TN #10	Filter Monitor Transition update	29/12/2021

TABLE 2: Status of all proposed technologies.

Process step	DDF/EWS [1] FACET 2"	WCF FACET	DDF/EWS [1] FAUDI 2" & 6"	WBF[2] PARKER 2"	WBF PARKER 5" & 6"
1 - Filter Qualification	Completed	EI Specification yet to be developed.	Completed	Completed	EI 1588 2nd edition in preparation
2 - Robustness Assessment	Withdrawn by Facet		Completed	Completed [3]	TBC - May not be required depending on the details of 2nd edition.
3 - Field Trial			Completed	In progress	
4 - Evaluation of results			Completed	In progress	
5 - Adopt in Standards			Completed		

Why safety barrier might be needed

- For several decades (nearly) all fuel systems offshore have had Filter Monitors installed to «monitor» the condition of the fuel delivered to the helicopters.
- Reason being the the Filter Water Separator (FWS) is not a failsafe technology.
- Attached are some excamples where we see that the FWS has failed, or potentially could fail, due to incorrect system operation or installation.
- Excamples are found during inspections done in the last years.

Bacterial Growth

Incorrect type of elements

Incorrect flowrate/installation

High Water content