U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: APPROVAL OF PROPULSION FUELS AND LUBRICATING OILS

Date: DRAFT

Initiated by: ANE-111

AC No: 20-24C DRAFT

COMMENTS for the Record from General Aviation Modifications, Inc. (GAMI)
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DATE: October 29, 2010

GAMI is an active general aviation engineering company which owns multiple engine and airframe STCs and has been actively engaged in the development of electronic engine and fuel control systems for the last 10 years.

GAMI has been an active participant in the ASTM aviation gasoline fuel specifciation process during the last 10 years.

GAMI has pending STC applications for use of an unleaded fuel developed by GAMI called G100UL, for use on Cirrus Aircraft with turbo normalized IO-550 N engines, and a more recent and broader STC application for approval of the G100UL fuel on essentially all general aviation piston engines.

Since December 2009, GAMI has been actively involved in the approval process for the G100UL unleaded avgas. With the exception of the Swift Enterprises “Swift Fuel” there is no other applicant publicly visible who is currently working on unleaded Avgas fuel projects and none who would be more directly and adversely impacted by the proposed revision C of the long standing AC 20-24B advisory circular.

GAMI has one of the most sophisticated aircraft piston engine test stands in the world. For a number of years GAMI has done contract unleaded aircraft piston engine fuel performance and detonation testing for other entities, including major international oil producing and refining companies.

It is from this background that these comments are submitted.

	The public "notice" of this advisory circular was and is insufficient, and therefore defective. See the last block, at the end of this series of comments. That block has the title: **"The FAA's "public notice" of this draft Advisory Circular does not meet the legally sufficient minimum standards of public notice."**
1. Purpose. This advisory circular (AC) provides guidance on regulations and policy applicable to adding fuels and oils to type certificates (TCs) as engine or propeller operating limitations. It also provides acceptable methods, but not the only methods, that may be used to approve aircraft, engines, or propellers to operate with specified propulsion fuels and oils.	This draft Advisory Circular, AC 20-24C is a clear and extensive example of "Rulemaking by AC". On December 16, 1997 a Memorandum was issued by FAA Regional Counsel Doug Anderson (ANM-7D). The title of that Memorandum is "Rulemaking by AC". That memorandum contains the following explicit requirement that is violated over and over again by the language and provisions included in this draft AC20-24C. That Memorandum states: "AC's, IN TURN, ARE NOT ALLOWED TO SET FORTH THE SUBSTANTIVE REQUREMENTS THAT WOULD OTHERWISE BE CONTAINED IN THE REGULATION. A RULE THAT IS DEFECTIVE BECAUSE IT IS EXCESSIVELY VAGUE CANNOT BE CURED SIMPLY BY PUTTING THE NECESSARY DETAIL IN AN AC". That memorandum goes on to quote with approval Section 5-1 of Order 1320.46A, "Advisory Circular System", which states: "AC's are not regulations and may not impose or lessen a burden on anyone, nor have a mandatory effect. AC's may not be used to add to, interpret, or relieve a duty imposed by a Fedeeral Aviation Regulation(FAR). " In addition, this draft AC 20-24C advisory circular is in open conflict with the mandates stated in the November 8, 1999 Memorandum on "Rulemaking and Advisory Material Guidance", issued by the Transport

	Standards Staff, ANM-110 and signed by Dorenda Baker. This draft AC contains multiple explicit substantive requirements that are clearly in excess of and in conflict with the plain language of the pertinent regulations. Some, but not all, of those are noted below.

2. Applicability. a. The guidance provided in this document is directed to engine manufacturers, airplane manufacturers, rotorcraft manufacturers, modifiers, and foreign regulatory authorities. This guidance also applies to manufacturers of aviation fuels, oils, and additives. b. This material is neither mandatory nor regulatory in nature and does not constitute a regulation. It describes acceptable means, but not the only means, for demonstrating compliance with the applicable regulations. We ("the FAA") will consider other methods an applicant may present to demonstrate compliance. Terms such as "should," "shall," "may," and "must" are used only in the sense of ensuring applicability of this particular method of compliance when the method in this document is used. While these guidelines are not mandatory, they are derived from extensive FAA and industry experience in determining compliance with the relevant regulations. If we find that following this AC would not result in compliance with the applicable regulations, we will not be bound by this AC, and we may require additional substantiation as the basis for finding compliance. c. This material does not change, create any additional, authorize changes in, or permit deviations from existing regulatory requirements.	The language highlighted in yellow is peculiar language which appears to be nearly unique to advisory material which has recently been issued from the Engine Propeller Directorate. A review of other advisory circulars reveals that this language does not appear in past or even other recent Advisory Circulars from other regions of the FAA, including Headquarters. In recent and direct communications, management representatives of the Engine Propeller Directorate have stated that this language **is the basis for the FAA to decide to add any other requirement that they may deem appropriate, to any advisory circular, and to do so without any justification of any kind.** Given the position taken by the FAA, the inclusion of this language defeats the whole purpose of the advisory circular process. The Advisory Circular process is supposed to provide a clear and "bright line" path for an applicant. The applicant can then rely upon that advisory material as one clear and certain way in which the applicant for any certification project can make business plans, raise capital for certification projects, and to otherwise do the normal and ordinary things that are required in the real world of business. A minimal level of certainty is absolutely essential in order for a business enterprise to be able to rationally conduct a business without fear of arbitrary action from the government which could bankrupt a business, or cause almost endless delays in a certification project. There is no indication whether or not the FAA intends to withdraw the existing Advisory Circular AC 20-24B, which has shown itself to be perfectly workable and functional over many years, and which has been the certification guidance material for a number of successful previous fuel and lubricant certification projects.

	Before closing the comment period, the FAA should advise the relevant stakeholders in the fuel and lubricant field if the FAA intends to withdraw AC 20-24B, or not. If the FAA does intend to withdraw AC20-24B, then it should extend the comment period after making that revision to the notice.
3. Related Regulations. The following regulations from Title 14 of the Code of Federal Regulations (14 CFR) are some of the regulations that apply: a. Section 33.7(b)(2) and (3), Engine ratings and operating limitations (Fuel, Oil). b. Section 23.1521(d), Powerplant limitations (Fuel grade). c. Section 23.1522, Auxiliary power unit limitations. d. Section 23.1583(b)(1), Operating limitations (Fuel grade). d. Section 25.1521, Powerplant limitations. e. Section 25.1583(b)(1), Operating limitations. f. Section 27.1521(d), Powerplant limitations. g. Section 27.1583(b)(1), Operating limitations. h. Section 29.1521(d), Powerplant limitations. i. Section 29.1583(b)(1), Operating limitations. j. Section 91.9, Civil aircraft flight manual, marking, and placard requirements.	No comment.
4. References and Related Reading. a. <u>FAA Guidance</u>. (1) Policy Memorandum ANE-2006-33.7-4-1, "Policy for Diesel	The references and related reading material should include AC 20-24B.

(Compression Ignition) Engine Certification," September 6, 2007. (2) Advisory Circular 23.1521-1B, "Type Certification of Automobile Gasoline in Part 23 Airplanes with Reciprocating Engines," March 2, 1995. (3) Advisory Circular 23.1521-2, Change 1, "Type Certification of Oxygenates and Oxygenated Gasoline Fuels in Part 23 Airplanes with Reciprocating Engines," April 24, 1996. (4) Advisory Circular 33.47-1, "Detonation Testing in Reciprocating Aircraft Engines," June 27, 1988. (5) Advisory Circular 91-33A, "Use of Alternate Grades of Aviation Gasoline for Grade 80/87, and Use of Automotive Gasoline," July 18, 1984. (6) Policy Memorandum ANE-2010-33.7-x DRAFT, "Policy for Aviation Fuel and Oil Operating Limitations, § 33.7." b. <u>Industry Guidance</u>. (1) ASTM International Standard D1655, "Standard Specification for Aviation Turbine Fuels." (2) ASTM International Standard D6615, "Standard Specification for Jet B Wide-Cut Aviation Turbine Fuels." (3) ASTM International Standard D7223, "Standard Specification for Aviation Certification Turbine Fuel." (4) ASTM International Standard D7566, "Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons." (5) ASTM International Standard D910, "Standard Specification for Aviation Gasolines." (6) ASTM International Standard D6227, "Standard Specification for Grade 82 Unleaded Aviation Gasoline." (7) ASTM International Standard Practice D4054, "Guideline for the	

Qualification and Approval of New Aviation Turbine Fuels and Fuel Additives." (8) ASTM International Subcommittee D.02.J Operating Procedures, Annex A6, "Guidelines for the Development and Acceptance of a New Aviation Fuel Specification For Spark-Ignition Reciprocating Engines." (9) Defence Standard 91-90: "Gasoline, Aviation: Grades 80/87, 100/130 and 100/130 Low Lead. Joint service Designation: AVGAS 80, AVGAS 100 and AVGAS 100LL." (10) Defence Standard 91-91: "Turbine Fuel, Aviation Kerosine Type, Jet A-1 NATO Code: F-35 Joint Service Designation: AVTUR." (11) SAE International Surface Vehicle Standard J1899, "Lubricating Oil, Aircraft Piston Engine (Ashless Dispersant)." (12) SAE International Surface Vehicle Standard J1966, "Lubricating Oils, Aircraft Piston Engine (Non-Dispersant Mineral Oil)." (13) SAE International Aerospace Standard AS5780, "Specification for Aero and Aero Derived Gas Turbine Engine Lubricants." (14) ASTM International Standard Practice D6424, "Standard Practice for Octane Rating Naturally Aspirated Spark Ignition Aircraft Engines." (15) ASTM International Standard Practice D6812, "Standard Practice for Ground-Based Octane Rating Procedures for Turbocharged/Supercharged Spark Ignition Aircraft Engines." c. Other Guidance. U.S. Government Office of Management and Budget (OMB) Circular No. A-119, "Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities," February 10, 1998.	Reliance upon this document in the context of this advisory circular is completely misplaced and misleading to the reader. This mandate is primarily related to government procurement, not the development of fuels for use in aircraft that are subject to regulatory scrutiny. Paragraph 1 of that OMB document states: ". . . this Circular directs agencies to use voluntary consensus standards in lieu of government-unique standards . . . " In the matter of fuel specifications, there is not now and there never have been any "government-unique standards". All there have ever been are standards developed by industry or private

	enterprises. As such, that circular has no application, according to its own language. The referenced OMB document does not direct the FAA to use any "consensus" standard in lieu of or as a preference to any proprietary standard when there is no competing government standard involved. As noted, the OMB document makes it clear that the document is primarily directed at government procurement activities, not government regulatory activities over the development of new fuels. "d. **How does this policy affect my agency's procurement authority?** This policy does not preempt or restrict agencies' authorities and responsibilities to identify the capabilities that they need to obtain through procurements. Rather, this policy limits an agency's authority to pursue an identified capability through reliance on a government-unique standard when a voluntary consensus standard exists (see Section 6a). " (Paragraph 6 d.) And in subsection "f." of paragraph 6 of that OMB document the OMB **clearly directs the FAA to NOT use consensus standards** when they would impede innovation and technical progress: f. **What considerations should my agency make when it is considering using a standard?** When considering using a standard, your agency should take full account of the effect of using the standard on the economy, and of applicable federal laws and policies, including laws and regulations relating to antitrust, national security, small business, product safety, environment, metrication, technology development, and conflicts of interest. Your agency should also recognize that use of standards, if improperly conducted, can suppress free and

	fair competition; **impede innovation and technical progress;** exclude safer or less expensive products; or otherwise adversely affect trade, commerce, health, or safety. Nowhere in this draft advisory circular does the FAA provide guidance for how an applicant's project is to move forward in the face of resistance or opposition from a "consensus standards" organization which has competitive economic interests to those of an applicant. The reality is that the consensus process to which the FAA refers is notorious for imposing multi-year delays on the development of standards for aviation gasolines. The history of ASTM 82UL fuel, which took about 10 years is one example. Other examples have taken so long that the sponsor of the proposed "consensus" standard has simply decided to withdraw or abandon the proposed specification. This draft advisory circular would, on its face, and if it also involves withdrawal of the existing AC 20-24B, leave an applicant with no guidance as to how to proceed in the face of the real world time and anti-competitive constraints that are periodically associated with the consensus based process.
5. Background. a. Title 14 of the CFR requires that type certificate applicants identify the fuel and oil grade or specification that must be used in their products when operated. Once compliance with the airworthiness certification regulations has been demonstrated, the grade designation or specification becomes part of the airplane, rotorcraft, and engine operating limitations. These operating limitations are specified in the type certificate data sheet (TCDS), and in the airplane flight manual (AFM), or rotorcraft flight manual (RFM). Aircraft operators are required by § 91.9 to only use the fuel and oil listed in the AFM or RFM. These fuels and oils must, therefore, be identified with sufficient specificity to ensure that the engine and aircraft continue to meet their airworthiness certification basis during service. b. Historically, the FAA has used the voluntary consensus standards from	While it is true that applicants have used the ASTM and SAE standards, the statement is misleading because it fails to also note that the FAA has used proprietary standards developed for fuels

ASTM International (ASTM) or SAE International (SAE) to identify fuel and oil grades, designations, or specifications that were to be identified on a TCDS. Functionally, applicants showed (and continue to do so) that the product; the engine, propeller, airplane, etc., operated as designed over the product's complete operating range using the proposed fuel or oil. Applicants made this showing during TC, amended TC, or supplemental TC (STC) programs. Once shown, the Engine and Propeller Directorate (E&PD) issued the TC, amended TC, or STC with the fuel or oil identified as an operating limitation. (1) Thereafter, when applicants proposed adding new fuels or oils to an existing TC or STC, those new fuels or oils were also identified by ASTM or SAE industry-based consensus grades designations or specifications. As with the original showing, applicants then showed that the product's airworthiness certification basis remained intact, and after the showing, the FAA identified the fuel or oil grade, designation, or specification, as an approved operating limitation. c. The FAA has also historically recognized the MIL-STD process and the controls in place in governmental bodies. Accordingly, the FAA has accepted their grades, designations, and specifications, as sufficient to meet its regulatory needs related to identifying fuel and oil as operating limitations on a TCDS. This historical approach to identifying new fuels and oils through a consensus based industry organization, military standard, and other governmental bodies, should continue. And after the proper regulatory showing, the identified fuel or oil can be identified as an operating limitation on a type certificate. (1) Accordingly, fuels identified by an ASTM International aviation fuel specification, military specification, governmental specification, or other industry-based consensus organization specification, are identified in sufficient detail to meet the FAA's needs related to identifying a fuel by grade, designation, or specification on a TC, amended TC, or STC. (2) Oils identified by an SAE International oil standard or a brand name that meets an SAE International standard, military specification, governmental specification, or other industry based consensus organization specification, are identified in sufficient detail to meet the FAA's needs related to identifying an oil by grade or specification on a TC, amended TC, or STC. d. Applicants proposing a fuel or oil for a product should first contact the E&PD and provide proof that the standard or specification has been approved by a voluntary industry-based consensus organization, military, or governmental organization. The	and lubricants. Two examples are the AGE 85 fuel which was first certified in the 1999-2000 time frame. That fuel, subsequently was approved on a series of STCs for various aircraft. That approval was based solely upon the existing AC 20-24B advisory circular. The Engine Propeller Directorate was fully involved in that non-ASTM fuel specification development, as is evident from memorandum from that era. See for example the November 22, 1999 Memorandum from the Manager, Engine Propeller Standards Staff, ANE-110, addressed to the Manager, Special Certification Office, ASW-190, and whose subject was "AGE-85 Ethanol Based Fuel Projects." More recently, around 2006, an oil additive, CAMGAURD ® has been approved without reference to any consensus group specification. That approval was also accomplished pursuant to the enabling language of AC20-24B. Again, the FAA Engine and Propeller Staff was actively involved in that certification effort. This innovative oil additive has been demonstrated to be effective for its intended purpose and has a very successful track record in the industry since its introduction. It is almost certain that if this proposed AC20-24C had been in effect at the time the inventor of CAMGUARD® began developing that product, the CAMGAURD® product would have been abandoned because of the onerous certification requirements that are included in this draft AC20-24C and most of which cannot be traced back to any provision in 14 CFR. As these examples make clear, the broad and expansive language of the draft AC 20-24C clearly violates the FAA's internal mandate against "rulemaking by Advisory Circular."

applicant should then coordinate with the cognizant aircraft certification office(s) (ACOs) and Directorate(s) to develop compliance plans and conduct the certification program. e. Once the FAA concludes that the identified fuel or oil, grade designation or specification, when used in the product, does not invalidate the certification basis of the product, the new fuel or oil may be identified as an engine operating limitation in the airplane or rotorcraft TCDS and flight manuals. This approval requires that an applicant meet the requirements for the specific engine, APU, and aircraft (e.g., 14 CFR part 23, 25, 27, 29, and 33 or TSO C77).	
6. Aviation Fuel. a. <u>Historically Accepted Aviation Fuel Specifications</u>. (1) The primary specification for Jet A and Jet A-1 turbine engine aviation fuel is ASTM International Standard D1655, "Standard Specification for Aviation Turbine Fuels." This specification describes acceptable materials for producing turbine engine fuel, required properties that the fuel must meet and test methods to measure those properties. The oversight of this specification is performed by ASTM International Subcommittee D.02.J on Aviation Fuels. (2) Turbine engine international fuel specifications. The following are examples of international aviation fuel specifications. These specifications are operating limitations on some U.S. products: (a) Defence Standard 91-91, "Turbine Fuel, Aviation Kerosene Type, Jet A-1" is issued by the United Kingdom (U.K.) Ministry of Defence. This standard is produced for the Defence Fuels and Lubricants Committee in collaboration with the U.K. Aviation Fuels Committee (AFC). (b) CAN/CGSB-3.23-05, "Aviation Turbine Fuel, Kerosene Type." includes grades Jet A and Jet A-1 and is issued by the Canadian General Standards Board. (c) GOST 10227-86, "Jet Fuels Specification." The requirements for the regular grade TS-1 fuel are cited in this specification. It is the predominant fuel used in Russia, the Commonwealth of Independent States, and some East European countries. (d) "No. 3 Jet Fuel," according to GB6537-94 issued in 1994 by the National Technology Supervisory Bureau, describes the fuel predominately offered at	

major international airports in China. (e) MIL-DTL-83133F, Detail Specification, Turbine Fuel, Aviation Kerosene Type, JP-8 (NATO F-34), NATO F-35, and JP-8+100 (NATO F-37) is issued by the U.S. Department of Defense. (3) Reciprocating Spark Ignition (SI) fuel specification(s). ASTM International Standard D910, Standard Specification for Aviation Gasolines, is the primary specification for reciprocating SI engine aviation fuel. This specification describes acceptable materials for producing leaded aviation gasoline, required properties that the fuel must meet, and test methods to measure those properties. The ASTM International Subcommittee D.02.J on Aviation Fuels oversees this industry specification. Other specifications for reciprocating SI engine aviation fuel include: (a) ASTM International Standard D6227, "Standard Specification for Grade 82 Unleaded Aviation Gasoline"; and (b) Defence Standard 91-90, "Gasoline, Aviation: Grades 80/87, 100/130 and 100/130 Low Lead" is issued by the U.K. Ministry of Defence. This standard is produced for the Defence Fuels and Lubricants Committee in collaboration with the U.K. AFC.	
6. Aviation Fuel. (continued) **b. <u>Operating Limitations for Aviation Fuel</u>.** (1) FAA regulations require that the Administrator establish engine operating limitations related to fuel and oil. These operating limitations are included in the engine TCDS for each type certificated design. Operating limitations for fuel are related to fuel grade or specifications for reciprocating engines and to fuel designation or specification for turbine engines. The following regulations apply to fuel operating limitations: (a) Engine operating limitations for fuel are required by § 33.7(b)(2) (reciprocating engine) and § 33.7(c)(2) (turbine engine). (b) Airplane operating limitations for fuel are required by § 23.1521(d) (Normal category) and § 25.1521(b)(2) and (c)(2) (Transport category). (c) APU operating limitations for fuel are required by	

§ 25.1522.

(d) Rotorcraft operating limitations for fuel are required by § 27.1521(d) (Normal category) and § 29.1521(d) (Transport category).

(2) The FAA has determined that ASTM International aviation fuel specifications, and other industry consensus-based, military, or governmental specifications, are acceptable as specifications and may be identified as operating limitations for fuel. When ASTM fuel specifications are specified, applicants should list the root number of the ASTM fuel specification (e.g., D1655) and the fuel types or grades in the engine and aircraft TCDS and in manufacturer's documents referenced in the TCDS. For STC projects, the fuel specification root number and fuel types or grades should be listed in the limitations section of the STC. Other aviation fuel specifications (industry-based consensus, military, or governmental), will be reviewed to determine how to identify the operating limitation.

(3) Special Considerations.

(a) Minor Revisions. Fuel specifications are often revised, changing criteria, materials, or processes. These changes are typically not extensive enough to require a new specification, rather, they are incorporated into the existing specification as new suffix numbers.

(b) Drop-In Jet Fuels. ASTM Standard D1655, Standard Specification for Aviation Turbine Fuels, is most frequently used to establish a fuel designation or specification for conventional jet fuel. ASTM, however, requires that new jet fuels or significant modifications of existing fuels be evaluated in accordance with standard D4054 to determine if the new fuel is suitable for aviation use. Modifications such as the use of alternative feed stocks, for example, coal, natural gas, or biomass, are evaluated in accordance with D4054. If the new fuel is found to possess performance characteristics and chemical compositions essentially identical to conventional jet fuel, then it is called a "drop-in fuel."

1 ASTM Standard Specification D7566. ASTM has issued a separate specification for drop-in fuels entitled ASTM Standard Specification D7566, Aviation Turbine Fuel Containing Synthesized Hydrocarbons. D7566 and D1655 are cross-referenced to allow D7566 fuels to be redesignated as D1655 fuels when they enter the distribution system. Consequently, D7566 fuels are effectively equivalent to a revision to the existing D1655 aviation fuel specification.

The language contains no guidance at all for any applicant that elects to not use an ASTM or SAE "consensus" fuel or oil specification. As such, this AC is defective in that it does not provide as much guidance as has been successfully used for these purposes pursuant to the language in AC 20-24B.

2 If the fuel is a drop-in fuel and the currently specified operating limitations are adequate to accommodate the fuel, as in the case of D7566 or D1655 fuels, then further FAA testing is not required. (c) ASTM Non-Applicable Fuel Specifications. Non-applicable ASTM fuel specifications are those ASTM specifications for which the scope does not explicitly include the intended type of aircraft or aircraft engine. Non-applicable ASTM fuel specifications, such as automotive gasoline specifications, have been specified as operating limitations for some reciprocating SI engines. For these special cases, the operating limitation needs to reference both the specification root number and the issue suffix number or revision level. This will require the TC/STC holder to apply for a TC/STC amendment each time the revision number changes. Non-applicable ASTM fuel specifications that have been approved as operating limitations are listed below. 1 ASTM International Standard D4814, Standard Specification for Automotive Spark Ignition Engine Fuel. For example, the operating limitation is listed as D4814-10 for a certification project initiated in calendar year (CY) 2010. 2 ASTM International Standard D4806, Standard Specification for Denatured Fuel Ethanol for Blending with Gasolines for Use as Automotive Spark-Ignition Engine Fuel. For example, the operating limitation is listed as D4806-10 for a certification project initiated in CY 2010. (d) ASTM D1655 Jet Fuel for Aircraft Diesel Engines. Reciprocating compression ignition engines (diesel engines) are typically designed to operate on aviation turbine fuel due to the wide availability of this fuel at airports. The ASTM specification for aviation turbine fuel is D1655. This is a non-applicable specification for diesel engines because the specification scope does not include aviation diesel engines. Therefore, the operating limitation needs to reference both the specification root number and the issue suffix number or revision level. This will require the TC/STC holder to apply for a TC/STC amendment each time the revision number changes. For example, the operating limitation should be listed as D1655-10 for a project initiated in CY 2010. (e) Other governmental military or industry voluntary consensus-based standards, designations, or specifications. If an applicant proposes to specify an aviation fuel identified by another governmental, military or industry voluntary consensus-based standard, designation, or specification, the E&PD will review the standard, designation, or specification for adequacy (see reference in paragraph 4.a.(6)).	Again, this language contains no guidance at all for any applicant that elects not to use an ASTM or SAE fuel or oil specification. As such, this AC is defective in that it does not provide as much guidance as has been successfully used for these purposes pursuant to the language in AC 20-24B.

6. Aviation Fuel. (continued) **c. <u>Operating Limitations for Aviation Fuel: Certification Compliance Plans</u>.** (1) The E&PD is the FAA's technical focal point for identifying the applicable airworthiness certification requirements involving aviation fuel. Applicable airworthiness requirements are those FAA regulatory standards for which the showing of compliance is contingent on fuel properties. Once applicants present the industry consensus-based, military, or governmental fuel grade, designation, or specification to the E&PD, the Directorate will aid applicants as they develop a compliance plan. (2) An applicant's compliance plan should address all applicable airworthiness certification standards, some of which are discussed below. Sound testing techniques and thorough data analysis should be well documented in the compliance plan. Accordingly, close contact and frequent coordination are recommended to ensure the plan is developed with minimal delay. (3) Applicants must demonstrate that the engine and the airplane or rotorcraft in which the engine is installed continue to meet all certification standards. If a qualification project for a new operating limitation for fuel for an APU is required for a new Technical Standard Order (TSO), major change, or STC, then the compliance plan should include the applicable requirements and performance standards from the latest revision of TSO C77. (4) Applicable Regulations for Engines and APUs. See appendix 2 of this AC, paragraphs 1, 2, and 3 for a list of some of the regulations that may apply to fuel projects. Additional guidance on some airworthiness standards follows: (a) Fuel composition can significantly affect material properties and durability. Applicants need to demonstrate materials compatibility of the fuel-wetted materials, including elastomers, seals, and metallic components. This can be accomplished by a combination of soak testing and component testing (see §§ 33.15, 33.53, and 33.91). In some cases, materials compatibility data that was generated during the ASTM fuel specification development may be used. (b) Applicants should perform long-duration engine testing to evaluate the effect of any change in combustion characteristics on the ability of the engine and engine components to operate safely for the specified overhaul or maintenance	This language appears to be mandatory and to only allow an applicant to proceed with a fuel certification project after having first obtained an industry consensus group approval of a specification. After a careful review of 14 CFR 33 et seq, there does not appear to exist any regulation as to which this language can be traced. As such, this kind of provision is in stark violation of the mandates in the December 16, 1997 Memorandum issued by FAA Regional Counsel Doug Anderson (ANM-7D), entitled "Rulemaking by AC" which states: "AC's, IN TURN, ARE NOT ALLOWED TO SET FORTH THE SUBSTANTIVE REQUREMENTS THAT WOULD OTHERWISE BE CONTAINED IN THE REGULATION. A RULE THAT IS DEFECTIVE BECAUSE IT IS EXCESSIVELY VAGUE CANNOT BE CURED SIMPLY BY PUTTING THE NECESSARY DETAIL IN AN AC". Further, this language does not comply with the requirements of Section 5-1 of Order 1320.46A, "Advisory Circular System", which states: "AC's are not regulations and may not impose or lessen a burden on anyone, nor have a mandatory effect. AC's may not be used to add to, interpret, or relieve a duty imposed by a Fedeeral Aviation Regulation(FAR). " In addition, this language is in open conflict with the mandates stated in the November 8, 1999 Memorandum on "Rulemaking and Advisory Material Guidance", issued by the Transport Standards Staff, ANM-110 and signed by Dorenda Baker. This language is not traceable to any portion of 14 CFR 33 et seq relating to engine certification on fuels identified by specification by the applicant. Those regulations only contemplate a simple 150 hour engine run. The FAA asserts conclusions about the effect of long term deposits without providing references to any data

intervals. For example, the octane requirement for reciprocating engines has been shown to increase over time as combustion deposits accumulate. Deposit build-up in the turbine engine fuel system and combustor components should also be evaluated. Further, the vaporization characteristics of a fuel may affect combustion by-products that can have a long-term impact on engine components (see §§ 33.19, 33.49, and 33.87). (c) Applicants should evaluate engine cooling requirements as different fuels may change combustion characteristics and thereby impact cooling requirements. This is particularly important for reciprocating engines where fuel characteristics can impact cylinder temperatures (see § 33.21). (d) The engine fuel system should function properly with the fuel throughout its complete operating range under all flight and atmospheric conditions. Fuel density, vaporization, and low temperature properties may affect fuel system performance under certain conditions (see § 33.51). For reciprocating engine fuels, carburetor icing and vapor lock tendencies should be evaluated (see §§ 33.35 and 33.67). (e) Engine detonation is a critical requirement for reciprocating engines. A fuel must demonstrate adequate anti-knock margin under the worst-case operating conditions to prevent destructive detonation. Applicants should perform engine detonation testing with instrumentation that has been approved by the FAA for accuracy (see § 33.47 and AC 33.47-1). (f) Fuel composition and properties can significantly affect the ability to support combustion at certain points in the operating envelope. Applicants should evaluate engine operability with the new fuel for all approved operating and atmospheric conditions. The test should include engine starting, acceleration, deceleration, and steady-state operation under all approved conditions (see §§ 33.51 and 33.89). (5) Applicable Regulations for Airplanes and Rotorcraft. See appendix 3 of this AC, paragraph 1 for a list of some of the regulations that may apply to fuel projects. Additional guidance on some airworthiness standards follows: (a) Applicants should evaluate the effect of differences in fuel properties such as density on aircraft weight and center of gravity and aircraft structure (see §§ 25.23, 25.25, 25.29, 23.23, 23.25, 23.29, 27.25, 27.27, 27.29, 29.25, 29.27, and 29.29). (b) Applicants should evaluate the effect of differences in fuel properties, such as density, energy content and combustion characteristics, on aircraft	supporting those conclusions. This requirement is novel and unprecedented. For example, there is no similar requirement for FAA approval of test equipment for even exotic testing performed to meet DO-160 environmental testing. This new requirement is a major departure from all previous FAA certification testing requirements wherein the applicant provides calibration of instrumentation to be used in testing. It is doubtful that any OEM engine detonation testing that has been accomplished in the past has been conducted with detonation testing instrumentation that has been formally approved by the FAA for "accuracy." The FAA has, recently, created a set of numerical detonation knock index values. This methodology is useful as a starting point. But various personnel in the FAA have recently stated that knock indexe values upon which the FAA relies have not been correlated to any level of harm to the engine. Other industry sources confrim that observation. Further, there has been no industry consensus developed as to the appropriate level of knock intensity or any correlation to any level of harm or insult to the engines.

performance (see §§ 25.105, 25.117, 25.119, 25.121, 23.53, 23.69, 23.77, 27.51, 27.65, 27.67, 29.51, 29.65, and 29.67). (c) Fuel composition can have a significant impact on material properties and durability. Applicants should demonstrate materials compatibility of the fuel wetted materials, including elastomers, seals, metallic components, fuel bladders, and fuel tanks. This can be done by a combination of soak testing and component testing (see §§ 23.603, 25.603, 27.603, and 29.603). (d) Applicants should evaluate the effect of differences in fuel properties such as density, energy content and combustion characteristics on installed engine and APU performance, including in-flight restarting (see §§ 25.901(d), 25.903(a), 25.903(e), 25.903(f), 25.939, 23.901(d), 23.903, 23.903(d), 23.939, 27.903, 27.903(d), 27.939, 29.903, 29.903(e), 29.923(p), and 29.939). (e) The fuels ability to perform safely in high temperature conditions can be influenced by fuel properties such as vapor pressure, liquid/vapor ratio, and thermal conductivity. Applicants should perform fuel system hot weather and engine cooling testing to evaluate the fuel's performance (see §§ 23.961, 25.961, 27.961, 29.961, 25.1041, 25.1043, 25.1045, 23.1041, 23.1043, 23.1045, 23.1047, 27.1041, 27.1043, 27.1045, 29.1041, 29.1043, 29.1045, 29.1047, and 29.1049). (f) Applicants should show the fuel is compatible with the aircraft fuel system components and does not have any adverse effect on fuel system performance. Evaluate fuel properties such as flash point or vapor pressure for their effect on fuel tank flammability. Fuel properties such as the dielectric/density relationship can change the gauging system function since some gauging systems do not have densitometers and are based on an assumed relationship for typical Kerosene fuels. Some fuel types can also cause corrosion, adversely affect material properties and durability of engine fuels system components as discussed in paragraph 6c.(4)(a) above, or have an affinity for water retention and icing. Consider the effect of additives on pumping and flow characteristics (see §§ 25.951, 25.952, 25.955, 25.959, 25.969, 25.975, 25.979, 25.981, 25.997, 25.1001, 25.1305, 25.1337, 23.951, 23.955, 23.959, 23.969, 23.973(e)(f), 23.975, 23.979, 23.997, 23.1001, 23.1305, 23.1337, 27.951, 27.955, 27.959, 27.965, 27.969, 27.997, 29.951, 29.955, 29.959, 29.969, 29.975, 29.979, 29.997, and 29.1001, 29.1305, and 29.1337).	The FAA hardware methodology is itself, problematical. It requires mechanical alteration (holes have to be drilled into the highly stressed portion of the combustion chamber cylinder head) of engine cylinder heads which makes it impractical for many smaller engines and unnecessarily expensive in all cases. Further, flight testing with cylinders altered with holes drilled into the cylinder heads have unknown safety hazards for use in fight testing. This requirement is a major departure from all previous FAA certification testing rquirements wherein the applicant provides calibration of instrumentation to be used in testing. This provision should therefore be withdrawn or re-drafted after realistic and meaningful consultation with the knowledgeable industry stakeholders.
7. Lubricating Oil.	

a. <u>Historically Accepted Oil Standards</u>.

(1) Formerly, commercial and military turbine engine type design holders used MIL-STD-23699 to qualify engine oil. Today, the standard for turbine engine oil is SAE International Aerospace Standard AS5780, Specification for Aero and Aero Derived Gas Turbine Engine Lubricants, which replaced MIL-STD-23699.

(2) SAE AS5780 defines physical, chemical, and performance limits for gas turbine engine oils along with standard test methods and requirements. It includes specialized laboratory and rig testing to determine if the oil is suitable for aircraft turbine engines. It also defines quality control requirements to ensure batch conformance and materials traceability, and it includes procedures to manage and communicate changes in oil formulation and brand.

(a) SAE AS5780 is maintained by SAE Technical Committee E-34, Propulsion Lubricants. The SAE E-34 Propulsion Lubricants committee addresses all facets of aerospace propulsion lubricants—development, maintenance, and in-service experience. This work includes lubricants used for gas turbine engines, aircraft gearboxes and accessories.

(2) Similarly, commercial and military turbine engine type design holders used MIL-L-6082 (Non-Dispersant Mineral Oil) and MIL-L-22851 (Ashless Dispersant) for reciprocating engines. However, SAE Surface Vehicle Standard J1899, Lubricating Oil, Aircraft Piston Engine (Ashless Dispersant) and SAE Surface Vehicle Standard J1966, Lubricating Oils, Aircraft Piston Engine (Non-Dispersant Mineral Oil), replaced the MILSTD as the primary standards for reciprocating engine oil. These specifications define physical, chemical, and performance limits for reciprocating engine oils along with standard test methods and requirements. They include specialized laboratory and rig testing to determine if the oil is suitable for aircraft reciprocating engines. They also define quality control requirements to assure batch conformance and materials traceability. SAE Standards J1899 and J1966 are maintained by the SAE Fuels and Lubricants Technical Committee 8 (TC-8) Aviation Piston Engine Lubricants.

7. Lubricating Oil. (Continued) **b. <u>Operating Limitations for Lubricating Oil</u>.** (1) FAA regulations require that the Administrator establish engine operating limitations related to oil. These operating limitations are also included in the engine TCDS for each type certificated design. Operating limitations for oil are related to oil grade or specifications for reciprocating and turbine engines. (2) The FAA has determined that SAE grade or specification known as an SAE standard, oil formulation brand designations based on SAE standards, or other industry-based consensus, military, or governmental standards, grades, or specifications, are acceptable to include as engine operating limitations related to oil. The oil formulation brand designation or the standard number should be listed in the engine TCDS or in manufacturers' documents referenced in the TCDS. For STC projects, the oil formulation brand designation or the standard number should be listed in the limitations section of the STC. (3) Special Considerations. (a) Oil Formulation Brand Name Designation. Turbine engines generally require lubricating oils that meet SAE AS5780 standard, but the operating limitation specified in the engine TC is most often defined by the brand name(s) of specific oil formulations. Similarly, piston engine lubricating oil typically meets SAE J1899 or J1966 standards with the operating limitations defined by brand name(s) of specific oil formulations. This is a more specific means of identification than simply referencing SAE AS5780, J1899 or J1966, and therefore, is generally acceptable for establishing an operating limitation related to oil, as required by §§ 33.7(b)(3) and (c)(3). However, specifying AS5780, J1899 or J1966 is also acceptable if the engine manufacturer has demonstrated that any oil with properties that fall within the range of criteria in the specification is acceptable for use in the subject engine. (b) Changes to SAE Approved Oil Formulation. The oil manufacturer may change oil formulation, base stock composition, additive composition, or manufacturing plant location. These changes may affect the performance of the oil. Changes that have the potential to adversely impact the engine oil system will result in SAE	This language is more important for what it omits than what it includes. This language fails to provide any guidance of any kind for any applicant as to how to draft an acceptable specification that is not derived from an SAE standard. The existing AC 20-24B does provide that guidance. As such, this Advisory Circular should not supersede the existing AC20-24B which does provide guidance which has a successful past track record.

requiring a brand re-identification, which in turn will require a change to the TC or STC to add the new brand as an operating limitation. 1 If SAE determines the change does not result in a change to the brand name, then it is not considered a change to the oil grade or specification, and accordingly, no change to the TC or STC is required. This is because operating limitations relative to oil are typically defined in terms of the brand name. 2 If SAE determines the change results in a brand name reidentification, then the SAE industry oversight group generally evaluates the change in parallel with the engine manufacturer's FAA design change control process. The industry oversight group's report and associated evidence can be used to support the FAA's review process. (c) Other governmental military or industry voluntary consensus-based standards or specifications. If an applicant proposes to specify an aviation oil identified by another governmental, military or industry voluntary consensus-based standard, or specification, the E&PD will review the standard or specification for adequacy (see reference in paragraph 4.a.(6)).	Again, this language fails to provide any guidance of any kind for any applicant as to how to draft an acceptable specification that is not derived from an SAE standard. The existing AC 20-24B does provide that guidance. As such, this draft AC 20-24C should not supersede the existing AC20-24B which does provide guidance which has a successful past track record.
7. Lubricating Oil. (Continued) **c. <u>Operating Limitations for Oil: Compliance Plans</u>.** (1) The E&PD is the FAA's technical focal point for identifying the applicable airworthiness certification requirements involving aviation oil. Applicable airworthiness requirements are those FAA regulatory standards for which the showing of compliance is contingent on oil properties. Once applicants present the industry consensus-based, military, or governmental oil brand, standard, grade, or specification to the E&PD, the Directorate will aid applicants as they develop a compliance plan. (2) An applicant's compliance plan should address all applicable airworthiness certification standards, some of which are discussed below. Sound testing techniques and thorough data analysis should also be well documented in the compliance plan. Accordingly, close contact and frequent coordination are recommended to ensure the plan is developed with minimal delay. (3) Applicants using engine oil for airplane or rotorcraft systems must	This language appears to be mandatory and to only allow an applicant to proceed with an oil / lubricant certification project after having first obtained an industry consensus group approval of a specification. After a careful review of 14 CFR 33 et seq, there does not appear to exist any regulation as to which this language can be traced. As such, this kind of provision is in stark violation of the mandates in the December 16, 1997 Memorandum issued by FAA Regional Counsel Doug Anderson (ANM-7D), entitled "Rulemaking by AC" which states: "AC's, IN TURN, ARE NOT ALLOWED TO SET FORTH THE SUBSTANTIVE REQUREMENTS THAT WOULD OTHERWISE BE CONTAINED IN THE REGULATION. A RULE THAT IS DEFECTIVE BECAUSE IT IS EXCESSIVELY VAGUE CANNOT BE CURED SIMPLY BY PUTTING THE NECESSARY DETAIL IN AN

demonstrate that the engine and the airplane or rotorcraft in which the engine is installed continue to meet all certification standards. If a qualification project for a new operating limitation for oil for an APU is required for a new TSO, major change, or STC, then the compliance plan should include the applicable requirements and performance standards from the latest revision of TSO C77.	AC". Further, this language does not comply with the requirements of Section 5-1 of Order 1320.46A, "Advisory Circular System", which states: "AC's are not regulations and may not impose or lessen a burden on anyone, nor have a mandatory effect. AC's may not be used to add to, interpret, or relieve a duty imposed by a Fedeeral Aviation Regulation(FAR). " In addition, this language is in open conflict with the mandates stated in the November 8, 1999 Memorandum on "Rulemaking and Advisory Material Guidance", issued by the Transport Standars Staff, ANM-110 and signed by Dorenda Baker.
7. Lubricating Oil. (Continued) **d. <u>Applicable Regulations for Engines and APUs</u>.** See appendix 2 of this AC, paragraphs 4, 5, and 6 for a list of some of the regulations that may apply to oil projects. Additional guidance on some airworthiness standards follows. (1) Applicants should review the design of the turbine engine oil system and provide data that shows that the new turbine engine oil will not result in harmful build-up of carbon deposits for compliance with §§ 33.19 and 33.71. This can be accomplished by any combination of engine test, rig test, and analysis based on prior service experience or testing. For reciprocating engines, applicants should conduct a similar durability evaluation to evaluate deposit build-up and other long-term oil effects over the overhaul interval of the engine (see §§ 33.19 and 33.39). (2) Applicants should also include in the Instructions for Continued Airworthiness if applicable, instructions for inspections, repair, and cleaning of turbine engine areas or components shown to be susceptible to carbon deposits build-up. These instructions should be derived from the review of the oil system design accomplished during compliance with § 33.71 and the durability testing accomplished during compliance with § 33.19. (3) If all oil-wetted materials on the specific engine model under review were not evaluated during the SAE qualification process, then additional materials compatibility testing will be required for FAA approval (see § 33.15).	There is no "durability" **<u>testing</u>** requirement that can be traced to 14CFR 33.19. That provision is emphatically NOT a testing provision. 14CFR 33.19 is found in Subpart B – "Design and Construction: General". **ALL testing** in 14 CFR 33 et seq is explicitly defined in Subpart D and Subpart F ("Block Tests"). In recent years some Advisory Circular material has attempted to

	impose testing requirements under a claim that 14 CFR 33.19, entitled "Durability", provides authority for the FAA to impose "testing" requirements under that section. This is simply not an intellectually honest interpretation of the plain language of 33.19 which starts out with the following words: "Engine design and construction must minimize the development of an unsafe condition of the engine between overhaul periods." That section is a pure "design" mandate and has no requirement for any testing. As such, any attempt to use that section as a justification for further "testing" is a blatant example of "Rulemaking by Advisory Circular". See the other comments that reference the long standing FAA internal memorandum which prohibit FAA advisory circulars from employing language that violates that mandate.
7. Lubricating Oil. (Continued) **e. <u>Applicable Regulations for Airplanes and Rotorcraft</u>.** See appendix 3 of this AC, paragraph 2 for a list of some of the regulations that may be applicable for oil projects. Additional guidance on some airworthiness standards follow. (1) Applicants should show that the oil is compatible with aircraft or propeller systems that use the oil (see §§ 25.901(d), 25.903, 25.903(f), 25.905, 25.943, 25.1011(b), 25.1019, 23.901(e), 23.901(f), 23.903(b)(2), 23.905(d), 23.909, 27.903, and 29.903). (2) Applicants should show that the oil has no adverse effect on engine cooling (see §§ 25.1041, 25.1043, 25.1045, 23.1041, 23.1043, 23.1045, 23.1047, 27.1041, 27.1043, 27.1045, 29.1041, 29.1043, 29.1045, 29.1047, and 29.1049).	

Appendix 1	
APPENDIX 1 **HORIZONTALLY OPPOSED RECIPROCATING ENGINE OIL APPROVALS:** **THE SAE J1899 PROGRAM** **1. Introduction**. This appendix provides guidance for oil qualification programs performed in accordance with SAE standard J1899, Lubricating Oil, Aircraft Piston Engine (Ashless Dispersant). This appendix provides guidance specific to SAE J1899 qualified piston engine lubricating oils. It applies only to Teledyne Continental Motors (TCM) and Lycoming Engines (LE) horizontally opposed reciprocating engines. **2. Background.** a. This appendix applies to a single engine model or a family of engine models if the applicant can show that the tested engine represents the most severe case. The costs associated with such a substantiation program are prohibitive for single reciprocating engine models; therefore, a broader applicability for lubricating oil approvals is required for these engines. b. The Naval Air Warfare Center (NAWC) developed a standardized procedure to qualify a particular engine oil across engine models, based on similarities of materials and design operating parameters. Today, this procedure applies only to horizontally opposed reciprocating engines manufactured by TCM and LE. c. The NAWC's procedure is captured in SAE standard J1899. It provides specific requirements for laboratory testing, engine bench testing, and engine flight testing. It represents an acceptable method of showing the FAA that applicable airworthiness certification standards are retained when the oil is used. **3. FAA Oversight of SAE J1899 Qualification Program**. The SAE J1899 qualification program consists of: Step 1— all laboratory analysis and testing and engine endurance testing; and Step 2— flight testing of the oil using the specified engine model. The SAE	

technical team, comprised of the oil manufacturer, engine manufacturers, the FAA, and the U.S. Navy, oversees both steps. Under Step 1, applicants conduct sufficient testing and analysis to obtain a limited STC which approves the use of the oil for flight testing in Step 2. Step 1 requires direct FAA participation. Step 2 relies on delegated oversight performed by the engine manufacturers under their design change approval system. An overview of each step is provided below. a. Step 1: Preliminary Data and Ground Testing. (1) The objective of this step is to provide sufficient substantiation to obtain a limited supplemental type certificate that authorizes flight testing of the LE and TCM engine models specified in SAE J1899. For this step, applicants should submit a compliance plan to the E&PD which identifies the applicable regulations from part 33 (or Civil Air Regulation (CAR) 13). The applicant should also provide the FAA with analyses, data, test plans and test reports to substantiate compliance with each regulation. (2) The first step consists of providing all preliminary data, laboratory testing, and evaluation; the L-38 engine test; and the 150-hour engine endurance test of a Lycoming TIO-540 engine. The applicant must perform these tests in accordance with SAE J1899. (3) The compliance plan should reference the applicable J1899 sections. The following table summarizes the relationship between J1899 and part 33; applicants can use it to aid in developing their compliance plan.	The advisory circular should elaborate on the concept of a "limited STC" and how it is defined and how it may be used. The concept of a "limited STC" would be very useful to industry and would be highly beneficial to the individuals and groups involved in certification activities. However, it does not appear that there is any regulatory basis for a "limited STC" for use in "testing". If the FAA does intend to provide for some kind of "limited STC" that would be a welcome development for the industry, but so far as one can tell, there is "no such animal" that can be found within the scope of the existing FAA regulations or practice in the field.

Table A-1. Relationship between J1899 and Part 33

CFR Section	Subject	Comments	J1899 Reference
33.7	Engine operating limitations	Oil specification reference defined.	3.
33.15	Materials	Data from L-38 engine test, and any other laboratory data related to materials compatibility.	3.8.1
33.39	Lubrication system	Analyses and test data to confirm the lube system operates properly with the new oil.	3.
33.42	General (block tests)	Break-in, oil consumption, and pre-and post-test calibration runs, 150 hour endurance test.	3.8.2, appendix B
33.45	Calibration tests	Break-in, oil consumption, and pre-and post-test calibration runs.	3.8.2, B6.2, B6.3, B6.4, B6.6
33.49	Endurance test	150 hour endurance test.	3.8.2, B6.5
33.55	Teardown inspection	Post-test inspection requirements.	3.8.2, B7

For engines certified under CAR 13, applicants should reference the equivalent requirement

from that regulation. (4) Some differences exist between § 33.49 and the J1899 endurance test of section B6.5. For example, J1899 B6.5 does not require that the engine be operated at critical and 8000 ft. altitudes, as required by § 33.49(e)(1)(ii), and does not require that accessories be loaded, as required by § 33.49(a). Also, the turbo supercharger 50-hour test specified in § 33.49(e)(1)(iii) is not included in the J1899 test. However, the J1899 B6.5 test is acceptable to show that the engine oil or additive is acceptable for the limited flight test to be performed in Step 2. (5) The 150-hour endurance test specified in J1899 B6.5 is considered an official FAA test and, therefore, subject to FAA certification test requirements. These include conformity of the test lubricant or additive, conformity of the test hardware and apparatus, and FAA testing oversight. Applicants should submit a test plan for approval, and the cognizant FAA ACO should issue a Test Inspection Authorization, prior to conducting the tests. (6) Upon completion of the above requirements, the FAA will issue a limited STC to authorize flight testing of the specified LE and TCM engine models in accordance with appendix C of SAE J1899. b. Step 2: Flight Testing. (1) Flight evaluation is the second step, using the specified LE and TCM engine models, as described in SAE J1899, appendix C. In this step, the applicant should conduct a long duration flight test of 500 hours on both LE and TCM engines. (2) The FAA has delegated oversight of these tests to the engine manufacturers under their design approval holder authority. Test conformity and procedure requirements need only meet the engine manufacturer's requirements for a design change. Although the company designated engineering representative is responsible for FAA oversight, the FAA retains the authority to observe the testing or review the engine manufacturer's approval of the product, if necessary. The applicant should ensure that the engine manufacturer is participating in the evaluation of the oil and has access to sufficient data to assess the acceptability of the product.	This requirement is not traceable to any identifiable section of 14 CFR 33 et seq. As such, it is an example of rulemaking by advisory circular.

(3) Step 2 allows the SAE technical team to complete the evaluation of the oil. Once completed, the team will determine if the oil should be added to the U.S. Navy's QPL. Engine manufacturer approval of the product is accomplished by reference to the QPL in LE and TCM service documents.	
Appendix 2	
APPENDIX 2 **APPLICABLE AIRWORTHINESS STANDARDS - ENGINES** The following sections from 14 CFR part 33 and TSO C77b may aid applicants in developing their compliance plans. This list is by no means all inclusive. Applicants should, therefore, work with the E&PD and their respective ACOs to develop their individual compliance plans. **1. Fuel Approval for Turbine Engines.** § 33.4 Instructions for Continued Airworthiness § 33.5 Instruction manual for installing and operating the engine § 33.7 Engine ratings and operating limitations § 33.15 Materials § 33.17 Fire prevention § 33.19 Durability § 33.21 Engine cooling § 33.28 Engine control systems § 33.65 Surge and stall characteristics § 33.67 Fuel system § 33.72 Hydraulic actuating systems § 33.73 Power or thrust response § 33.82 General § 33.85 Calibration tests § 33.87 Endurance test § 33.89 Operation test § 33.91 Engine component test § 33.93 Teardown inspection	

§ 33.99 General conduct of block tests

2. Fuel Approval for APUs (from TSO C77b).

a. Paragraph 4. MARKING, subparagraph b.(2), “Fuel type and specification.”

b. Paragraph 5, DATA REQUIREMENTS, subparagraph (b), “TSO Technical Data.” including the following statements from this paragraph:

(1) “(4) A model specification that specifies the APU ratings and operating limitations established when demonstrating compliance with the requirements of this TSO.”

(2) “(5) Manual(s) that contain instructions for installing and operating the APU.”

(3) “(6) Manual(s) containing instructions for continued airworthiness of the APU.”

c. Appendix 1 (Performance Standards). The following sections apply:

4.2 Materials
4.4 Operating characteristics
4.5 APU Control System
5.2 Fire prevention
5.5 Fuel system
5.7 Cooling
6.1 General (Block Tests)
6.2 Calibration tests
6.3 Endurance test
6.4 Teardown Inspection
6.9 Electronic Control Components

3. Fuel Approval for Reciprocating Engines. § 33.4 Instructions for Continued Airworthiness § 33.5 Instruction manual for installing and operating the engine § 33.7 Engine ratings and operating limitations § 33.15 Materials § 33.17 Fire prevention § 33.19 Durability § 33.21 Engine cooling § 33.28 Engine control systems § 33.35 Fuel and induction system § 33.43 Vibration test § 33.45 Calibration test § 33.47 Detonation test § 33.49 Endurance test § 33.51 Operation test § 33.53 Engine component test § 33.55 Teardown inspection § 33.57 General conduct of block tests **4. Oil Approval for Turbine Engines.** § 33.4 Instructions for Continued Airworthiness § 33.5 Instruction manual for installing and operating the engine § 33.7 Engine ratings and operating limitations § 33.15 Materials § 33.17 Fire prevention § 33.19 Durability § 33.21 Engine cooling § 33.71 Lubrication system § 33.72 Hydraulic actuating systems § 33.82 General § 33.85 Calibration tests	

§ 33.87 Endurance test
§ 33.91 Engine component test
§ 33.93 Teardown inspection
§ 33.99 General conduct of block tests

5. Oil Approval for APUs (from TSO C77b).

a. Paragraph 4. MARKING, subparagraph (b), including "(3) Lubricating oil type and specification."

b. Paragraph 5, DATA REQUIREMENTS, subparagraph (b), "TSO Technical Data," including the following statements from this paragraph:

(1) "(4) A model specification that specifies the APU ratings and operating limitations established when demonstrating compliance with the requirements of this TSO."

(2) "(5) Manual(s) that contain instructions for installing and operating the APU."

(3) "(6) Manual(s) containing instructions for continued airworthiness of the APU."

c. Appendix 1 (Performance Standards). The following sections apply:

4.2 Materials
4.4 Operating characteristics
4.7 Extreme attitude operation
5.2 Fire prevention
5.4 Lubrication system
5.7 Cooling
6.1 General (Block Tests)
6.2 Calibration tests
6.3 Endurance test
6.4 Teardown Inspection

6.9 Electronic Control Components **6. Oil Approval for Reciprocating Engines.** § 33.4 Instructions for Continued Airworthiness § 33.5 Instruction manual for installing and operating the engine § 33.7 Engine ratings and operating limitations § 33.15 Materials § 33.17 Fire prevention § 33.19 Durability § 33.21 Engine cooling § 33.39 Lubrication system § 33.42 General § 33.45 Calibration tests § 33.49 Endurance test § 33.53 Engine component test § 33.55 Teardown inspection § 33.57 General conduct of block tests	
Appendix 3	
APPENDIX 3 **APPLICABLE AIRWORTHINESS STANDARDS – AIRPLANES AND ROTORCRAFT** The following sections from 14 CFR parts 23, 25, 27, or 29 may aid applicants in developing their compliance plans. This list is by no means all inclusive. Applicants should, therefore,	

work with the E&PD and their respective ACOs to develop their individual compliance plans.

1. Fuel.

a. Transport Category Airplanes.

§ 25.23	Load distribution limits
§ 25.25	Weight limits
§ 25.29	Empty weight and corresponding center of gravity
§ 25.105	Takeoff
§ 25.117	Climb: general
§ 25.119	Landing climb: All-engines operating
§ 25.121	Climb: One-engine-inoperative
§ 25.603	Materials
§ 25.863(b)(2)	Flammable Fluid Fire Protection
§ 25.901(d)	Auxiliary power unit
§ 25.903(a)	Engine type certificate.
§ 25.903(e)	Restart capability
§ 25.903(f)	Auxiliary power unit
§ 25.939	Turbine engine operating characteristics
§ 25.943	Negative acceleration
§ 25.951	General (fuel system)
§ 25.952	Fuel system analysis and test
§ 25.955	Fuel flow
§ 25.959	Unusable fuel supply
§ 25.961	Fuel system hot weather operation
§ 25.969	Fuel tank expansion space
§ 25.975	Fuel tank vents and carburetor vapor vents
§ 25.979	Pressure fueling system
§ 25.981	Fuel tank ignition prevention
§ 25.997	Fuel strainer or filter
§ 25.1001	Fuel jettisoning system
§ 25.1011(b)	General (oil system)
§ 25.1041	General (cooling)
§ 25.1043	Cooling tests

§ 25.1045	Cooling test procedures	
§ 25.1305	Powerplant instruments	
§ 25.1337	Powerplant instruments	
§ 25.1521	Powerplant limitations	
§ 25.1522	Auxiliary power unit limitations	
§ 25.1529	Instructions for Continued Airworthiness	
§ 25.1557(b)	Powerplant fluid filler openings	
§ 25.1541	General (markings and placards)	
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b.	Normal, Utility, Acrobatic, and Commuter Category Airplanes.	
§ 23.23	Load distribution limits	
§ 23.25	Weight limits	
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§ 23.943	Negative acceleration	
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§ 23.963	Fuel tanks: General	
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§ 23.1001	Fuel jettisoning system	
§ 23.1011	General (oil system)	
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§ 23.1043	Cooling tests	
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§ 23.1501	General	
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§ 23.1529	Instructions for Continued Airworthiness	
§ 23.1541	General (markings and placards)	
§ 23.1549	Powerplant and auxiliary power unit instruments	
§ 23.1557(c)	Powerplant fluid filler openings	
§ 23.1581	General (airplane flight manual)	
§ 23.1583	Operating limitations	
§ 23.1585(i)	Operating procedures	

c. Normal Category Rotorcraft. (Note: Additional requirements from appendix A to part 27 may apply for Category A approval of rotorcraft.)

§ 27.25	Weight limits	
§ 27.27	Center of gravity limits	
§ 27.29	Empty weight and corresponding center of gravity	
§ 27.45	Performance (General)	
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§ 27.75	Landing	
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§ 27.863(b)(2)	Flammable fluid fire protection	
§ 27.903	Engines	
§ 27.903(d)	Restart capability	
§ 27.939	Turbine engine operating characteristics	
§ 27.951	General (fuel system)	
§ 27.955	Fuel flow	
§ 27.959	Unusable fuel supply	
§ 27.961	Fuel system hot weather operation	
§ 27.969	Fuel tank expansion space	
§ 27.975	Fuel tank vents	
§ 27.997	Fuel strainer or filter	
§ 27.1011(b)	General (oil system)	
§ 27.1041	General (cooling)	
§ 27.1043	Cooling tests	
§ 27.1045	Cooling test procedures	
§ 27.1305	Powerplant instruments	
§ 27.1337	Powerplant instruments	
§ 27.1521	Powerplant limitations	
§ 271529	Instructions for Continued Airworthiness	
§ 27.1541	General (markings and placards)	
§ 27.1557(c)	Miscellaneous markings and placards	
§ 27.1581	General (rotorcraft flight manual)	
§ 27.1583	Operating limitations	
§ 27.1585(e)(f)	Operating procedures	

d. Transport Category Rotorcraft.

§ 29.25	Weight limits
§ 29.27	Center of gravity limits
§ 29.29	Empty weight and corresponding center of gravity
§ 29.45	Performance (General)
§ 29.49	Performance at minimum operating speed
§ 29.51	Takeoff data: general
§ 29.53	Takeoff: Category A
§ 29.63	Takeoff: Category B
§ 29.65	Climb: All-engines operating
§ 29.67	Climb: One-engine-inoperative
§ 29.77	Landing decision point (LDP): Category A
§ 29.79	Landing: Category A
§ 29.83	Landing: Category B
§ 29.85	Landing: balked landing: Category A
§ 29.603	Materials
§ 29.863(b)(2)	Flammable Fluid Fire Protection
§ 29.901(c)(d)	Auxiliary power unit
§ 29.903	Engines
§ 29.903(e)	Restart capability
§ 29.923(p)	Rotor drive system and control mechanism tests
§ 29.939	Turbine engine operating characteristics
§ 29.951	General (fuel system)
§ 29.955	Fuel flow
§ 29.959	Unusable fuel supply
§ 29.961	Fuel system hot weather operation
§ 29.969	Fuel tank expansion space
§ 29.975	Fuel tank vents and carburetor vapor vents
§ 29.979	Pressure refueling
§ 29.997	Fuel strainer or filter

§ 29.1001	Fuel jettisoning system	
§ 29.1011(b)	General (oil system)	
§ 29.1041	General (cooling)	
§ 29.1043	Cooling tests	
§ 29.1045	Climb cooling test procedures	
§ 29.1047	Takeoff cooling test procedures	
§ 29.1049	Hover cooling test procedures	
§ 29.1305	Powerplant instruments	
§ 29.1337	Powerplant instruments	
§ 29.1521	Powerplant limitations	
§ 29.1522	Auxiliary power unit limitations	
§ 29.1529	Instructions for Continued Airworthiness	
§ 29.1541	General (markings and placards)	
§ 29.1557(c)	Miscellaneous markings and placards	
§ 29.1581	General (rotorcraft flight manual)	
§ 29.1583	Operating limitations	
§ 29.1585(e)(f)	Operating procedures	
§ 29.1587	Performance information	
2. Oil.		
a. Transport Category Airplanes.		
§ 25.863(b)(2)	Flammable fluid fire protection	
§ 25.901(d)	Auxiliary power unit	
§ 25.903	Engines	
§ 25.903(f)	Auxiliary power unit	
§ 25.905	Propellers	
§ 25.943	Negative acceleration	
§ 25.1011(b)	General (oil system)	
§ 25.1019	Oil strainer or filter	
§ 25.1041	General (cooling)	
§ 25.1043	Cooling tests	
§ 25.1045	Cooling test procedures	

§ 25.1521	Powerplant limitations	
§ 25.1522	Auxiliary power unit limitations	
§ 25.1529	Instructions for Continued Airworthiness	
§ 25.1541	General (markings and placards)	
§ 25.1581	General (airplane flight manual)	
§ 25.1583	Operating limitations	
b. Normal, Utility, Acrobatic, and Commuter Category Airplanes.		
§ 23.863(b)(2)	Flammable fluid fire protection	
§ 23.901(f)	Auxiliary power unit	
§ 23.903	Engines	
§ 23.905	Propellers	
§ 23.909	Turbocharger systems	
§ 23.943	Negative acceleration	
§ 23.1011(b)	General (oil system)	
§ 23.1019	Oil strainer or filter	
§ 23.1041	General (cooling)	
§ 23.1043	Cooling tests	
§ 23.1045	Cooling test procedures for turbine powered airplanes	
§ 23.1047	Cooling test procedures for reciprocating engine powered airplanes	
§ 23.1501	General	
§ 23.1521	Powerplant limitations	
§ 23.1522	Auxiliary power unit limitations	
§ 23.1529	Instructions for Continued Airworthiness	
§ 23.1541	General (markings and placards)	
§ 23.1549	Powerplant and auxiliary power unit instruments	
§ 23.1581	General (airplane flight manual)	
§ 23.1583	Operating limitations	
c. Normal Category Rotorcraft. (Note: Additional requirements from		

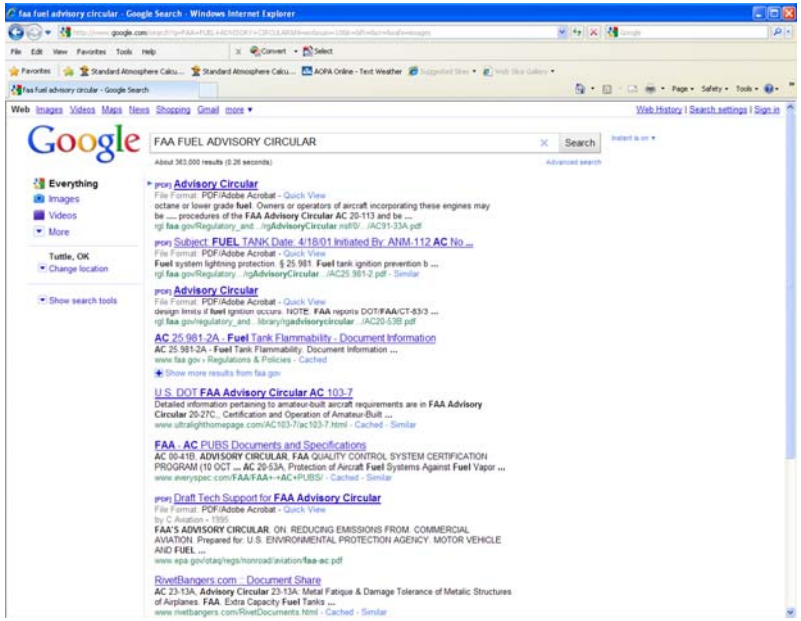
appendix A to part 27 may apply for Category A approval of rotorcraft.) § 27.863(b)(2) Flammable fluid fire protection § 27.903 Engines § 27.923 Rotor drive system and control mechanism tests § 27.927 Additional tests § 27.1011(b) General (oil system) § 27.1019 Oil strainer or filter § 27.1041 General (cooling) § 27.1043 Cooling tests § 27.1045 Cooling test procedures § 27.1521 Powerplant limitations § 271529 Instructions for Continued Airworthiness § 27.1541 General (markings and placards) § 27.1581 General (airplane flight manual) § 27.1583 Operating limitations d. Transport Category Rotorcraft. § 29.863(b)(2) Flammable fluid fire protection § 29.903 Engines § 29.901(c)(d) Auxiliary power unit § 29.923 Rotor drive system and control mechanism tests § 29.927 Additional tests § 29.1011(b) General (oil system) § 29.1019 Oil strainer or filter § 29.1041 General (cooling) § 29.1043 Cooling tests § 29.1045 Climb cooling test procedures § 29.1047 Takeoff cooling test procedures § 29.1049 Hover cooling test procedures § 29.1521 Powerplant limitations § 29.1522 Auxiliary power unit limitations	

§ 29.1529	Instructions for Continued Airworthiness	
§ 29.1541	General (markings and placards)	
§ 29.1581	General (airplane flight manual)	
§ 29.1583	Operating limitations	
	END	
		The FAA's "public notice" of this draft Advisory Circular does not meet the legally sufficient minimum standards of public notice. So far as this responder can determine, the draft AC 20-24C was not published in the federal register for comment. Neither the draft AC 20-24C nor a subsequent notice of it being available for comment was sent to the present commenter, even though GAMI had specifically asked for a copy of the draft AC just days before it was, apparently, posted up for comment somewhere in the labyrinth of the FAA web site . Interested groups like the Clean 100 Octane Coalition, who had previously expressed a direct interest in the subject matter to the FAA were not notified that the draft AC 20-24C was available for comments. That group, which represents a large fraction of the total dollars spent in the affected segment of the general aviation economic marketplace did even learn of the existence of the pending draft AC 20-24C until less than a week before the comment period closed. Based on very recent personal communications, it appears as if a number of other relevant interest groups had no actual knowledge of the pending AC 20-24C draft document. If one does a GOOGLE search on the internet, as of the morning of October 29, 2010 (the last day for comments) and searches on obvious relevant search terms, one cannot find any FAA or other

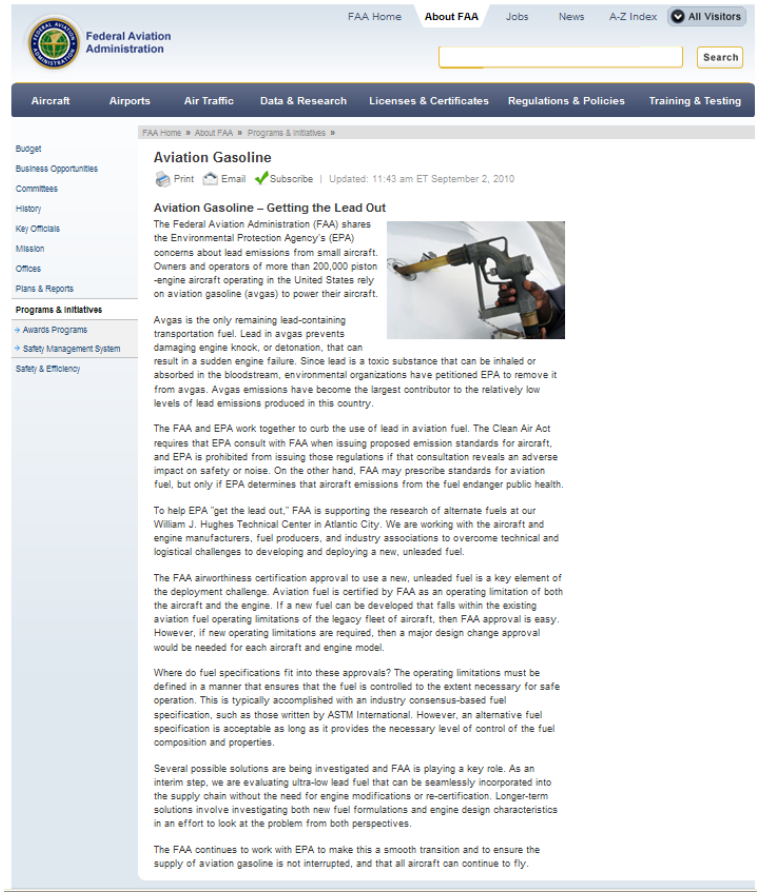
government provided information about the existence of the Draft AC 20-24C or its availability for comment.

For example, a GOOGLE search on the following (as of 0800 CDST, October 29, 2010):

"FAA FUEL ADVISORY CIRCULAR" turns up the following screen of data:



If one does a routine search on "Fuel Certification" at the www.FAA.gov web site, one finds pages of references and links, but there is no readily visible link or reference to the draft AC-20-24C. Such a search does, for example, turn up publications, such as the following, which are directly focused on aviation gasoline and which were published by the FAA after the official comment period opened, and which contain no reference to or links to the pending draft advisory circular:



This responder to this draft Advisory Circular suggests that, in light of the virtual secrecy with which the FAA has conducted the required "public comment" period for this important policy and guidance document, that the public notice actually given does not rise to a level which meets the minimum legal standard for this type of administrative agency activity.

This should especially be true for an advisory document which creates a completely new and hugely expanded interpretation of previously well understood regulations (see AC 20-24B, for the previously well understood policy and interpretation of the

	relevant rules.) Even if one were to "hear about" the draft AC 20-24C, one would have to already be an experienced "navigator" of the www.faa.gov web site in order to find the draft AC 20-24C. Ultimately, under all of the circumstances, the "notice" that was given by the administrative agency was not reasonably calculated to inform the relevant spectrum of obviously interested parties, much less "the public" in general. For that reason, alone, the draft AC 20-24C should be withdrawn.