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Manual on Civil Aviation Jet Fuel Supply

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Notice to Users

AMENDMENTS

Amendments are announced in the supplements to the *Catalogue of ICAO Publications;* the Catalogue and its supplements are available on the ICAO website at www.icao.int. The space below is provided to keep a record of such amendments.

RECORD OF AMENDMENTS AND CORRIGENDA

AMENDMENTS		
No.	Date	Entered by

CORRIGENDA		
No.	Date	Entered by

FOREWORD

The aim of the manual is to inform the aviation and petroleum industries globally about the existence of internationally accepted petroleum and aviation industry fuel practices, and to reinforce the need for compliance with them. In addition to informing future work for aviation fuel quality issues, the development of this manual has highlighted the importance of appropriate knowledge throughout the fuel supply chain.

Therefore, the manual acts as a ”signpost” document to the relevant industry practices that cover all matters related to aviation fuel quality control, operations and training across the entire supply and distribution system from refinery to aircraft. Future editions of the manual will consider the inclusion of more signposting information, including areas of training and organizational competence. Technical reviews will continue to be undertaken against any relevant changes in the aviation and/or petroleum industries, as well as methods for verification of organizational competence, appropriate to the industries.

The manual is not associated with any one specific ICAO Annex. The use of “shall” in several places quotes from, or makes reference to text that appears in industry standards or national safety regulations only, and not in the context of ICAO Standards and Recommended Practices (SARPs). Where used there is a footnote reference provided by the IATA Technical Fuel Group (TFG).

The manual was developed by ICAO from material drafted by a task force of IATA’s Technical Fuel Group, in coordination with the Airports Council International (ACI) and Airlines for America (A4A). The membership of the TFG’s task force is listed in Appendix 2, and their contribution is acknowledged.

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ACRONYMS AND ABBREVIATIONS

ACI	Airports Council International
AFQRJOS	Aviation Fuel Quality Requirements for Jointly Operated Systems
API	American Petroleum Institute
ARP	Aerospace Recommended Practice
AS	Aerospace Standard
ASTM	ASTM International
ATA	American Transport Association (now called; Airlines for America – A4A)
CSA	Canadian Standards Association
CEN	European Committee for Standardisation
COA	Certificate of Analysis
EI	Energy Institute
EQA	External Quality Assurance schemes
GOST	Russian National Standard
IATA	International Air Transport Association
IATA TFG	IATA Technical Fuel Group
IFQP	IATA Fuel Quality Pool
ISO	International Organization for Standardization
JIG	Joint Inspection Group
PSP	Policies, Standards and Procedures
PTC	Periodic Test Certificate
QMS	Quality Management System
RC	Release Certificate
RCQ	Refinery Certificate of Quality
RTC	Recertification Test Certificate
SAE	SAE International
SMS	Safety Management System
SARPs	Standards and Recommended Practices (ICAO)
UK AFC	UK Aviation Fuels Committee
UK MOD	UK Ministry of Defence

Chapter 1

INTRODUCTION AND MANAGEMENT SYSTEMS

1.1 INTRODUCTION

1.1.1 Purpose and background

The purpose of the manual is to inform the aviation and petroleum industries globally about the existence of internationally accepted petroleum and aviation industry fuel practices, and to reinforce the need for compliance with those requirements and operating procedures: the need for this emphasis has been highlighted by occurrences involving actual contamination of, or the potential to contaminate aviation jet fuel. The requirements are set out in numerous industry and company proprietary policies, standards and procedures (PSPs) covering the entire supply and distribution system. These PSPs have been developed to safeguard aviation fuel quality and to ensure safe operations from point of manufacture to delivery into aircraft fuel tanks.

Collectively, the PSPs referenced in this manual[1] describe the quality organization, facility design requirements, quality and safety management arrangements and operating practices to manage product movement through the supply chain. A primary purpose is to mitigate the threats to aviation fuel quality and to ensure the safe delivery of fuel into aircraft fuel tanks (into plane). The various controls and procedures reflect a philosophy of product testing, traceability and segregation to prevent contamination and to ensure that the fuel is on-specification at point of delivery to aircraft.

Using extracts from and references to these industry PSPs, this manual describes the fuel quality requirements through the stages of fuel provision from refinery to aircraft, as illustrated in Figure 1. References to other ICAO manuals are made in the appropriate areas.

The intended audience for this manual includes:

a. The various companies involved in the manufacture, supply, distribution and delivery of aviation fuel throughout the supply chain – from refinery to aircraft.
b. The receivers of these services.
c. Focal points for State safety activity, including State safety regulators of the aviation and petroleum industries[2].
d. Industry auditors, including those from aviation service providers and fuel end-users.

1 Readers should refer to the latest revision of any referenced document.
2 Appendix 4 is reserved for the consideration of examples of regulatory practices in a future edition.

1.1.2 Roles and responsibilities

Any business entity involved in the aviation fuel supply chain has an obligation to implement and comply with industry and/or company proprietary PSPs, as described in this manual, that cover the activities in which they are involved. For example:

a. Supply and distribution - for upstream of the airport see Chapter 3, and from airport to aircraft see relevant parts of Chapters 4 & 5.
b. Aircraft operators - see paragraphs 4.1.2 & 4.1.3 and 5.1.3 in Chapters 4 & 5.
c. Airport operators - Airport operators have a range of interfaces with other organisations operating on an airport. The following refer:
    i. ICAO Document 9774, Manual on Certification of Aerodromes, contains guidance on model regulations. This guidance includes, in the context of this Manual on Civil Aviation Jet Fuel Supply, the role of airport operators in relation to the users of airports in managing safety – see section 3D.4, Aerodrome Operator's safety management system, and 3D.5, Aerodrome Operator's internal safety audits and safety reporting.
    ii. ACI Airside Safety handbook - see Chapter 3 section 3.10, Interface with Stakeholders, and Chapter 4, SMS.

Additional guidance on ICAO Annex 6 Standards and Recommended Practices (SARPs) relating to air operators certification is in ICAO document 8335, Manual of Procedures for Operations Inspection, Certification and Continued Surveillance. Additional guidance on ICAO Annex 14 (Vol 1) requirements relating to airport certification SARPs is in ICAO document 9774, Manual on Certification of Aerodromes. More on Safety Management Systems (SMS), including references to ICAO, IATA, ACI and JIG SMS guidance documents, will be found in the following pages.

1.1.3 Fuel contamination in the supply chain, types of contamination and where it can occur

Figure 1 on the next page is from the IATA IFQP Training Manual[3]. It illustrates a schematic for the supply and distribution chain from refinery to the aircraft. Actual routes, outlined in Chapter 3, and required tankage and filtration will vary depending on the needs of any particular supply route. From the airport fuel depot the fuel is delivered to aircraft via hydrant and vehicle systems discussed in Chapters 4 and 5. The risk to the integrity of the fuel, in relation to its inherent properties and from contaminants, can occur at any point in the supply chain from the point of manufacture to the final delivery to aircraft, and create the potential to adversely affect fuel systems, including fuel tanks, aircraft fuel systems, and engines.

The primary types of contamination are water, particulate and microbiological material. In addition, contamination can occur from other fuel grades and chemicals that may be in multi-product transport systems. The fuel may also be rendered off-specification by either under-dosing/ overdosing of approved additives, using an incorrect additive or from product testing issues not limited to, but including poor sampling, incorrect test procedures and un-calibrated laboratory equipment. These issues can occur in the various elements of the supply chain as follows:

a. Refinery: Incorrect and/or inadvertent use of additives, insufficient settling/tank cleaning to allow removal of dirt and water, incorrect sampling, incorrect test procedures and a lack of laboratory equipment calibration.

[3] Used with the permission of IATA

b. Pipeline: Inadequate interface monitoring and cutting procedures, interface migration due to poor pipeline controls, failure to flush manifolds, dead legs and booster pumps. Also, inappropriate pipeline sequencing, lack of effective pipeline maintenance, infrequent or ineffective low point drains, lack of document checks/ traceability.

c. Marine: Inappropriate vessel selection, incorrect loading or unloading sequence, ineffective cargo segregation, incorrect and/or inadvertent use of additives on-board, non-dedicated marine loading arms or hoses and inadequate draining/flushing/change-of-grade procedures, lack of document checks/ traceability.

d. Filtration: Incorrectly specified filters, inadequate maintenance and daily operation checks, unsuitable or damaged filter vessel lining, incorrectly installed filters and incorrectly installed ancillary equipment.

e. Storage tanks: Poor design making water and dirt removal difficult or impossible, incorrect lining materials, failure to conduct adequate draining for water and dirt removal, lack of effective segregation, ineffective change of use procedures, infrequent tank inspection and cleaning.

f. Road and Rail: Breakdown and/or mishandling of critical equipment, cross contamination, incorrect change-of-grade procedures, no settling and draining prior to discharge, lack of document checks/ traceability.

g. Airport Vehicles: Breakdown and/or mishandling of critical equipment, inadequate checks during loading and/or fuelling.

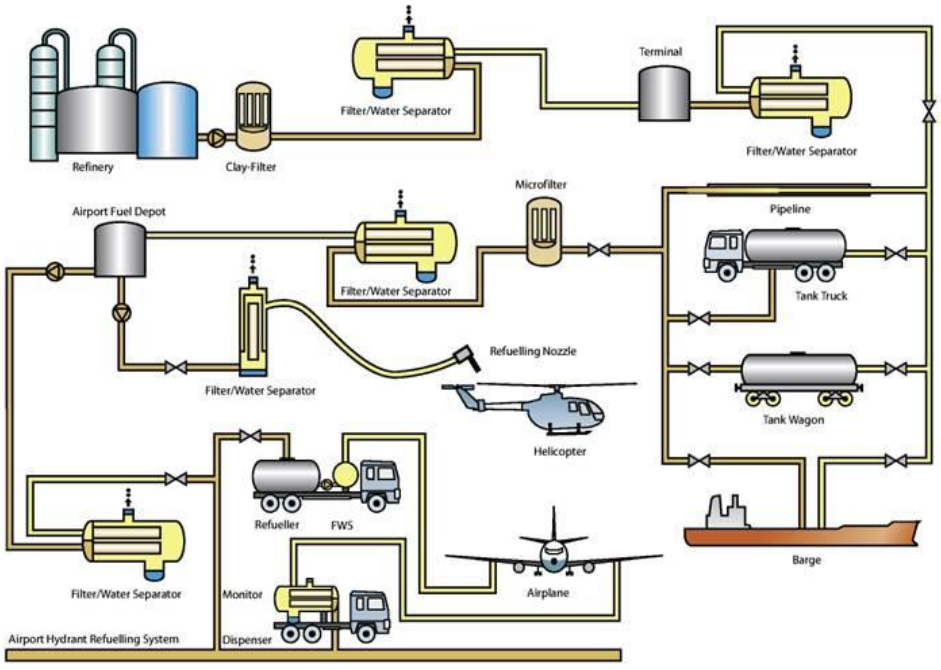

Figure 1

Schematic for the supply and distribution chain from refinery to the aircraft

1.2. SAFETY, QUALITY AND OPERATIONS MANAGEMENT

1.2.1 Safety management

It is a petroleum industry expectation, as well as that of other interested stakeholders and end-users that every responsible organization involved in aviation fuel manufacture, supply, storage, transport, testing and aircraft fuelling has a robust system for managing safety. ICAO defines a Safety Management System (SMS) as a systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures. ICAO has introduced harmonized requirements into its relevant Annexes to the ICAO Chicago Convention, including Annex 6, Aircraft Operations; Annex 8, Airworthiness of Aircraft; and Annex 14, Aerodrome Design and Operation (Volume 1). ICAO guidance document 9859, Safety Management Manual is referenced in all of these Annexes. Doc 9859 gives detail of an SMS framework and its constituent parts; the four Safety Components of Policy and Objectives; Risk Management; Assurance; and Promotion.

Examples of industry guidance on SMS are:

- IATA Doc ref No 8402-01 - Introduction to Safety Management Systems (SMS).
- ACI Airside Safety Handbook see Chapter 4 — Safety Management Systems.
- JIG Bulletin 32 — Health, Safety, Security and Environmental Management System.

Good accepted SMS practice includes the following:

a. Identification and acknowledgement of hazards and assessed safety risks, including those emerging from change and new technology or products.
b. Proactive and reactive measures to control risks to a level consistent with the acceptable levels of risk determined by organizations, as described in their system manuals.
c. A change management process as part of safety assurance.
d. A process for internal safety performance monitoring — safety audits.
e. Processes for assessing the adequacy of SMSs, including those of relevant third parties where appropriate, and arrangements to improve performance where necessary.

1.2.2 Quality management, and the interface with safety management

Quality control and assurance, that reflects good accepted international practice, is part of robust quality management (QM), and quality management tools offer support for the management of risks to aircraft safety[4].

[4] For more on the relationship between SMS and QMS refer to ICAO guidance document 9859, Safety Management Manual.

It is, therefore, of fundamental importance that every responsible organization involved in aviation fuel manufacture, supply, storage, transport, testing and aircraft fuelling has such a system in place for managing quality, in order to maintain the aviation fuel specification and quality while in their custody and/or under their control. These systems should ensure that:

a. Aviation fuel is manufactured to the latest issue of the relevant specification.
b. Facilities and equipment are maintained in good condition for the safe delivery of on-specification, clean and uncontaminated aviation fuel from refinery to aircraft.
c. An auditable and documented record exists, confirming correct handling and testing of aviation fuel throughout the supply chain from refinery-to-aircraft.
d. Traceability is maintained to ensure that products are on-specification and fit-for-purpose on delivery to aircraft — the requirement for traceability applies to products supplied in accordance with Defence Standard 91-91.
e. Where change or variation in standard procedures is required, then there is an implemented change management process with clear levels of authority to ensure the integrity of the product supply or service provision system during the change or variance. This process should be complementary to a similar change management process of safety management, using the risk management component of an SMS framework, or alternative industry standard.[5]
f. Notification of re-instatement of standard procedures after change or variance.

The elements of effective QM, described and documented appropriately include, but are not limited to[6]:

- Goals and objectives, with clearly expressed policies, standards and procedures.
- Organizational structure with management having appropriate and stated responsibilities.
- Qualified, competent and properly trained staff, with proficiency testing where necessary.
- Provision, maintenance and, where necessary, the calibration of adequate and appropriate facilities.
- Appropriate processes and procedures to match the scope of a company's activities, including:
    - Process controls that include the recording and handling of evidence.
    - Management of change and variance procedures.
    - The monitoring, auditing, and validation of activity.
    - Reporting, reviewing, and follow-up with corrective action plans.
    - Analytical procedures, as necessary.
    - The interface with safety requirements and assurance.
    - Accreditation, as necessary.

1.2.3 Operations Management

To adhere to the intent of this ICAO manual, companies involved in the manufacture, distribution, testing, monitoring and supply of aviation fuel should develop and implement an "'Operations Manual" describing the manner in which the company operates.

[5] For more on risk management refer to ICAO guidance document 9859, Safety Management Manual, and industry SMS guidance documents.

[6] This list is expanded upon in the other Chapters in the context of quality management. There is some overlap with the list of typical Operation Manual content in 1.2.3.

The scope of such a manual should be appropriate to the part or parts of the provision chain in which the company operates, taking account of interface issues, as well as reflecting the application of the petroleum industry standards and practices referenced in this ICAO manual. In order to meet this expectation each company operations manual should include the appropriate level of detail. Content should include:

a) The organization structure.
b) Names, roles and accountabilities/responsibilities of key personnel, appropriately qualified, knowledgeable and experienced. This will include:
    i. An “accountable” executive, who has overall accountability and authority for the organization’s policies, objectives, procedures, implementation and products.
    ii. Accountable managers with the authority to establish and modify processes.
    iii. A process to ensure the continuity of tasks and safety or quality programmes during the absence of a post-holder who is specified as having the primary responsibility for that task or programme.
c) Health, safety, security, environmental and quality policies and objectives, including that covering management commitment and organizational competence.
d) Health, safety, security, environmental and quality management systems, including assurance elements.
e) Product quality performance criteria, targets, and indicators.
f) Self-audit conducted by competent individuals independent of the management of daily operations, including arrangements for assessing process and process controls for effectiveness, such as:
    i. identifying non compliances from company operating procedures;
    ii. correcting reported discrepancies; and
    iii. determining organizational competence.
g) Standard Operating and Control Procedures; these will cover arrangements for working at the interfaces with other parts of the system, including end user safety requirements, as appropriate.
h) Emergency planning, including asset integrity, and business continuity planning, taking account of customers’ business continuity plans and needs.
i) Training and safety promotions programme.
j) Document management.
k) Independent audits.

In addition to an operations manual, companies should provide sufficient specialist operational facilities and resources — financial, technical, logistics and human. In case of doubt about, or to assess the adequacy of an operations manual or resources, a gap analysis of content and provision against requirements and scope of operations should be undertaken.

Operations manuals may also include the content of company quality and safety management systems, much of which will be covered by the above, or they may be separate but associated manuals.

Chapter 2

GENERAL REQUIREMENTS

2.1 OPERATIONS

2.1.1 It is essential that comprehensive industry and/or company proprietary PSPs are implemented across the entire supply chain, in order to cover the critical operational activities necessary to safeguard aviation fuel quality and ensure safe delivery into aircraft. The following operational activities are addressed in one or more of the referenced documents in this manual:

a. Receipts.
b. Transfers.
c. Storage.
d. Dispensing.
e. Product Inspection & Routine Check Programme:
    i. Quality control and maintenance record keeping requirements and record retention times.
    ii. Training programme.
    iii. Document & data control system.
    iv. Emergency response.
f. Reporting of observed deficiencies or hazards that could generate risks to the safety of personnel, facilities or equipment, including aircraft.
g. Managing and handling contaminated fuel.
h. Procedures for handling defuelled fuel products.
i. Customer notification.

2.2 AVIATION TURBINE ENGINE FUEL (JET FUEL)

2.2.1 There are numerous national and international specifications for civil jet fuel controlled by national Governments or by international organizations such as ASTM International and the UK Aviation Fuels Committee. Approved specifications are listed in the aircraft engine and airframe manufacturers' operation manuals and recognized by the various aviation regulatory authorities. Common civil grades and specifications used around the world include but are not limited to:

- Jet A or Jet A-1 to ASTM D1655.
- Jet A-1 to Defence Standard 91-91.
- TS-1 to GOST 10227.
- Jet fuel No. 3 to GB6537.

For more information refer to the IATA Guidance Material for Aviation Turbine Fuels Specifications, Part I — Guidance Material on Product Specifications. Only approved materials as defined by the primary specification shall[7] be used in the manufacture of aviation fuel.

[7] Refer to ASTM D1655 and Defence Standard 91-91, for example.

2.3 ADDITIVES

2.3.1 Approved additives are listed in each of the jet fuel specifications as well as the airframe and engine manufacturer specifications. Guidance on the use of additives in aviation fuels can be found in the IATA Guidance Material for Aviation Turbine Fuels Specifications, Part II — General Guidance on Additives.

The use of additives in aviation fuels is carefully controlled and limited because of the potential for undesirable side effects. For example, under certain circumstances additives can affect the ability to maintain fuel cleanliness during shipment and handling, or may adversely impact the aircraft fuel system and turbine engine operation or maintenance.

2.3.2 Only approved additives in the amount and of the composition approved by the airframe and engine manufacturers, and cited by the relevant specification authority may be used. Additives not listed in the specifications for aviation fuels are not permitted.

2.4 SAMPLING FOR TESTING OF AVIATION FUELS

2.4.1 At appropriate stages during the handling and storage of aviation fuels, samples will be required for laboratory or visual examination in order to establish that fuel products meet the requirements of the relevant specifications, or to detect fuel contamination or deterioration. Sampling standards and procedures appropriate to the test should be applied. In addition the following apply:

a. Sampling equipment fabricated from copper or its alloys should not be used for sampling Jet fuels. Refer to ASTM D4306 for suitable materials.
b. Sampling should be undertaken by appropriately trained personnel using correct procedures and apparatus. This is to ensure that the sample obtained is truly representative of the material from which it has been drawn.
c. Sampling should be in accordance with the latest requirements of the following procedures or other approved and equivalent standards that may be defined by the requirements of the testing to be performed on the sample:

- JIG – 1, 2 and 3; Chapters 2 “Sampling and Testing”.
- SAE AS 6401[8].
- ISO 3170 (IP 475) Petroleum Liquids, Manual Sampling.
- ASTM D4057 - International Standard Practice for Manual Sampling of Petroleum and Petroleum Products.

2.5 LABORATORY REQUIREMENTS

2.5.1 Appropriate quality processes for laboratory activities are a vital component of good laboratory practice. Laboratories engaged in the testing and certification of aviation fuels should adopt independent quality control and assurance standards, for example:

[8] Under development and described in Appendix 3

a. ASTM D6299 — Standard Practice for Applying Statistical Quality Assurance and Control Charting Techniques to Evaluate Analytical Measurement System Performance.
b. ASTM D6708 — Standard Practice for Statistical Assessment and Improvement of Expected Agreement Between Two Test Methods that Purport to Measure the Same Property of a Material.
c. Accreditation to EN ISO/IEC 17025 — General requirements for the competence of testing and calibration laboratories.
d. Participation in external quality assurance schemes (EQA).
e. Comparative testing through recognized cross check schemes such as run by the EI & ASTM.

2.5.2 The laboratory should establish and maintain a documented QMS that is appropriate to the testing activities. The quality manual should address, at a minimum, those appropriate elements in paragraph 1.2.2. For further information see EI Guidelines on development, implementation and improvement of quality systems in petroleum laboratories.

2.6 DOCUMENTATION

2.6.1 Documentation is an integral part of robust quality assurance. Documentation is used throughout the supply and distribution system for a variety of purposes, e.g. to certify fuel quality, confirm fuel quality after distribution, record quality control and maintenance checks and demonstrate fuel traceability. Certain documentation is mandatory, such as the refinery certificate of quality or certificate of analysis, as evidence that the fuel conforms to the relevant specification. Common quality documentation used with aviation fuel includes, but is not limited to:

a. Refinery Certificate of Quality (RCQ).
b. Certificate of Analysis (COA).
c. Recertification Test Certificate (RTC).
d. Periodic Test Certificate (PTC).
e. Release Certificate (RC).
f. Batch Make-up and Clearance Record.
g. Filter Inspection Report.
h. Tank Inspection Report.

Detailed definitions for these and other types of quality documentation can be found in JIG 1, 2 and 3, SAE AS 6401, API 1543 and 1595, and EI 1530[9].

2.7 MICROBIOLOGICAL GROWTH

2.7.1 Aviation fuels, fuel storage systems, fuel handling equipment and aircraft fuel tanks can become contaminated by microbiological species (microbes). Microbes can spoil fuels, cause severe damage to equipment and create blockages in fuel filters and fuel lines. In cases of confirmed microbial contamination, significant downtime is often required for remedial treatment which can lead to interruptions in supply and disruption to both fuelling and aircraft operations.

[9] EI 1530 to be published mid 2012

Microbial contamination in fuel and fuel systems is a very real, serious and costly issue which has potential for a direct impact on the safety of aviation operations.

Water is essential for microbiological growth; therefore it is critical that fuel systems are kept as dry as possible by frequent draining of any accumulated water. The fundamental method for assessing the presence of microbiological growth in storage tanks and filters is the daily clear and bright test on a sump sample. The presence of discoloured water, a lacy interface between the fuel and water layers or organic debris in the fuel or water layer are all indications of likely microbiological activity requiring immediate investigation and appropriate expert advice. The following industry documents provide detailed information on testing, control and remedial strategies:

- IATA Guidance Material on Microbiological Contamination in Aircraft Fuel Tanks.
- ASTM D6469 — Standard Guide for Microbial Contamination in Fuels and Fuel Systems.
- EI Guidelines for the Investigation of the Microbiological Content of Petroleum Fuel and for the Implementation of Avoidance and Remedial Strategies.
- SAE AS 6401.
- JIG 1, 2 and 3.
- API 1595.

2.8 DESIGN STANDARDS, AND COMMISSIONING/ MAINTENANCE PROCEDURES

2.8.1 Design is a vital factor in providing one of the first lines of defence against poor fuel quality and the potential for aircraft safety to be compromised. Well considered design, implemented into properly commissioned facilities and equipment can provide defences in areas that may not be identified through quality or safety audits. There are various design standards for different stages in the overall supply chain.

2.8.2 EI 1550 — Handbook on Equipment Used for the Maintenance and Delivery of Clean Aviation Fuel provides a comprehensive overview of the fuel handling systems used in the aviation industry to maintain batch integrity and product cleanliness throughout the distribution system and into the aircraft. EI 1550 provides detailed information on the following:

a. Maintaining aviation fuel cleanliness from batch/point of certification to into-plane delivery.
b. The design, installation and operation of filtration/water removal equipment used in aviation fuel handling systems, in order to ensure fuel cleanliness.
c. Operational characteristics of different system components as applied in the aviation fuel handling system.
d. Certain aspects of the design of the other fuel cleanliness monitoring/control equipment that may be used in aviation fuel handling systems.
e. Key issues to be considered in the selection and use of combinations of various technologies/quality assurance procedures to achieve the requisite fuel cleanliness.
f. Other standards or publications that should be consulted for additional in-depth information.

2.8.3 Information on commissioning and maintenance of facilities for handling aviation fuel at airport facilities can be found in:

- EI 1540 — Design, Construction, Operation and Maintenance of Aviation Fuelling Facilities.

- EI 1585 — Guidance in the cleaning of aviation fuel hydrant systems at airports is also relevant.
- SAE AS 6401.

2.8.4 JIG Bulletin No. 35 provides guidance on soak testing, which should be carried out after construction work or repairs on fuel systems and vehicles, in order to ensure that there are no leaks and potential contaminants present in the form of solvents from coatings/linings, welding flux, valve grease or other general debris. Soak testing should be carried out even if the systems are constructed of aluminium or stainless steel.

2.8.5 A defined system of regular maintenance should be in place to ensure the integrity of the supply system. A maintenance programme should be implemented for parts and equipment, encompassing manufacturers' service recommendations and practices. Refer to JIG 1, 2 and 3, EI 1530, API 1595 and SAE AS 6401 for further information.

2.9 MONITORING

2.9.1 The internal monitoring process assesses compliance with the requirements of the PSPs implemented throughout the entire supply and distribution system. The system includes refineries, pre-airport terminals, airport depots, into-plane fuelling operations, transportation companies (e.g. pipeline operators, waterway vessel operators and road/rail transport) and laboratories. Regularly scheduled PSP inspections and audits should be carried out by competent individuals using structured checklists to verify compliance with system controls and to confirm that the controls are working as intended.

External monitoring assesses compliance with the industry standards and customer requirements, and includes audits and inspections. These audits and inspections should be performed by competent personnel from related industry organisations, airlines and airline pools, and regulatory agencies where there are appropriate State regulations. Inspectors must have the necessary access to the relevant facilities, in order to perform these inspections or audits.

2.9.2 Industry best practice for monitoring compliance with site PSPs at supply and distribution facilities, airport depots and aircraft re-fuelling (Into-plane) operations is described in:

- IATA Fuel Quality Pool (IFQP) — Control of Fuel Quality & Fuelling Safety Standards, incorporating SAE AS6401.
- JIG Standards — JIG 1, JIG 2 and JIG 3 respectively.
- JIG Standards JIG 4 for smaller airports.
- ATA 103 Standards for Jet Fuel Quality Control (Airports).
- API 1595 (Pre-airfield Terminals).
- API 1543.

2.10 TRAINING AND EMERGENCY PROCEDURES

2.10.1 Any organization that manufactures, supplies or handles aviation fuel should have a documented training program for their personnel. The programme should cover product quality, safe operation of equipment, emergency procedures and occupational health, as well as management systems for operational safety, environment and security. In particular, the programme should include in its scope a systematic way to identify hazards and effectively control risks to fuel quality, personnel, and facility and equipment or aircraft safety. For more information refer to:

- JIG 1, JIG 2, JIG 3 and SAE AS 6401 for detailed Health, Safety, Security, Environment, Training and Emergency Procedures.
- ICAO Doc 9589, Safety Management Manual.
- IATA Doc ref No8402-01.
- JIG Bulletin 32 for Risk Management and Safety Promotion.
- ACI Airside Safety Handbook.
- ATA Airport Fuel Facility and Operations Maintenance Guidance Manual.

There should be a process to:

a. monitor implementation of the programme;
b. assess the effectiveness of the trainers and the training given, including retention of knowledge and adherence to procedures over time; and
c. identify requirements for recurrent training and updating of knowledge.

Chapter 3

SUPPLY AND DISTRIBUTION SYSTEM

3.1 GENERAL

3.1.1 PSPs have been developed and implemented across the supply chain to provide the maximum assurance possible that only on-specification, clean and uncontaminated fuel is delivered into airport fuel tanks. These PSPs are described in industry and company proprietary documents covering the manufacture, transport, storage, handling and testing of aviation fuels at refineries, pre-airfield terminals and airport depots.

3.2 REFINERY — QUALITY REQUIREMENTS AT MANUFACTURING SITES

3.2.1 The basic quality control requirements for handling aviation fuels at refineries are typically set out in company proprietary documents due to the complexity and unique nature of individual sites. Given this situation, no single industry standard exists that covers the aviation fuel quality requirements at refineries. It is therefore imperative that refinery quality-control PSPs meet or exceed the requirements described in recognized industry standards such as:

- EI; 1530 — Guidance on the Manufacture, Storage and Distribution of Aviation Fuels to Airports.
- JIG 3 — Aviation Fuel Quality Control and Standards for Supply and Distribution Facilities.
- API Recommended Practice 1543 — Documentation, Monitoring and Laboratory Testing of Aviation Fuel during Shipment from Refinery to Airport.
- API Recommended Practice 1595 — Design, Construction, Operation, Maintenance and Inspection of Aviation Pre-Airfield Storage Terminals.

EI 1530 provides greater detail on the quality control requirements that should be implemented at refineries. These requirements include, but are not limited to, process unit monitoring, additive use, storage and sampling and testing requirements for initial certification.

The main purpose of a refinery quality control manual is to ensure that certified aviation fuel meets all requirements of the relevant specification and not just the main table test results, and that the integrity of the batch is maintained up to the point of shipment off-site. It is critical for refineries that supply directly to airports to implement quality control procedures that meet or exceed the requirements set out in JIG 3 or API 1595. The manual should also cover the quality requirements for sites that act as intermediate supply and distribution facilities by importing finished product for subsequent release into the distribution system.

3.3 SUPPLY AND DISTRIBUTION FACILITIES — QUALITY REQUIREMENTS AT PRE-AIRFIELD TERMINALS

3.3.1 The basic quality control requirements for supply and distribution facilities upstream of the airport are described in the following industry standards:

- JIG 3.
- API 1543.
- API 1595.
- EI 1530.

3.3.2 Supply and distribution facilities which are owned and/or operated independently[10] or where the joint venture members agree, may implement quality control requirements set out in company proprietary documents that should meet, as a minimum, the requirements set out in the appropriate industry standards.

3.4 PRIMARY AND SECONDARY TRANSPORT — QUALITY REQUIREMENTS

3.4.1 Primary transport refers to the shipment of bulk aviation fuel from refineries to pre-airfield supply terminals. Shipment is typically via non-dedicated transport systems such as multi-product pipelines or vessels (marine and inland water). Secondary transport refers to the shipment of aviation fuel from pre-airfield supply terminals direct to airports. Shipment is typically via dedicated and segregated transport systems such as grade-dedicated pipelines, road tankers or rail tank cars. In some cases aviation fuel is shipped directly from the refinery to an airport via dedicated or non-dedicated transport systems.

3.4.2 The procedures used in the operation of multi-product pipelines are set out in operating manuals of the companies or organizations responsible. These are based on industry custom and practice (especially with regard to sequencing and interface cutting) and are optimized to the individual pipeline configurations. Minimum requirements for the operation of pipelines are set out in the following industry standards:

- JIG 3.
- API 1543.
- API 1595.
- EI 1530.
- EI Additive Protocol — Multi-product Pipelines; Minimum Criteria to Determine Additive Acceptability.

The latter EI guidance document addresses concern over the impact of surface active additives used in other fuel types that may trail back into following aviation fuel batches during transport in multi-product pipeline systems. The guidance requires initial laboratory testing, usually followed by a pipeline trial where the trailing kerosene batch is tested for conformance to the relevant aviation fuel specification.

[10] Independent in this context means that it is not a joint venture and thus not controlled by joint venture documents and QA standards.

3.4.3 There is no single industry standard controlling all aspects of the design and operation of multi-product vessels for the transport of aviation fuels. Typically, such vessels are chartered by traders or suppliers and it is the contractual responsibility of the Ship's Master to declare the vessel ready to load aviation fuel. Product quality is usually controlled by contractual agreement with the appointment of independent inspectors to verify that the product meets specification before and after loading and before and after discharge. Requirements are embedded in proprietary documents or procedures used by independent inspectors. Minimum requirements for the operation of vessels are set out in the following industry standards:

- JIG 3.
- API 1543.
- API 1595.
- EI 1530.
- EI HM 50 — Guidelines for the Cleaning of Tanks and Lines for Marine Tank Vessels Carrying Petroleum and Refined Products.

EI HM 50 is the key industry document that sets out the cleaning requirements for vessel tanks and associated pipe work to prevent contamination and deterioration of aviation fuel cargoes. EI HM 50 also includes important information on the risk of transporting jet fuel in vessel tanks fitted with copper heating coils or zinc linings and potential quality problems resulting from poorly operating inert-gas-generating systems.

3.4.4 Mobile secondary transport systems, i.e. road transports and rail tank cars, used to deliver aviation fuel to airports are typically operated in dedicated service mode, in order to prevent cross-contamination with other fuel grades. If secondary transport systems are used to carry other fuel grades, it is essential that effective change-of-grade procedures are followed before returning to aviation fuel service. Change-of-grade procedures for road transport and rail tank cars are set out in the following industry standards:

- JIG 3.
- API 1595.
- EI 1530.

Chapter 4

AIRPORT STORAGE AND HYDRANT SYSTEMS

4.1 GENERAL

4.1.1 Airport fuel storage and hydrant system operators should implement quality control requirements set out in their PSPs that meet the minimum requirements of the industry standards referenced and described in this manual.

4.1.2 The ultimate responsibility for the acceptance of the product or service provided by the airport fuel storage and hydrant system operators lies with the aircraft operator. However, a primary accountability of the contracted supplier of the fuel is to demonstrate at the time of transfer that the fuel delivered was clean, uncontaminated and on-specification. A written contractual agreement should exist between the aircraft operator and providers/deliverers of the fuel defining the individual responsibilities, safety related services and quality to be provided. The airport fuel storage and hydrant system operator's safety related activities relevant to the written agreement should be included in the aircraft operator's quality and safety assurance programmes.

4.1.3 The aircraft operator shall[11] ensure that the airport fuel storage and hydrant system operators have the appropriate authorization/approval when required, as well as the resources and competence to undertake the task.

4.2 DESIGN, CONSTRUCTION AND MAINTENANCE

4.2.1 The features relating to design of equipment are primarily intended for new facilities and equipment. It is not intended that the design and construction criteria described below would be applied retroactively where it is not practical to do so. The design requirements listed below should be applied to any future modifications or major repairs/upgrades for existing facilities and equipment, and maintenance requirements met appropriately. These requirements for airport fuel storage and hydrant systems are described in:

- EI 1540 — Design, Construction, Operation and Maintenance of aviation Fuelling Facilities.
- EI 1550 — Handbook on Equipment Used for the Maintenance and Delivery of Clean Aviation Fuel provides a comprehensive overview of the fuel handling systems used in the aviation industry to maintain batch integrity and product cleanliness throughout the distribution system and into the aircraft.
- EI 1560[12] — Handbook for the operation of aviation fuel hydrants.
- SAE ARP 5789 — Airport Fuelling Facilities.

4.2.2 For the construction, commissioning and maintenance of an airport hydrant system the following practices should be followed*:*

[11] Refer to, for example, EU OPS AMC M.A.301-1, FAR 121.105, and FAA order 8900
[12] To be published mid 2012

- EI 1540 - Design, Construction, Operation and Maintenance of aviation Fuelling Facilities or SAE ARP 5789 Airport Fuelling Facilities.
- EI 1541 - Performance requirements for protective coating systems used in aviation fuel storage tanks and piping.
- EI 1585 - Guidance in the cleaning of aviation fuel hydrant systems at airports.
- EI 1594 - Initial pressure strength testing of airport fuel hydrant systems with water.
- EI 1584 - Four-Inch Hydrant System Components and Arrangements.
- JIG Bulletin 39 - Fuel Hydrant Commissioning.

4.3 AVIATION PRODUCT QUALITY AND OTHER TECHNICAL PROGRAMMES

4.3.1 In addition to the general requirements of paragraph 1.2.2, this Section describes the minimum requirements for the quality of aviation products, as well as for health, safety security and environment. The operators of airport storage and hydrant systems should have established quality and safety management programmes to assure safe receipt, storage, and distribution of fuel within the fuel storage and hydrant operation, in accordance with one of the internationally accepted standards or practices:

- JIG 2 Guidelines for Aviation Fuel Quality Control & Operating Standards for Airport Depots.
- IFQP Control of Fuel Quality & Fuelling Safety Standards, incorporating SAE AS6401.
- ATA Specification 103 - Standards for Jet Fuel Quality Control 103.

The quality programme should be detailed in a manual. The purpose of the manual is to provide operational guidance to management and staff. This manual should be kept current and reviewed on a systematic basis. It should be made readily available to all relevant employees, including those on-site, and to customers' inspectors and auditors. The scope should include appropriate elements listed in paragraph 1.2.3, including provisions to ensure that there is a system in place to identify and correct non-compliances.

Chapter 5

INTO-PLANE OPERATIONS[13]

5.1 GENERAL

5.1.1 Contaminated fuel has the potential to create unacceptable safety risks to aircraft. In line with industry expectations and practices as signposted in the previous Chapters, there should be robust defences in place throughout the supply chain in order to protect aircraft from the potentially damaging effects of contaminated fuel. Into-plane operations present the last opportunity to ensure that only uncontaminated, on-specification fuel is pumped into aircraft tanks. Refer to industry Standards i.e. AS6401, JIG 1, ATA103 for more information.

5.1.2 Training — Step-by-step procedures for all critical tasks (e.g. aircraft fuelling; hot refuelling of helicopters; refuelling in a hangar environment; defueling; fuel quality control) shall[14] be clearly documented (i.e. hardcopy, electronic) in order to facilitate the induction and recurrent training of employees.

5.1.3 Responsibility — The ultimate responsibility for the acceptance of the product or service provided by the sub-contractor[15] always remains with the airline.

5.2 QUALITY CONTROL REQUIREMENTS

5.2.1 In addition to the general requirements of section 1.2.2, this section describes the minimum requirements for fuel suppliers and into-plane agents to ensure fuel product quality and safe operations. This management of fuel quality should include basic quality control requirements for provision of fuel into aircraft, in accordance with one of the internationally accepted standards or good practices below:

- IFQP Control of Fuel Quality & Fuelling Safety Standards, incorporating SAE AS6401.
- JIG 1 Standards for Aviation Fuel Quality Control and Operating Standards for Into-Plane Fuelling Services.
- JIG 2 Standards for Aviation Fuel Quality Control & Operating Standards for Airport Depots.
- ATA Specification 103 - Standards for Jet Fuel Quality Control 103.

5.2.2 The operators of airport fuel depots, and into-plane agents should implement quality control procedures and scheduled maintenance programme(s) set out in company proprietary documents which meet the minimum requirements of the above industry standards.

[13] This edition covers only hydrant and vehicle refuelling facilities.
[14] Refer to the standards in paragraph 5.1.1.
[15] Sub contractor is the term used in typical fuel contracts between the fuel provider and aircraft operator.

5.2.3 By virtue of contractual agreements, the aircraft operator or its representative has the authority and the access, to do technical surveys/inspections/audits of:

a) The manual and operating procedures of the contractor/fuel supplier.
b) The contractor/fuel supplier's records on quality control and checks of fuel.
c) The contractor/fuel supplier's services at the aircraft and operational standards of an airport fuel storage distribution system, including into-plane systems.

5.3 CUSTOMER NOTIFICATION

5.3.1 Aircraft and airport operators shall[16] be notified of any major modification, new, additional, out of service supply system (including intrusive scheduled maintenance), replacement, or modified equipment that is placed into operation, prior to the reactivation. Reference: SAE AS6401, ATA103 and ICAO SMS Doc 9859. Additional information can be found in JIG Bulletin 39.

5.4 RE-FUELLING OF AIRCRAFT — FUEL QUALITY CONSIDERATIONS

5.4.1 Adherence to correct processes and procedures for refuelling of on-specification aviation fuel is fundamental for the safe operation of an aircraft. The IATA Guidance Material on Standard Into-Plane Fuelling Procedures, Chapter 2 "Safety" identifies mandatory precautions that must be taken, prior to commencing refuelling. It is an aviation industry expectation that the applicable standards, as well as the terms of the agreement between the aircraft operator and the sub-contractor will be followed before and during refuelling operations.

5.5 FUELLING VEHICLES TECHNICAL AND FILTRATION REQUIREMENTS

5.5.1 Fuelling vehicles — General

Reference to vehicle technical requirements can be found in EN 12312-5 or, amongst others, SAE SAE-5 Committee documents:

a) ARP5818 - Design and Operation of Aircraft Re-fuelling Tanker Vehicles.
b) ARP5918 - Standard Test Criteria for Aircraft Re-fuellers.
c) AS5877A - Detailed Specification for Aircraft Pressure Re-fuelling Nozzle.
d) AS 6401 - standard for Storage, Handling and Distribution of Aviation fuels at Airports.

[16] Refer to the standards in paragraph 5.3.1

5.5.2 Fuelling vehicles — Filtration

All jet fuel fuelling vehicles shall[17] be fitted with at least the following filtration equipment, meeting the appropriate and latest edition specification of:

a) filter monitors — EI 1583; or
b) filter water separators — EI 1581; or.
c) a 3-stage filter system — EI 1581 (for filter water separators) and EI 1583 (for filter monitors).

Where fuelling equipment is equipped with filter water separators, a system to detect free water in the sump should be installed. Additional information on filtration can be found in EI 1550.

[17] Refer to the standards in paragraph 5.5.2

Appendix 1

REFERENCED DOCUMENTS

CHAPTER 1

ACI	Airside Safety Handbook.
IATA	Doc 8402-01, Introduction to Safety Management Systems (SMS).
IATA	IFQP Training Manual
ICAO	Annexes 6, 8 and 14
ICAO	Document 8335 — Manual of Procedures for Operations Inspection Certification and Continued Surveillance.
ICAO	Document 9774 — Manual on Certification of Aerodromes.
ICAO	Document 9859 — Safety Management Manual.
JIG Bulletin 32	Health, Safety, Security and Environmental Management System.
UK MOD	Defence Standard 91-91

CHAPTER 2 (ADDITIONALLY)

Aviation turbine engine fuel (jet fuel)

Jet A or Jet A-1 - ASTM D 1655
Jet A-1 - Defence Standard 91-91
TS-1 - GOST 10227
Jet Fuel No. 3 - GB6537

ATA 103	Standards for Jet Fuel Quality Control.
ATA	Airport Fuel Facility and Operations Maintenance Guidance Manual
API 1595	Design, Construction, Operation, Maintenance and Inspection of Aviation Pre-Airfield Storage Terminals.
API 1543	Documentation, Monitoring and Laboratory Testing of Aviation Fuel during Shipment from Refinery to Airport.
ASTM D4306	Standard Practice for Aviation Fuel Sample Containers for Tests Affected by Trace Contamination.

ASTM D4057	International Standard Practice for Manual Sampling of Petroleum and Petroleum Products.
ASTM D6299	Standard Practice for Applying Statistical Quality Assurance and Control Charting Techniques to Evaluate Analytical Measurement System Performance.
ASTMD6708	Standard Practice for Statistical Assessment and Improvement of Expected Agreement between Two Test Methods that Purport to Measure the Same Property of a Material.
ASTMD6469	Standard Guide for Microbial Contamination in Fuels and Fuel Systems.
EI 1530	Guidance on the manufacture, storage and distribution of aviation fuels to airports.[18]
EI 1540	Design, Construction, Operation and Maintenance of Aviation Fuelling Facilities.
EI 1550	Handbook on Equipment Used for the Maintenance and Delivery of Clean Aviation Fuel.
EI 1585	Guidance in the cleaning of aviation fuel hydrant systems at airports.
EI	Guidelines for the investigation of the microbiological content of petroleum fuel and for the implementation of avoidance and remedial strategies.
EI	Guidelines on development, implementation and improvement of quality systems in petroleum laboratories.
EN ISO/IEC 17025	General requirements for the competence of testing and calibration laboratories.
IATA	Guidance Material on “Microbiological Contamination in Aircraft Fuel Tanks.
IATA	Guidance Material for Aviation Turbine Fuels Specifications. Part I — Guidance Material on Product Specifications. Part II — General Guidance on Additives.
IATA IFQP	IATA Fuel Quality Pool (IFQP) — Control of Fuel Quality & Fuelling Safety Standards.
ISO 3170	Petroleum Liquids – Manual sampling.
JIG 1	Aviation Fuel Quality Control and Operating Standards for Into-Plane Fuelling Services.
JIG 2	Aviation Fuel Quality Control and Operating Standards for Airport Depots and hydrants.

[18] To be published mid 2012

JIG 3	Aviation Fuel Quality Control and Operating Standards for Supply & Distribution Facilities.
JIG 4	Guidelines for Aviation Fuel Quality Control and Operating Procedures for Smaller Airports.
JIG Bulletin 35	Soak Testing.
SAE AS6401	Storage, Handling and Distribution of Jet fuels at Airports[19].

CHAPTER 3 (ADDITIONALLY)

EI HM 50	Guidelines for the cleaning of tanks and lines for marine tank vessels carrying petroleum and refined products.
EI Additive Protocol	Multi-product pipelines - minimum criteria to determine additive acceptability.

CHAPTER 4 (ADDITIONALLY)

EI 1541	Performance requirements for protective coating systems used in aviation fuel storage tanks and piping.
EI 1560	Handbook for the operation of aviation fuel hydrant systems[20].
EI 1584	Four-Inch Hydrant System Components and Arrangements.
EI 1585	Guidance in the cleaning of aviation fuel hydrant systems at airports.
EI 1594	Initial pressure strength testing of airport fuel hydrant systems with water.
JIG Bulletin 39	Fuel Hydrant Commissioning
SAE ARP 5789	Airport Fuelling Facilities.

CHAPTER 5 (ADDITIONALLY)

CEN EN 12312-5	Aircraft ground support equipment — Specific requirements — Part 5: Aircraft fuelling equipment.
EI 1581	Specifications and Qualification Procedures for Aviation Jet Fuel Filter/Separators.

[19] Under development – see Appendix 3
[20] To be published mid 2012

EI 1583	Laboratory tests and minimum performance levels for aviation fuel filter monitors.
IATA	Standardized Into Plane Fuelling Procedures.
SAE ARP5818	Design and Operation of Aircraft Refuelling Tanker Vehicles.
SAE ARP5918	Standard Test Criteria for Aircraft Refuellers.
SAE AS5877A	Detailed Specification for Aircraft Pressure Refuelling Nozzle.

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Appendix 2

ORGANIZATIONS INVOLVED IN THE DRAFTING OF THIS MANUAL

IATA & A4A — Joint leaders of the IATA TFG task force that drafted the technical fuel content.

Workgroups

1. **Supply group** — All aspects from refinery up to supply to airport storage:

    a. Air BP (lead)
    b. Exxon Mobil
    c. Shell Aviation
    d. United Airlines
    e. Platinum Fuels
    f. PAMAS
    g. American Airlines (initial work)

2. **Storage group** — Airport storage and hydrant systems:

    a. UPS (lead)
    b. Q8 Aviation
    c. Exxon Mobil
    d. World Fuel Services
    e. Delta Air Lines
    f. Star Services
    g. British Airways

3. **Provision group** — All vehicles, pressure control and into-plane:

    a. Lufthansa (lead)
    b. Servisair
    c. Airbus
    d. KLM
    e. Austrian Airlines
    f. Cathay Pacific Airways (initial work)
    g. AFS Germany

ICAO collaborated with IATA and ACI during work on development of the manual providing inputs, including those from the ICAO Aerodrome Operations and Services Working Group of the Aerodromes Panel.

In addition to the specific task force members, other affiliated organizations, such as JIG, EI, and IATA IFQP were involved.

Appendix 3

FUEL INDUSTRY DOCUMENTS UNDER DEVELOPMENT

SAE[21] AS6401

1. The vision for this draft document[22] is intended to offer a global focus for the purpose of:

    a. Ensuring that the safe practices it contains can be applicable in all areas of the world[23]. Whenever possible, the best practices of the documents referred to in its introduction have been reproduced in the document.
    b. Ensuring that it's harmonized and standardized content reflect current levels of technical knowledge and industry experience include suitable reference to environmental protection controls and facilities that are receiving increased emphasis and regulation in most regions.

2. The SAE document has been complied by an Aviation Fuels Operations Committee, known as the G-16[24], from the following accepted industry practices:

    a. Airlines for America (A4A) — ATA 103.
    b. Canadian Standards Association (CSA) — B836.
    c. Coordinated Agency for Supplier Evaluation Inc (CASE) 2A.
    d. IATA Fuel Quality Pool (IFQP) standards.
    e. Joint Inspection Group (JIG) Standards.

3. Various other related standards documents were reviewed and provided the framework and are, where necessary, incorporated by reference within the body of the draft.

4. The features relating to design of equipment are primarily intended for new facilities or equipment, and for existing facilities or equipment which are significantly upgraded. It is not therefore intended that the guidance be applied retroactively where it is not practical to do so. In the case of conflict between the standards in the document and any local regulations, local regulatory requirements prevail.

5. Intended users of this document will need to give proper consideration to the effect of any unusual or abnormal circumstance, on which it is not possible to generalize.

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[21] SAE is a non-profit educational and scientific organization dedicated to advancing mobility and developing technical information on aerospace, aircraft, and all other types of self-propelled vehicles including: automobiles; buses; off-highway equipment; marine; rail; transit systems; and trucks.

[22] The text is taken from the SAE document. The application is intended to be for commercial aviation operations, however, many of the practices and procedures are suitable for military operations, except where they conflict with specific regulations and codes that are designed to fulfil military requirements. It is to be used as the basis for the IFQP8 audit programme from Jan 2012.

[23] In those cases where there may be a deviation between the standards in the draft SAE AS6401 and any pre-existing standards in specific world regions the G-16 will convene the necessary taskforce to undertake the required research to ensure technical justifications allow for their resolution as soon as practical.

[24] The G-16 is a committee sanctioned by SAE within their Aerospace General Projects Division, and differs from the AE-5C "Aviation Ground Fuelling Systems Committee", in that the G-16 is more concerned with the operation of facilities and equipment by an end user, as opposed to the detailed design by an equipment manufacturer.

Appendix 4

REGULATORY PRACTICES IN STATES

ICAO is seeking examples of effective regulatory oversight of the supply chain from States, particularly examples of those where the scope covers that part of the supply chain from arrival in State to airport fuel depots, and those:

- Of non aviation regulatory bodies, taking account of those parts of the supply chain that are generally outside the remit of civil aviation safety regulators.
- That use less burdensome but effective performance based regulation.
- Where the oversight arrangements have proven to be effective while imposing minimal burden on industry and using minimum State resources, for example using the results of other audits, such as those conducted by independent fuel or aviation industry auditors.
- That include requirements for the mandatory reporting of fuel quality related occurrences.
- Regulatory arrangements when either an aircraft or airport operator also engages in fuel handling or provision.

On receipt of this information ICAO will consider including information on State regulatory roles for future editions of this manual.

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Appendix 5

GLOSSARY OF TERMS

Term	Definition
Fuel contamination	For the purpose of this document, fuel that: • is cross-contaminated by other products, including other fuel grades or additives, that could put the fuel off-specification; • contains unacceptable levels of particulates or water — fails the visual clear and bright check or exceeds the cleanliness limits set out in IATA Guidance Material for Aviation Turbine Fuel Specifications, Part III, Cleanliness and Handling; or • contains unacceptable levels of microbiological growth — see paragraph 2.7.
Fuel Quality	A degree or level of confidence that fuel provided meets the requirements of the appropriate fuel specification, and end-user purpose, in terms of specification and cleanliness.
Quality • **Control** • **Assurance** • **Management**	 A system of maintaining standards in manufactured products by testing a sample of the output against the specification. A systematic monitoring and evaluation of the various aspects of a project, service or facility to maximize the probability that minimum standards of quality are being attained. A systemic integration of, planning, quality control, quality assurance and process improvement in order to achieve a desired or improved output.

— END —