228. The flow of information was slow owing in part to the difficulty in reconstructing fuelling events over a 5 week period and identifying the aircraft that had received fuel during that time. The Inquiry noted that whilst post-crash management is a considered and practiced evolution, incidents short of a crash are not, other than airfield reactions to a declared air emergency. The lack of a plan was a **latent weakness** in the **system defences**.

229. Resident aircraft were informed in a reasonable timeframe but visiting and civilian aircraft were lamentably slow. In particular, it was appreciated immediately that the Air Seychelles charter air-bridge was airborne at the time of the discovery, yet Air Seychelles were not informed for 4 days. Whilst concerns over security and a lack of the full picture coupled with the empirical evidence of 5 weeks of flying on the contamination influenced this decision, the Inquiry considers the decision to delay informing civilian aircraft was a **mistake**.

230. The lack of formal reporting was principally as a result of 2 unintended **lapses**; the fuel contamination report was never considered and the request to raise a DFSOR was forgotten.

231. The lack of a contamination report was not germane to the incident as discovery and the subsequent use of the report would have occurred after the events in question. However, the Inquiry makes the **observation** that the use of a formal report would have assisted in informing a wider audience.

RECOMMENDATIONS

- 1.5.28
- 1.5.29
- 1.5.30
- 1.5.31

The application of FSII to the runway

INTRODUCTION

232. Once the source of the contamination was discovered, it was soon appreciated that the glycol that did contain FSII had also been misidentified and used as ICA.

FINDINGS

233. ICA and other aircraft de-icers are kept at a compound on the airfield known as the ICA Compound. This provides purpose built bulk storage tanks for ICA and AL-34. Prior to decanting the glycols, 80,372 litres of ICA was in holding tank 2. S&AMS staff then added 20,000 litres of ICA from Glycol GESU8003192, and 20,000 litres of FSII from Glycol GESU8003314, bringing the total in the tank to 120,372 litres. At this stage, the percentage of FSII within the tank would have been 16.6%. When issued to the ASMT runway sprayer, the ICA was diluted with water at a ratio of 50%, the reasons for which are discussed in the section on the use of ICA. As a result, the contamination levels of FSII sprayed on the runway were no greater than 8.31% of the total volume. Figures from well-maintained MT Ops records show that the total amount of product, including water sprayed on the airfield surfaces was 125,340 litres, which emptied the holding tank completely by 6 Aug 11 and necessitating a switch to tank one. Details of the spraying operations are in the ICA usage and precipitation spreadsheet, at **Annex BB**.

234. **Effect on the runway**. Univar Ltd advised that no tests had been carried out on the possible effects on marshal asphalt although they anticipated that it could soften the bitumen surface. Inspections of the marshal asphalt surfaces were carried out on 9 Aug 11 and 11 Aug 11. All areas were inspected paying particular attention for any indication of softening or opening of the marshal asphalt surface. No indication was found of the surface softening or any opening up of the surface finish. No de-bonding of the 'Addagrip' sand coating to the concrete touchdown ends was found. DIO's consultant for the runway resurfacing project advised that because the substance is water soluble and with the rain, snow and strong winds over the weeks when it was applied, the FSII would have been quickly diluted even further and if any softening was going to happen, he was content that it would have been appreciable during the inspection.

235. **Health and Environment**. Once alerted to the incident, the Theatre Health and Safety Officer (THSO), with the assistance of Interserve's chemist, compared the hazard data sheets for FSII and ICA and assessed the application and precipitation data, and concluded that the FSII (in the concentrations and volumes applied to the runway) presented no significant health and environmental risks over and above that presented by the normal use of ICA solution. The runway drains to the MPC sewage plant, which was checked for any abnormal indications; there were none, and indeed, the plant seemed to be better health than would normally be expected, following the incident. On this basis, the THSO advised that no health or environmental action was required and there was no requirement to report an environmental contamination incident or inform the local authorities.

Safety data

236. The Inquiry noted that in various areas involved in the incident, FSII has been described variously as dangerous, highly volatile, highly toxic or simply "nasty stuff". Indeed, the main holding tank at the PSD denotes the contents as FSII and 'high toxic' (See **figure 10**).

Figure 10 – Main FSII tank warning labels

237. The manufacturer's safety data (at **Annex ZZ**) includes the assessment that exposure may cause slight temporary eye irritation, prolonged skin exposure is not likely to cause significant irritation or result in absorption. No adverse results are anticipated from single cases of inhalation and small amounts swallowed incidentally as a result of handling are not likely to cause injury due to its low toxicity. The advice goes on to record that studies in laboratory animals indicate slight toxicity to the foetus following skin contact at nontoxic levels to the mother. Birth defects have been seen only following high oral doses which have little relevance to human exposure. It also notes that it is combustible but stable under recommended conditions.

238. The supplier's safety data sheet for FSII (at **Annex AAA**) notes that it may be an irritant if inhaled in high concentrations, it may cause discomfort if swallowed, and it may irritate the skin and eyes on contact. Under hazard identification it states that it is suspected of damaging the unborn child. It is also states under fire-fighting measures that the product is not flammable. DE&S's safety data sheet is at **Annex BBB** and repeats the majority of the advice from Univar although it also suggests that: it is harmful if swallowed; there is a possible risk of harm to the unborn child; full PPE is recommended including respiratory equipment if exposure to high concentrations is likely; and that supply labels should include the symbol for harmful.

239. **Mistaken Reporting.** In the aftermath of the contamination incident the Inquiry saw several incidences of misinterpretation and mistaken reporting including describing FSII as having carcinogenic properties and posing 'a risk to unborn children'. This may be as a result from interpreting the detail from the original manufacturer's data but may also be a legacy from when the composition of FSII was slightly different over 15 years ago, when there were concerns over possible carcinogenic effects. Initial concerns over the toxicity of FSII were clearly unfounded but both the medical centre and MT section at MPC were advised to watch for any respiratory or skin complaints from any airfield operatives.

CONCLUSIONS

240. There are no significant health and safety or environmental protection issues associated with the incidents and this aspect of the incident was well handled. There was no evidence of any damage to the runway as a result of the mistaken application of FSII. The Inquiry noted that inspections are continuing to ensure that this remains the case.

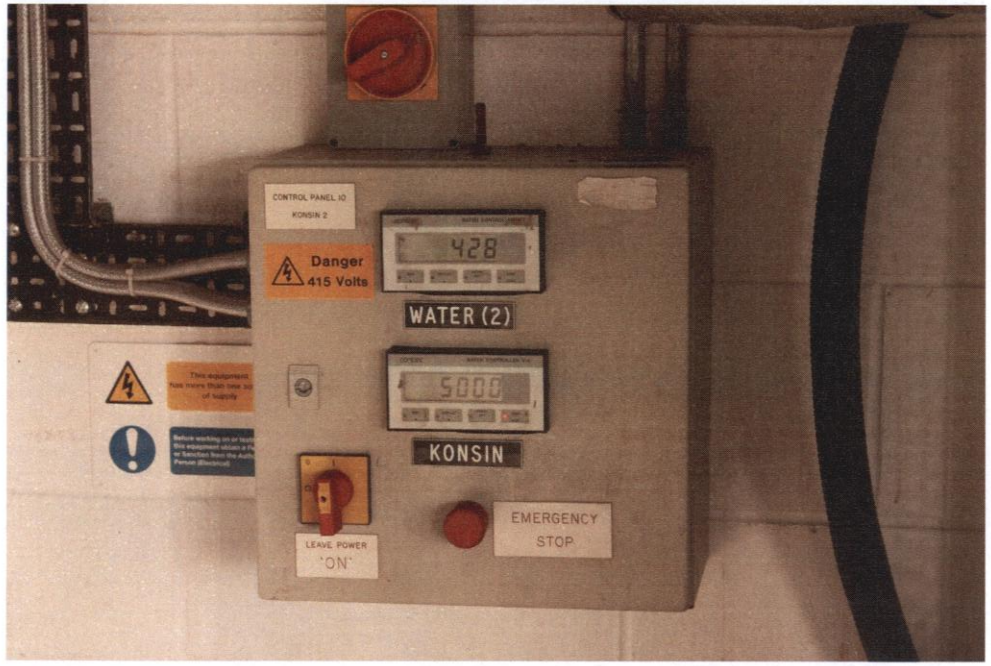
241. Subsequent iterations of safety data had elevated cautionary advice or had quoted sections out of context or applied generic 'chemicals' handling advice. Whilst erring on the side of caution cannot be criticised, the Inquiry considered that there is an unnecessary perception of the hazard posed by FSII. This had no bearing on the contamination event but the Inquiry **observed** that the inaccurate use of health and safety information caused a distraction and raised unnecessary concerns amongst personnel and therefore was considered a **latent weakness** as **an error provoking condition**.

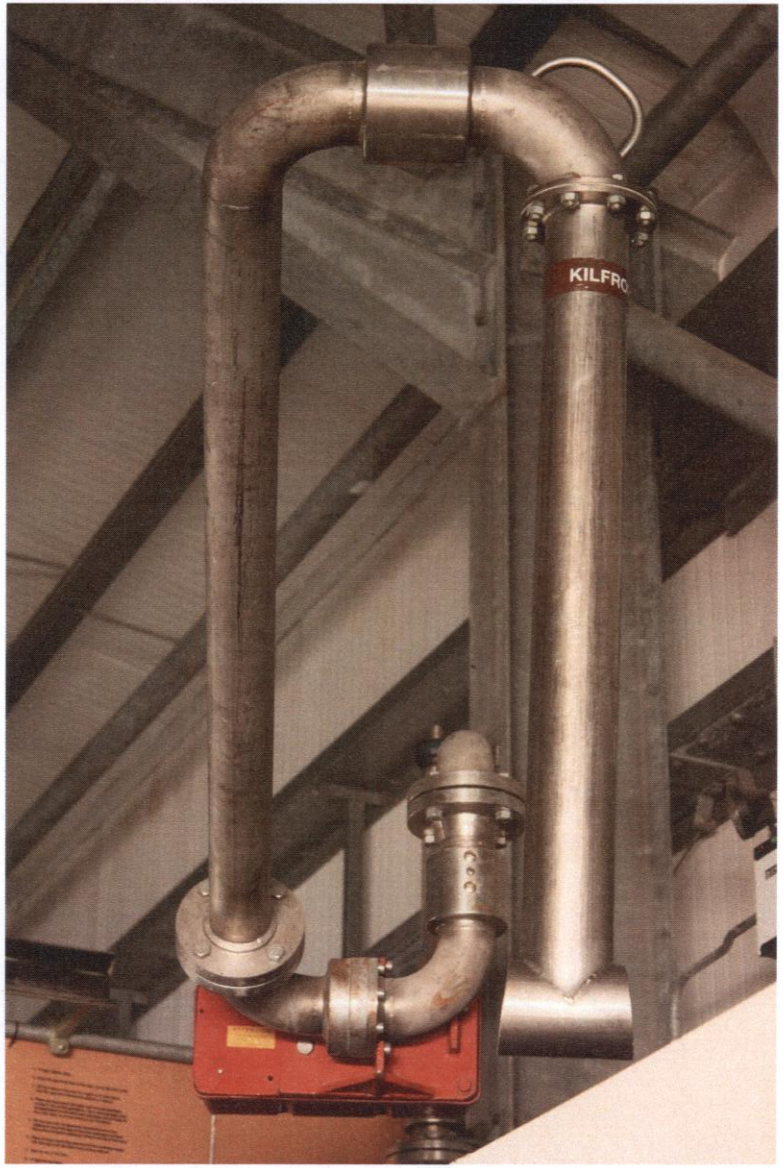
242. The Inquiry noted a minor risk of cross contamination of products at the ICA compound. Supply valves to the bulk storage tanks were very clearly labelled but used the proprietary name Konsin for the ICA storage tanks, as did control panels and delivery pipes. Similarly, AL-34 tanks, valves and delivery pipes were labelled Killfrost (sic), as indicated in figure 11. Although this had no bearing on the incident, the Inquiry **observed** that it could generate confusion in future and represented a **latent weakness**.

RECOMMENDATIONS

- 1.5.32
- 1.5.33

Figure 11 – Labelling at the ICA compound





AL-34 contamination

INTRODUCTION

243. During the Panel's visit to the Falkland Islands, there was sufficient doubt about the methods adopted to identify all the glycols at the ICA compound that the Inquiry sought composite testing of a sample from the AL-34 storage tank and one from the ICA storage tanks to support suppositions of where the contents of each glycol had gone. The Panel then began to investigate the possible contamination of all products within the ICA compound.

FINDINGS

244. By the time testing on the tanks was requested, the ICA tank was empty but samples were drawn from the AL-34 tank and sent to Intertek. The initial response on 31 Aug 11 (**Annex CCC**) noted that the sample had failed the specification for appearance and freeze point (detailed in the Intertek report at **Annex DDD**) but that this was not unusual and the de-icer was fit for use. S&AMS staff requested confirmation that there was no MEG in the AL-34 as there remained a possibility that the second ICA glycol GESU8003192 had been decanted into the AL-34 bulk tank. The Intertek sample report on 6 Sep 11 at **Annex FF** demonstrated an initial concentration of 4,000 ppm EG. DF&FS requested a re-sample to rule out sample equipment contamination, which was duly provided. On 2 Sep 11 DF&FS confirmed that the AL-34 preliminary results indicated the presence of MEG albeit at much lower levels than the first test indicated, and recommended quarantining the bulk tank. On 12 Sep 11 Intertek provided the final results (also at **Annex FF**) from the AL-34 bulk tank from upper, middle, and lower tank samples. The results revealed MEG concentrations of:

Upper: 483 ppm
Middle: 497 ppm
Lower: 516 ppm

245. The Inquiry considers that the variance in the EG concentrations between the initial sample and the final test results are most likely due to poor sampling. DF&FS advised MPC of the confirmed results on 13 Sep 11 and recommended that the AL-34 was not fit for use unless prior authorisation was given from the appropriate PTs or OEMs – the email is at **Annex EEE**. Analysis of Intertek's report by 1710 NAS MIG opines that at these concentrations (<1 %) the contamination of EG would have had no detrimental effect on aircraft performance or aircraft surfaces or a reduction in the capability of the fluid as an aircraft de-icer, particularly as MEG and MPG have very similar chemical properties; the email is at **Annex FFF**.

246. Subsequent investigations revealed that the contaminated AL-34 had been issued to one bowser (recorded in the AL-34 issue log at **Annex GGG**) and applied to only one aircraft on 3 separate occasions: C130 J Hercules Tail No: ZH 884, on 25 Jun 11, 2 Aug 11 and 20 Aug 11. No issues were reported following any of the applications.

247. The concentration in both the initial sample and subsequent samples are too small to suggest that 20,000 litres of ICA were added to the AL34 tank. Witness testimony (**Statement 10**) provided that there was only one connection coupling available at the time the decanting took place so the contamination may have come from this shared source. The volume in the tank was approximately 70,000 litres based on the amount that was removed and placed in glycols awaiting disposal. The contamination level, assuming an equal spread, would have equated to 0.35 litres; an amount that could conceivably be left in a coupling attachment following prior use. However, the same witness testimony also suggested that the AL-34 glycol was the first to be decanted, so this amount would have had to have remained in the coupling from a previous decanting operation.

Consequently, the scenario became less plausible so the Inquiry could not rule out the possibility that a considerable volume of ICA had been added to the AL-34 bulk tank at some stage previously.

CONCLUSION

248. As there was only one coupling and no SOP for the decanting operation (discussed in the section on receiving the glycols) there was no instructions to flush through the coupling prior to use. The lack of an SOP or a dedicated coupling was a **latent weakness** and **contributed** to this contamination event. In the absence of instructions or clearly identified and dedicated equipment, a **mistake** was made when SNCO Av Fuels elected to use part of the same equipment for both decanting operations, without appreciating the possible consequences.

RECOMMENDATIONS

- 1.5.34
- 1.5.35

SECTION 5 – BROADER ISSUES

MOD fuel supplies

INTRODUCTION

249. The apparent ease with which jet fuel was contaminated and the inability to detect the contamination led naturally to concerns over supplies in the UK, other Permanent Joint Operating Bases (PJOB) and other operational theatres, particularly where fuel additives were being used.

FINDINGS

UK supplies

250. UK supplies are overseen on behalf of the MOD by the Oil and Pipeline Agency who are an executive Non-Departmental Public Body (NDPB)[16], established under an Act of Parliament (The Oil and Pipelines Act 1985) and are responsible for managing the Government Pipeline and Storage System (GPSS). The OPA oversees all aspects of the operation and maintenance of the pipeline and storage facilities, ensuring that UK military requirements for aviation fuel are met. The MOD sponsors the OPA through DE&S Commercial Directorate, although this was formerly under the auspices of DFG. For daily operation of the system, the OPA contracts 2 companies to manage the GPSS on its behalf – GreyStar and Babcocks.

251. The GPSS consists of some 2,500 km of underground cross-country pipelines of differing diameters, together with storage depots, salt cavities, associated pumping stations, receipt and delivery facilities and other ancillary equipment. An outline map of the GPSS is at **Annex HHH**. Most of the storage depots are connected to the pipeline ring main, which in turn is supplied by the majority of the major refining centres and port areas in England. The OPA also provides oversight of a number of independent pipelines and depots situated elsewhere in England and Scotland. The system receives, stores, transports and delivers light oil petroleum products for military and civil users. Fuel is procured through the Bulk Fuels Framework Agreement from one of 8 contractors; BP, Shell, Q8, Cepsa, WFS, Spa and MOH.

252. The GPSS supplies the following RAF stations direct from the ring main: Waddington; Coningsby; Brize Norton; Marham; and Wittering. RAF Lossiemouth is supplied from a dedicated pipeline from Inverness PSD which is supplied by Ocean Tanker and RAF Leuchars is supplied via a dedicated pipeline from Linkswood PSD, which in turn is supplied by rail tankers; both under the auspices of the GPSS. The following locations are supplied by road tanker direct from a PSD on the ring main: Backford North PSD for Shawbury, Stafford and Valley; Hallen PSD for RNAS Culdrose, RNAS Yeovilton, Credenhill, Middle Wallop, Netheravon, Benson, Odiham, Chivenor, Fleetlands, Rolls Royce, St Athan; Misterton PSD for Cranwell, Linton-on-Ouse, Scampton, Dishforth, Boulmer, Leconfield and Leeming; Sandy PSD for Northolt; Thetford PSD for Honington, Manston and Wattisham. Two other locations are served by road tanker from a variety of sources: HMS GANNET and Aldergrove. Road tanker deliveries from PSDs to units are contracted to Wincanton.

253. Regardless of the method of delivery to a unit, the Inquiry has seen evidence of robust assurance processes that support a philosophy that the product is increasingly quality assured as it is progressively filtered and tested on its way through the system. This includes receipting,

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[16] An NDPB is a body that has a role in the process of national Government, but is not a Government Department or part of one, and which accordingly operates to a greater or lesser extent at arms length from Ministers. MOD NDPBs are split into those with executive and those with advisory functions. Executive bodies usually carry out prescribed functions within Government guidelines, and receive some sort of funding from their sponsoring Departments.

loading, storage and delivery processes that rely on Certificates of Quality or Conformity for receipting and operation of delivery mechanisms and go-no-go quality test on the fuel when ownership is being changed. Furthermore, all additive dosing in UK is conducted at the supplying PSDs before the product is delivered to units. Again, no testing of bulk additives is conducted, but the same stringent acceptance procedures appear to tightly control the acceptance of product from the manufacturer, as documentation from the supplier is checked and in particular, the certificate of quality or conformity. As a result of a close call at one blending site, it is now unlikely that substances could be mixed up as FSII is supplied in tankers and AL-61 is supplied in barrels.

254. Acknowledging that whilst a pipeline delivery offers a good deal of security and assurance for the product, the use of road tankers creates an additional risk. Accordingly, the Inquiry examined the processes at Misterton PSD and found similarities with the safe systems demonstrated by Univar. Before any loading operations, loading consignment notes are checked to confirm the requirement. A meter ticket is then issued which controls delivery mechanisms. Different substances are physically separated by different loading bays. All vehicles and barrel tanks are required to meet industry standards and regulations. Finally, sampling is conducted for every load for density and temperature, water check, appearance and conductivity, together with a refractometer test. As with the standard testing considered in the section on specification and testing, sampling would be unable to detect contamination, either deliberate or mistaken, but any deviation from the acceptable test ranges is quarantined and reported.

Worldwide supplies

255. Bulk Aviation fuel supplied under the auspices of the military procurement and delivery system overseen by DF&FS is supplied to: Ascension, Cyprus and the Falkland Islands by Ocean Tanker and via road to BATUK, BATUB and Germany. Concerning the use of glycols, the Inquiry noted that Ascension only received 205 litre drums of FSII and Cyprus had already taken considerable steps to ensure receipting processes were adequately addressed with the production of a local work order (at **Annex III**) and briefing for all fuels staff. Elsewhere, supply is via host nation support (eg Italy for Libyan operations), a lead nation under NATO or UN operations or a commercial contractor (as for Supreme in Afghanistan). In each case, varying levels of assurance are provided, with DF&FS, Air Command Fuels Ops Cell (formerly the Role Office) or PJHQ (dependent on capacity and availability at the time) providing an assessment of the facilities at the point of delivery.

256. For new requirements in support of operations and exercises overseas, a reconnaissance party will investigate the availability of fuel at the proposed location. The purpose of the reconnaissance party is to seek assurance that the third party is capable of delivering aviation fuel safely. The reconnaissance party work for the sponsoring organisation for the deployment and it is their responsibility to assess the risk and pass the assessment to the operators. DF&FS provides advice and guidance, as required. The reconnaissance team is unlikely to be suitably qualified to assess all of the criteria stipulated by DF&FS and therefore DF&FS must be consulted to provide assurance.

257. From the report supplied by the reconnaissance party, DF&FS will seek a certificate of quality[17] and the details of the test methods used from the fuel suppliers. If the fuel is not manufactured to an MOD specification, then DF&FS make an assessment if this can be classed as equivalent to the relevant UK Def Stan. DF&FS will then provide assurance to the relevant FLC/PJHQ for onward transmission to the operators.

258. Occasionally, supplies may be provided under UK contract to a third party (eg another NATO member state or host nation) for issue to UK forces. Under these circumstances, the refinery[18] will provide certificates of conformity to DF&FS, and a recognised and accredited[19] bulk fuel carrier will be chartered. The fuel carrier is inspected by DF&FS to ensure that the vessel will not compromise the quality of the refinery product. There are a number of criteria that are scrutinised including the cleaning of the vessel[20]. The fuel is receipted on arrival by a UK military representative and then passed to the host or lead nation for re-certification testing, storage, blending and eventual issue to the UK forces. Once the Ocean Terminal receipt has been conducted, responsibility for the quality control of the product and indeed ownership and responsibility for the quality of the product is outside any UK authority. If this third party is a NATO member they will conform to STANAGs 3149, 1110 and 3747. If they do not conform to these STANAGs, then a quality plan can be submitted to DF&FS to consider against the criteria in the STANAGs or a reconnaissance team would need to assess the competence of the third party as described above. Should this fail to meet the required criteria, MOD would either have to find an alternative location to operate from or deploy its own tactical fuels set-up.

259. HQ Air Command Fuel Operations Cell administers a casual uplift contract that provides global coverage for aviation fuel taken from commercial sources. Their remit is to provide specialist fuels subject matter expert input to Air Command (AC) for planning for operations and exercises through: operational sponsorship of the AC fuels capability; sponsorship of specialist fuels training and provision of air input to the deployed specialist fuels capability; and to articulate the air military requirement for fuels to the DF&FS PT. DF&FS are technical sponsors for the contract and scrutinise suppliers to ensure that they can produce fuel to meet Def Stan 91-91/91-87 and 91-86; they will also inspect the suppliers' quality plan to ensure that they can handle the product in accordance with appropriate standards to the MOD's requirements.

260. In considering the need to demonstrate due diligence, the Inquiry found that many of the procedures adopted reflect those described for the supply of additives. The initial establishment of a contract with an accredited refinery establishes a baseline and the refinery's quality plan is examined. Thereafter, routine testing of samples and inspection of certificates of quality confirms that the refinery is delivering a product within specification. Similarly, DF&FS check that the Ocean Tankers are accredited, through the Q88 process, and through the collection of normal delivery

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[17] All Certificates of Quality must by signed by an approved authority and contain full details of the refinery of origin, testing laboratory and related quality accreditations (for example ISO 9000/ UKAS/ ISO17025). All Certificates of Quality must also give details of sample number, batch and/ or storage tank number and the quantity of fuel in the batch. A date when the sample was taken, and when it was tested is also essential to ensure the sample is representative of the fuel being supplied. DF&FS would also require sight of the refinery ISO 9000 accreditation certificate, or Quality Plan if not ISO 9000 (or similar) accredited (AQAP 2130 and AQAP 2105 refers). If the fuel has been traded or distributed since manufacture the original Refinery Certificate of Quality must be provided plus all subsequent Certificates of Analysis. All Certificates of Analysis must originate from an approved, accredited, laboratory (as above) and provide re-certification results for all the analyses. The Certificate of Analysis data must be compared against the original Refinery Certificate of Quality for compliance and to ensure that all variability and homogeneity limits are met. Satisfactory provision of the above Certificates of Quality and Certificates of Analysis provides DF&FS with the ability to track the product from any point in the trading or logistic and distribution systems to its origins at the refinery of manufacture.

[18] Principally BP Rotterdam or MOH, Corinth.

[19] Intertankco provided accreditation to an internationally recognised standard, known as Q88.

[20] In accordance with the Energy Institutes' Hydrocarbon Management Guidelines for the cleaning of tanks and lines for marine tank vessels carrying petroleum products (EI HM50).

samples confirm that the Ocean Tanker is delivering a product within specification. Records of previous cargoes of the vessel are also inspected to ensure that it meets criteria designed to avoid cross contamination with products such as FAME. Furthermore, all Ocean Tanker receipts are quarantined, a sample is tested and re-certified (in accordance with JSP 317 and STANAG 3149) at Intertek before the fuel is released from quarantine and issued.

261. DefStans are a UK requirement and fuels purchased around the world or acquired through casual uplifts were not potentially subjected to the same requirements. DF&FS and OEMs approve the use of fuels which meet slightly different specifications, but are in effect technically equivalent in use, such as the American fuel JP-8 which is specified to MIL-DTL-83133. It was understood that if more uncommon fuels were to be used such as the Russian TS1, advice would be sought from DF&FS, agreed with OEMs and authorised by air platform PTs. Formal advice from DF&FS would have needed to consider the assessment of the quality assurance of the fuel through "batches and traceability" to assure against non contamination and specification acceptance.

CONCLUSION

262. Overall, the Inquiry found that a good deal of work has gone in to ensuring the fuel system manages its risks appropriately. Both GPSS and MOD's world wide supplies operate a comprehensive safety system with low levels of risk to aviation fuel supplies. Furthermore, there was a good deal of proactive management of issues such as FAME detection in the few areas where the pipeline was used for multiple products. However, the Inquiry **observed** that the same contamination issues that represent a low level risk in the Falklands are present here as well. In accordance with MOD procurement policy, the risk and management of the risk is correctly placed with the suppliers and that reliance on the supplier for quality assurance is better supported by standardised testing and scrutiny of documentation. However, an inability to detect low level or novel contamination events could be an issue in a future incident. Furthermore, the operation of the system relies on contractors overseen by an NDPB on whom we conduct no quality assurance, other than DIO inspections of infrastructure, whereas a number of other users of the system do conduct QA, which perhaps represents a lack of due diligence, which is discussed later.

263. The risk of fuel contamination occurring through the operation of the GPSS is likely to be as low as is reasonably practicable. However, both this and the increasing levels of risk through the use of third party, Host Nation Support or contractorised supply, regardless of the original source of the fuel should be passed to the operating authorities as a risk to quality.

RECOMMENDATIONS

- 1.5.36
- 1.5.37
- 1.5.38
- 1.5.47

Civilian aviation associations and their involvement in fuel safety

INTRODUCTION

264. To determine if the MOD could learn best practices from the civil aviation sector with regard to a fuel Safety Management System, the Inquiry visited the UK Civil Aviation Authority (CAA) and British Airways (BA) to discuss findings and to ascertain the extent of any air safety fuel legislation that was already in place in the civil sector. Agencies that were discussed that played key roles in aviation management and safety were the International Civil Aviation Organization (ICAO), Joint Inspection Group (JIG), Energy Institute (EI) and the International Air Transport Association (IATA). However, with regard to airworthiness of fuel none of the agencies were an 'authority', instead providing advice, guidance on standards and regulation of what has to be achieved as a minimum to ensure that jet fuel that is uplifted to aircraft meets the fuel specifications and thus prevents an incident or accident occurring.

FINDINGS

265. The CAA is the UK's specialist aviation regulator who regulates airlines, maintenance organisations, airports and National Air Traffic Services. An initial observation was that the UK Government requires that the CAA's costs are met entirely from its charges on those whom it regulates. The CAA does not authorise the quality or specification of fuel; however, it does provide a regulation in the form of CAP 748 Aircraft Fuelling and Fuel Installation Management at **Annex JJJ** for the aerodrome licence holders to comply by producing procedures for fuel storage, management, handling and distribution and a regulation[21] for fuel installation managers to assure fuel supply is 'fit for purpose' for delivery to aircraft. The second regulation is caveated with:

> 'Air Navigation: The Order and the Regulations Published for the use of those concerned with air navigation, but not to be treated as authoritative.'

266. The Inquiry attempted to set up a meeting with the Heathrow Airport Fuel Installation Manager but at the time, there was no-one acting in this role as the operation had been contracted out by BAA Airports Limited.

267. Although CAA Regulation in respect of fuel provision applied to Aerodrome Operators, their safety oversight was not bounded by the limits of an aerodrome. However, due to lack of resources and competencies the CAA did not have direct oversight of fuel installations and they relied upon the airport operator to have adequate oversight of all third party operators. For Heathrow, the fuel installation was managed by a consortium organisation Heathrow Hydrant Operating Co Ltd (HHoPCO). Moreover, whilst BA conducts audits on HHoPCO (discussed later in this chapter) this was only visible to Airlines who were members of IATA and not necessarily the Heathrow Aerodrome Operator.

268. Different regulatory bodies cover different aspects of operations too. Engine and aircraft type certificates detail the acceptable fuel specifications, which are approved by the engine and aircraft equipment manufacturers. The civil regulatory airworthiness authorities issue Type Certificates. To carry fare-paying passengers on large aircraft, civil operators must adhere to the legal requirements applicable to their Aircraft Operator's Certificate (AOC). AOC Holders must operate and maintain aircraft in accordance with manufacturer's data, which includes acceptable fuel specifications. AOC Holders are therefore required to ensure that their fuel meets these specifications. Civil aircraft are regularly refuelled with passengers on board or whilst boarding the

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[21] CAP 393 Air Navigation: The order and the Regulations, Section 1, Part 27, Page 6, Item 217 "Aviation fuel at aerodromes", issued 14 Apr 2010.

aircraft. EASA EU-Ops 1 305 requires airlines to develop procedures to ensure the safety of passengers during refuelling.

269. From discussions with BA Engineering, it was explained that in addition to maintaining fuel to the JIG standards, Heathrow aerodrome's fuel storage supplier would generally conduct laboratory fuel specification tests at least once a week. BA relies on an ever increasing list of suppliers to assure compliance and ensure quality through contractual arrangements with suppliers which require traceability and assurance through the Certificates of Quality or Conformity, much as the MOD does. BA trains their company ramp and cabin staff on aircraft fuelling in accordance with a well-established training requirement, a copy of which is at **Annex KKK**. Fuel procurement was a very dynamic business process for BA; there was an increase in independent operators getting involved in the fuel supply business, and it was challenging to ensure everyone complied fully with all the regulations.

270. **IATA**. IATA is an international trade association that represents approximately 240 airlines, who between them comprise 84% of total air traffic. The declared aim of the organisation was 'to help airlines help themselves by simplifying processes and increasing passenger convenience while reducing costs and improving efficiency.' IATA's goal was to 'continually improve safety standards.' This was achieved through a number of processes but notably:

a. IATA's Operational Safety Audit (IOSA); a quality audit program under the continuing stewardship of IATA.

b. IATA De-Icing/Anti-Icing Quality Control Pool (DAQCP). The main goal of the DAQCP is to ensure the safety guidelines, quality control recommendations and standards of the De-icing/Anti-icing procedures at all airports are followed.

c. The IATA Fuel Quality Pool (IFQP). The IFQP is a group of airlines that actively share fuel audit inspection reports and workload at locations worldwide.

271. The IFQP was an area that the Inquiry believed demonstrated best practice. IATA provides a commonly agreed audit framework but offers neither audit capability nor guarantees of quality as a result. Instead, the member airlines provide auditors at various locations, principally their main operating airports, to conduct an audit at least every 2 years, or more frequently if there are concerns. The audits are usually conducted by the largest operator at each airport – so BA audits Heathrow, for example. A comprehensive report is produced on each airport, before being codified on a shared database and the audit information sheet is shared with the IATA members. Concerns can be highlighted and an assessment made of each aspect of the fuel supply. Fundamentally, if the IATA audit reveals a supplier falling below the standards required, then they are highly unlikely to be used. This has the added bonus of a significant financial incentive to encourage all suppliers to meet the IATA standards. The audit also allows for minor issues and areas for improvement to be noted and a traffic light colour coding to be applied to a supplier. This allows the individual IATA members to make a risk assessment on using that supplier, although it was acknowledged that this is informal at present and IATA was attempting to introduce risk analysis over these audits. Details of the scheme are at **Annex LLL**.

272. There are benefits for the airports and the fuel suppliers too. The IFQP program is highly regarded by the supplier community as it drastically reduces the repetitive inspections at many airports. It also improves overall quality as inspections are more effective due to the stringent evaluation criteria established by the pool. Fundamentally, suppliers are motivated to respond to the audit and improve safety shortcomings as the combined purchasing power of the member community means that it is financial suicide not to.