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IATA Guidance Material for Sustainable Aviation Fuel Management

2nd | Edition

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Section 1—Introduction

In view of the growing demand by airlines for information on standard procedures for the use of Sustainable Aviation Fuel (SAF), the IATA Operations Committee in 2010 indicated the need to develop guidance materials for the management of SAF, otherwise known as as biojet fuel, aviation biofuel or sustainable aviation fuel. The IATA language preference is sustainable aviation fuel although all terms imply the same meaning. The multi-disciplinary nature of SAF-use was supported by the involvement of multiple IATA departments who collaborated to produce an outline of this guidance document. The scope includes aspects of Technical Fuel, Commercial Fuel, and Environment.

From early 2011, member airlines and IATA Strategic Partners have been participating in the development of this material. Ten airline representatives, SAF producers, and petroleum companies joined IATA staff in creating the first edition of the IATA Guidance Material on Biojet Fuel Management, known in short as the „BioGuide“. With the rapidly evolving technical and certification landscape for SAF fuel it was decided to update this document with a second edition effective April 2015.

The BioGuide is intended to serve two purposes:

1. Inform the reader of existing requirements relating to SAF fuel purchase, handling, and regulations; as well as,
2. Propose industry-standard best practices for managing SAF transactions

The main questions addressed are:

- What are the required technical specifications for SAF fuel?
- What documentation must be provided to track the bio-component and apply for emissions credit?
- Which supply chain options are available to purchasers of SAF?
- What terms must be contained in the SAF purchase agreement?

The preparation of this document involved:

- A review of technical fuel specifications including ASTM International¹ and DefStan²,
- Analysis of European Commission (EC) legislation to clarify acceptable practices under the European Emissions Trading Scheme (EU ETS),
- Analysis of different purchase scenarios to identify roles and responsibilities of involved parties,
- Review and recommendation of updates to the IATA Aviation Fuel Model Purchase Agreement.

Note that special attention is given to the European Emissions Trading Scheme (EU-ETS), which requires operators to supply detailed evidence material for recognition of SAF use.

¹ Formerly the American Society for Testing and Materials

² UK MOD Defence Standard 91-91

Section 2— Key Findings

2.1 Technical Certification and Handling of SAF

To be acceptable to Civil Aviation Authorities aviation turbine fuel must meet strict chemical and physical criteria. There exist several specifications that authorities refer to when describing acceptable conventional jet fuel such as ASTM D1655 and Def Stan 91-91. At the time of issue of this document, different types of blends have been found to be acceptable for use under these specifications, but must first be certified under ASTM D7566. Once the blend has demonstrated compliance with the relevant product specifications, it may be regarded as equivalent to conventional jet fuel certified under ASTM D1655.

2.2 SAF Sustainability

The environmental sustainability of SAF must be verified through a sustainability analysis if the purchaser wishes to benefit from the most prominent renewable fuel incentive programs and to demonstrate the environmental benefits of SAF use to passengers and the public (e.g. in corporate social responsibility (CSR) reports). If the analysis deems the fuel compliant, batches of this fuel must be accompanied by appropriate documentation - referred to here under the general term „certificate of sustainability“ (CoS) – to the final destination. As one example, the European Commission (EC) has stated that from 2013 a proof of sustainability will be required for zero-emissions rating of SAF purchased by airlines from the European Emissions Trading Scheme. Acquiring a CoS is also highly recommended to ensure that SAF meets relevant sustainability criteria, such as not causing deforestation, competition with food, or other unsustainable side-effects.

2.3 Compliance with Emissions Regulations

The EC provides guidelines for the monitoring, reporting and verification (MRV) of emissions from aviation activities for the purposes of the EU ETS. The MRV of the bio-component of SAF blends can only be reasonably achieved through a system based on purchase records. Purchase records and certificates of sustainability provide sufficient detail of batch contents to satisfy the requirements of the EC. Information relating to SAF purchases is provided to airlines by fuel producers, whose records are generally subject to audit under existing tax codes.

Other emissions trading schemes (e.g. New Zealand, Australia) require less detailed evidence about SAF use from the operator. Other SAF incentive schemes, such as the US Renewable Fuel Standard, give benefits to producers of sustainable biofuels and do not require any proof of SAF use from operators.

2.4 Purchase Contracts and Insurance

SAF purchase agreements can be based on the IATA Aviation Fuel Supply Model Agreement (AFSMA) with only minor modifications. The structure of the AFSMA allows for contracts to establish a set of general principles applicable to purchases at all airports in the Master Agreement plus Location Agreements in which details of particular relevance to individual airports, such as logistics and pricing, can be defined. Purchase agreements should also clearly stipulate that records such as the Refinery Certificate of Quality (RCQ) and any agreed documentation relating to the sustainability of SAF be made available to the airline.

Section 3—Technical Certification and Handling of SAF

3.1 Overview

This chapter describes the technical certification and handling of batches of SAF. For the purposes of this document, SAF is defined as jet fuel derived from biomass or non-biomass waste and used as a blending component to meet the relevant specification for use on aircraft, such as ASTM D1655/7566 or Defence Standard 91-91 (Def Stan 91-91). Today, three different pathways have been approved for use on commercial airliners:

- Biomass gasification and synthesis using the Fischer-Tropsch (FT)
- Hydroprocessing of plant oils and fats (HEFA - hydroprocessed esters and fatty acids)
- Conversion of plant sugars into Synthesized Iso-Paraffinic (SIP) fuel

In all three cases, neat SAF must be blended with conventional jet fuel before it can meet the standard jet fuel specifications. Other pathways are currently undergoing the certification process and are expected to become available in the near term.

3.2 General Caveat

In general, this guidance material focuses on blends containing jet fuel derived from biomass or non-biomass waste, explicitly excluding coal to liquid (CTL) jet fuel, gas to liquid (GTL) jet fuel, and other jet fuel not derived from biomass or non-biomass waste. This exclusion is due to the fact that fuels derived from biomass or non-biomass waste will generally have lower lifecycle carbon emissions than fossil-derived jet fuel (thus contributing to industry targets for emissions reduction) and may qualify for various financial incentive programs associated with renewable energy, biofuel, and emissions reduction.

3.3 Introduction

In order to be used on commercial aircraft and existing fuel storage and handling infrastructure, SAF need to meet the requirements described in the relevant specifications. Specifications are used to control the chemical and physical properties of aviation turbine fuel (both conventional and SAF) and allow fuel to be periodically checked for compliance as it travels through the distribution infrastructure to its final destination. Specifications are published by a variety of bodies around the world, including international standards associations and government agencies. In addition, there are companies and industry associations that issue manuals and other guidance documentation with recommended practices along the supply chain to ensure the integrity of the fuel.

To be used in commercial aviation applications, neat (i.e. pure, unblended) SAF must first meet the requirements described in the relevant annex of ASTM Specification D7566, Standard Specification for Aviation Turbine Fuels Containing Synthesized Hydrocarbons³. Once a batch has demonstrated compliance with the annex requirements, it is blended with conventional jet fuel according to the requirements in ASTM D7566 and re-tested to show compliance with Table 1 of ASTM D7566. A blend manufactured, certified and released to all the requirements of Specification ASTM D7566 meets the requirements of ASTM Specification D1655, Standard Specification for Aviation Turbine Fuels⁴, and shall be regarded as Specification ASTM D1655 turbine fuel.

A SAF blend manufactured and certified using ASTM's procedure is also compliant with Def Stan 91-91. Aircraft, engines and other equipment manufactured to operate on jet fuel meeting ASTM D1655 or Def Stan 91-91 may therefore use a SAF blend.

3.4 Key Definitions

- **Conventional jet fuel:** Jet A, or Jet A-1 produced from conventional hydrocarbons (crude oil, liquid condensates, heavy oil, shale oil, and oil sands), meeting standard jet fuel specifications such as ASTM D1655 or DefStan 91-91.
- **SAF:** General term describing biomass or non-biomass waste-derived jet fuel manufactured through processes such as Fischer-Tropsch synthesis, hydroprocessing, or fermentation of sugars per Annex A1, A2, or A3 of ASTM D7566, either in pure form ("neat SAF") or blended with conventional jet fuel.
- **SAF blend:** A mix of up to 50% SAF fuel in conventional jet fuel meeting the requirements set out in ASTM D7566, Table 1.
- **Bio-component:** The fraction in a SAF blend that is derived from biomass or non-biomass waste.

3.5 Fuel Specifications

Commonly-used specifications and recommended practices for conventional jet fuel (Jet A or Jet A-1) include the following:

- ASTM D1655 "Standard Specification for Aviation Turbine Fuel" (US and international)
- UK Defence Standard 91-91 "Turbine Fuel, Aviation Kerosene Type, Jet A-1" (UK and international)
- Joint Inspection Group (JIG) Aviation Fuel Quality Requirements for Jointly Operated Systems (AFQRJOS, or "joint checklist" – international)
- GOST 10227 TS-1 (Russia and CIS)

³ <http://www.astm.org/Standards/D7566.htm>

⁴ <http://www.astm.org/Standards/D1655.htm>

- Number 3 Jet Fuel (China)
- Others, produced by organizations (engine manufacturers, pipeline operators, etc.) wishing to define fuel to their own requirements

These specifications are all very similar because they essentially describe the same product, i.e. aviation kerosene. For instance, ASTM D1655 and Def Stan 91-91 have nearly identical requirements for Jet A-1: of the approximately thirty test results that must be reported, there are only two minor variations in test limits (acidity level, and a parameter related to naphthalene content). All requirements relating to energy density, freeze and flash points, aromatic content and other defining fuel characteristics are the same. Discrepancies are further reduced by the Aviation Fuel Quality Requirements for Jointly Operated Systems (AFQRJOS), often referred to as the “Check List”, which incorporates the strictest elements of both ASTM D1655 and Def Stan 91-91. The appropriate grade of jet fuel and specification to be used in each circumstance is determined by the type certification of the aircraft and engine, as well as local regulations, although ASTM D1655 and Def Stan 91-91 are the most commonly cited. A brief description of the different specifications most commonly used around the world is presented next.

3.6 Technical Certification

3.6.1 ASTM International

ASTM International, formerly known as the American Society for Testing and Materials, develops and publishes specifications for a wide variety of products, including jet fuel. ASTM International follows a consensus-based approach and its standards are recognized worldwide. In 1959, ASTM International first issued standard D1655 *Standard Specification for Aviation Turbine Fuels*. This is the standard for conventional jet fuel and it has been modified numerous times since it was first released to reflect changes in quality requirements associated with engine and aircraft modifications and new materials. ASTM D1655 covers Jet A and Jet A-1 fuels. Jet A is the most common jet fuel in the United States while Jet A-1 is used in most of the rest of the world.

In 2009, ASTM International approved D7566 *Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons*, the first specification describing a jet fuel not derived from petroleum crude. These synthesized molecules are referred to as “synthetic paraffinic kerosene” or SPK. ASTM D7566 is divided in two main parts: the first part (Table 1) contains the specifications for the blend of SPK and conventional jet fuel; the second part includes Annexes for the different pathways that have been approved since the introduction of ASTM D7566:

- Annex A1 for Fischer-Tropsch Hydroprocessed Synthesized Paraffinic Kerosene (FT SPK)
- Annex A2 for Synthesized Paraffinic Kerosene from Hydroprocessed Esters and Fatty Acids (HEFA SPK)
- Annex A3 for Synthesized Iso-Paraffins from Hydroprocessed Fermented Sugars (SIP SPK)

The FT SPK process can take virtually any carbonaceous raw material such as organic matter in municipal solid waste (MSW), forest and agricultural residues, natural gas, and coal and turn them into transportation fuels such as renewable diesel and SAF. HEFA fuels can be made from plant oils, including used cooking oil, as well as from animal fats and greases. SIP fuels are produced from sugars through a fermentation process. More information on these feedstocks and production processes can be found elsewhere.⁵

According to ASTM D7566, neat SAF has to be blended with conventional jet fuel to meet all the requirements in Table 1. Blending of FT SPK and HEFA SPK is allowed up to 50% with conventional jet fuel while SIP SPK can only be blended up to 10%. Once the SPK is blended and the blend is certified to meet all requirements in Table 1 of ASTM D7566, the fuel is considered to meet the requirements of specification ASTM D1655 and should be considered as ASTM D1655 jet fuel from then on. This is a key feature of ASTM D7566 because once the SPK blend is certified under ASTM D7566, it is allowed to enter the conventional jet fuel handling, storage, and distribution network and be treated as conventional jet fuel.

It is important to highlight that ASTM certification for SAF is a very thorough process in which many entities participate, especially engine and airframe manufacturers.⁶ The original equipment manufacturers (OEMs) spend weeks if not months testing hundreds of thousands of gallons of SAF in many different test and component rigs to ensure that the fuel is compatible with existing fuel infrastructure and equipment. The standard-setting approach is very conservative and limits on blending percentage, for example, are set to ensure the fuel blend is fit for purpose in common operating environments.

Over the coming years, it is expected that further annexes will be added to ASTM D7566 as new synthetic jet fuel types are approved. Some of the new pathways being evaluated are proposed as 100% replacements so that no blending with conventional jet fuel would be necessary. It should be noted that ASTM D1655 recognizes the fully synthetic jet fuel manufactured by Sasol in South Africa using the FT process as meeting the requirements of the specification.

3.6.2 UK Ministry of Defence (MoD) Defence Standard (DefStan) 91-91

The U.K. Ministry of Defence (MOD) publishes Defence Standard (Def Stan) 91-91⁷, which has evolved into a commercial specification with worldwide recognition, especially outside of the United States. MOD and ASTM International have a long history of cooperation. With the intent of creating a single global set of specifications, they typically incorporate each other's test methods in order to capture and accommodate the availability of different testing equipment and technologies in different regions of the world.

Def Stan 91-91 allows for synthetic jet fuel components derived from non-petroleum sources, but only on a case-by-case basis dependent on the initial raw material and production process. For example, Def Stan 91-91

⁵ E.g. IATA 2010 Report on Alternative Fuels: www.iata.org/alternative-fuels

⁶ For more information, see: D4054 *Standard Practice for Qualification and Approval of New Aviation Turbine Fuels and Fuel Additives*, available at: <http://www.astm.org/Standards/D4054.htm>

⁷ Available through: http://www.dstan.mod.uk/closure_notice.html

approved the use of Sasol's unblended coal-to-liquids synthetic jet fuel for commercial use on all types of turbine aircraft⁸. Furthermore, Def Stan 91-91 states that blend components conforming to ASTM D7566 and its annexes are permitted. Since Def Stan 91-91 specifically cites ASTM D7566 as the reference for synthetic jet fuel, the procedure for certifying SAF blends under Def Stan 91-91 is as described by ASTM D7566.

Compliance with Def Stan 91-91 requires the listing of volume percentage of synthetic components, as stated in Note 9 of Table 1 of Def Stan 91-91: *"The volume percentage of each synthetic blending component type shall be recorded along with its corresponding release Specification and Annex number, product originator and originator's RCQ number."* Furthermore, Def Stan 91-91 has fuel traceability requirements that ASTM D7566 does not contain as stated in Def Stan 91-91 Annex D: *"The location at which a semi-synthetic jet fuel meeting this specification is blended need not be a refinery, but the point of blending shall be considered as the point of manufacture of the jet fuel for the purposes of this specification. Therefore the appropriate requirements of this specification apply at that point."*

3.6.3 Canadian General Standards Board (CAN CGSB)

The Standards Council of Canada has accredited CAN CGSB as a Standards Development Organization. CGSB has developed a number of specifications related to jet fuel, such as:

- CAN CGSB - 3.22 for wide-cut fuel (Jet B) which is used in parts of Canada and Alaska
- CAN/CGSB - 3.23 for Jet A and Jet A-1
- CAN/CGSB - 3.24 for military grades JP-5 and JP-8

CAN/CGSB 3.23 and CAN/CGSB 3.24 have been amended to reflect industry changes on alternative fuels.

3.6.4 Russia and CIS

Russia's State Standard Committee is the body responsible for specification GOST 10227 which covers the light kerosene-type fuel (TS-1 and RT) used in the Commonwealth of Independent States (CIS) and parts of Eastern Europe. This is the only specification that uses different test methods.

3.6.5 China

China's National Technology Supervisory Bureau is in charge of issuing Chinese specifications for jet fuel. Its GB6537 standard covers "No.3 Jet Fuel" which is the predominant kerosene used in China and is equivalent to Jet A-1.

⁸ <http://www.sasol.com/media-centre/media-releases/sasol-achieves-approval-100-synthetic-jet-fuel>

3.7 Role of Other Entities

3.7.1 Aircraft and Engine Manufacturers

Original equipment manufacturers (OEMs) are heavily involved in the development and maintenance of fuel specifications as their products are designed and built according to the requirements established in those specifications. For example, changes to fuel specifications and the development of new annexes to ASTM D7566 must undergo an approval process through the OEMs, as mentioned in Section 3.6.1. The operating manuals for aircraft and engines specify the type of fuel that may be used with the equipment (e.g., ASTM D1655 or Def Stan 91-91) and these indications must be followed by the operator of the equipment.

3.7.2 Regulatory Agencies

Typically, regulatory agencies do not certify fuels or issue fuel specifications. Rather, regulatory agencies take into account the operating manuals issued by OEMs and ensure that the equipment operators have processes in place to comply with the requirements in those manuals, such as the fuel specification approved for use on the equipment.

3.8 Supply Chain Recommended Practices

In addition to fuel specifications such as ASTM D1655 and Def Stan 91-91, there are guidance documents by different entities with recommended practices to ensure the quality of the jet fuel as it moves along the supply chain. Some of the main entities and their associated documents are presented below.

3.8.1 Energy Institute (EI)

The Energy Institute (EI) is a professional membership body based in the United Kingdom providing knowledge and information through conferences and technical publications to the energy sector. EI has published a number of significant technical documents for the aviation industry, including:

- **EI 1530 Quality assurance requirements for the manufacture, storage, and distribution of aviation fuels to airport.** This document presents best practices for safe handling of jet fuel from the refinery to storage at the airport and has a short section on alternative fuels. EI 1530 is a joint publication with the Joint Inspection Group (JIG).
- **EI 1550 Handbook on equipment used for the maintenance and delivery of clean aviation fuel.** This document complements EI 1530 with more in-depth information regarding equipment and best practices to keep aviation fuel clean as it travels along the supply chain.

3.8.2 Joint Inspection Group (JIG)

The Joint Inspection Group (JIG) was originally established by major oil companies serving major airports around the world to develop a set of standards for the operation and handling of jet fuel at shared facilities at those airports. JIG continuously updates those standards to ensure they reflect the latest understanding of jet fuel quality control practices. The Standards which JIG maintains are:

- **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**
- **JIG 3 – Aviation Fuel Quality Control and Operating Standards for Supply & Distribution Facilities**
- **JIG 4 – Aviation Fuel Quality Control and Operating Standards for Smaller Airports**

JIG also maintains the Aviation Fuel Quality Requirements for Jointly Operated Systems (AFQRJOS), a checklist with the most stringent requirements from both ASTM D1655 and Def Stan 91-91. As with Def Stan 91-91, synthetic components are permitted but “shall be reported as a percentage by volume of the total fuel in the batch”. This checklist is used extensively especially at airports outside the United States.

3.8.3 International Civil Aviation Organization (ICAO)

In 2012, ICAO published the Manual on Civil Aviation Jet Fuel Supply (Doc 9977, AN/489) which summarizes the main recommended practices for the safe handling of jet fuel along the entire supply chain from the refinery to the wing of the aircraft. The manual references specific guidelines as published by other entities such as EI and JIG. This document was created in collaboration with IATA, Airports Council International (ACI), and Airlines for America (A4A).

3.8.4 International Air Transport Association (IATA)

IATA has a number of initiatives to support the application of best practices for jet fuel quality control and procurement. The IATA Fuel Quality Pool (IFQP) is an effort to help set standards for fuel handling and inspection of fuel facilities around the world. IATA also collaborates with other entities in the preparation and dissemination of guidance documents such as the Manual on Civil Aviation Jet Fuel Supply (Doc 9977, AN/489) mentioned above. On the procurement side, IATA has prepared an Aviation Fuel Supply Model Agreement (AFSMA), a generic fuel purchase model agreement that airlines and producers may use to facilitate fuel purchase contracts. This document will be discussed in more detail in Section 6.

3.8.5 Airlines for America (A4A)

A4A, formerly known as Air Transport Association or ATA, is the largest trade association for commercial airlines in the United States. With the collaboration of representatives from airlines, oil companies, and fuel

handling companies, ATA developed ATA 103 *Standard for Jet Fuel Quality Control at Airports* which is widely used at airports in the United States.

3.9 Supply Chain Quality Control

3.9.1 Overview

As fuel travels from the production facility to the wing of the aircraft, it will be transported by pipeline, truck, or barge and may be stored in intermediate storage facilities prior to delivery to the airport fuel farm. Prior to delivery to the airport, it is necessary to ensure that the fuel has been certified to the appropriate specification. The proper handling of fuels ensures they remain essentially free of harmful contaminants during production, transportation and distribution. The specifications described in the above sections provide a benchmark against which fuel quality is measured. No deviations from the specifications are permitted although it is important to keep in mind that the specifications allow for some variation in the value of the fuel properties.

3.9.2 Relevant Quality Control Documents

Technical documents demonstrating fuel quality must accompany the product to its destination. The most common of these documents are listed here:

- Refinery Certificate of Quality (RCQ)
- Certificate of Analysis (COA)
- Recertification Test Certificate (RTC)

The following document descriptions were adapted from Def Stan 91-91:

Refinery Certificate of Quality: The RCQ is the definitive original document describing the quality of an aviation fuel product. It contains the results of measurements, made by the product originator's laboratory, of all the properties listed in the latest issue of the relevant specification. It also provides information regarding the addition of additives, including both type and amount of any such additives. Moreover, it includes details relating to the identity of the originating refinery and traceability of the product described. RCQs shall always be dated and signed by an authorized signatory.

Certificate of Analysis: A COA may be issued by independent inspectors or laboratories that are certified and accredited, and contains the results of measurements made of all the properties included in the latest issue of the relevant specification. It does not, however, include details of the additives added previously. It shall include details relating to the identity of the originating refiner and to the traceability of the product described. It shall be dated and signed by an authorized signatory.

Note: A COA shall not be treated as an RCQ.

Recertification Test Certificate: The RTC demonstrates that recertification testing has been carried out to verify that the quality of the aviation fuel concerned has not changed and remains within the specification limits, for example, after transportation in ocean tankers or multiproduct pipelines. Where aviation product is transferred to an installation under circumstances which could potentially result in contamination, then before further use or transfer, recertification is necessary. The RTC shall be dated and signed by an authorized representative of the laboratory carrying out the testing. The results of all recertification tests shall be checked to confirm that the specification limits are met, and no significant changes have occurred in any of the properties.

3.9.3 Main Steps along the Supply Chain

A diagram of the main steps in the supply chain, including references to the main specification and other quality documents are shown in Figure 1:

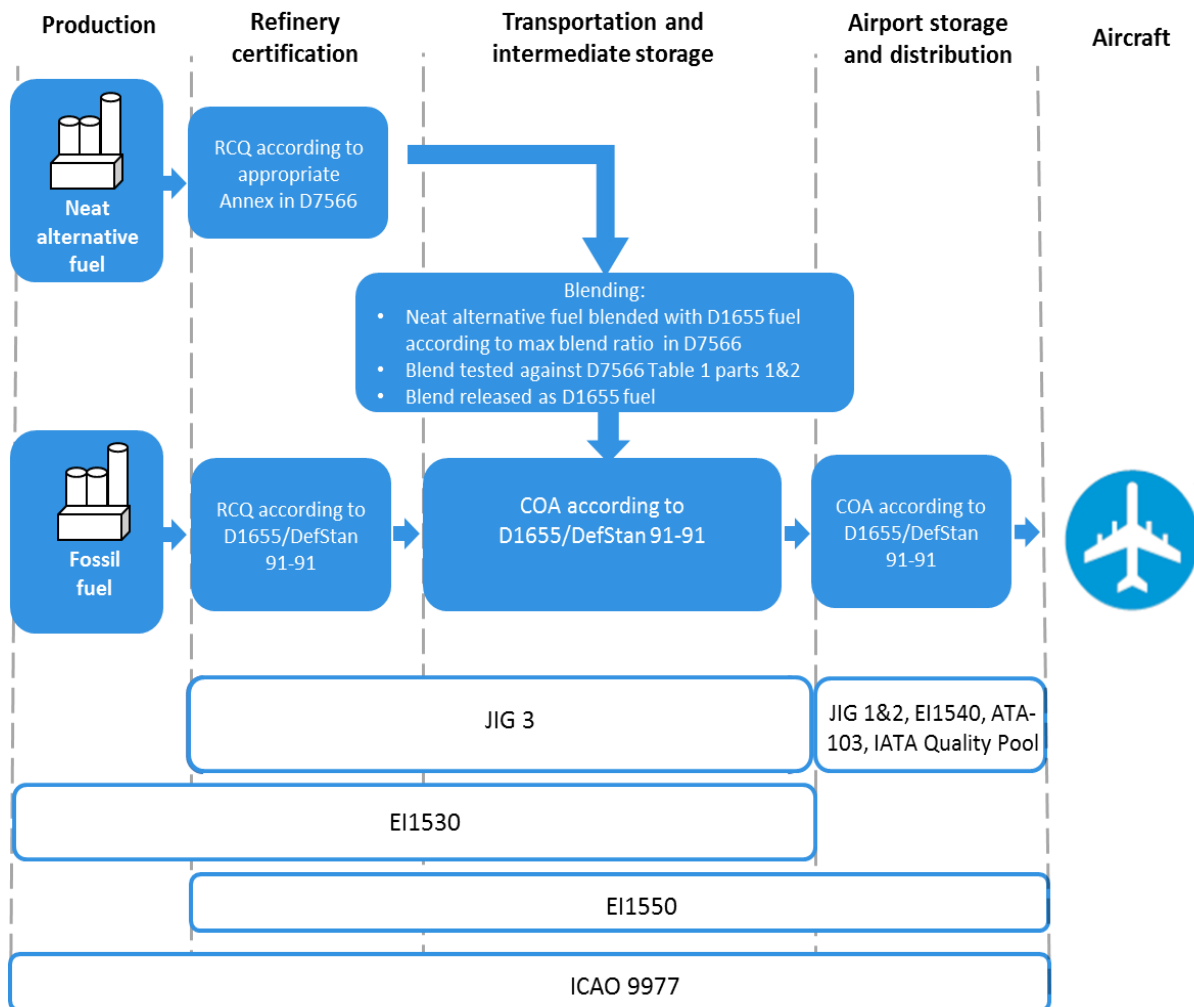


Figure 1. Main steps in the supply chain of aviation fuel.

For conventional fuel, the quality process starts with the creation of an RCQ according to the relevant specification, typically ASTM D1655 or Def Stan 91-91. Once the fuel leaves the refinery, it will travel by pipeline, truck, rail, or barge directly into the airport tank farm or an intermediate terminal prior to reaching the airport. At each transition point, the fuel will typically be re-inspected and a Certificate of Analysis (COA) according to the relevant specification will be issued.

For neat SAF, the process is similar but with some additional steps, in particular blending. As with conventional fuel, an RCQ will be issued at the refinery but in this case, it will be according to the appropriate annex in the ASTM D7566 specification and not to ASTM D1655 or Def Stan 91-91. As such, the neat SAF cannot yet enter the supply chain for conventional fuel. First, the neat SAF has to be blended with conventional fuel up to the limits specified in ASTM D7566. Once the fuel is blended, it will be tested against ASTM D7566 Tables 1 and 2. Once it is confirmed that the blended fuel meets this specification, it will be released as meeting the ASTM D1655 specification. From this moment on, the fuel is considered to be fungible with conventional fuel and can be handled as regular ASTM D1655 fuel.

3.10 Considerations for the Introduction of SAF

A recent study completed for the FAA concluded that there are no radical changes needed in current fuel quality control practices for the introduction of SAF⁹; however, a number of recommendations were suggested to strengthen current practices, some of which are discussed below.

3.10.1 Blending

As mentioned in Section 3.6, the specification for currently approved SAF requires blending with conventional jet fuel. Thus, prior to entering the supply chain, blending and re-certification according to ASTM D7566 must take place. In theory, blending can take place at any point along the supply chain as illustrated in Figure 1 but there are a number of factors to consider to choose the best location, including:

1. **Source of conventional fuel:** Where and how the conventional fuel for blending is procured is of critical importance. If the refinery where SAF is produced has ready access to conventional jet fuel, either because it also produces conventional jet fuel or is located within easy reach of a conventional jet fuel source, blending at the refinery would arguably be the best solution.

If the SAF refinery is not located within easy access to conventional fuel, blending could occur at a suitable point along the supply chain such as an intermediate storage facility or the airport. In this case, the neat SAF would need to be kept segregated until the blending point. This may increase transportation and handling costs but may be the most practical solution.

2. **Availability of blending and storage infrastructure:** Access to existing infrastructure for blending reduces cost as new facilities would not be needed. It is important to consider that at least four tanks

⁹ Available at:

http://www.faa.gov/about/office_org/headquarters_offices/apl/research/alternative_fuels/media/Metron_Fuel_Quality_Final.pdf

may be required for blending: one for the conventional fuel, one for the neat SAF, one for blending, and one for the blended fuel. Depending on the volumes of the respective fuels, additional tanks may be required.

3. **Quality of conventional fuel:** It is important to note that not all conventional fuel is created equal and that the specifications allow for a range of values for the different properties such as density and aromatic content, which are key for blending. Thus, prior to blending, it is important to understand the quality of the conventional fuel to ensure that the blend can meet the ASTM D7566 specification.

There is still some uncertainty with respect to the ability to blend neat SAF with conventional fuel at the airport. ASTM D7566 does not address the blending location, whether on-airport or off-airport, but Def Stan 91-91 has the following language in Article D 3.1.3:

“D.3.1.3 The location at which a semi-synthetic Aviation Turbine Fuel meeting this specification is blended need not be a refinery, but it shall be upstream of the airport fuel storage depot...”

While it is widely accepted that neat SAF should not enter the airport fuel farm because it has not yet been certified to meet the ASTM D1655 of Def Stan 91-91 specification, there can be a situation in which the blending location is separate from, but in the proximity of the airport fuel farm to take advantage of the availability of conventional jet fuel nearby. The neat SAF would be blended with the conventional jet fuel upstream of the fuel farm storage and, once it has been certified to the relevant specification, it would be released into the airport fuel storage. Depending on local conditions at given airports, this blending location could be located within the airport property but separated from the airport fuel farm. Thus, blending would happen on airport property but upstream from the airport fuel storage. This is still an open question that is expected to be resolved as more experience with blending and handling of SAF in general is gained.

3.10.2 Batch Traceability

As the fuel, conventional or SAF, travels along the supply chain, traceability to its point of origin is highly recommended. Prior to leaving the refinery, each batch of fuel is assigned a unique reference number that is included in the RCQ; however, as the fuel enters intermediate storage or comingled storage facilities, such as those near or at the airport, new COAs have to be generated and batch identity is lost. EI 1530 recommends listing all the component batches that are included in the new batch that the new COA represents either in the new COA directly or in a separate batch make-up record. This avoids having to send excessive documentation along with the fuel while preserving a paper trail that tracks the fuel back to its point of manufacture.

3.10.3 Specific Technical Documentation for SAF

With the notable exception of Certificates of Sustainability (not required for conventional jet fuel, and described in Chapter 4 for SAF), the same certification documents apply to SAF as to conventional jet fuel, with the following modifications:

Since the SAF blend cannot be certified to ASTM D7566 or Def Stan 91-91 until it has been blended with conventional jet fuel (see Section 3), the blend point is considered the point of batch origin, and an RCQ or COA must be produced at this point. This RCQ or COA should also indicate the volume fraction of the bio component. This is important to alert downstream handlers as of the composition of the SAF blend especially if further blending may be expected. Furthermore, the SAF component information may be necessary to apply for credit under emissions trading programs.

Section 4—SAF Sustainability

4.1 Overview

Airlines are strongly recommended to request proof of sustainability for all SAF purchases. Relevant documentation, issued by an accredited organization, not only gives assurance that the fuel will result in a net carbon emissions reduction and meet further sustainability requirements that are relevant in environmental and CSR reporting, but also allow the fuel to qualify for certain renewable energy incentives which provide financial benefits to the SAF producers and/or users, such as the EU ETS.

4.2 Introduction

Sustainability, in the context of SAF, may be broadly defined as conserving an ecological balance by avoiding depletion of natural resources. While airlines may use any SAF that meets the certification criteria described in Chapter 3, those certifications (ASTM D7566, DefStan 91-91, etc.) do not guarantee sustainability; they only describe the physical properties of the fuel itself. There are multiple reasons that an airline should seek to use SAF that has also been certified sustainable, including the following:

- Simply using SAF does not necessarily reduce overall carbon emissions; a SAF must demonstrate a net carbon reduction through a lifecycle analysis (LCA), which is an essential element of sustainability certification. The property of achieving a net carbon emissions reduction is a main motivation for using SAF in order to meet the aviation industry’s ambitious climate goals.
- Governmental financial incentives for SAF production or use are typically only available for SAF meeting sustainability criteria. Prominent examples include the US Renewable Fuels Standard (RFS2), the EU Emissions Trading Scheme (EU ETS), and the EU Renewable Energy Directive (RED). Details are given in Chapter 5; it is expected that similar schemes will be introduced in various countries in the near future.
- In the US and EU, only certified SAF may contribute to government mandates for renewable fuel volumes or quotas.

4.3 Key Definition

- Certificate of Sustainability (CoS): For the sake of simplicity, this term is used in the BioGuide to design any documentation issued by an accredited organization certifying that SAF from a specific origin and produced using a specific processing pathway meets the criteria of a given sustainability standard, even if it does not present all characteristics of a “certificate” in a strict sense.

4.4 Elements of Sustainability Schemes

There are multiple criteria that are taken into consideration when determining the sustainability of a SAF. Some typical sustainability metrics are as follows:

- Lifecycle carbon emissions
- Direct and indirect land use change
- Authorized land categories
- Water, air and soil considerations
- Fertilizer and pesticide management
- Waste management
- Invasive species controls

There are many organizations that can assess the production of a SAF and determine if the fuel is considered sustainable. Different schemes have different sustainability ambition levels. The aviation industry has generally opted for a high sustainability standard such as that set by the Round Table on Sustainable Biomaterials.

4.5 Existing Sustainability Certifications

In May 2011, the International Energy Agency published a technology roadmap on biofuels for transport¹⁰, and found no fewer than 67 sustainability programs operating or under development around the world. As of August 2012, the European Commission (EC) only recognizes the following twelve¹¹ voluntary programs as compatible with RED and from 2013 the ETS as well:

1. ISCC (International Sustainability and Carbon Certification)
2. Bonsucro EU
3. RTRS EU RED (Round Table on Responsible Soy EU RED)
4. RSB (Roundtable on Sustainable Biomaterial)
5. 2BSvs (Biomass Biofuels voluntary scheme)
6. RBSA (Abengoa RED Bioenergy Sustainability Assurance)
7. Greenergy (Greenergy Brazilian Bioethanol verification programme)
8. Ensus (Voluntary scheme under RED for Ensus bioethanol production)
9. Red Tractor (Red Tractor Farm Assurance Combinable Crops and Sugar Beet Scheme)
10. Scottish Quality Farm Assured Combinable Crops Scheme
11. Red Cert
12. NTA 8080

¹⁰ http://www.iea.org/papers/2011/biofuels_roadmap.pdf

¹¹ Source: http://ec.europa.eu/energy/renewables/biofuels/sustainability_schemes_en.htm

The ISCC and RSB (numbers 1 and 4) are known to directly address aviation biofuels.

To be certified sustainable under the US RFS2, the SAF must be derived from an approved feedstock that meets the RFS2 definition of sustainable biomass and converted using an approved pathway.

4.6 Airlines' Role in Selecting a Sustainability Scheme

Generally, it is the SAF producer's duty, rather than the airline's, to apply for sustainability certification, including a GHG emissions statement, for their product. For producers to qualify for renewable energy financial incentives in the EU under the RED, which from 1 January 2013 is a prerequisite for exemption from ETS, biofuels must be produced in compliance with the RED sustainability criteria. RED compliance can be achieved through the third-party certifications listed in Section 4.5. In the USA, the RFS2 also provides for financial incentives for biofuels meeting sustainability criteria. These incentives have the effect of offsetting production costs and the savings are passed on to the customer.

At the present time, aviation is exempt from quotas of renewable fuels that have been imposed by both the RED and RFS on other manufacturing and transportation sectors. However, aviation fuels can contribute towards the overall targets for renewable transport fuels.

The EU ETS will require biofuels to meet the RED sustainability criteria from January 2013 in order to be zero-emissions rated, according to the future Monitoring and Reporting Regulation that will enter into force at that date.

Airlines are encouraged to seek out SAF suppliers who are certified by a well-known sustainability certification programme, such as RSB, ISCC and similar, in order to have certainty that the SAF used meet the objectives that the aviation industry has committed to, and meet the requirements for exemption from EU ETS if used on routes that are subject to it.

RSB certification is a legal requirement for biofuels in New South Wales (Australia). Moreover, the Sustainable Aviation Fuels Users Group (SAFUG) is committed to a set of sustainability criteria, which *"...should be consistent with, and complementary to emerging internationally-recognized standards such as those being developed by the Roundtable on Sustainable Biofuels."* IATA and other aviation industry stakeholders have participated in the development of the RSB standard incorporating a wide range of criteria. For further details on this certification, see the 2010 IATA Report on Alternative Fuels, Chapter 5.

4.7 Certificates of Sustainability

Each of the programs listed in Section 4.5 offers some form of documentation supporting the claims of sustainability; this documentation is broadly referred to here as a Certificate of Sustainability (CoS). A CoS will be created by the certified SAF producer and will also be passed along with the fuel as it is blended and transported, along with the other documentation. In some cases, the documentation may need to be

updated after each transfer of custody, to reflect the additional carbon footprint of each transportation operation. An example of such a certificate, in this case for compliance with ISCC, is given in Figure 1.

Sustainable biofuel declaration for products from RED Bioenergy Sustainability Assurance (RBSA) scheme						
1.Operator/seller issuing the attestation (name and address)			2.RED Bioenergy Sustainability Assurance Scheme Reference number of the RBSA certificate:			
3.Buyer of the product (name and address) Reference number of the contract:			4.Country of dispatch:			
5.General sustainability information about the biofuel (use box 8 if necessary to specify for each sub - batch) Type of biomass: Origin of harvest: Energy content (MJ): Gross volume (m ³):			6.Country of destination: 7.Address of place of destination:			
8.Sustainability data for batch identification Bioethanol produced under the rules of the RED Sustainability Assurance scheme.						
Sub-batches	Volume (m ³)	Energy content (MJ)*	Sustainable information			
			Origin (country level)	Biomass type	GHG saving (%)	Grandfathering clause (if applies)
Sub-batch 1						
Sub-batch 2						
Sub-batch 3						
Total batch (m³)						
* Energy content values are considered default values						
9.GHG saving (in case sub - batches have some identification) Total GHG saving:%						
10.Declaration of the operator issuing the Sustainable biofuel declaration This form is to state that the products designated above have been obtained in accordance with all the requirements of the RBSA scheme.						
11. Additional comments (if appropriate)						
12.Place of issue of the declaration Date: _____ Authorized VAT reference number: _____ Name and signature of authorized person: _____						

Figure 2. Sample of a "sustainable biojet fuel attestation", a certificate of sustainability offered by ISCC

Section 5—Compliance with Emissions Regulations

5.1 Overview

For countries that are signatories to the Kyoto Protocol and with legally binding emission targets, an Emissions Trading Scheme (ETS) is one of several options for actively tracking and reducing greenhouse gases. According to the United Nations Environment Program, an emissions trading scheme represents “...a so-called *cap-and-trade* scheme which means countries are allowed a certain amount of emissions which should decrease over time to achieve overall emission reduction.”¹²

At the time of writing, airline participation is mandatory only in two emissions trading schemes: (1) the EU ETS, and (2) the domestic New Zealand (NZ) ETS. Neither of these systems mandates the use of renewable fuels, but both reward airlines by reducing their financial obligations if they do use SAF. Airlines following the EU ETS procedures for domestic flights within NZ (international flights are not included in the scheme) are likely to result in compliance with NZ ETS requirements as well, which at the time of writing still have to be fully elaborated. A domestic ETS is also under development in Australia, other countries may follow.

5.2 Disclaimer

This chapter proposes general procedures that should be applicable to ETSs around the world that include aviation, and in particular within the EU. While the authors of this guidance have made every attempt to ensure compliance with existing regulations, the final decision for whether or not the requirements have actually been met, lies with the Competent Authority of the administering state. The BioGuide shall not be considered a substitute for regulations.

5.3 The EU ETS

Beginning in 2005, the EU ETS was initially restricted to static emission sources, such as power plants and cement factories;¹³ the inclusion of aviation was not authorized until 2008.¹⁴ The EU ETS, which requires airlines to actively participate for the first time in 2012, caps the emissions of all flights to, from and within

¹² *Kick the Habit: A UN Guide to Carbon Neutrality*. E-book published by UNEP/GRID-Arendal, 2008. <http://www.unep.org/publications/ebooks/kick-the-habit/> (last accessed August 13th, 2012)

¹³ Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC.

¹⁴ Directive 2008/101/EC, amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community

the 28 EU member states plus Norway, Iceland and Liechtenstein (with exceptions¹⁵ for some flights), and requires the airlines to purchase additional emissions allowances to make up any difference.

The EU ETS functions using a system of emissions allowances, each allowance being equivalent to one ton of CO₂. In 2012, airline emissions are capped at 97% of the average annual emissions from 2004-2006, and airlines receive 85% of their proportionally-allocated allowances (based on 2010 emissions) for free. These aviation-specific 1-ton units are called EU Emissions Aviation Allowances (EUAA). At the end of each reporting year – that is, by March 31 the following year – each airline must submit to its competent authority (along with its Annual Emissions Report) a number of EUAAs or approved equivalent certificates equal to its CO₂ emissions during captured flights. If its emissions are greater than the amount corresponding to the allowances it received for free, the airline must purchase additional allowances to make up the difference; if its emissions are less, the airline may sell its excess EUAAs to other airlines, potentially via brokers or markets (EUAAs cannot be used by other emitters than airlines). SAF under this system are considered to have zero emissions and are exempted from the obligation to surrender CO₂ certificates.¹⁶

5.4 Tracking Quantities of Biojet

One of the principal challenges for airlines, verifiers and regulators, is determining the actual mass of biomass-derived fuel purchased and consumed over a reporting year. The Commission Decision establishing guidelines for monitoring and reporting of greenhouse gas emissions (Decision 2007/589/EC), was amended in 2009 to include aviation emissions (Decision 2009/339/EC). These guidelines are in effect until the end of the 2012 reporting year, after which they will be replaced by a Monitoring and Reporting Regulation (MRR).¹⁷

The new MRR, which was approved 21 June, 2012 and was applied at Member State level from 1 January 2013, allows for the estimation of SAF consumption based on fuel purchase records. The mass of SAF purchased during the reporting year may be reported along with the Annual Emissions Report as a memo-item.

5.5 EU ETS Requirements for Tracking SAF Quantities

The MRR, Article 53 („Specific provisions for biomass”), states that “...*the biomass fraction, net calorific value and emission factor or carbon content of the fuel used in an EU ETS aviation activity [...] shall be determined using fuel purchase records.*” However, only sustainable biofuels will be zero-rated, as Article 53 goes on to say that biofuels “...*for aviation shall be assessed in accordance with Article 18 of Directive 2009/28/EC,..*” which describes the sustainable production of biomass and biofuels under the EU

¹⁵ Ibid. Annex I

¹⁶ Ibid. Annex IV.

¹⁷ Commission Regulation (EU) No 601/2012 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council Text with EEA relevance

Renewable Energy Directive (RED). Therefore, for biofuels to qualify for EU ETS exemptions, the SAF must be produced in accordance with the RED sustainability requirements.

The MRR is therefore clear that the following two pieces of documentation will be sufficient to demonstrate compliance:

- Fuel purchase records that indicate the biomass fraction, net calorific value, and emission factor or carbon content of the fuel, and
- Certificate of sustainability demonstrating compliance with the RED.

Over the course of the reporting year, airlines must keep track of the total masses of SAF purchased (Annex II of the BioGuide contains a table for tracking such purchases and extracting the portion of the total mass that is derived from biomass), and report the sum as a memo item on the Annual Emissions Report. Any SAF sold to a third party prior to use must be subtracted from this total.

In the event that the biomass fraction cannot be determined from fuel purchase records, the BioGuide contains a proposed procedure in Annex I that could be proposed to the Competent Authority as an industry standard methodology for tracking quantities of SAF, and provides a reliable model for other ETSs outside the EU as well. This procedure describes the required documentation to ensure that the SAF blend:

- Meets the required physical specifications for jet fuel,
- Meets the sustainability requirements under RED, and
- Properly tracks the purchase records for the SAF fraction.

Annex II of the BioGuide provides a template spreadsheet for compiling key information for batches of SAF blends purchased over the reporting year. This spreadsheet lists each SAF purchase, and assists the user in determining the net mass of SAF purchased over the year. Once the net mass of biomass-derived fuel has been determined, this amount shall be reported in the Annual Emissions Report as a memo-item.

5.5.1 SAF at Non-EU Airports

Biojet purchased at a specific non-EU airport should be eligible for credit under the EU ETS, providing the purchasing airline is (a) captured by the EU ETS, (b) operates flights from that airport to EU airports, and (c) has ensured the biojet fuel meets all other requirements set forth in this guidance. The volume of biojet credited for flights from a specific non-EU airport under the EU ETS shall not exceed the total jet fuel consumed on EU-bound flights from that airport. Annex I further describes the concept of “qualifying airports”, which are non-EU airports with flights to the EU.

Section 6—Purchase Contracts and Insurance

6.1 Overview

Conventional jet fuel purchase agreements need only slight amendments to accommodate SAF. It is assumed that the seller of the fuel will be one of the following four parties: SAF producer, petroleum refinery, blender, and airport fuel depot. In all cases, purchase agreements should list the agreed conditions for fuel specification, bio-component tracking, sustainability certification and the assignment of any renewable energy and carbon credits. Standard insurance is required which typically covers third party liability and business-related risk.

6.2 Introduction

The objective of this section is to discuss issues related to the purchase of SAF by airlines and to identify changes that may be required to the airline jet fuel procurement process. The IATA Aviation Fuel Supply Model Agreement¹⁸ (AFSMA) is used to illustrate this discussion since many fuel agreements in the industry are modelled after it. Given that the BioGuide is focused on regular commercial use of blended SAF, this chapter will mainly be dealing with matters related to such use and will not discuss matters related to test flights or restricted use of SAF on commercial flights.

6.3 Analysis of Potential Changes to Fuel Purchase Agreements

6.3.1 Overview of Fuel Purchase Agreements

The IATA Aviation Fuel Supply Model Agreement (AFSMA) is an example of the type of fuel contracts that are used in the airline industry today. Rather than developing new types of contracts, it is expected that airlines will modify their existing fuel agreements to accommodate the introduction of SAF.

The AFSMA is structured in different sections, as follows:

1. Specimen Agreement for Aviation Fuel Supply
2. Annexes:
 - a) Annex I: IATA Model General Terms and Conditions
 - b) Annex II: Location Agreements
 - c) Annex III: Safety, Quality and Operations Management

¹⁸ Agreement can be purchased online at http://www.iata.org/ps/publications/Pages/fuel_supply_model.aspx

- d) Annex IV: Administrative Arrangements
- e) Annex V: Service Agreement

The Specimen Agreement is a master agreement that establishes the overall framework of the agreement, including scope, parties, duration, pricing mechanism, point of delivery, and insurance. In addition, it includes all Annexes by reference. The advantage of this structure is that it allows for changes to the annexes without having to re-negotiate the entire agreement. This is particularly helpful with respect to the Location Agreements as these are likely to be modified from year to year to reflect changes on the operation of the airline such as contracted volumes and prices.

Some of the changes that are expected to be incorporated into this type of agreements to include SAF are explained below. The discussion is illustrated with the specific example of the AFSMA but it is understood that airlines would have to look at the specific language in their own agreements prior to making any changes.

6.3.2 Changes to the Specimen Agreement for Aviation Fuel Supply

Changes in the Specimen or Master Agreement could include the following:

- **Article 1 – Scope:** This section can be used to describe the nature of the relationship between the parties, the expected duration and total amounts of biojet fuel to be negotiated, and any other overall guiding principles that the parties would want to describe.
- **Article 5 – Prices and Price Adjustments Mechanism:** Typical price arrangements for conventional jet fuel include market prices and formula prices. Market prices are fixed for a period of time while formula prices are based on a published market price index that varies periodically (e.g., daily, weekly, or monthly). To the extent that the price for the SAF may be determined differently, those modifications could be incorporated here or directly into the Location Agreements.
- **Article 6 – Point of Delivery:** This could be a good place to specify where delivery of the blended SAF would occur, for example, at the airport fuel farm (e.g., into-storage) or at the wing of the aircraft (e.g., into-wing). The Point of Delivery may also be different at different airports, therefore, it could also be specified in each Location Agreement.

A key consideration that is not currently contemplated in the AFSMA is how and where blending will take place. In particular, it should be determined which party will be responsible for blending and for ensuring that the blend meets the ASTM D7566 specification. The blend ratio should also be indicated; in addition, the party responsible for procurement of the conventional fuel component should be specified. Under certain circumstances, airlines may be in a better position to procure the conventional fuel given they already purchase it from conventional providers at the airports they serve. The location for blending should also be considered. As discussed in Section 3.10.1, this decision depends on a number of factors that can vary from location to location. This is another item that can be incorporated into each Location Agreement.

A main reason for an airline to procure the SAF is to receive environmental and other credits associated with the use of SAF. It must be noted that SAF production can generate credits to both the producer and the user

of the fuel. Thus, the Master Agreement should specify how any credits associated with production and the consumption of the biojet fuel will be allocated. In the case of credits accrued to the user of the biofuel, the agreement should specify the type of documentation (e.g., Certificate of Sustainability) that the seller needs to provide to the user. This is further discussed in Section 6.3.6.

6.3.3 Changes to Annex I: IATA Model General Terms and Conditions

Additional changes to the fuel supply agreement are expected to be incorporated in this section, as follows:

- **Article 1 – Definitions:** the current definition of Fuel would need to be broadened to include various forms of SAF.
- **Article 3 – Specification:** this should be expanded to include the appropriate specification to be used for the SAF (i.e., ASTM D7566). This should be kept simple in order to handle specific details such as blending on each applicable Location Agreement.
- **Article 5 – Quantity:** Contracted SAF for each location should be stated in the respective Location Agreement. It is important to keep in mind that airlines may have a monthly nomination process in which they indicate the approximate amount of fuel that they expect to purchase in the next period. This nomination process typically occurs on a monthly basis. It should be specified if and how the SAF producer is expected to participate in this process. In addition, it should be specified if the SAF producer will be required to provide documentation indicating the actual mass and volume of SAF delivered to the airline. This may be necessary depending on official or voluntary compliance frameworks that the airline may be intending to participate in.
- **Article 10 – Force Majeure:** Force majeure should also be extended to the procurement of conventional fuel for blending.

6.3.4 Changes to Annex II: Location Agreement

The Location Agreements are a good place to reflect elements that depend on the particular circumstances at individual airports, such as:

- Delivery Point
- Quantity (also, whether the SAF will be delivered neat or blended)
- Price

In addition, the Location Agreement can be modified to include other elements, such as:

- Party responsible for blending
- Party responsible for sourcing conventional fuel
- Blend ratio

6.3.5 Changes to Annex III: Safety, Quality and Operations Management

In principle, safety, quality, and operations management should not represent any difficulties since the blended fuel will meet ASTM D1655 or Def Stan 91-91 and will not require any additional procedures; however, in practice, it may take some time for all concerned parties to accept this and, hence, steps should be taken to educate all relevant parties. While no changes to this Annex are contemplated, airlines should be aware of the potential need for spending additional time with suppliers, third-party service providers, and stakeholders to ensure everyone is comfortable with handling and storing the blended SAF.

6.3.6 Changes to Annex IV: Administrative Arrangements

No particular changes are envisioned for this Annex; however, the invoicing section could be augmented to reflect the type of information that the airline would want to receive with respect to the purchase of SAF. This information could include:

- Volume and mass of SAF purchased
- Feedstock used for the production of the SAF
- Blend ratio
- Quality documentation such as a Refinery Certificate of Quality (RCQ) or a Certificate of Analysis (COA) demonstrating physical compliance with ASTM D7566 (or equivalent such as Def Stan 91-91) shall be provided for each batch of SAF blend. The RCQ or COA should clearly indicate the SAF blend percentage in volume, as well as the density of the SAF component, to ensure proper tracking.
- Documentation of any environmental or other credits associated with the purchase of the fuel, such as a Certificate of Sustainability (CoS). The CoS is generally required if an airline intends to claim credit for SAF use under various renewable energy incentive programs (e.g. EU ETS) or for other environmental or Corporate Social Responsibility (CSR) purposes. The requirements of the EU ETS are given in Chapter 4. Given that the CoS is not fully fungible, this requirement should also be reflected in the Main Agreement between the supplier and the airline or in the Location Agreement between the parties.

Annex IV of the BioGuide includes language on insurance requirements, specifically on the need for the supplier to have an aviation general third party liability insurance up to an amount to be negotiated among the parties. In a previous version of the BioGuide, it was determined that current insurance practices for conventional fuel are sufficient to also cover SAF. However, if any additional insurance requirements are desired, they could be incorporated in this annex.

6.3.7 Changes to Annex V: Service Agreement

This Annex is for suppliers that would be providing into-plane fueling services. Thus, if the SAF producer will not be engaged in this type of operation, this Annex would not apply.

Given that SAF blends that will be allowed in aviation will meet ASTM D 1655 or Def Stan 91-91 specification no changes would be required to fuel handling procedures for transportation, storage, distribution, fuelling and defuelling. However, the airline and oil industries will need to continue efforts to educate all concerned parties to enable acceptance by all.

Annex I – IATA Airline SAF Accounting Method Proposal

A.1 Overview

Airlines use fuel suppliers' receipts to demonstrate having purchased and consumed SAF. Batches of SAF purchased by an airline and destined for a qualifying airport are counted towards the airline's total SAF consumption. The total mass of bio-component purchased over the year is the sum of the bio-components from each batch. The SAF accounting method proposal presented here is modeled after the requirements of the EU ETS but is representative of an accounting method that could be modified for other purposes.

A.2 Qualifying Airports under the EU ETS

To qualify under the EU ETS, SAF must be destined for the fuel storage facility of an aerodrome of departure with flights captured under 2003/87/EC Annex I. The airline wishing to claim for exemption from the obligation to surrender carbon credits must have operations at this airport that are captured under 2003/87/EC Annex I.

A.3 Documentation

For each batch of SAF purchased, the airline shall ensure the following documentation is kept on file and made available to verifiers:

1. Proof of sustainability. From 1 January 2013, SAF must meet the RED sustainability criteria to be exempted from ETS. A proof of sustainability will then be required. The sustainability documentation must be compliant with the RED requirements, i.e. it must be established by one of the certification organisations recognised under RED.
2. Proof of purchase (detailed receipt, certified bill of lading) of blended batch containing at a minimum the total volume or (preferably) mass of the batch, the biomass fraction (preferably by mass rather than volume), net calorific value, and the emission factor.

In some cases, it may be necessary for airlines to further interpret data present on a purchase receipt. For example, if the purchase receipt of a batch of blended SAF indicates it contains a 50% by volume blend of conventional and bio-derived jet fuel, with no further details of the mass fraction, the density, net calorific value, and emission factor of the biomass portion must be inferred from the default values for the two components given below:

	Conventional jet fuel default values	Bio-component default values
Density (kg/L)	0.8 ¹⁹	0.75 ²⁰
Net calorific value (MJ/kg)	44.59 ²¹	44.2 ²²
Emission factor	3.15 ²³	0 ²⁴

Example: 100,000L of a 25% blend by volume of SAF is delivered with an accompanying proof of sustainability. To determine the mass of bio-component, the following calculation would be made:

Volume of bio-component = 25% × 100,000L = 25,000L

Mass of bio-component = 25,000L × 0.75 kg/L = 18,750kg

Therefore, the delivery included 18,750kg of biomass-derived fuel, with a net calorific value of 44.2 and an emission factor of 0.

A.4 Final Step – Indicating the Mass of Bio-Component on a Memo Item

The total mass of bio-component, expressed in metric tonnes, shall be indicated on a memo attached to the Annual Emissions Report. The net mass of biojet the airline has sold to a third party during the reporting year shall be subtracted from this reported mass. A weighted average of the net calorific value, expressed in MJ/kg, for the bio-components shall be calculated and reported along with the total mass of bio-component. A sample spreadsheet for tracking biojet batch information is provided in Annex II of this guidance.

¹⁹ MRR 601/2012, Article 52.6

²⁰ http://www.boeing.com/commercial/environment/pdf/PAS_biofuel_Exec_Summary.pdf (Table 2.3)

²¹ <http://www.ipcc-nggip.iges.or.jp/public/gl/guidelin/ch1wb1.pdf>

²² http://www.boeing.com/commercial/environment/pdf/PAS_biofuel_Exec_Summary.pdf (Table 2.3)

²³ MRR 601/2012, Table 2 of Annex III

²⁴ Ibid. Table 1 of Annex VI (Other liquid biofuels)



Annex II – Template Spreadsheet for Tracking SAF Purchases

How it works

Airlines enter information on each batch of SAF blend purchased over the reporting year. Total mass of biomass is aggregated and submitted to the competent authority.

Sample Template											
Airline:											
Reporting Year:											
Date (dd/mm/yy)	Supplier	Batch #	Total volume (L)	% Bio-component by volume	% Bio-component by mass	Final known location	Sustainability certification	Bio-component volume (L)	Bio-component density (kg/L)	Bio-component mass (kg)	Bio-component Net calorific value (MJ/kg)
Total bio-component =		kg									

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