Operational acceptance, which is required for any custom ASO LSAP, is performed by the airline's regulatory authority and can vary for each agency.

Updating 787 Airplane Software Configurations

Airlines now have the capability to change a number of software options on the 787 without requiring a service bulletin from Boeing. Setting of these options, which are referred to as airline selectable options (ASOs), is enabled by the Airline Selectable Options Tool (ASOT). This article discusses ASOs, the use and benefits of ASOT, and the associated Boeing guidelines.

By Ronald Trees, Airline Selectable Options Tool Project Manager, and
Susan Tankersley, 787 e-Enabling Implementation and Deployment Project Manager

When an airline orders a Boeing airplane, it specifies settings for the configurable software options for that airplane. These options configure the operation of the airplane when loaded to their respective line replaceable units. Because these options are delivered as part of the airplane type certification, changes to an airplane's software configuration requires a service bulletin from Boeing.

Starting with the 787 Dreamliner, Boeing worked with the U.S. Federal Aviation Administration (FAA) to make it possible for airlines to change a number of airplane software options without requiring a service bulletin. This enables airline cost reductions, condenses airplane reconfiguration flow time, and streamlines processes. Airlines can configure these options using the Web-based ASOT accessed through the Web portal MyBoeingFleet.com. The ASO-capable systems are shown in figure 1. All possible ASO settings for these systems are certified during 787 type certification, so a Boeing service bulletin is not required to reconfigure these software options.

Airlines are responsible for obtaining regulatory operational acceptance of the resulting custom ASO loadable software airplane parts (LSAP) for the 787 ASO-capable systems.

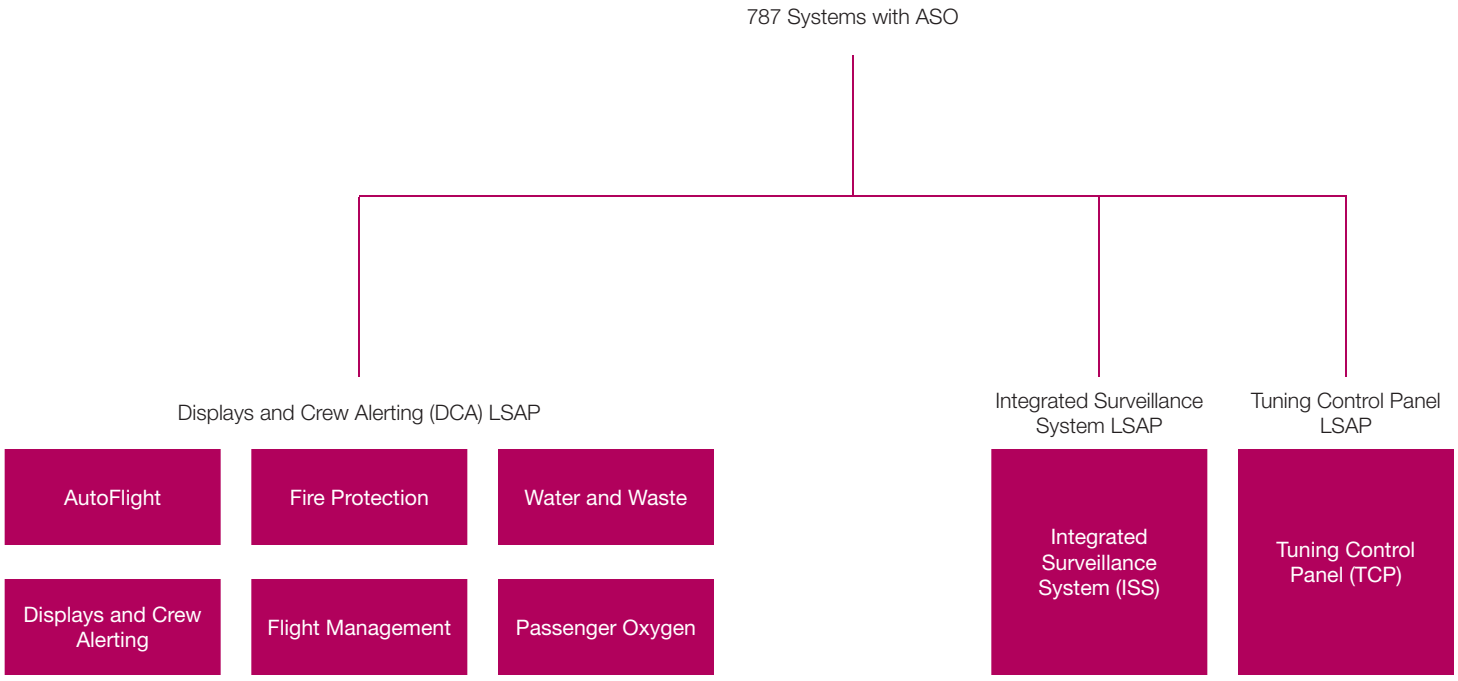
BENEFITS OF ASOs

A number of benefits result from ASOs, including:

- Greatly decreased time for an airline to create a new airplane configuration. Boeing estimates that the use of ASOs will cut as much as 11 weeks from the process, compared to the previous method.
- Reduced FAA Part 25 regulatory authority workload. There is no recurring Part 25 involvement with customer configuration of ASOs.
- Decreased workload and cost to reconfigure airplanes.

Figure 1: 787 systems with airline selectable options

Airlines can use the ASOT to configure 68 options in these loadable software airplane systems.



USING THE ASOT

Boeing maintains the ASOT throughout the life of the airplane and provides ASO services to airlines that do not want to generate custom ASO LSAPs.

The ASOT allows the airlines to:

- Access ASO documentation, including:
  - Airline Process Guidance Document, D6-83640.
  - ASO Description Document, D610Z010-01.
  - ASOT User Manual, D6-83469-700-1.
- Modify ASO selections.
- Generate and manage ASO LSAP.
- Generate reports.
- Request flight crew operating manual (FCOM) updates associated with the options changes.

The ASOT runs on a Web browser on a standard personal computer and can be accessed via MyBoeingFleet.com (see fig. 2). Adobe® Reader is required to display PDF files. The ASOT fully validates user inputs and verifies the LSAP against the user inputs as a qualified verification tool per RTCA/DO-178B, Software Considerations in Airborne Systems and Equipment Certification (the FAA process requirements for in-flight software certification).

The ASOT uses definition files and assignment files to create ASO LSAPs. Definition files, which are provided and managed by Boeing, define the available options and their attributes, including allowed values and value constraints. An assignment file, created by the airline, allows the airline to select values for each available option (see fig. 3).

The selected options values are used to generate an ASO LSAP (see fig. 4).

The ASOT also incorporates full reporting capabilities, enabling the airline to generate reports (see fig. 5). The reports include detailed information such as:

- LSAP configuration.
- Configuration of files used to generate the LSAP.
- Settings of the airline options.

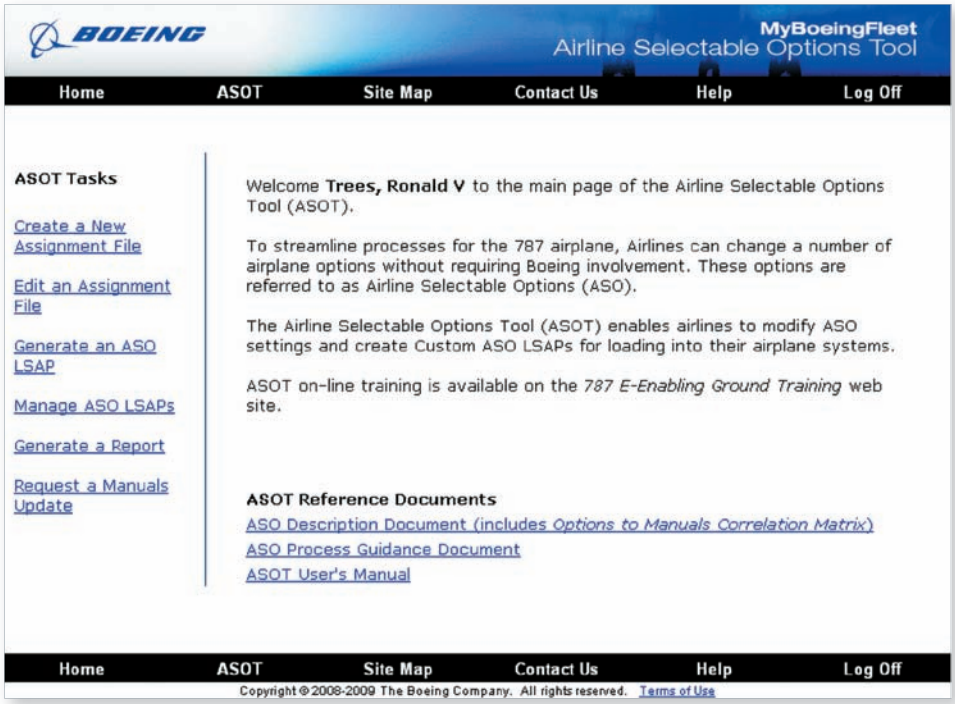


Figure 2: ASOT Welcome page

The ASOT Welcome page, which is accessed from the My Products section of the MyBoeingFleet home page, provides access to all the tool functions and documentation.

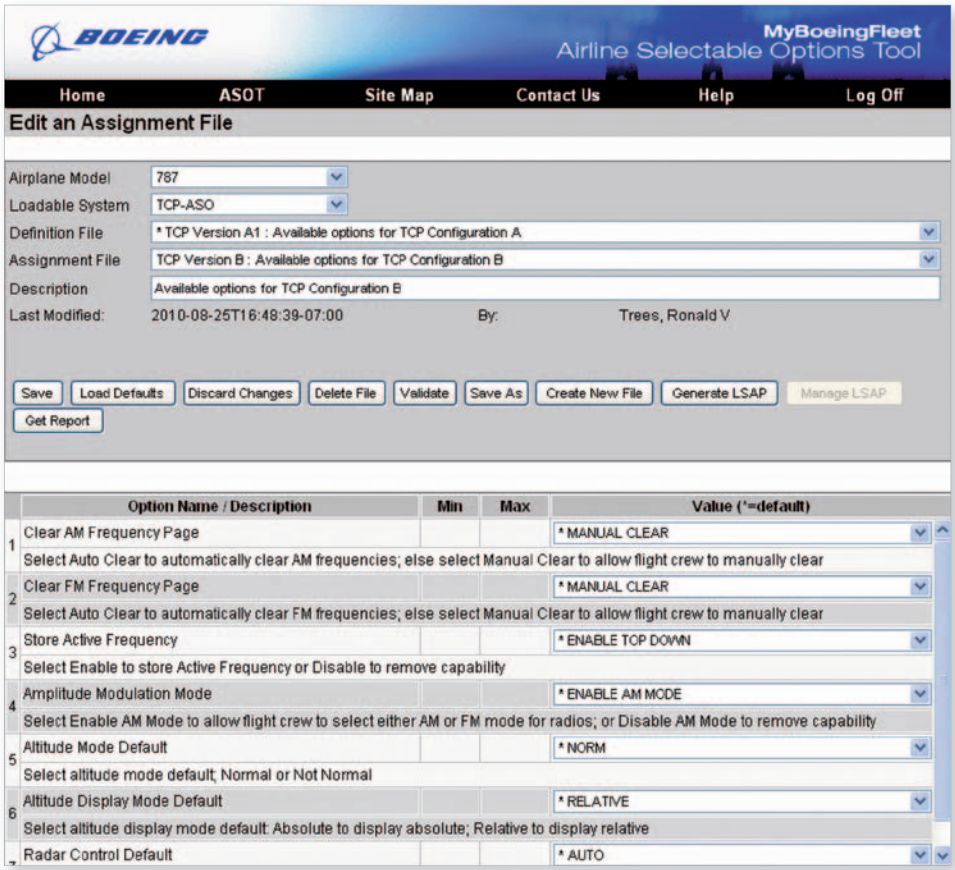


Figure 3: Editing an assignment file

The airline uses this simple form to select option values.

Figure 4: Generating an ASO LSAP

The user can provide additional description information when an ASO LSAP is generated.

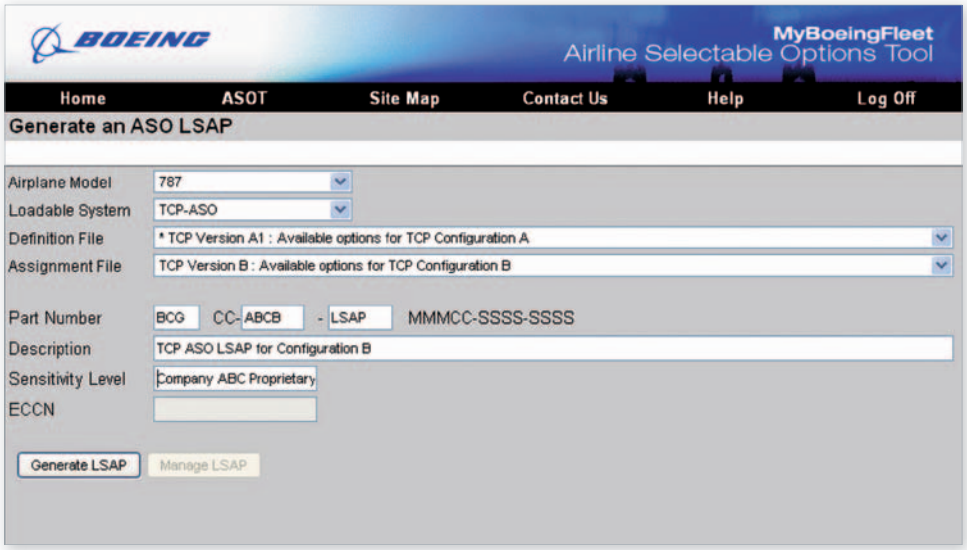
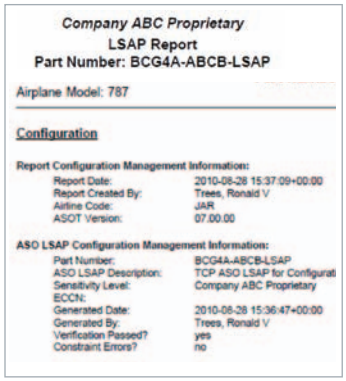


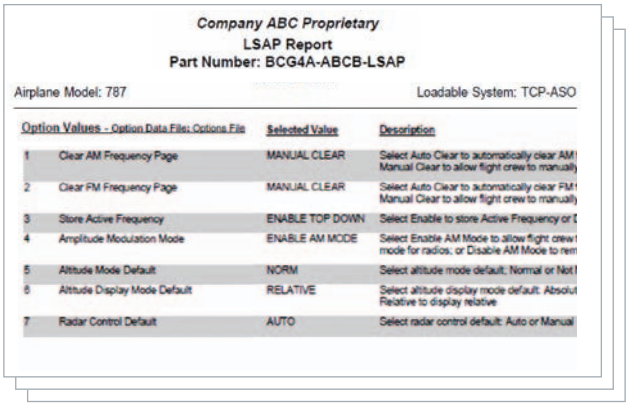
Figure 5: LSAP report

The first section of the LSAP report shows the configuration information for the LSAP.

Subsequent sections of the LSAP report show the airline option selections for the LSAP.



First section



Subsequent sections

ONLINE TRAINING AVAILABLE THROUGH MYBOEINGFLEET

Training for the ASOT is hosted on MyBoeingFleet at the 787 e-Enabling Ground Training Web site. To access the training, the user needs to have a MyBoeingFleet account and the account must have been granted access to 787 e-Enabling Ground Training.

ASO PROCESS FOR IN-PRODUCTION AIRPLANES

The airline's role while the airplane is in production is limited to providing the option selections based on its desired airplane operations. Boeing will use the airline-provided selections to create the customized ASO LSAP that is included with the delivered airplane. Boeing has created an ASO description document and worksheets to help airlines determine option selections. The ASO description document provides details about the options, including pictorial examples of airplane display options and symbols, and their available settings.

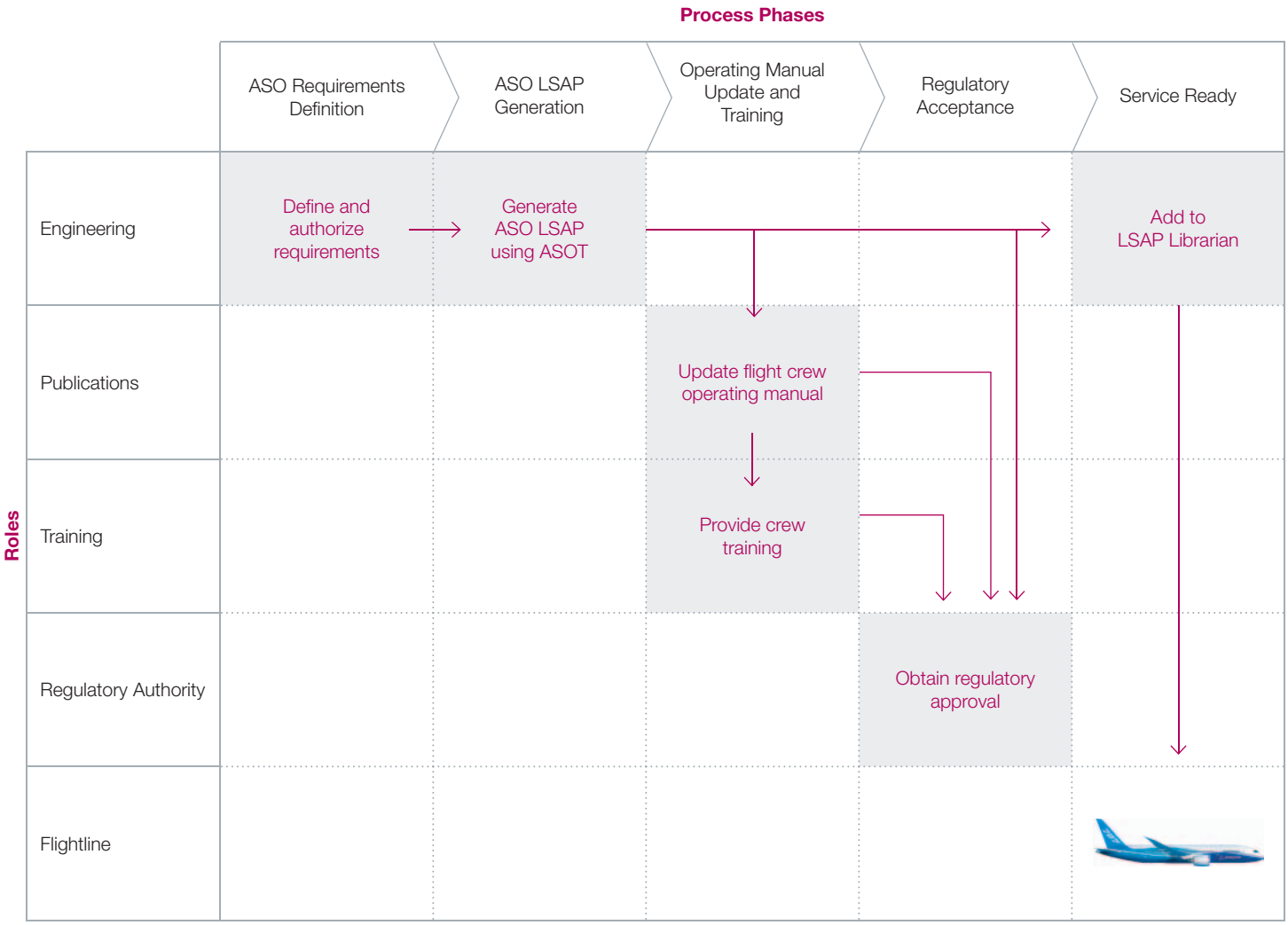
ASO PROCESS FOR IN-SERVICE AIRPLANES

A modification to an in-service airplane requires the airline to create a new ASO LSAP (see fig. 6) for one of two reasons:

- A change to an option has occurred in one of the ASO-capable systems. In this case, Boeing notifies the airline via a service bulletin that a new version of operational software is available and a new ASO LSAP needs to be created and loaded with the new version of operational software.

Figure 6: ASO processes for in-service airplanes

This is the general process flow when creating new ASO LSAPs for in-service airplanes. The detailed process is specified in the ASO Process Guidance Document.



- The airline wants to change the configuration of the ASO-capable systems. In this case, the airline can create a new ASO LSAP on its own initiative.

Before performing any work with the ASOT, the airline needs to define the ASO requirements depending on the desired operation of the airplane. Once the requirements are defined, the new ASO LSAP can be generated using the ASOT. Because the option selections can cause changes in the FCOM, the airline must notify Boeing of the changes so the manual can be generated. The ASOT provides a link to Boeing that automates this function. A new custom ASO LSAP may also require the airline to perform crew training.

Operational acceptance, which is required for any custom ASO LSAP, is performed by the airline's regulatory authority and can vary for each agency.

Boeing worked with the FAA to obtain agreement on the ASO process. This agreement is documented in an Item of Record (IOR), "Airline Selectable Options (ASO) and ASO Tool (ASOT), FAA IOR number SA-2," and is included in the ASO airline process guidance document, which is available from Boeing and is accessible on the ASOT Welcome page (see fig. 2). Airlines may use this IOR to work with their regulatory authorities as needed.

SUMMARY

The new ASOT allows airlines to configure and manage a number of selectable software options on the 787. Airlines will be able to update specific software options, generate and manage LSAPs, and request FCOM updates without Boeing service bulletins.

For more information, please contact Susan Tankersley at susan.d.tankersley@boeing.com.