



**Oxidation, Hot Corrosion, Thermal Fatigue, and Erosion Characteristics Testing to Support  
14 CFR, Part 33, 33.15, Compliance for Turbine Engines**

Comments on the Draft Advisory Circular 33-Burner Rig  
published online for public comment at [http://www.faa.gov/aircraft/draft\\_docs/ac/](http://www.faa.gov/aircraft/draft_docs/ac/)

Submitted to Marc Bouthillier via email to [marc.bouthillier@faa.gov](mailto:marc.bouthillier@faa.gov)

**Submitted by the  
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May 23, 2014

Marc Bouthillier  
Federal Aviation Administration  
Engine and Propeller Directorate  
Standards Staff, ANE-111  
12 New England Executive Park  
Burlington, MA 01803

Dear Mr. Bouthillier:

Please accept these comments in response to Draft AC 33-Burner Rig, Oxidation, Hot Corrosion, Thermal Fatigue, and Erosion Characteristics Testing to Support 14 CFR, Part 33, 33.15, Compliance for Turbine Engines, which was published for public comment at [http://www.faa.gov/aircraft/draft\\_docs/ac/](http://www.faa.gov/aircraft/draft_docs/ac/).

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## Who is MARPA?

The Modification and Replacement Parts Association was founded to support PMA manufacturers and their customers. Aircraft parts are a vital sector of the aviation industry, and MARPA acts to represent the interests of the manufacturers of this vital resource before the FAA and other government agencies.

MARPA is a Washington, D.C.-based, non-profit association that supports its members' business efforts by promoting excellence in production standards for PMA parts. The Association represents its members before aviation policy makers, giving them a voice in Washington D.C. to prevent unnecessary or unfair regulatory burden while at the same time working with aviation authorities to help improve the aviation industry's already-impressive safety record.

MARPA represents a diverse group of manufacturing interests – from the smallest companies to the largest - all dedicated to excellence in producing aircraft parts.

MARPA members are committed to supporting the aviation industry with safe aircraft components. MARPA members manufacture and sell aircraft components that provide equal or better levels of reliability when compared to their original equipment manufacturer competitors.

MARPA supports efforts to produce guidance that increases the aviation industry's already excellent safety record.

## Comments

### Paragraph 1 “Purpose” Implies a more Narrow Scope of the Advisory Circular than does the Body of the Advisory Circular.

#### Issue

The “Purpose” paragraph explains that the AC describes an acceptable method to support compliance with 14 C.F.R. § 33.15, which is applicable to parts approved under TC, STC, PMA or repair alteration authority. However the paragraph goes on to specifically discuss only comparative testing for purposes of compliance, thus serving to significantly narrow the scope and usefulness of the AC.

#### Discussion

The guidance provided by the AC is intended to be applicable to those applicants seeking approval for “PMA, TC design change, STC, or repair or alteration of turbine engine and APU parts.”<sup>1</sup> The AC goes on to describe Part and Material Characteristics considerations, Burner Rig Test Methods, Test Planning, and Test Results considerations. Such considerations are useful not only in performing comparative equivalence analyses, but also in developing and confirming new designs and specifications. Comparative assessment is therefore only one use for data obtained from Burner Rig tests. Further, appropriate engine testing for specific engine parts can range anywhere from static testing to full engine tests, depending on the nature of the part.

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<sup>1</sup> Advisory Circular 33-Burner Rig (DRAFT), Para. 2.a.

Different properties of a part may need to be assessed depending on the purpose and operating conditions of the part. Therefore comparative analysis is often, but not always, necessary for the development of replacement parts.

### **Recommendation**

Paragraph 1 should be amended to read “Comparative assessment of certain data ~~is~~ *may be* necessary to show the required functional and durability equivalencies . . . .” Such a change would reflect the broad scope of the AC and the various uses of test data made available by resort to the Burner Rig test methods described therein.

## **The Language of the AC Appears to limit the use of Burner Rig Testing to Comparative Testing Only**

### **Issue**

Burner Rig testing can be used to develop significant data sets for multiple methods of analysis and testing. The AC appears to limit the use of Burner Rig testing to Comparative tests alone.

### **Discussion**

Burner Rig testing is a valuable method for testing the durability of materials and articles. Although comparative testing is one of the most common methods used to test and demonstrate equivalence, numerous other tests can be performed based on the results of Burner Rig testing. The Purpose of the AC explains that it is intended to develop data relating to oxidation, hot corrosion, thermal fatigue, and erosion characteristics in the engine environment in order to support FAA design approval. It is important that those applicants referring to the AC not be inadvertently deterred from using test methods other than comparative tests, which may provide additional valuable data and results.

By placing the primary contents of the guidance under the heading “Comparative Tests” the AC potentially limits in scope the usefulness of Burner Rig testing for the purposes of developing data to support an applicant’s package. Broadening the scope of the primary guidance paragraph will help to support AC’s purpose of developing data to support compliance findings to § 33.15.

### **Recommendation**

Paragraph 5 should be re-labeled to reflect a broader scope of Burner Rig testing possibilities rather than limiting the scope to comparative tests alone.

## **Paragraph 5.a. suggests that Burner Rig Testing is always Required**

### **Issue**

Paragraph 5.a. states that applicants must evaluate certain characteristics in an “engine operating environment.” This implies that a Burner Rig test will always be required. However in certain cases, independent static testing can be sufficient to show compliance to § 33.15.

### **Discussion**

Certain parts and articles, particularly those non-gas path parts, can undergo durability testing on the basis of independent static tests. The type of test used to determine the part and material characteristics of a

given project should be determined based on the experience of the applicant, the nature of the part, and the operational environment of the part.

The paragraph should provide discretion to the applicant to determine the necessary test or combination of tests to adequately demonstrate part and material durability equivalence.

### **Recommendation**

Revise the sentence “Applicants must evaluate the following part and material characteristics in an engine operating environment:” to permit the applicant discretion to determine the testing methods necessary to obtain part and material characteristics data needed to support the project application.

### **Paragraph 5.c. is misleading in that it implies all testing must be FAA approved.**

#### **Issue**

Burner Rig testing can be used to perform tests and obtain data outside the scope of an FAA approved test plan.

#### **Discussion**

Test planning in and of itself is not required to be approved by the FAA. The applicable FAA-approved test plans should be the result of a collaborative project compliance plan. These approved plans should be distinguished from those testing plans that are used simply for research and development or experimental purposes in the introductory stages of part development. Comparative testing and assessment should have its own section after the discussion of this type of durability testing.

### **Recommendation**

Revise the paragraph to clarify that the guidance applies only in the context of an FAA-approved test plan, and not to the use of Burner Rig testing in general.

### **Paragraph 5.c.1 implies that all Oxidation tests will require high-velocity gas streams to produce meaningful results**

#### **Issue**

Paragraph 5.c.1 states that “Meaningful results require gas streams of relatively high velocity” and refers to Table 1, which provides for an exhaust gas velocity of up to Mach 0.9.

#### **Discussion**

Although many parts will require testing replicating high Mach exhaust gas velocity, certain parts—notably non-gas path parts—do not experience high exhaust gas velocity. It is therefore inaccurate to imply that meaningful results will always require high velocity gas stream testing to provide accurate data.

### **Recommendation**

Revise the final sentence in Paragraph 5.c.1 to read “Meaningful results *may* require . . . .”

## Conclusion

MARPA looks forward to working with the FAA to better improve aviation safety. We are happy to sit down with you to work on ways to improve the guidance if you would like further input. Your consideration of these comments is greatly appreciated.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read "Ryan Aggergaard". The signature is fluid and cursive, with the first name "Ryan" and the last name "Aggergaard" clearly distinguishable.

Ryan Aggergaard  
Associate Counsel  
Modification and Replacement Parts Association