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This advisory circular (AC) explains the technical standard order (TSO) process outlined in Title 14 of the Code of Federal Regulations (14 CFR), part 21, O, for manufacturers producing articles and appliances under a TSO authorization (TSOA) or letter of TSO design approval (LODA).

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Chapter 1. General Information

1-1. Purpose.

a. This advisory circular (AC) explains the technical standard order (TSO) process, the responsibilities of the applicant for a technical standard order authorization (TSOA), letter of TSO design approval (LODA), and the responsibilities of holders of article approvals (TSOA holders) and appliance approvals (LODA holders) already approved with a TSOA or a LODA.

b. This AC is not mandatory and is not a regulation. This AC describes an acceptable means, but not the only means, to comply with the requirements of Title 14 of the Code of Federal Regulations (14 CFR), part 21, O. However, if you use the means described in this AC, you must follow it entirely.

1-2. Audience. We wrote this AC for manufacturers of articles applying for a TSOA or a letter of design approval (LODA), and for manufacturers of articles already approved by a TSOA or a LODA.

1-3. Where To Find This AC. You can find this AC on the Federal Aviation Administration (FAA) website at: http://www.faa.gov/regulations_policies/advisory_circulars/.

Chapter 2. The TSO Program

2-1. TSO is a Minimum Performance Standard. A TSO is a minimum performance standard issued by the FAA for specified materials, parts, processes, or appliances (aka articles) used on civil aircraft. (See 14 CFR § 21.601(b)(1).) Each TSO covers a specific type of article.

2-2. TSO Approvals.

a. Definition of TSO approval. A TSO authorization is an FAA design and production approval issued to a manufacturer of an article that has been found to meet a specific TSO. The manufacturer also must control all the suppliers they use for parts or services in the design and production of the TSO article.

b. Two types of TSO approval. As used in this AC, the term TSO approval is used to refer to a TSOA or a LODA.

(1) We issue a TSOA *only* to a U.S. manufacturer. A TSOA is a design and production approval the FAA issues to the U.S. manufacturer. Before we issue the TSOA, we determine that the manufacturer's article design meets the applicable TSO, and the manufacturer has a quality control system (QCS) that will produce every article to conform to the approved design. For TSOAs, the United States is the State of Design (SOD) and the State of Manufacture (SOM) as defined by the International Civil Aviation Organization (ICAO), Annex 8.

(2) We issue a LODA *only* to a foreign manufacturer. A LODA is a design approval we issue to the foreign manufacturer located in a country with which we have a bilateral agreement that allows for the import of their appliances that meet our TSO. A LODA is not a production approval. The civil aviation authority (CAA) for the manufacturer's country approves and oversees the QCS and production of the article under the provisions of the bilateral agreement. Before the FAA can issue a LODA, we determine if we have a bilateral agreement with the manufacturer's country and that the CAA for that country has submitted a statement that the article meets our TSO. In order for us to issue the LODA in a timely manner, the manufacturer must provide evidence of import. If these requirements are met, we can issue a LODA. For LODAs, the manufacturer's country is the SOD and the SOM as defined by ICAO.

Note: More information about bilateral agreements can be found at the following FAA website:
http://www.faa.gov/aircraft/air_cert/international/bilateral_agreements/.

2-3. Limitations of a TSO Approval.

a. A TSO approval doesn't approve the article to any regulations, requirements, or other standards except those listed in the specific TSO.

b. A TSO approval isn't an approval for installation of the article in an aircraft, aircraft engine, or propeller (hereafter referred to as "product"). A person who wants to install a TSO article in a product must obtain a separate approval under the type certification process or under 14 CFR part 43 to show the article meets the applicable airworthiness requirements for the product. The person approving the installation of the article in the product must evaluate the TSO performance criteria and article installation instructions to determine if they are adequate for meeting the airworthiness requirements of the product.

2-4. TSOAs or LODAs Not Mandatory. TSOAs and LODAs are not mandatory. TSOAs and LODAs are one way to get an article approved.

2-5. TSO Markings. A TSO marking means the article design meets the FAA TSO for which it is marked. The TSO marking also means that the article conforms to the approved design since it was produced under an approved quality system. A TSO marking made under a TSOA or LODA *doesn't* mean the article is approved for installation or the article's design meets airworthiness regulations for a particular product. We don't allow anyone to mark an article with a TSO marking unless we have issued them a TSOA or LODA.

Chapter 3. TSOA and LODA Applicant Responsibilities

3-1. Certify Your Article Complies with Applicable TSO Standard. As an applicant for a TSO authorization, you certify that the design of your article meets all the requirements of the applicable TSO.

a. If the TSO specifies a method for substantiation, you should use that method to substantiate your article unless you propose other means of compliance (e.g., analysis versus test). Use of a method other than as specified in the TSO requires a deviation (see 14 CFR § 21.609).

b. All substantiation must be completed prior to submitting your application for TSO approval unless otherwise agreed to by the responsible TSO aircraft certification office (ACO). You may coordinate with the FAA, any potential issues with your article, prior to submitting your application. We suggest you coordinate potential issues with an article well in advance of submitting your application.

3-2. Control the Design and Quality of Your Article. You must control both the design and the quality of the article. This includes controlling the design and quality of any items you receive from a supplier to the extent necessary to ensure that article meets the TSO.

a. To control the design of the article means that you have the responsibility for the development and the management of each component, feature and function regardless of where that process takes place or who you have contracted. Because we issue the TSO approval to you, we hold you responsible for ensuring the design meets the TSO. This also means that each design change to the article or any of its components, features or functions must also be controlled by you to ensure that after the change, the article still meets the TSO and any required documentation delivered with each article is updated accordingly.

b. To control the quality of the article means you must build your article in accordance with the approved design. You are responsible for controlling all your suppliers and all changes they implement in their production line for any part, process, or service they are providing you, as needed.

3-3. Set-Up and Maintain a Quality Control System. If you are a TSOA applicant, you must set-up and maintain a QCS that meets 14 CFR § 21.605(a)(3). Before we can issue a TSOA we must have evidence that you have a quality system that meets 14 CFR § 21.143. AC 21-1, *Production Certificates*, provides guidance on the type and content of documentation you should submit to allow us to make a determination as to whether or not you have an acceptable QCS.

3-4. TSOA Application Requirements.

a. You must submit a TSOA application to the ACO in your geographical area, per 14 CFR § 21.605. If your facility has multiple locations, the principal manufacturing facility that controls the design and quality of the article(s) submits the TSO authorization application.

b. You must use the applicable TSO that is effective on the date of application for that article, per 14 CFR § 21.605(a)(1). However, if the applicable TSO was revised within the last 6 months, we may allow you to use the previous version if we know you were working to meet the earlier version before the new TSO version became effective. Otherwise, you must ask for an exemption to 14 CFR § 21.605(a)(1), as outlined in 14 CFR part 11.

c. Your TSOA application must include:

- (1) The TSO number for which the approval is requested,
- (2) The manufacturer's name and physical address of the principal facility that controls the design and quality of the article,
- (3) A statement of conformance that states your article meets the applicable TSO and you meet the requirements in 14 CFR part 21, O,
- (4) A copy of the technical data and other documents required by the TSO,
- (5) A description of your QCS. See AC 21-1 for information about describing your QCS,
- (6) Any requested deviations from the TSO (see paragraph 3-9 of this AC), and
- (7) Any non-TSO functions data for which you seek acceptance.

d. We suggest you include with your application a part numbering methodology per 14 CFR 21.605(b) that uses open brackets to define minor changes. The part numbering methodology should include open brackets that define characteristics of the article that you consider will be minor changes. See paragraph 4-4 for more information on design changes.

e. It is our experience that applications are processed more efficiently when an applicant submits to us a TSO compliance checklist or matrix. The checklist or matrix is simply a list of each TSO requirement and how the applicant has met the requirement (e.g., by documentation, analysis, test, etc).

3-5. LODA Application Requirements.

a. You must submit a LODA application to the CAA for your country. Your CAA must review your LODA application and determine if it meets the applicable TSO. Once the CAA

determines your LODA application meets the applicable TSO, they must make a certifying statement to the FAA that they find that your article meets the TSO.

b. You must use the applicable TSO that is effective on the date of application for that article, per 14 CFR § 21.605(a)(1). However, if the TSO being applied for was revised within the last 6 months, we may allow you to use the previous version if we know you were working to meet the earlier version before the new TSO version became effective. Otherwise, you must ask for an exemption to 14 CFR § 21.605(a)(1), as outlined in 14 CFR part 11.

c. Your LODA application must include:

- (1) The TSO number for which the approval is requested,
- (2) The manufacturer's name and physical address of the principal facility that controls the design of the article,
- (3) Evidence of import,
- (4) A statement of conformance that states your article meets the applicable TSO *and* you meet the applicable requirements in 14 CFR part 21, O,
- (5) A copy of the technical data and other documents required by the TSO,
- (6) Any requested deviations from the TSO (see paragraph 3-9 of this AC), and
- (7) Any non-TSO functions data for which you seek acceptance, if specifically permitted by the applicable bilateral.

3-6. Use of Subject Matter Experts in the TSOA Process. Any person who has the expertise to review TSO data can assist a TSO applicant in making their statement of conformance. See paragraph 3-1 for more information.

3-7. Provide Installation Instructions, Limitations, and Maintenance Instructions. The TSO installation instructions provide information for proper integration or attachment of the article into the product. Installation instructions are typically a step-by-step procedure for use by the installer to accomplish this goal. A TSO installation limitation is information that helps an installer determine the applicability [eligibility] of the article to the product. The TSO installation limitations ensure that the article, when installed according to the installation instructions, continues to meet the requirements of the TSO minimum performance standards (MPS).

a. As an applicant for a TSO approval you must establish and provide installation instructions, limitations, and maintenance instructions.

b. Provide enough detail in the installation limitations for the installer to determine if the TSO article is compatible with the product and all foreseen equipment and systems with which

the article is intended to interface. As an example, for avionics TSO articles, the limitations section should clearly state the software and hardware design assurance levels as well as interoperable versions/revisions so the installer can determine compatibility of the TSO article.

c. You can choose to limit the TSO article to interface only to specific components or equipment, as installed in the product. Identify and describe any unique aspects of the TSO article, including all non-TSO functions and any incomplete TSO contingencies in the limitations section.

d. If you do not demonstrate by lab or simulator testing and/or by analysis that this TSO article will perform its intended function when installed, then list additional testing requirements in the installation instructions or procedures. The additional testing requirements should allow the installer to demonstrate that the article is compatible with the interfaced equipment and will continue to meet the requirements of the TSO after installation.

e. Typically the TSO also requires that installation instructions, limitations, and maintenance instructions be furnished with each article that is shipped. Generally if a group of articles is being shipped to one location, it's acceptable to ship one set of the documentation for the entire group of identical articles. This is an acceptable practice unless the recipient wants a copy of the documentation for each article.

f. Include in your installation and limitations documentation:

- Basic instructions on how your article is intended to be installed in the product,
- Specific steps to be followed for the integration of the article into the product,
- Tests or inspections to help verify that the article is installed correctly, and
- Any installation limitations or additional requirements for the installation of your article, necessary to insure that your article will continue to meet the MPS specified in the TSO, once installed in a product.

g. Identify any pertinent limitations to the evaluation you made for the TSO in the installation instructions. In some cases, you will know the configuration of the product in which your article will be installed. Although the installation of the article is not your responsibility, we encourage you to develop a thorough set of installation instructions and limitations to help ensure your article will be installed and operated in a manner that continues to meet the TSO and the anticipated airworthiness regulations.

3-8. Provide Instructions for Continued Airworthiness (ICA) for the Article. Most TSOs require you to develop and submit maintenance instructions for approval. Instructions for Continued Airworthiness (ICA) are required for all products; therefore, you must submit maintenance instructions that will allow the article to continue to meet the TSO requirements after it is installed. These are not necessarily the same requirements necessary for the product,

but your instructions can be used by the TC/STC applicant as the basis for them to meet their responsibilities for ICA at the product level. Include in your ICA, as appropriate:

- Inspection intervals,
- Inspection procedures,
- Recommended service life,
- Wear limits,
- Cleaning instructions,
- Basic maintenance instructions,
- Calibration information,
- Information on any special tools required,
- Acceptable repairs and repair procedures, and
- Any other information necessary to keep the article compliant with the TSO while in service.

3-9. Requesting Approval to Deviate from TSO (14 CFR § 21.609).

a. A deviation is a difference to a requirement specified in the TSO. It is specific to the article, and cannot be re-used on new TSOA or LODA applications without resubmitting for approval.

b. As an applicant for a TSO approval, if you want to deviate from the TSO you must submit a deviation request regardless of the significance of the TSO criteria from which you want to deviate. For example, we require applicants to get a deviation approval even when they propose to use a version of an industry standard later than the one referenced in the specific TSO.

c. To get our approval for a deviation, you must show that compensating features or factors provide an equivalent level of safety (ELOS) to the TSO performance requirement(s) from which you propose to deviate.

d. We evaluate your deviation request, and approve the deviation if an ELOS can be assured. The deviation approval may identify limitations for the approval, which you should consider when making subsequent design changes to ensure that the limits continue to be met.

(1) We encourage you to discuss and coordinate the deviation proposal with the ACO before you submit your official deviation request. Discuss the application with your ACO to ensure that you don't do testing or analysis that we may not approve as an ELOS. These

discussions usually help everyone agree on whether or not your proposal establishes an ELOS and can save you a lot of time and resources. Don't consider discussions binding. We will evaluate your official deviation request once we receive it.

(2) If you are applying for a LODA we encourage you to have an unofficial dialogue with the CAA. The CAA can coordinate with the FAA to ensure you don't do testing or analysis that we may not approve as an ELOS. These discussions usually help everyone agree on whether or not your proposal establishes an ELOS and can save you a lot of time and resources. Don't consider discussions binding. We will evaluate the official deviation request once we receive it.

e. Substantiating the ELOS. Ensure your deviation request includes substantiating data that specifically covers the compensating factors or features. The proposed TSO deviation must clearly establish an ELOS to the TSO.

f. Marking the article for approved deviations. If we have granted a deviation to you for your article, you should mark the article to indicate a deviation was granted. This will help ensure that installers know the article met the TSO requirements in some manner other than as specified in the TSO. It will also help make them aware that they need to review the associated installation manual for details of the deviation.

g. Documenting details of an approved deviation. If you are granted a deviation you must list, in your installation manual, the specific details of the deviation granted. This is necessary to alert installers to evaluate the article further for installation or operational limitations affected by the deviations. Describe the details of any deviations and document any known functional differences resulting from a deviation.

3-10. The Roles of FAA and Applicant. We coordinate between the ACO and the manufacturing inspection district office (MIDO) to help ensure that the applicant produces TSO articles according to the approved design. Approving a TSOA application requires the ACO to approve the design and the MIDO or manufacturing inspection satellite office (MISO) to approve the production system. A LODA is an FAA design approval only. Approving a LODA application requires the ACO to approve the design of the foreign manufactured appliance. The applicable CAA issues the corresponding production approval and oversees the production system.

Chapter 4. TSOA and LODA Holder Responsibilities

4-1. Continue to Meet Requirements of TSO. As the TSOA or LODA holder, you must:

- a. Assure your article continues to conform to the TSO MPS including all design changes,
- b. Assure you continue to comply with 14 CFR, part 21, O,
- c. Maintain your QCS,
- d. Maintain a current file of complete data and records as per 14 CFR § 21.613,
- e. Mark each article with TSO marking, and
- f. Report any service difficulties per 14 CFR § 21.3.
 - TSOA holders report to FAA.
 - European LODA holders report to EASA.
 - Other countries follow requirements of bilateral agreements (if applicable).

4-2 How to Mark Each Article. Mark each article according to 14 CFR § 21.607(d) and as specified in the TSO.

a. Before you ship any article you must determine that it conforms to its approved design and you must mark it with all the information required by 14 CFR § 21.607(d) which includes the specific TSO for which the approval was granted. You must also mark it with all specific marking requirements as called out in the TSO for which approval was issued or as described in paragraphs 4-2d, and 4-2e. Typically this is in section 4 of the TSO. Be sure to review appendices in the TSO as they may contain additions or exceptions to other marking requirements contained in a referenced industry document (such as, Society of Automotive Engineers (SAE), aerospace standards (AS) or RTCA, Inc. documents).

b. The marking must be permanent and legible. If you receive information about your in-service articles that the TSO markings are missing or can no longer be read, you must investigate the cause and make any design changes necessary to resolve the issue.

c. When you believe an article is impractical to mark (e.g. size or space limitations), you must request a deviation unless the specific TSO provides explicit alternate marking instructions.

d. Electronic part marking which identifies the article by electronically embedding the identification within the hardware component itself (using software) may be used instead of marking it on the equipment nameplate. If electronic marking is used, it must be readily

accessible without the use of special tools or equipment. Electronic marking of an article is acceptable when the information provided by an electronic identification query system is stored in non-volatile memory. The electronic identification system must be verifiable on-board the aircraft, when the aircraft is on the ground at any geographic location, and must provide the specific information required by 14 CFR § 21.607(d).

e. When an article has been approved to multiple TSOs, you must mark the article with at least the primary TSO and mark it for the installer to refer to the instruction manual or component maintenance manual (CMM) for the complete list of TSOs to which it was approved. See paragraph 5-4 for further marking information on multiple TSO approvals.

f. See chapter 5, paragraph 5-3 for further marking information on incomplete TSO approvals.

4-3. Report Service Difficulties per 14 CFR § 21.3.

a. As a TSOA holder, 14 CFR § 21.3(b) requires you to report to us any defect in your article that you've determined could result in any of the occurrences listed in 14 CFR § 21.3(c). These occurrences include, but are not limited to:

- Fires,
- Engine exhaust system failures,
- Toxic or noxious gases in the crew compartment or passenger cabin,
- Malfunctions, failures, or defects in the propeller control system,
- Flammable fluid leakage,
- Structural or material brake system failures,
- Malfunctions, failures, or defects in the flight control system including interference with normal control, and
- Malfunctions or failures of attitude, airspeed, or altitude instruments.

Note: Review 14 CFR § 21.3(c) for the complete and accurate list of your responsibilities.

b. If we determine during an accident investigation or service difficulty that your article is unsafe, you must report to us at our request any results you find or actions you plan to take to correct the deficiencies. You will also have to submit to us any data we need to help us issue an airworthiness directive.

4-4. Design Changes. As a TSOA holder, you are responsible for any design changes you make to your TSO approved article and supporting data. Design changes to your article or supporting data are classified as either minor or major. We require that you evaluate all design changes to determine if they are minor or major changes.

a. Minor design changes under TSOA. We permit TSOA holders to make minor design changes to their articles without further approval.

(1) We encourage you to propose to your ACO what constitutes a minor change for the particular TSO article being manufactured and work with them to establish a mutually agreed upon process for managing minor design changes. Sometimes minor changes may require significant substantiation (including testing) to ensure the article still meets the TSO requirements. But unless the change results in a “substantially complete investigation” to the TSO, it can be classified as minor per 14 CFR § 21.611(a). Note that a major/minor design change classification under 14 CFR §21.611(a) or (b) is made at the article level relative to the TSO standard and should not be confused with a major/minor design change classification under 14 CFR § 21.93 . Design change classifications under 14 CFR § 21.93 are made at the product level.

(2) We encourage you to use a partnership for safety plan to formalize this agreement with your ACO. The manufacturer must maintain and submit to the FAA, on request, minor change substantiation data.

(3) The article model and/or part number are used for configuration management at the aircraft level. You should change the part number of any article where a minor change to a previously manufactured article affects the interchangeability at the product level. This can include changes to aspects of the use or installation of the article, in addition to changes relating to the minimum performance characteristics specified in the TSO. Update any associated documentation, such as the installation instructions, to identify the difference between the previous and new part number versions of the article.

(4) You must substantiate and document all minor design changes. You must notify your ACO within the time frame agreed upon with them. We recommend the data be submitted prior to the date of shipping any articles. This will prevent you from distributing potentially non-complying articles in the event the ACO finds that a minor change claim is improperly substantiated. State in your minor change notification letter that the article with the change complies with the TSO, reaffirming your compliance with 14 CFR part 21, O. You can send this letter to the ACO by email.

(5) If we determine a minor design change submittal isn't sufficiently or properly substantiated, you must provide additional substantiation or other data as requested by your ACO. This could require you to retest the article to show compliance with the TSO standard.

(6) If we determine that a minor design change is really a major design change, as defined in 14 CFR § 21.611(b), you must immediately stop marking and shipping any changed articles and comply with the criteria for major design changes.

b. Major Design Changes under TSOA.

(1) **Requirement for New TSO Application.** Per 14 CFR § 21.611(b), we require a new TSO application for all major design changes to TSO articles under a TSOA.

(2) **When the applicable TSO is revised while an application is pending.** You need to demonstrate compliance only with the TSO in effect at the time of the original application, not the revised TSO. We may give up to a 6-month relief period to applicants with pending applications.

c. Design changes - LODA. Design changes to articles that have been issued a LODA are subject to the requirements defined in the applicable bilateral agreement. Generally, when the CAA considers a design change minor, it is approved without any FAA involvement. Design changes the CAA considers major require the LODA holder to apply for a new LODA.

d. Design change by person other than manufacturer – TSOA and LODA. Under 14 CFR § 21.611(c), we permit design changes to a TSO article by a person other than the original manufacturer who holds the TSO approval. If the person seeking approval is another article manufacturer (see 14 CFR §21.601(b)(5)), they must apply under a separate TSOA or LODA and obtain approval prior to modifying the article. The article may also be altered as part of an installation in an aircraft or engine, and approved under 14 CFR part 43 or the applicable airworthiness regulations 14 CFR parts 23, 25, 27, 29, 31, 33, and 35. In all cases, the article must be permanently marked to indicate that it has been modified.

e. Modifying an installed article under 14 CFR part 43. Persons other than the TSO authorization holder may get approval for design changes to the TSO article as part of the approval for a change to the TC'd product under 14 CFR part 43 **or** under the applicable airworthiness regulations.

(1) The physical modification of a TSO approved article made by a person under 14 CFR part 43 needs to be classified as a major or minor alteration.

(2) Permanently mark the modified article with sufficient data to identify that it has been modified, and what the modification was. This may be accomplished by providing a reference to a design approval (e.g., STC number), the modifier's name and address, or reference to other documentation describing the modification.

(3) If the modifier cannot assure that the article continues to meet the MPS of the applicable TSO(s), permanently obliterate the TSO marking while retaining all other identifying data.

4-5. Transferability. As stated in 14 CFR § 21.621, TSO approvals can't be transferred.

a. Example of a Transfer. A transfer is the sale or liquidation of a company that holds TSOAs or LODAs which results in the change in the legal status of the company, or the sale of

an individual TSOA or LODA from one company to another.

(1) For example, the acquisition of a company with a TSOA or LODA by a holding company would be considered a transfer if the acquired company is disbanded or absorbed into the purchasing company. In this case the legal entity which received the TSOA or LODA no longer exists and the purchasing company would need to reapply for a TSOA or LODA, or request an exemption. A company can transfer a TSOA or LODA only when we grant them an exemption to 14 CFR § 21.621.

(2) As another example, assume that XYZ Company holds a TSOA. ABC Corporation purchases XYZ Company. ABC Corporation plans on disbanding XYZ Company and absorb XYZ Company into the ABC Corporation. In this case the legal status of XYZ has changed (such as the company no longer exists as a legal entity) and the acquisition of the XYZ Company is considered a transfer.

b. Example of what is NOT a transfer.

(1) A company changing their name or relocating their facilities is not considered a transfer. The acquisition of a company with a TSOA or LODA by a holding company would not be considered a transfer if the acquired company continues to exist as the same legal entity to which the original TSOA or LODA was issued under the following conditions:

- The acquired company retains possession of the TSOA or LODA, substantiating data, and responsibilities under the original approval.
- The acquired company retains the same quality system (TSOA only).

(2) Example: ABC Corporation purchases XYZ Company. XYZ Company holds a TSOA and will continue to operate; under the same name, in the same location, with the same management, and under the same production system. In this case the legal status of XYZ has not changed and is therefore not considered a transfer.

c. Articles approved with a TSOA. If you are changing your name, relocating your facilities, or being acquired by another company, you must inform your ACO prior to the action occurring. You:

(1) Should expect your ACO to forward this information immediately to your MIDO/MISO.

(2) Must not ship any articles from a new facility until the MIDO has inspected and approved the new facility, and the ACO has reissued your TSOA.

(3) Should expect your ACO to reissue the TSOA at the same level as the original TSO after the MIDO determines your QCS meets 14 CFR § 21.143 and you can produce each article to conform to your approved design.

d. Articles approved with a LODA. If you are a foreign manufacturer who holds a LODA and you are changing your name, relocating facilities, or being acquired by another company. You:

(1) Must make sure your CAA provides the FAA written confirmation that your legal status remains unchanged after an acquisition.

(2) Must not mark or ship any appliances with the TSO marking until the FAA has reissued the LODA for name changes or facility relocations.

(3) Should expect the FAA to reissue the LODA at the same level as the original TSO after receiving written confirmation from the CAA that your article meets the TSO after a name change(s) or facility relocation.

e. Converting a TSOA to a LODA. Our regulations do not have a provision for a manufacturer who holds a TSOA and wants to become a foreign manufacturer (e.g., relocate your design and production facilities outside the United States). In this case, your foreign facility should apply for a LODA as described in this AC, applying for the current version of the applicable TSO(s). As the design approval holder for the original TSOA, you will retain continued operational safety (COS) responsibilities.

f. Converting a LODA to a TSOA. Our regulations do not have a provision for a foreign manufacturer who holds a LODA and wants to become a U.S. manufacturer (e.g., relocate your design and production facilities into the United States). In this case, your U.S. facility should apply for a new TSOA as described in this AC, applying for the current version of the applicable TSO(s). As the design approval for the original LODA, you will continue to have COS responsibilities.

Chapter 5. Additional TSO Topics

5-1. Get a PMA to Modify a TSO Approved Article. We do not issue PMAs to modify TSO articles; we issue PMAs to modify products (i.e. aircraft, engines, and propellers).

5-2. Shipping a Subcomponent of an Article Independent of the Complete Article. You can ship a subcomponent of an article independent of the complete article, but you should complete an FAA Form 8130-3, *Airworthiness Approval Tag*, (or other document acceptable to us). This tag will help make it clear that it is only a piece of an article and to clarify the article it is intended to be installed in.

5-3. Incomplete TSO Article. An incomplete TSO article is one that provides only part of the performance or functionality specified in the applicable TSO. In order for us to approve and issue a TSOA or LODA for an incomplete TSO article, all of the following conditions must be met:

a. The incomplete article provides a major and independent function of that specified in the TSO. There must be TSO requirement(s) that are specific to the function that is provided (i.e., in addition to general requirements on software or environmental qualification).

(1) An example of an incomplete article that is major and independent: an electronic flight instrument system (EFIS) may be used properly with TSO-C4, *Bank and Pitch Instruments*. The EFIS displays “bank and pitch” information, but does not include a vertical gyro. Since the EFIS provides a major part and independent function of the TSO-C4 functions with specific requirements pertaining to the display, you may be granted an incomplete TSOA to TSO-C4.

(2) Example of an incomplete article that is not major and independent: A cooling fan for a global positioning system (GPS) under TSO-C129, *Airborne Supplemental Navigation Equipment Using the Global Positioning System (GPS)*. Since the cooling fan does not provide a major part of the TSO-C129 functions, we will not grant a partial TSOA.

b. The TSO MPS specifically provides appropriate and adequate standards for evaluation of the article as an incomplete article. You must identify and meet all the specific performance standards in the TSO that are applicable to the incomplete article.

c. You must adequately document in the installation drawings and/or installation manual, detailed instructions and limitations for the installation and use of the incomplete article. Example: Company “ABC” manufactures under TSO-C119, *Traffic Alert and Collision Avoidance System (TCAS) Airborne Equipment, TCAS II with Optional Hybrid Surveillance*, a traffic alert and collision avoidance system (TCAS) antenna with an interface that is interoperable with a Company “XYZ” Model “123” TCAS computer. The installer must substantiate the interoperability when showing compliance to the applicable airworthiness

requirements.

d. You must list in the installation manual the specific MPS that your article meets. This should be provided by referencing the specific paragraphs (a single reference can frequently be used to a parent paragraph and all of its subparagraphs). This information will assist the installer of the TSO article in knowing the limitations of the article's capabilities.

e. When not obvious from the component, you should permanently and legibly mark the article with at least "INCOMP" adjacent to the TSO number marking (e.g., "Meets TSOC69c INCOMP") and include detailed instructions in the installation drawings or installation manual. Marking an article "INCOMP" or "Incomplete" will eliminate ambiguity about the article's level of compliance.

5-4. Multiple TSO Approvals for the Same Article. If you elect to apply for a TSO approval, you must apply for all applicable TSOs pertinent to the functions that your article provides.

a. Marking. After TSO approval is received the article must be marked as meeting each TSO for which approval was issued. The article can be marked as meeting the primary TSO, along with a marking to refer to the CMM or installation instructions for further information on other TSO approvals issued for the article.

b. Multiple TSO approvals with incomplete TSOs. You should apply for multiple TSO approvals even when the article does not meet the entire TSO but meets the requirements for an incomplete TSO article as explained in paragraph 5-3. In cases where the article isn't complete in meeting any TSO, a primary TSO must be established for marking. Typically this is the TSO that the article comes closest to meeting in full. The requirements listed in paragraph 5-3. must also be followed. The article or the installation manual must list each TSO approval and identify which deviations and/or incomplete approvals are associated with each approval.

5-5. Non-TSO Function. TSO articles may contain additional functions or features that are not covered by a TSO. Identify functionality, features or performance contained in the article not evaluated under the REQUIREMENTS section of the TSO. Non-TSO functions are accepted in parallel with the TSO authorization. For those non-TSO functions to be accepted, you must declare these functions in your TSO application package.