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of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: Application For Parts Manufacturer Approval Via Tests And Computations Or Identicality

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1. Purpose.

a. This advisory circular (AC) updates the Federal Aviation Administration's (FAA) guidance to applicants for parts manufacturer approval (PMA) of articles via tests and computations or identicality without a license agreement. This AC cites regulations in Title 14, Code of Federal Regulations (14 CFR) part 21, Subpart K that became effective April 16, 2011. In addition, this AC provides a convenient application and compliance checklist, adds a certifying statement of compliance, provides guidance for assessing an article's impact on safety and describes how the FAA approves replacement parts for technical standard order (TSO) articles. This AC does not apply to the articles that are listed in 14 CFR 21.9(a)(1) through (6).

b. This AC refers to parts and components as articles per 14 CFR 21.1. This section defines an article as a material, part, component, process or appliance. These items may include sealants, modified standard parts, brake assemblies, etc. that are in a product's type design. Please note PMA is not for base materials, processes or inspection procedures.

c. This AC is not mandatory and does not constitute a regulation. This AC describes an acceptable means, but not the only means, to comply with 14 CFR Part 21, Subpart K. If you chose to use any of these best practices, we expect you to follow it completely. Adherence to the guidance for each applicable facet will show that an article's design complies with the airworthiness requirements of its eligible products. Also consult other ACs when you need guidance on product specific requirements for showing compliance. For example, AC 33-8 has guidance for Parts Manufacturer Approval of Turbine Engine and Auxiliary Power Unit Parts under Test and Computation.

2. Audience.

a. This AC is for applicants seeking PMA through tests and computation or identicality without a license agreement. Consult AC 21-43, *Production under 14 CFR Part 21, Subparts F, G, K, and O* and Order 8120.22, *Production Approval Procedures* for further guidance on applications for PMA via identicality with a license agreement or via supplemental type certificate (STC). Recommend new applicant's consult with the responsible ACO before applying for PMA. Early discussions will provide essential information on the PMA process, the

associated level of effort, its data requirements, potential pitfalls and timelines. These discussions will allow the FAA and you to focus our efforts in a productive and effective manner.

b. Qualified existing holders of PMA may use an expedited process to attain approval for non-safety significant articles. See Modification and Replacement Part Association (MARPA) Document 1100, *Streamline Program for PMA Applications of Non-Safety Significant Articles Submitted by Experienced Applicants with a Qualifying Performance Record* and FAA Order 8110.119, *Streamlined Process for Parts Manufacturer Approval (PMA)*

3. General Requirements. 14 CFR 21.8(a) lists PMA as one way to approve articles for type-certificated products. 14 CFR 21.9 requires any person representing a replacement or modification article as eligible for installation on a type-certificated product to get approval. A PMA is a combined design and production approval for replacement articles. However, if any replacement article alters a product by introducing a major change, then 14 CFR 21.113 requires an STC for the approval of these articles. See FAA Order 8110.4, *Type Certification,* for STC procedures. An STC approves the design and installation of modification articles in products. A subsequent PMA approves the production of these modification articles.

4. Getting a PMA for TSO Articles. PMA approves replacement and modification articles for specific type-certificated products. These articles may reside in an assembly approved under a TSOA on these specific products, but the PMA limits installation of these articles to those specific products. PMA cannot approve replacement articles solely for original articles approved solely under a TSOA.

5. What are the Exceptions to PMA?

a. Materials, Procedures and Processes. Manufacturers use a variety of raw and refined materials to produce their finished articles. The manufacturing process integrates these materials into articles for installation on products. A PMA is not for the base materials that compose an article. These materials include sheet, bar and plate stock, rough forgings, extrusions, etc. Also PMA is not for the approval of inspection procedures or processes. Any specific procedures or processes (such as hardening, plating, or shot peening) integral to a PMA are valid only for that particular article. Any person performing only specialized processes or procedures on articles intended for installation on type-certificated products must do so within a production approval or as a supplier to a production approval holder (PAH).

b. 'One-Time Only' STCs. Articles produced under a "one-time only" STC or a field approval are ineligible for a PMA. Holders of these design approvals may produce replacement articles for installation in their modifications or alterations without PMA.

c. Other Production Approval Holders (PAH). Holders of production certificates or TSO authorizations do not need a PMA to produce replacement parts for their products or TSO articles. A supplier to a PAH needs direct ship authorization to sell an article to any other entity than that PAH. A direct-ship authorization is a written permission from a production approval holder to a supplier for shipment of articles directly to a user or operator. See Order 8130.21, *Procedures for Completion and Use of the Authorized Release Certificate, FAA Form 8130-3, Airworthiness Approval Tag*.

d. Aircraft Owners or Operators. Owners and operators may produce articles for installation on their own product without a PMA. The installation of these articles must comply with applicable airworthiness standards to preserve the regulatory compliance of their products and ensure continued safe operation. If an owner or operator intends to sell an article for installation on another owner's aircraft, then they need a PMA.

e. Air Carriers Operating Under 14 CFR Parts 121 or 135. Carriers may produce articles for installation on their own products without a PMA when their approved maintenance program contains the appropriate instructions and procedures. Also, the installation of the article must comply with 14 CFR part 43. If air carriers intend to sell an article to other owners or operators, then they need a PMA.

f. Repair Stations. An FAA-certificated repair station may fabricate an article for installation on a type-certificated product provided it is consumed within a repair authorized under their operations specification. See AC 43-18, *Fabrication of Aircraft Parts by Maintenance Personnel*, for further guidance. They cannot sell these fabricated articles to others.

g. Producing and Selling Standard Parts. Production and sale of standard parts for type-certificated products do not require a PMA. These parts conform to established industry or U.S. specifications. However, a PAH may buy standard parts, subject them to more restrictive inspection criteria and then assign new part numbers. These parts are no longer standard parts. If questions arise, contact the certificating Aircraft Certification Office (ACO), Manufacturing Inspection District Office (MIDO), or both to determine if the part design meets the criteria for standard parts. See appendix H for details of acceptable standards.

h. Commercial Parts. These articles are on an FAA-approved commercial parts list (CPL) in a design approval holder's instructions for airworthiness (ICA). Companies that produce articles on the CPL do so without PMA. See AC 21-45, *Commercial Parts*, for more information.

i. Imported Modification and Replacement Articles. Under 14 CFR 21.502, foreign manufacturers may export modification and replacement articles to the United States if it is within the scope of an applicable bilateral agreement and is marked in accordance with 14 CFR part 45. This agreement defines the scope and manner of the FAA's acceptance. These foreign manufacturers will include documentation of airworthiness with these exported articles. Other acceptable replacement and modification articles from foreign countries with bilateral agreements include:

(1) Articles produced by a foreign holder of an FAA TC, STC, or letter of TSO design approval (LODA) on a product with a foreign State Of Design, or

(2) Articles produced under a licensing agreement with the U.S. design approval holder or by a foreign manufacturer holding a production approval from the bilateral partner civil aviation authority (CAA) or,

(3) Articles that have PMA or equivalent approval from a foreign airworthiness authority and are covered by a bilateral agreement with the FAA.

6. PMA and Older Products. Approval of replacement articles in older products may present potential problems due to incomplete design data, out-of-production products, and inactive type certificate holders. Regardless, applicants must provide enough information to show that the prospective PMA design meets applicable airworthiness standards. Applicants may introduce changes to these legacy designs that include later industry-adopted standard practices and specifications. Additionally, applicants still must produce articles conforming to an approved design.

7. How to Submit an Application.

a. Apply by letter to the ACO or MIDO in the geographic area of your manufacturing facility depending on the basis of your PMA. The FAA may reassign review of your application to another ACO or MIDO at its discretion. See appendix F for ACO addresses. Use appendix B, *PMA Application Checklist*, as an aid to your application. The following guidance assumes that the listed supporting data is complete at the time of application. However, use a Part Specific Certification Plan (PartSCP) and discussions with the project ACO to schedule significant showings of compliance and associated test reports.

b. If your PMA basis is **identicality with a license agreement or STC**, see AC 21-43 and Order 8120.22 for further guidance.

c. If the PMA basis **is identicality without a license agreement**, show the design of your replacement article is identical to the design of an article approved under a type certificate. Identical means the same in every respect including dimensions, tolerances, processes, etc. Provide sufficient data to show your design is identical. Send this application and supporting data to the geographic ACO.

d. If the PMA basis is **test reports and computations**, send the application letter to the geographic ACO. Test reports and computations employ two strategies to show compliance with applicable airworthiness requirements for eligible products: general analysis and comparative analysis. This AC provides guidance on each of these strategies and aids you in providing the necessary data to show compliance with the appropriate airworthiness requirements.

8. The application letter regardless of basis must:

- Provide the name and address of the manufacturing facility for the article;
- Identify the replacement article and its original counterpart from a type certificate (TC, STC or Amended Type certificate (ATC));
- Identify the makes, models/series of aircraft, engines or propellers eligible for the proposed article or refer to the eligibility listing in an enclosed draft supplement;
- State the method of showing compliance with airworthiness requirements (i.e., test reports and computations using either general analysis, or comparative analysis, or a combination of both methods; or identicality without a license agreement);
- Stipulate use of a quality system that meets the requirements of 14 CFR 21.137 per 14 CFR 21.307. If using a previously approved quality system, cite the associated

quality manual, its latest revision, and date. See AC 21-43, *Production under 14 CFR Part 21, Subparts F, G, K, and O,* for further guidance.

9. Also enclose with your letter the following supporting data:

a. For each PMA basis supply:

- Drawings and specifications necessary to show the configuration of the article;
- Information on dimensions with tolerances, materials and processes necessary to define the structural strength of the article;
- The marking scheme for the article that complies with 14 CFR 45.15;
- A draft PMA supplement that will facilitate entry into our PMA database (see appendix C). Send the draft supplement in a Microsoft Word compatible file to the project ACO;
- If establishing a new quality system per 14 CFR 21.307, provide your manual to your geographic MIDO for FAA approval per 14 CFR 21.308. Get the specific requirements from a MIDO representative.

b. If the PMA basis is test and computation, add the following as enclosures:

- A PartSCP when warranted or requested by the ACO;
- A compliance checklist that lists the specific 14 CFR requirements, the associated methods of compliance and the reports that document these compliances (see the sample in appendix A);
- Add a statement on your checklist about any initial showings of compliance per AC 21-51, *Applicant's Showing of Compliance and Certifying Statement of Compliance*;
- Test reports and computations that show the article's design meets the airworthiness requirements of its eligible product(s) as called out in the compliance checklist;
- A safety assessment that characterizes the nature of the article and the impact of its failure modes on safety;
- A continued operational safety plan reflective of the article's safety significance;
- If applicable, a list of proposed designated engineering representatives (DER) and their respective authorizations.

10. Applicant's Statement of Compliance for PMA via Test Reports and Computations. Include a signed statement of compliance upon completion of all showings to applicable airworthiness requirements of the eligible products. See AC 21-51 for guidance on complying with 21.303(a)(5). You may include the statement in the text of your application letter, on an

enclosed compliance listing or as a separate letter with a signature. See appendix E for a sample PMA application that has this statement as an enclosure. Make reference in your statement to the associated compliance listing accompanying the PMA data package.

11. Installation Eligibility.

a. Identify the eligible aircraft, engines or propellers for proposed installation of your article. List each product by make, model or series, and if appropriate serial numbers, as specified on the applicable type certificate data sheet (TCDS). Usually the "make" of an aircraft, engine or propeller is the common name of the entity that built the respective product. The data plate on the product (14 CFR 45.11) declares its builder. The "make" designation, builder and type certificate holder are usually the same on a product's TCDS. A block in the upper right hand corner of the TCDS consolidates and abbreviates this information in one place. However, type certificates are transferable. The FAA updates the holder information on the TCDS to cite the new holder. In this case, refer to the record of ownership for the make and model designations of the original builder and TC holder of the product.

b. Also identify the corresponding article from the type design by a descriptive name and part number. Show this article's location in its respective products. Consider using an IPC along with other data like drawings, purchase orders, service bulletins, maintenance manuals, technical publications indexes, or master drawing lists from holders of design and production approvals. Other evidence of installation eligibility includes:

- FAA airworthiness approval tag (FAA Form 8130-3, Authorized Release Certificate, Airworthiness Approval Tag),
- Other PMA supplements, and
- Other evidence including attributions from operators along with enough information from various supporting sources to show eligibility.

12. Approval of Critical and Life-Limited Parts.

a. Approval of critical and life-limited parts usually requires an STC. Small differences in the designs of these replacement parts may affect associated life limits and represent a major change to its product. However, PMA of critical and limited parts is possible when a replacement part's design produces only a minor change in its product. PMA will require the same rigor of compliance showings as an STC process. Use a tailored PartSCP to propose a compliance framework and plan for approval of these parts (see appendix G).

b. Refer to product specific criteria for rotorcraft and turbine engine critical parts in 14 CFR 27.602, 29.602 and 33.75, respectively. Refer to any specific accountable directorate guidance and consult the specific guidance for critical parts on rotorcraft in AC 27-1 and 29-2 as necessary. For turbine engines, refer to AC 33.70-1. Otherwise, see appendix H for a general criteria for critical parts.

13. PMA and TSO Assemblies.

a. PMA for replacement articles in TSO assemblies occurs when these assemblies are in the type designs of aircraft, engines or propellers. As a result, the replacement article is for the type-certificated product, not the TSO assembly. Additionally, the installation eligibility of these replacement articles is tied to the type-certificated product.

b. Assess the effects of your replacement article on the minimum performance requirements of the applicable TSO. Assessments may range from qualitative evaluations to quantitative analyses and performance testing. For example, replacement articles that maintain the same interfaces in their assemblies as the respective original parts probably preserve the minimum performance requirements of the TSO assembly. A qualitative evaluation may attest that these articles do not affect an assembly's performance. A replacement for a dynamic component in a TSO assembly may need quantitative analyses and tests to confirm continued compliance with the minimum performance requirements of its TSO.

c. Describe the effect of the replacement article on the TSO assembly. If installation of a replacement article prevents a TSO assembly from meeting its minimum performance requirements, but it still complies with the associated product's airworthiness requirements, then direct installers of your replacement article to remove the assembly's TSO markings in a supplemental ICA.

14. Compliance Listing. Use a compliance listing in the suggested tabular format of Appendix A to support your statement of compliance. The listing presents the applicable airworthiness requirements, their associated means of compliance and respective reports that document such. This template aids coordination with the responsible ACO by defining the project scope from the various showings.

15. Test Reports and Computations. Test reports and computations show that an article's design meets the applicable airworthiness requirements of its respective product. Use the certification basis of the eligible product from its TCDS to establish the relevant airworthiness requirements for your article. An article's nature lies in its purpose, physical characteristics, interfaces with its products and how its failure modes impact safety. The scope and rigor of each test and computation vary with the nature of the article and includes at least the following:

- A safety assessment that characterizes the nature of the article and its effect on safety;
- Computations that show regulatory compliance or substantiate the comparative analyses;
- Test results that show direct regulatory compliance or verify the comparative analyses;

16. The Safety Assessment.

a. The safety assessment establishes the nature of an article and its impact on safety. The safety assessment looks at the consequences of an article's failure modes on the next higher assembly and associated interfaces. Then it assesses any resulting degradation or failure of this higher assembly on the product (i.e., aircraft, engine or propeller). One way to characterize an

article is through a failure modes and effects analysis (FMEA). This analysis is at a minimum qualitative and demonstrates an understanding of where the article goes and what it does. Use the applicable product criteria in 14 CFR 33.75, 29.602, 27.602, 25.1309, or 23.1309 as a guide.

b. The nature of an article is also inherent in its design and function. A design's sophistication varies greatly, as does its functions, which are often vital to a product's continued safe operation. The safety assessment considers how these attributes of design and function interface with the product to determine the effect of an article's failure or improper function on safety in its various applications. For example, if an article, such as an o-ring, has a variety of uses on the same product, then the safety assessment should catalog these uses and evaluate the ones with the greatest effect on safety.

c. The safety assessment also considers the service history of the original article or its next higher assembly on the type-certificated product. If the next higher assembly has reported failures, assess whether the original article contributed to those failures. The assessment summarizes the investigation of the original article's service difficulties, any airworthiness directives against the article and its role in any accidents. The following available databases can help you with your investigations:

- Service Difficulty Report (SDR) database (*http://av-info.faa.gov/sdrx*) for any service problems with the original article;
- Airworthiness Directive (AD) database (*http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgAD.nsf/Frameset?OpenPage*) for unsafe conditions in the original articles;
- Special Airworthiness Information Bulletins (SAIB) that concern the article (*http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgSAIB.nsf*); and
- National Transportation Safety Board (NTSB) accident and synopses database (*http://www.ntsb.gov/aviationquery/index.aspx*) for causal factors; and
- Also review pertinent safety bulletins and airworthiness directives from other airworthiness authorities.

17. Manufacturing Inspection and Test Procedures. The Quality System Manual describes the processes and procedures that ensure each article conforms to its approved design. These processes and procedures refer to inspections and tests during manufacture that confirm the attributes of the article's design. If the article is critical or life-limited, cite these procedures in your quality manual or provide them in your data package to the ACO. The project ACO may require demonstration of these procedures as an element of finding compliance with applicable airworthiness requirements. These tests and procedures include process controls, finished product performance, and incoming material controls. The associated data include elements of the manufacturing cycle such as raw material purchase, evaluation of material chemistry and grain structure, fabrication processes, melt practices, forging processes, machining and surface treatments, other material properties, and required inspections. If the approval basis for the critical part or life-limited article is identicality, show that article's manufacturing processes, inspection and test procedures produce a part that is identical to the original from a type certificate. Consult product specific guidance for critical parts from the accountable directorate.

18. Test Results. Coordinate test plans with the responsible ACO at the onset of your project. Propose the anticipated level of FAA involvement in the testing. Use the PartSCP for substantial test plans. Upon establishment of FAA involvement, provide test results commensurate to the article's design, function and its basis for approval. If the article is critical, the project ACO may require specific FAA inspections, tests and the resulting reports to confirm the airworthiness of the conforming design. For critical parts, use a FAA-approved test plan which mandates FAA review and approval of the resulting data. If the basis of the critical part or life-limited article is identicality, submit test results that show your article has the same attributes and life-limits as the original.

19. Airworthiness Limitations. If the TC holder's article has a life limit, assess the proposed replacement article's fatigue life using an appropriate method that considers material property distributions, loads, frequency of loads, mission profiles, stress and temperature distributions, and results from fatigue testing. Consult product specific guidance from the responsible directorate for acceptable methods to determine life limits. Provide data that supports your article's replacement times, inspection intervals or related procedures. Develop and submit a supplemental ICA with the updated airworthiness limitations section to the project ACO. Approval of life-limited parts in turbine engines usually requires an STC and a preapproved methodology to establish the part life. Pertinent product specific guidance is in various ACs on our regulatory and guidance library (RGL) (*http://rgl.faa.gov)*.

20. System Effects. Consider the effects of your article on the environment of its system and any associated life-limited parts. Assess how differences in your article's design and resulting characteristics impact its interfaces. Include this assessment in any engineering plan involving life-limited parts. Articles that affect these life-limited parts in turbine engines are influencing parts. See AC 33.70-1 for specific guidance on these articles.

21. Life Assessment. If your article is not life-limited, but is in a cyclic load environment, evaluate its life relative to the corresponding article approved via a type certificate. This evaluation typically involves fatigue tests or analyses. Consider other factors in the cyclic load environment, such as temperature. The results verify equivalent article life and support the proposed ICA and continued operational safety plans. Also, assess the impact of your article on mating life-limited assemblies. See pertinent product specific guidance in various advisory circulars on our RGL website (*http://rgl.faa.gov*).

22. Airworthiness Directives (AD).

a. Identify all ADs and service difficulties involving the original article from the product. Show your design does not reproduce the unsafe conditions noted in ADs. Also avoid the known service difficulties of the respective original articles when feasible.

b. Approvals of articles that replace those under ADs require additional showings and FAA coordination. Provide a sound technical rational for your design and show how it preserves the level of safety in the AD. Then the replacement article still needs a subsequent AMOC prior to installation. The ACO that finds your design compliant and the ACO that issues the AMOC are not always the same entity. The design of the article will require the approval of both these ACO's. The responsible ACO may include this provision in your notification letter of PMA supplement.

23. Continued Operational Safety Responsibilities. PMA holders are responsible for the integrity of their designs throughout their articles' service lives. Their continued operational safety depends on three principles: monitoring an article's performance in service, investigating its problems and then providing remedies and problem prevention. The nature of the article and its effect on safety determines the scope and scale of these efforts. Articles that have little impact on safety may rely on unsolicited feedback from users to monitor their in-service performance. Other articles, however, may need more robust plans. An example of an acceptable COS plan and its principles is found in the *Modification and Replacement Parts Association (MARPA) Guidance Material for a PMA Continued Operational Safety (COS) System*. Go to *http://www.pmamarpa.com/government/cos.shtml* for this guidance. The application of these principles enables applicants to fulfill the reporting requirements of 14 CFR 21.3, ICA per 14 CFR 21.50(b) and resolve unsafe conditions in compliance with 14 CFR 21.99.

24. Compliance with Airworthiness Standards. Applications based on test reports and computation, either comparative or general test and analysis, must show the design of an article complies with applicable airworthiness requirements of 14 CFR Subchapter C, *Aircraft*. These applicable requirements stem from the certification bases of eligible products. They may include special conditions that apply to these respective products. See the relevant TCDS and certification basis for each eligible product. If you desire eligibility to more than one product category (i.e. small aircraft and rotorcraft), show compliance with applicable airworthiness requirements for each category. However, the project ACO may stipulate that showing compliance with the more rigorous airworthiness requirements from one product as satisfying that of another product. Use minimum performance standards in applicable TSOs and airworthiness requirements in the following 14 CFR parts:

- 14 CFR part 23, Airworthiness Standards: Normal, Utility, Acrobatic, and Commuter Category Airplanes.
- 14 CFR part 25, Airworthiness Standards: Transport Category Airplanes.
- 14 CFR part 27, Airworthiness Standards: Normal Category Rotorcraft.
- 14 CFR part 29, Airworthiness Standards: Transport Category Rotorcraft.
- 14 CFR part 31, Airworthiness Standards: Manned Free Balloons.

- 14 CFR part 33, Airworthiness Standards: Aircraft Engines.
- 14 CFR part 34, Fuel Venting and Exhaust Emission Requirements for Turbine Engine Powered Airplanes.
- 14 CFR part 35, Airworthiness Standards: Propellers.
- 14 CFR part 36, Noise Standards: Aircraft Type and Airworthiness Certification.

25. General and Comparative Tests and Analyses.

a. General tests and analyses show that an article directly complies with all airworthiness regulations applicable to the product affected by article installation. Regulations require this direct showing of compliance. For example, 14 CFR 25.853 requires demonstration of flammability characteristics for articles in cabin interiors. Consult the project ACO along with relevant ACs for specific guidance on showing compliance through article and product testing.

b. Comparative tests and analyses substantiate that the PMA article is at least equal to the original article approved under a type certificate. Replacement articles replicate the functionality and airworthiness of original articles from respective type certificates. The methods of showing compliance may vary from those of a type certificate, but meet applicable airworthiness requirements. Thus, the PMA article preserves the certification basis of its eligible products. Include data from back-to-back comparisons and testing of your article with an article from a type certificate. For example, showing compliance with 14 CFR 33.83 for replacement blades in turbine engines entails comparing their vibratory characteristics to those from a type certificate. See AC 33.83-1 for specific guidance.

c. A combined approach uses both general and comparative analyses for different aspects of an article's design. This combined approach confirms that the functional design of a proposed article is at least equal to that of an original article approved under a type certificate. The original articles provide the standard for determining the adequacy of the proposed replacement articles. Dimensions and material characteristics are normally acquired through the reverse engineering process. However, some article attributes need destructive analyses and laboratory testing to discern their material composition and vibratory response respectively. Analyses and tests confirm that any differences meet the applicable airworthiness requirements. Comparative analyses show that the physical characteristics of an article (i.e., dimensions, tolerances, materials, etc.) are at least the same as or better than the original article. Assess these improvements to avoid possible adverse effects on interfacing articles. You may also extend the comparative approach to back-to-back testing of the replacement and original articles. This back-to-back testing shows the relative durability and performance of the articles in the same operating environment.

d. Often showings of compliance by either general or comparative analyses require sound statistical principles. Use these principles to establish an appropriate approach for comparing article attributes and variability.

26. Reverse Engineering. Reverse engineering is but one way to obtain an article's design. The reverse engineering process uses techniques that vary widely, produce diverse results and often require validation. The challenge lies in selecting the processes and techniques that are

appropriate to the article's attributes and functions. Dimensional analysis by itself is usually inadequate to fully characterize an article and support a comparative analysis. However, dimensional and material analyses may adequately define some non-critical articles where their uses and attributes are well known and defined. Other articles need other substantiating information to show equivalent attributes and performance to an original article. One usually considers the following when using reverse engineering:

a. Sample Size. Typically, these samples are new or unused articles from approved sources with traceable documentation (e.g., purchase orders or FAA airworthiness tags). The sample size varies with the key attributes that define an article. Usually one needs at least three articles to ascertain the essential characteristics of a design. This minimum sample size can establish the maximum, minimum and nominal dimensions of its geometry. Other characteristics include tolerances, material properties and fabrication processes. Reverse engineering based on used articles is acceptable only for characteristics that do not deteriorate from use. Use the appropriate number of samples that will minimize the effects of inaccuracies inherent in the sampling method. Less than three samples may constrain your replacement's design to narrow or impractical limits. Support the validity of your sampling approach and consult available product specific guidance. Use measurements from new, original articles when the datum and dimensional relationships are fundamental for an article's function and interfaces.

b. Sample Sources. When possible, get samples from separate lots, billets, production runs or other sources to find the variability in key characteristics of the original design. If production-tracking data for an article is unknown, obtain articles from different sources at different times to capture additional potential sources of variability. Testing may include more samples to show equivalency between a new original and the PMA article.

c. **Dimensional Tolerances.** Variations in the sample measurements and accepted engineering practices determine the tolerances in article dimensions. Ensure the measurement techniques and dimensioning systems of the article preserve the dimensional relationships in the original design. Potential differences in the datum and reference dimensions of a replacement article from that of the original may require testing to validate functional design and interfaces to the next higher assembly and product. The resulting tolerances for the PMA article should not exceed the minimum and maximum dimensions measured on the sampled approved articles. *Exceeding these limits requires further substantiation via analyses, fit checks and/or functional tests.*

d. Key Dimensional Characteristics and Datum. Consider the functional design of an article, its interfaces with other hardware and systems, and its operating environment to properly replicate the needed dimensional characteristics and relationships. Tolerances establish the physical boundaries that support the article's functional design. Tolerances can vary throughout an article and across individual features. Control tolerances that affect functional design (i.e., concentricity, circularity, run-out, etc.). Maintain a system of dimensioning compatible with that of the original article. Identify, at a minimum, the primary and secondary datum, reference dimensions and tolerances in the drawings for the replacement article.

e. Materials. Various tests and documentation establish the material composition of an article from a type certificate. Usually materials for PMA articles are the same as the original article including the base material, added welds and coatings. However, one may propose and substantiate alternate materials and processes that have at least equivalent properties. Obtain the

material properties of the original article through destructive testing by qualified and/or accredited laboratories. Have these accredited laboratories discern at least the following:

- Composition of each material in the article. However, for metal alloys, a small sample size for composition testing will limit the applicant to a small range of variability in each constituent of the alloy, which may inhibit material acquisition for the PMA;

- Material metallurgical, mechanical and physical properties (that is, moduli, density, strength and fatigue characteristics, hardness, grain structure, coefficient of expansion etc.);

- Form of material (that is, casting, forging, bar stock, sheet, etc.); and

- Use of special processes (that is, nitriding, heat treat, shot peen, etc.) and resulting effects on material properties.

Note: Some methods of material analysis cannot establish the needed material properties on their own. Supplement any shortfalls with established industry conventions and data from the original manufacturer

f. Weight and Mass Properties. The mass properties of an article are often significant to its function and impact on the associated product. A comparison of mass properties to assess their effects on the next higher assembly and product is essential for dynamic components. This assessment accounts for weight differences and inertial properties between the proposed article and the original article to ensure the absence of detrimental effects. For example, a small weight increase in compressor blades may affect disc life.

27. Test Scope and Plan. The nature of an article and its effect on safety determines the need, type and scope of testing to support either a comparative or general analysis. Testing verifies the replacement article's functional design and its performance relative to an article in a type design. This testing may include performance, durability, resistance to fatigue, creep, corrosion, durability, dynamic properties, operational loads; etc., which shows compliance with the applicable airworthiness standards. Some non-critical articles that have little impact on safety may need little or no testing.

a. Functional testing has many purposes, including:

- Verifying design characteristics (for example, vibratory, fatigue, coating effectiveness, etc.);

- Verifying that variations in the manufacturing process have no detrimental effects on the functional design of the replacement article;

- Verifying article interactions with the next higher assembly and affected systems (for example, gears, bearings, seals, blades, etc.); and

- Evaluating sophisticated articles made of intricate components.

b. Test Plan. If the design warrants testing, include a proposed test plan and a draft request for conformity via the National Automated Conformity Inspection Process (NACIP) webtool in your application to the ACO. At a minimum, the test plan identifies the:

- Test purpose;
- Physical and functional description of the test article and setup;
- Number of test units;
- Unit identification;
- Test conditions and duration;
- Test methods and their suitability;
- Test method accuracy;
- Criteria for test success and failure;
- Test instrumentation and data collection;
- Test safety control; and
- Control of test procedures.

c. Test Article Conformity and Test Reports. Conduct tests using articles that conform to their proposed design. Coordinate with the responsible ACO and MIDO via NACIP for any required FAA conformity inspections. Use designees, as allowed by the ACO or MIDO, to witness conformity inspections, subsequent tests and teardown inspections. Upon completion of testing, send reports of these inspections and tests to the responsible ACO, including any analyses of the test results and associated showings of compliance to applicable airworthiness standards. Also include the results of any comparative testing of the article within a product.

d. Flight Testing. If needed to confirm the functional design, conformance and intended function, conduct flight tests as necessary. However, get an approved type inspection authorization when any flight tests require an FAA test pilot or designee. Use FAA Form 8110-1.

e. Test Standards. Use one or a combination of the following test standards to gauge the compliance of the PMA article:

- Comparative Testing uses articles from the TC or STC holder that have documented zero service time. Perform side-by-side tests of corresponding PMA and TC articles under conditions representative of the environment within their product.
- General Testing verifies that the article meets the applicable airworthiness requirements of its product, and if applicable, the technical standard orders (TSO) performance requirement.

- Other test standards deemed acceptable by the FAA.

28. Maintenance Instructions and ICA. ICA give information essential to the airworthiness of your article in its product. See the appropriate product appendix in 14 CFR for the content and format of these ICA. Design differences between your replacement article and the original may warrant revised maintenance instructions. Provide these supplemental ICA for FAA review. Then make these ICA readily available per 14 CFR 21.50. If the ICA for the original article is valid for your replacement article, show and stipulate such in your ICA submission. See Note 2 on the sample draft supplement in appendix C.

29. Article Identity and Marking Requirements. 14 CFR 45.15(a) requires permanent and legibly markings on your articles. These markings identify the article's manufacturer, part number and its production under FAA-PMA. Define the marking location and method on your design drawings. Ensure the marking location and process does not degrade airworthiness. Installation eligibility markings are no longer required on the article, but are still required on the associated PMA supplement.

a. Marking Critical Parts. Parts with a fixed replacement time, inspection interval or related procedure as specified in the airworthiness limitations section of a product's ICA require a serial number per 14 CFR 45.15(c). Ensure your design data specifies the method and location of the serial number marking on these parts. The method of marking must not compromise the life or integrity of the part.

b. Marking an Assembly. As required by 14 CFR 45.15, apply PMA article markings to the top-level assembly of the approved replacement or modification article. The FAA does not require markings on subassemblies or individual detail articles unless the associated PMA supplement lists them separately. For example, if the top-level assembly is a hydraulic pump, mark this assembly accordingly. Marking the detail articles of the pump with part numbers and trademarks is optional. However, if the PMA supplement lists these detail articles individually, mark them accordingly as distinct replacement articles for corresponding TC articles.

c. Part Numbering. Identify your article with a number that distinguishes it from the corresponding TC or STC holder article number. It is sufficient to add a prefix or suffix to the TC holder's article number as long as the prefix or suffix does not replicate the TC or STC holder's marking practices for design changes. You can also use a prefix or suffix to satisfy 14 CFR 45.15(a)(1) requirements for marking the article with a name, trademark or symbol. This only applies if the prefix or suffix is consistent across your entire PMA product line. A final requirement per 14 CFR 45.15 is that each article must bear "FAA-PMA."

d. Supplier Numbers. If you are a supplier to a PAH that uses your supplier article numbers in their approved designs, and you later apply for a PMA, you may continue to use your original article numbers with the added marking requirements of 14 CFR 45.15(a)(1) and (2). These added requirements entail permanently marking the article with your name, trademark or symbol, as well as "FAA-PMA".

e. Articles Impractical to Mark. If your article is too small or otherwise impractical to have all of the information marked on it, show evidence of such and request relief from the specific marking requirement per 14 CFR 45.15(d). Stipulate the proposed location of the

missing information. It will usually go on an attached tag or the article's container label. The responsible MIDO grants this relief as part of the production approval.

f. Eligibility Information. 14 CFR 45.15 no longer requires installation eligibility information on the article itself, but it is still required on the associated PMA supplement (see Appendix C). Make the eligibility lists readily available to installers of your articles. Since the list is likely to change, a tag or label on a container may refer to your publicly available article eligibility information. You may provide a manual or catalog via the Internet. However, access to the Internet is not universal. Therefore, you must have an alternative means of providing the manual or catalog.

g. Marking a PMA Article installed in a TSO Assembly. Mark PMA articles that go on TSO assemblies per 14 CFR 45.15 with the needed information from the respective supplements. Do not list any TSO identification information (that is, TSO-C149, TSO-C63C, TSO-C85A, etc.) in the eligibility column on the associated supplement.

30. Delegation in PMA.

a. Designees can expedite the review and approval process for PMA. Individual designees can make findings of compliance to airworthiness standards within their authorized limitations in support of the PMA process. Identify the names, contact information and authorizations of your proposed designated engineering representatives (DER) in your application letter or PartSCP. Get prior approval from the ACO before these designees make any specific findings of compliance.

b. PMA holders with PMA Organization Designation Authorization (ODA) must notify their respective FAA ODA management teams and process their showings of compliance through their ODA engineering unit members.

31. Communication and Coordination. Establish a good line of communication with the project ACO. Discuss and coordinate with them any changes to the approach used in your application.

Susan J. M. Cabler

FOR David W. Hempe
Manager, Design, Manufacturing &
Airworthiness Division
Aircraft Certification Service

Appendix A. Sample Compliance Listing

Compliance Listing

ARTICLE: New Aileron Control Bracket, Smith Manufacturing P/N 441284 A as a replacement for Piper P/N 441284

AIRCRAFT APPLICABILITY: PA-31-350

AIRCRAFT CERTIFICATION BASIS: 14 CFR part 23 Amendment 42

Requirement	Compliance Claimed	Method of Compliance	Document Ref
14 CFR 23.603 Workmanship	Yes	Analysis/Test	First Article Report
14 CFR 23.605 Fabrication	Yes	Analysis/Test	First Article Report
14 CFR 23.613 Material Strength	Yes	Analysis/Test	Report No 1
14 CFR 23.619 Special Factors	Yes	Analysis	Report No 1 Para 6
14 CFR 23.625 Fitting Factor	Yes	Analysis/Test	Report No 5
14 CFR 23.621 Casting Factor	N/A	Nil castings	
14 CFR 23.693 Joints	Yes	Test	Report No 4

Requirement	Compliance Claimed	Method of Compliance	Document Ref
14 CFR 23.627 Fatigue Strength	Yes	Test and Analysis	Report No 3
14 CFR 23.629 Flutter	Yes	Analysis	Report No 6
14 CFR 23.641 Strength	Yes	Test	Report No 2
14 CFR 23.657 Hinges	Yes	Test	Report No 4
14 CFR 23.689 Cables	Yes	Cable system Unchanged	Drawing No 884

General Instructions

1. Address only relevant sections of the design requirements. Also this example had no changes to the flight envelope, landing and take-off performance. Thus, this table omits these detailed compliance citations. However, note such in the application package.

2. This list may support your certifying statement of compliance. This statement is due upon completion of the applicable showings.

Appendix B. PMA Project Checklist

PMA Project Checklist

Company Name: _____
Article name and P/N: _____

Application based on Test & Computation

1. __ Application letter
    - __ Your company's name and address
    - __ Address of your manufacturing facility if different
    - __ Identity of your article
    - __ Installation eligibility information; make, model/series
    - __ P/N of the article from a type certificate (TC, ATC, STC)
    - __ Method of design approval

2. __ Draft PMA supplement (See Appendix C)
    - __ Provide a copy on digital media

3. __ Data Package
    - __ Drawings with pertinent material and process specifications
    - __ Compliance checklist with a qualifying statement per AC 21-51
    - __ Test reports and computations on the compliance checklist
    - __ Reverse engineering report(s)
    - __ Safety Assessment
        a. Description of the article and its intended function(s)
        b. A qualitative assessment of failure modes and effects
        c. Effect of article failure on the next higher assembly and its performance
        d. Effect of article failure on the product and its performance
    - __ Manufacturing Inspection and test procedures **
    - __ Manufacturing Test Results **
    - __ Airworthiness Limitations **
    - __ Life Assessment (applicable to cyclic load environments)
    - __ Airworthiness Directives (ADs) or service difficulties involving article
    - __ Continued Operational Safety (COS) Plan.

__ Maintenance Instructions and Instructions for Continued Airworthiness (ICA)

__ Article Marking [Compliance to 14 CFR 45.15]

__ Test Plans with a draft conformity request when warranted

__ Evidence of installation eligibility

__ DER 8110-3 forms (as required)

4. __ A separate statement of compliance upon completion of regulatory showings
5. __ Quality Manual (if a new PMA applicant, or changes/revisions when applicable)
6. __ List of proposed designees and ACO concurrences
7. __ Unnumbered draft PMA Supplement (MS Word format)

** If article is Critical or Life-Limited

Note: Life Limited Parts require a supplement to the limitations section of the ICA per 14 CFR 21.50.

Notes:

_____

_____

_____

Appendix C. Draft PMA Supplement

Use this MS Word table format where each article name and number occupies a separate row. Do not add extra fields, rows, or columns to separate data. ***Each page of the supplement must contain the PMA header and page number footer to ensure correctness in the event supplement pages are separated. While formatting may vary between offices, all information shown below must be present for the supplement to be valid.***

FEDERAL AVIATION ADMINISTRATION - PARTS MANUFACTURER APPROVAL

Smith Engineering Corporation PMA NO._____

(Applicant address) SUPPLEMENT NO._____

DATE_____

Article Name	Article Number	Approved Replacement for Article Number	Approval Basis and Approved Design Data	Make/TCH Eligibility	Model /Series Eligibility
Spring	SE24689	24689	Identicality per 14 CFR 21.303 DWG No: SE 25206, Rev: None Date: 3/31/13 or later FAA-approved revisions	PW Canada	PT6T-3, 3A, -3B, 3BE, -3D, -3DE, 3DF, -6
Pin	SE24695	24695	Test and Computations per 14 CFR 21.303, DWG No: SE 25207, Rev: None Date: 3/31/13 or later FAA-approved revisions	Aerospace Technologies	N22B, N24A
				Boeing (McDonnell Douglas)	DC-10-10, DC-10-30, DC-10-40, MD-11, MD-11F

----------END OF DATA----------

GENERAL NOTES:

1) Provide minor design changes in a manner as determined by the ACO. Handle major design changes to drawings and specifications in the same manner as that for an original FAA-PMA.

2) The FAA accepted the ICA approach for the above articles with their designs. These ICA may refer to those of the respective articles from the holders of type certificates. Otherwise, provide supplemental ICA for differences in the replacement articles. Make referral statements or supplemental ICA readily available per 14 CFR 21.50.

_____ _____

Manager, *(ACO name)*Aircraft Certification Office

Manager, *(MIDO name)*Manufacturing Inspection District Office

Pg. 1 of X

Appendix D. Other Documents

1. Related References.

a. AC 21-9, *Manufacturers Reporting Failures, Malfunctions, or Defects*

b. AC 21-43, *Production Under 14 CFR Part 21, Subparts F, G, K and O*

c. AC 21-45 *Commercial Parts*

d. AC 33.8, *Parts Manufacturer Approval of Turbine Engine and Auxiliary Power Unit Parts under Test and Computation*

e. AC 33.70-1, *Guidance Material for Aircraft Engine Life-Limited Parts Requirements*

f. AC 43-18 *Fabrication of Aircraft Parts by Maintenance Personnel*

g. Order 8110.37, *Designated Engineering Representative (DER) Handbook*

h. Order 8110.42, *Parts Manufacturer Approval Procedures*

i. Order 8110.54, *Instructions for Continued Airworthiness Responsibilities, Requirements, and Contents*

j. Order 8120.22, *Production Approval Procedures*

k. Order 8150.1, *Technical Standard Order Program*

2. How to Get Referenced Documents. Get copies this AC, other referenced guidance and orders from our regulatory guidance library (RGL). Go to *http://www.faa.gov/regulations_policies/advisory_circulars/* for ACs. Go to *http://www.faa.gov/regulations_policies/orders_notices/* for orders. You can obtain a copy of MARPA's guidance on COS at *www.pmaparts.org/gvt/COSGuidance.pdf*.

Appendix E. Sample FAA-PMA Letter of Application from a New Applicant

The ABC Tool Company
3000 Hill St.
Randolph, MA 02368
(781) 555-1212

FAA - New England Region
12 New England Executive Park
Burlington, MA 01803
(781) 238-7199

Attention: Mr. Mark Jones
Manager, Engine Certification Office, ANE-140

Subject: Request for New FAA-PMA Approval

Mr. Jones:

We are applying for parts manufacturer approval for our part number (P/N) ABC 13579. We request your review of the enclosed data in support of this application. ABC 13579 is a bushing assembly eligible for installation on PS PT9D-1, -7, -9 series engines. We base this requested approval on submitting test reports and computations per 14 CFR 21.303(a)(4). ABC 13579 replaces PS bushing assembly P/N 13579 installed on B767-400 series aircraft. Our bushing assembly complies with the applicable airworthiness requirements of the eligible engines as specified on the enclosed compliance listing. See our enclosed statement of compliance.

We will manufacture this bushing assembly in our facility at 3000 Hill Street, Randolph, MA 02368. We have (*or will establish*) an approved quality system per 14 CFR 21.307 for manufacture of this article.

Very truly yours,

PMA Administrator,
ABC Tool Company

Enclosures:
1 copy ABC drawings, specifications and processes
1 copy Draft PMA supplement
1 copy Statement of compliance
1 copy Compliance Checklist
1 copy Substantiating data and reports
1 copy Continued operational safety plan
1 copy Instructions for continued airworthiness (ICA)
1 copy ABC Tool Company Quality Manual
1 copy DER list

Appendix F. List of FAA Aircraft Certification/Field Offices

Go to *http://www.faa.gov/aircraft/air_cert/locate_office/aco/* to find the appropriate ACO in your region.

Appendix G. Part Specific Certification Plan (PartSCP)

Note: This document is a template and an aid to help define content and format when drafting a PartSCP. All text in italics is instructional for editing or deletion as necessary. Retain all text not in italics in the PartSCP, but edit as necessary for each project.

Part Specific Certification Plan

Between

[Insert the Name of the Applicant/Company]

and the

[Insert the FAA Certification Office]

Project Number (leave blank until number assigned)

List of Revisions			
Revision Number	Revision Description	Approved by:	Release Date

Table of Contents

1.0 Introduction

1.1 Scope

The purpose of this Part Specific Certification Plan (PartSCP) is to define and document the requirements and tasks required for FAA evaluation and PMA approval of replacement articles. The *[Insert the applicable FAA Certification Office]* of the Federal Aviation Administration and the applicant will jointly manage and maintain this PartSCP.

1.2 Project Description

This section should contain a brief description of the aircraft, engine, propeller, or TSO article requested for PMA approval including the article name, part number, and its installation eligibility by product make/model.

1.3 Background (include service history)

1.4 Component Description

1.5 Instructions for Continued Airworthiness Plan

2.0 Applicable Documents

The following documents are required as article of this PartSCP to define the design of the article, establish its eligibility and to show compliance to the regulations:

Item	*Document/Drawing*	*Revision*	*Description*
1	*12121212*	*A*	*ABC Article Drawing*
2	*IPC*	*IR*	*Illustrated Parts Catalog or other proof of installation eligibility*

3.0 Project Schedule

Milestones as Applicable	**Proposed Completion Date**
Submittal of PartSCP	
First Article Conformity	
Test Plan submittal to FAA	
Test Plan approval	
Testing completed	
Test Report submittal to FAA	
DER approved 8110-3 reports/drawings	
Final data submittal for PMA completion	
Issuance of engineering design approval	

Addition milestones as appropriate

4.0 Certification Basis

The certification basis and compliance with the applicable regulations is required, if the substantiation is accomplished by test and computation..

5.0 Tests

The applicant will propose any tests necessary to show compliance with the applicable regulations. These tests support the associated general or comparative analysis.

6.0 Conformity Inspections

Please list any expected conformity inspections necessary for this project.

7.0 Communication and Coordination

The focal points for official communication between the FAA and the applicant are as follows:

FAA Office Branch	Project Manager	*[Insert Name and phone number]*
[Insert Company Name]	Project Manager	*[Insert Name and phone number]*

This does not prevent team members from engaging or communicating with any other team member, however team members must inform the project focal point. Both the FAA and the applicant will provide to each other a listing of their project team members.

The project focal points will manage the project by conducting regularly scheduled status briefings.

8.0 Delegation.

Both the FAA and the applicant agree to foster an environment where the designees, the FAA, and the applicant maintain open communications. The FAA supports using designees to the fullest extent possible to help in the successful completion of the project in the identified time frame.

The applicant will propose the use of any suitable designee in specific test plans for FAA concurrence of the test plan, and the designees will complete the task. It is important the applicant keep the designees and the FAA focal point informed of any potential shift in the project schedule.

9.0 Signatures:

The FAA and the applicant agree to the provisions of this PartSCP as indicated by the signature of their authorized representatives.

FAA Concurrence:

_____ Date: _____ _____ Date:_____
Project Manager MIDO Manager *[If applicable]*

Date: _____

Applicant Concurrence:

_____ Date:_____
Project Manager

Appendix H. Definitions and Terms

When following procedures in this order, the following definitions and terms apply:

1. Accredited Laboratory is a laboratory which prescribes to a set of national standards, follows at least one of the available industry defined accreditation processes and has a certificate as proof. These laboratories also employ qualified individuals with technical degrees in the fields of chemistry, engineering, or metallurgy.

2. Aircraft Certification Office (ACO) is the field branch of the FAA Aircraft Certification Service. The **project ACO** has geographic responsibility for finding the design complies with applicable airworthiness standards. It administers and secures compliance with agency regulations, programs, standards, and procedures governing the design approval of replacement and modification articles. Appendix F has a link to the FAA website that gives ACO locations, addresses and geographic areas of responsibilities.

3. Article means a material, part, component, process or appliance. Articles may include sealants, modified standard parts, brake assemblies etc.

4. Certificate Management ACO (CMACO) is the ACO that issues and has oversight over the original design approval for the product/appliance for which the PMA applicant's article is eligible for installation.

5. Continued Operational Safety (COS) assures the integrity of a product throughout its service life. This involves problem prevention, service monitoring and corrective actions that feedback into a product's design and production**.**

6. Critical part is an article identified as critical by the design approval holder during the product type validation process, or otherwise by the exporting authority. Typically, such components include articles for which a replacement time, inspection interval, or related procedure is specified in the Airworthiness Limitations section or certification maintenance requirements of the manufacturer's maintenance manual or Instructions for Continued Airworthiness.

7. Design is all drawings and specifications that show the article's configuration and all information on dimensions, tolerances, materials, processes, and procedures necessary to define all article characteristics. A master drawing list is the summary of these drawing and specifications. The design can also include the airworthiness limitations section of the ICA.

8. Eligibility relates to the type-certificated products that the PMA articles are approved for installation.

9. FAA-PMA Letter is the initial production approval document issued to the PMA applicant by the appropriate MIDO. This letter accompanies a PMA supplement. The supplement is the ACO's record of design approval and the MIDO's production authorization. Later MIDO transmittal letters that references the initial PMA letters may revise eligibilities or add new articles to PMA supplements.

10. Instructions for Continued Airworthiness (ICA) documents directions and requirements to maintain the continued airworthiness of an aircraft, engine, or propeller.

11. Life-limited Part is an article with an established replacement time, inspection interval, or related procedure in the airworthiness limitations section as required by 14 CFR 21.50, 23.1529, 25.1529, 27.1529, 29.1529, 31.82, 33.4, and 35.4. NOTE: Early type certificate data sheets (TCDS) have mandatory replacements or inspections for some products. These products were certified before 14 CFR had the above airworthiness requirements. Also, a technical standard order (TSO) authorization may note or reference mandatory replacement or inspection for an affected article.

12. Make is the common name associated with the original design of the product

13. Manufacturer is a person (14 CFR Part 1) who causes production of a product or article. PAHs or their suppliers are likely manufacturers.

14. Manufacturing Facility is the location of the approved quality system that produces the article.

15. Manufacturing Inspection District Office (MIDO) is the field branch of the FAA Aircraft Certification Service responsible for certificate management in the geographic area in which the PMA applicant's principle manufacturing facility is located. In some areas, a **manufacturing inspection satellite office (MISO)** will perform these functions. Go to *http://www.faa.gov/aircraft/air_cert/locate_office/mido/* to find the location, addresses, and geographic areas of responsibility of the individual MIDO/MISO. The **certificating MIDO** is the MIDO that issued the initial production approval or has certificate management responsibility for producing the product/appliance on which the PMA applicant's article is eligible for installation.

16. Model is the TCDS designation to classify a product of a particular style of design.

17. Modification article is new to the product and approved under a major or minor change to the type design. An STC is the most common source of modification articles.

18. Owner/Operator Produced Article requires participation in controlling an article's design, manufacture, or quality. Significant participation in one or more of the following actions establishes an owner/operator as the manufacturer of an article:

- Fabricating or finishing the article, or performing a value-added article inspection.
- Developing the design or performance data to manufacture the article.
- Selecting materials to manufacture the article.
- Developing fabrication processes or assembly methods to manufacture the article.
- Developing quality control procedures to manufacture the article.
- Controlling or supervising the manufacture of the article.

19. A **Part Specific Certification Plan (PartSCP)** is an agreement between the ACO and applicant that defines and documents the requirements and tasks required for FAA evaluation and PMA approval of articles.

20. Product is an aircraft, aircraft engine, or propeller. See 14 CFR 21.1(b).

21. Production Approval Holder (PAH) is the holder of a production certificate, approved production inspection system, PMA, or TSO authorization. This person controls the design and quality of a product or article.

22. Qualified Laboratory is a laboratory which does not hold an accreditation from a governing body. However, it does employ qualified individuals with technical degrees in the fields of chemistry, engineering, or metallurgy,

23. Quality System is an organizational structure with responsibilities, procedures, processes, and resources that implements a management function to determine and enforce quality principles. A quality system encompasses quality assurance and quality control.

24. Replacement article is a direct substitute for an article approved under a type certificate. It is a fit, form and functional replacement for an original article in a product's type design.

25. Revision is a correction of typographical errors or an update of administrative data on existing PMA supplements.

26. Series is a grouping of similar product models identified on the applicable TCDS.

27. Source Control Drawing is a drawing in which specific production and/or process details, typically found in the "Notes", are directly controlled by the PMA DAH and flow down to their suppliers. This control is typically accomplished via additional agreements outside the direct purview of the drawing.

28. Standard Parts conform to established industry-wide or government specifications. These specifications stipulate the design, manufacturing and uniform identification requirements. The specifications are readily available to any persons or organizations who want to manufacture these articles. Also standard parts may include those that solely meet uniform performance criteria if the Administrator finds complete compliance with industry-wide and government performance specifications. These specifications must include performance, test and acceptance criteria, and uniform identification requirements. The Administrator deemed discrete electrical and electronic components that conform to their applicable performance criteria as standard parts. See Volume 62 *Federal Register* 9923, March 5, 1997.

29. Supplier is any person as defined by 14 CFR Part 1, Definitions and Abbreviations, That furnishes products, articles, or services (at any tier in the supply chain) that are used or consumed in the manufacture of, or installed on aviation products of articles.

30. Technical Standard Order (TSO) Authorization is an FAA design and production authorization issued to a specific manufacturer of an article that we found to meet a specific TSO's minimum performance standard. The Aircraft Engineering Division (AIR-100) is responsible for TSOs. The geographic ACO is responsible for issuing the TSO authorization to the applicant. The TSO authorization is not an installation approval. We approve the installation of the article as part of the type design of a type-certificated product or subsequently by STC.

31. Type Certificate Holder is an individual or company who has been issued a design approval by the FAA and meets the requirements of 14 CFR part 21.21.

Appendix I. Advisory Circular Feedback Information

If you have comments or recommendations for improving this advisory circular (AC), or suggestions for new items or subjects to be added, or if you find an error, you may let us know about by using this page as a template and 1) emailing it to 9-AWA-AVS-AIR500-Coord@faa.gov or 2) faxing it to the attention of the AIR Directives Management Officer at 202-267-3983.

Subject: (insert AC number and title) Date: (insert date)

Comment/Recommendation/Error: (Please fill out all that apply)

An error has been noted:

Paragraph _____

Page _____

Type of error (check all that apply): Editorial:----- Procedural-----

Conceptual____

Description/Comments:_____

_____

_____

Recommend paragraph _____ on page _____ be changed as follows:
(attach separate sheets if necessary)

_____

In a future change to this advisory circular, please include coverage on the following subject:
(briefly describe what you want added attaching separate sheets if necessary)

_____

Name: _____