

FUTURE CHANGES TO AVIATION FUEL QUALITY REQUIREMENTS FOR JOINT OPERATIONS SYSTEMS (AFQRJOS) CHECKLIST

BULLETIN NO. 144

CHANGES TO JIG CHECKLIST

07/07/2022

This Bulletin is addressed to all users of the AFQRJOS Checklist, announcing important changes to the Checklist that will take effect from the next Issue. In the future, Table 1 will not be a full list of physical properties and will only detail differences between Defence Standard 91-091 and ASTM D1655.

Users will have to refer directly to the primary standards for the full requirements to certify Jet Fuel and review test certificates.

Background:

AFQRJOS Checklist was created many years ago to give operators working together in joint facilities a reference document that combined the most stringent requirements of the Defence Standard 91-091 and ASTM D1655 Specifications.

Since that time the two specifications have progressively been harmonised, leaving few differences between the two specifications, which means that there is no longer a requirement for an extensive comparison document such as the Checklist. Furthermore, we are aware that the existence of the Checklist leads some operators to incorrectly certify and release fuel only against the physical characteristics of Checklist Table 1, thereby overlooking the other important requirements that are listed in the other clauses of the Specifications.

In addition, the manufacturing, handling and composition requirements of Jet Fuel will become progressively more complex as synthetic fuels and components enter the supply chain. These requirements cannot be adequately covered by a document such as the Checklist.

The simplification of the Checklist is intended to enable operators to quickly identify the differences between the two main Specifications, whilst ensuring that operators refer to one of the primary fuel standards, to take into account all aspects of a fuel specification when testing, certifying and accepting fuel.

In order to support JIG Members making this transmission, the latest Issue of DefStan 91-091, with the permission of the MOD, will in future be available for download on the JIG Website within the Publications tab of the “Standards & Publications” page. Issue 14 can be accessed directly via this [link](#). Non JIG Members may register on the MOD DefStan site to gain access to their documents by clicking [here](#).

New Format and Content for Checklist:

- a. The Aviation Fuel Quality Requirements for Jointly Operated Systems for Jet A-1 will be defined in a table, which should be read in conjunction with the Notes that follow the table. The Notes highlight some of the main issues concerning the specification parameters. As indicated above, the next issue will introduce the following changes:
 - Significant editorial changes with the elimination of test requirements that are common to both primary specifications.
 - The Checklist table of requirements will only detail tests that are not common to both specifications on the basis that in order to claim conformance to the AFQRJOS Checklist, fuels must be tested and certified to one of the two primary standards as well as test properties that are not common to both standards.

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- b. AFQRJOS will be revised when necessary.
- c. The main table requirements in IATA Guidance Material for Aviation Turbine Fuels Specifications (GM) will no longer be part of the Checklist because Part I of the IATA GM is now a guide to specifications rather than a specification itself. However, the water and dirt limits for fuel at the point of delivery into aircraft, which are embodied in Part III of the IATA GM, will remain part of the Checklist

An example of the new Checklist format and content, based on issue 33 is included for reference after the Action Table.

Actions to Implement this Bulletin (See Table 2 for Action Type Codes)

Action Description	Action Type	Target Completion Date
In-scope Operations, testing laboratories and other entities using or referring to JIG AFQRJOS Checklist.	I	When Issue 34 is published

Table 2 Action Type Codes

Action Types	JIG Bulletin Action Type Definition
JS	Change to JIG Standard – to be adopted by JV and/or Operator to continue to meet the JIG Standard(s) (JIG 1, 2, 4, EI/JIG 1530 and the JIG HSSE Management System).
RA	Required Action to implement one off verification or checks outlined in the table of actions.
RP	JIG Recommended Practice which the JV should consider adopting as its own practice
I	Issued for information purposes only.
Note (***) - If the JV agreements require any of the JIG Standards and/or any of the JIG Common Processes as the governing operational standard then adoption of changes to applicable JIG Standards and/or Common Processes should not be considered optional by the JV Board.	

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1. INTRODUCTION

1.1 This document defines the fuel quality requirements for supply into Jointly Operated Fueling Systems operated to JIG Standards. The Aviation Fuel Quality Requirements for Jointly Operated Systems (AFQRJOS) for Jet A-1 embodies the requirements of the following two specifications:

- (a) British Ministry of Defence Standard DEF STAN 91-091 Issue 14 07 March 2022 for Turbine Fuel, Kerosene Type, Jet A-1, NATO Code F-35, Joint Service Designation: AVTUR.
- (b) ASTM Standard Specification D1655 for Aviation Turbine Fuels "Jet A-1" (Latest issue).

1.2 Jet fuel that meets the AFQRJOS is usually referred to as "Jet A-1 to Checklist" or "Checklist Jet A-1" and, by definition, allows custodians of the fuel to supply against either of these specifications.

1.3 Test certificates shall state conformance to either of the two reference specifications. The Checklist is not a specification and manufacturing, and supply locations shall not release fuel only to the Checklist. If reference to the Checklist is to be made, the following statement should be used if the fuel meets the requirements of this bulletin.

"It is certified that the samples have been tested using the Test Methods stated and that the Batch represented by the samples conforms with DEF STAN 91-091 Issue 14 and AFQRJOS Checklist Issue 33".

Or

"It is certified that the samples have been tested using the Test Methods stated and that the Batch represented by the samples conforms with ASTM D1655 latest issue and AFQRJOS Checklist Issue 33".

The minimum requirements of information to be included on the fuel's point of manufacture batch certificate of quality shall be:

- Specification name, issue and any amendment number;
- Name, telephone number, fax number, email address and postal address of testing laboratory;
- Tank Number;
- Batch number or unique identifier;
- Quantity of fuel in the batch;
- Properties tested and including specification limit, test method and result of test;
- Additives, including qualification reference and quantity added;
- Name and position of authorised test certificate signatory or an electronic signature;
- Date of certification.

1.4 AFQRJOS is normally revised and published annually but if urgent issues need to be addressed it may be revised more frequently.

1.5 The main table requirements in IATA Guidance Material for Aviation Turbine Fuels Specifications (GM) are no longer part of the Checklist because Part I of the IATA GM is now a guide to specifications rather than a specification itself. However, the water and dirt limits for fuel at the point of delivery into aircraft, which are embodied in Part III of the IATA GM, remain part of the Checklist.

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- 1.6 The Aviation Fuel Quality Requirements for Jointly Operated Systems for Jet A-1 are defined in the following table, which should be read in conjunction with the Notes that follow the table. The Notes highlight some of the main issues concerning the specification parameters. Specifically of note, Issue 33 introduces the following changes:
- Significant editorial changes with the elimination of common test requirements to both primary standards listed in **1.1**
 - The Checklist table of requirements now only details tests that is not common to both requirements on the basis that in order to claim conformance to the AFQRJOS Checklist, fuels must be tested and certified to one of the two primary standards (see **1.3**) as well as test properties that are not common to both standards.
- 1.7 Conformance to AFQRJOS requires conformance to the detail of both specifications listed in **1.1** above, not just the following table. Clarification on the statements to be used when certifying fuel is detailed in **1.3** and it provides further guidance on statements declaring conformance to these specifications. Airports operated to JIG Standards may supply jet fuel to either of the primary specifications listed above provided the participants agree.
- 1.8 It should be specifically noted that DEF STAN 91-091/14 requires traceability of product to point of manufacture and requirements applicable to fuels containing synthetic or renewable components. See Annexes D and B of DEFSTAN 91-091/14 respectively for more information. For fuel to comply with this Checklist, traceability to point of manufacture is required. Additional guidance on traceability in fungible transport systems is detailed in EI/JIG 1530.
- 1.9 Attention is drawn to the guidance in DEF STAN 91-091/14 and ASTM D1655 concerning the need for appropriate management of change measures at the point of manufacture of both jet fuel and its constituent components. The implications of any changes to feedstock, processing conditions or process additives on finished product quality and performance shall be considered (for example, experience has shown that some process additives might be carried over in trace quantities into aviation fuels).
- 1.10 Although there has been wide acceptance by UK MOD for alternative jet fuels, before fuel containing synthetic components may be delivered to a NATO aircraft, it shall be ascertained that the appropriate clearance document(s) permitting its use have been obtained according to contract. This may restrict supply of fuel containing synthetic components in some pipeline systems with direct connections to NATO storage locations.

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2. CHECKLIST REQUIREMENTS

JOINT FUELLING SYSTEM CHECKLIST FOR JET A-1

Issue 33b – April 2022
Supersedes Issue 32 – November 2020

Table 1 - Requirements

Embodies all tests and other the requirements of the following specifications for the product shown:				
(a) British MoD DEF STAN 91-091/Issue 14, dated 07 th March 2022, Jet A-1				
(b) ASTM D1655 – Jet A-1 Latest Issue				
In conjunction with the following test requirements				
PROPERTY	LIMITS	TEST METHOD		REMARKS
		IP	ASTM	
APPEARANCE - Visual appearance	Clear, bright and visually free from solid matter and un-dissolved water at ambient fuel temperature			See Note 1
Colour	Report		D156 or D6045	See Note 2
- Particulate contamination mg/L max	1.0	23	D 5452	See Note 3
Or - Particulate, cumulative channel particle counts	Channel counts / ISO code	565 or 577	D7619	
ISO Code & Individual Channel Counts	Report / Max 19			See Note 3
≥ 4 µm(c)	Report / Max 17			
≥ 6 µm(c)	Report / Max 14			See Note 4
≥ 14 µm(c)	Report			
≥ 21 µm(c)	Report			
≥ 25 µm(c)	Report / Max 13			
≥ 30 µm(c)				
COMPOSITION				See Note 5,6,7
Total Acidity, mg KOH/g	Max	0.015	354	D 3242
Aromatics, % v/v.	Max	25.0	156	D 1319
Or Total Aromatics, % v/v	Max	26.5	436	D 6379
Sulphur, Total, % m/m	Max	0.30	336	D 1266 or D 2622
Sulphur, Mercaptan, % m/m	Max	0.0030	342	D 3227
Or Doctor Test	Max	Negative	30	D 4952
				See Note 8

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Components at point of manufacture:				
Non Hydroprocessed Components, %v/v	Report (incl. 'nil' or '100%')			See Note 9
Severely Hydroprocessed Components, % v/v	Report (incl. 'nil' or '100%')			
Synthetic Components, %v/v	Report (incl. 'nil' or '50%')			See Note 5
VOLATILITY Distillation Initial Boiling Point, °C	Report	123	D 86	D7345., See Note 10 Or IP 406 or D 2887
CONDUCTIVITY Electrical Conductivity, pS/m	50 min to 600 max	274	D 2624	See Note 11
LUBRICITY BOCLE wear scar diameter, mm max	0.85		D 5001	See Note 12
ADDITIVES	Refer to relevant sections of the primary specifications			
	<p>Names and approval code from DEF STAN 91-091/14 should be quoted on quality certificates.</p> <p>The types and concentrations of all additives used shall be shown on the original Certificates of Quality and on all other quality documents when they are added downstream of the point of manufacture.</p> <p>When additives are diluted (with hydrocarbon solvent only) to improve handling properties prior to addition, it is the concentration of active ingredient that shall be reported. See Annex A of DEF STAN 91-091 for detailed advice</p> <p>See 1.9 about requirements for management of change in refineries.</p> <p>* When the original dosage of additives is unknown, it has to be assumed that first doping was applied at maximum dose rate.</p>			

Remarks on alternative method differences

- Aromatics – ASTM D1655 allows D8305 but Def Stan 91-091 does not
- Specific Energy – ASTM D1655 allows D4259 but Def Stan 91-091 does not

Notes and Comments

1. The method for visual appearance in DEF STAN 90-091 is Visual (assessment). Alternative methods are D4176 Procedure 1 and D6986 Procedure A, Section 8.1.1.1.
2. The requirement to report Saybolt Colour shall apply at point of manufacture. Unusual or atypical colours should also be noted and investigated. For further information on the significance of colour, see Annex F in DEF STAN 91-091 Issue 14
3. This limit shall apply at point of manufacture only. The limits of either particulate contamination or particulate counts shall be met and it is only necessary to report whichever property is being used to support release of the fuel. It is the Specification Authority's intention to replace gravimetric Millipore test with Particle counting from April 2025. For more information on particulate contamination refer to Annex F of DEF STAN 91-091 Issue 14. For guidance on contamination limits for into-plane fueling, refer to 7th Edition IATA Guidance Material (Part III).
4. The number of particles and the number of particles as a scale number as defined by Table 1 of ISO 4406 shall be reported where this method is being used to release the fuel (see also Note 2). If limits are exceeded, Annex B of IP

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565 or IP 577 or Annex A2 of D7619 may be applied to eliminate trace free water, and cleanliness re-determined. In such cases, results before and after application of annex shall be reported.

5. The need to report the %v/v of non-hydroprocessed, severely hydroprocessed and synthetic components (including "nil", "50%" or "100%" as appropriate) on Point of Manufacture Certificates of Quality for Jet A-1 to Checklist derives from DEF STAN 91-091/14. Each of the defined components used in the make-up of the batch shall be reported on the certificate of quality as a percentage by volume of the total fuel in the batch.
6. Attention is drawn to DEF STAN 91-091 Issue 14 which approves both Semi-Synthetic and Fully Synthetic Jet Fuel produced by SASOL. It also approves all the generic components listed in the Annexes of ASTM D7566. For these fuels, additional testing requirements apply, and reference should be made to DEF STAN 91-091 Issue 14 Annex B. These semi- and fully synthetic fuels may be certified against this Issue of the Check List
7. The co-processing of mono-, di- and triglycerides, free fatty acids and fatty acid esters and the co-processing of hydrocarbons derived from synthesis gas via Fisher Tropsch process have been approved in DEF STAN 91-091 Issue 14 in alignment with ASTM D1655. The requirements for co-processing are detailed in Annex B4 of DEF STAN 91-091 Issue 14 and the relevant annex of ASTM D1655.
The Certificate of Quality (CoQ) produced at the point of manufacture shall include wording to reflect that the batch may contain up to 5 % by volume co-hydroprocessed synthesized kerosene.
8. The Doctor Test is an alternative requirement to the Sulphur Mercaptan Content. However, if the Doctor Test is positive, Sulphur Mercaptan Test shall be carried out and reported. In the event of conflict between the Sulphur Mercaptan and Doctor Test results, the Sulphur Mercaptan result shall prevail
9. The use of anti-oxidant is optional for jet fuels containing only conventional components. Anti-oxidant continues to be mandatory as part of the production process for synthetic components (see ASTM D75
10. In methods IP 123 and ASTM D 86 all fuels certified to DEF STAN 91-091 Issue 14 or ASTM D1655 shall be classed as group 4, with a condenser temperature of zero to 4 °C. Where ASTM D 7345 is used, results shall be corrected for relative bias as described in the test method.
11. The conductivity limits are mandatory for product to meet the requirements of DEF STAN 91-091 Issue 14. However, it is acknowledged that in some manufacturing and distribution systems it is more practical to inject SDA further downstream. In such cases, the Certificate of Quality for the batch should be annotated thus: "Product meets the requirements of DEF STAN 91-091 Issue 14 except for electrical conductivity". In some situations, the conductivity can decrease rapidly, and the fuel can fail to respond to additional dosing with Static Dissipator Additive(s). In such cases, fuel may be released with conductivity down to a minimum of 25pS/m provided that the fuel is fully tested against the specification and the Tank Release Note is annotated with the explanation "Product released below 50pS/m due to conductivity loss as per Annex F of DEF STAN 91-091 Issue 14".
12. This requirement comes from DEF STAN 91-091 Issue 14. The requirement to determine lubricity applies only to fuels whose composition is made up of a) less than 5% non-hydroprocessed components and at least 20% of severely hydroprocessed components or b) includes synthetic fuel components.
The limit applies only at the point of manufacture. For important advisory information on the lubricity of aviation turbine fuels see Annex F of DEF STAN 91-091 Issue 14.
Lubricity Improver Additive (also known as LIA) may be used to improve lubricity. It may be added to the fuel without prior consent of the joint system participants. However only those additives listed in Table 2 of ASTM D1655 / Annex A of DEF STAN 91-091 Issue 14 are permitted. Note that the list of approved LIAs has been revised and reduced with the change to Def Stan 91-091 Issue 14. Refer also to Appendix A.5 of DEF STAN 91-091 Issue 14 for advice on point of addition. When injecting LIA downstream of point of manufacture, care shall be taken to ensure that maximum dose rates are not exceeded.