

The Type Certification Process - A Primer

The FAA Organizations Involved (#1-3 are Aircraft Certification, #4 is Flight Standards)

1. Seattle Aircraft Certification Office (SACO)
2. Certificate Management Office/Manufacturing Inspection District Office (CMO/MIDO)
3. Transport Airplane Directorate
4. Aircraft Evaluation Group (AEG)

The Regulations & Other FAA Documents

- Find the Regulations and Orders at:
[http://www.airweb.faa.gov/Regulatory and Guidance Library/rgFAR.nsf/MainFrame?OpenFrameSet](http://www.airweb.faa.gov/Regulatory%20and%20Guidance%20Library/rgFAR.nsf/MainFrame?OpenFrameSet)
- FAR 21 – Certification Procedures for Products and Parts
- FAR 25 – Airworthiness Standards: Transport Category Airplanes
- FAR 36 – Noise Standards
- FAR 121 – Operating Requirements: Domestic, Flag and Supplemental Operations
- FAA Order 8110.4B – Type Certification (Recommended reading but a snooze)
- FAA Order 8100.9 – DAS, DOA and SFAR 36 Authorization Procedures (aka DDS, Delegation)
- FAA Form 8110-12 – Application for Type Certificate
- FAA Form 8130-9 – Statement of Conformity
- Advisory Circular (AC) 25.21 - Certification of Transport Airplane Structure

The BASIC Type Certification Process

FAR 21 is *The Gateway* to the Type and Production certification process, it is the single most important Aircraft Certification regulation. If you do nothing else, read:

- FAR 21 Subpart B: “Type Certificates” FAR 21.11 - .53
- FAR 21 Subpart G: “Production Certificates” FAR 21.131 - .165

In Subpart B you will find the fundamental process requirements for earning a Type Certificate. You will find topics like “Special Conditions” (21.16), Certification Basis (21.17), the definition of Type Design (21.31) and Type Certificate (21.41) and Instructions for Continued Airworthiness (21.50). Subpart G provides the fundamental requirements for earning a Production Certificate, secondary for you.

The Type Certification process has these fundamental elements (Hint – print and keep Order 8110.4B for reference, it’s the guide to FAR 21):

1. Application for TC (FAR 21.15): The date of application is important because it locks in the Certification Basis (21.17), which will generate much discussion. If a regulation is about to be published and it will be difficult to deal with, application should be made before that date, HOWEVER for transport airplanes we have five years from the date of application to get our TC [21.17(c)]. Five years is not much for a program like this.
2. Conformity requirements: Whenever a plane or part is presented to the FAA for a test, we must declare that the article conforms to the design, basically meaning the part and the drawing match. MIDO does conformity inspections.
3. Type Inspection Authorization (TIA): The TIA is an internal FAA document that authorizes the ACO employees to begin the test program, usually the flight test portion. It is the FAA “kickoff” document, and is fully described in

Order 8110.4B. When the TIA is issued, Boeing people will celebrate because it means; “Let’s do it”.

4. Type Certification Board: This is actually a series of meetings between FAA and Boeing in which issues are discussed and reviewed at a high level. Important note; The TCB, often called Type Board, is owned by the FAA, and Boeing is an invitee only. You can expect several closed FAA meetings during the program. The TCB decides when to take the critical steps, lock in Type Certification basis, issue the TIA, issue the TC, etc. See Order 8110.4B.

The sequence of events will be along these lines, with some overlap, redundancy, gaps, modifications, etc:

1. The design phase will be ongoing, of course, but there will be tension with design & airline mission requirements vs. the basic and evolving Boeing design philosophies vs. the regulations. Basic engineering design trade-offs.
2. When the design has firmed up, we must decide WHEN to make application.
3. After application is made there will be many, many discussions with the ACO and the Directorate to lock in the Certification Basis. The ACO applies the regulations but the Directorate OWNS them and assures the ACO applies them correctly. *There is some tension here because the ACO folks value their independence, they see the Directorate engineers as too far removed.* There will be discussions about issues like special conditions, equivalent levels of safety, exemptions and alternate methods of compliance. Once you know and understand the Certification Basis you will be able to develop your compliance plan.
4. AEG will play a significant role throughout the program, but mostly operational. AEG is the Flight Standards organization that bridges the gap between the Type Certification program and revenue operation of the plane. They watch the certification program and make sure the PMIs, POIs and PAIs (avionics) are prepared for what’s coming. They’re in the background for the most part but can swing a lot of weight, they’ve stopped programs in the past.
5. Special conditions and equivalent levels of safety will be discussed quite a bit for any new designs or technology Boeing will be dealing with. Things like, oh, composite wings. If there is an issue that needs to be discussed because of a unique situation, the ACO will generate an Issue Paper; a living document that will circulate among the stakeholders. The IP process will result in final determinations of what the FAA will do with unique situations. TRACK THEM, you need to know where the FAA is going before they get there.
6. Boeing will have to show the ACO that we’re truly ready for testing, and eventually the TIA will be signed. Then we go. By the way, the FAA will not participate in some tests, like flutter tests. Check out FAR 21.35. The TIA is, for the most part, a flight test document so it won’t be signed until the beginning of the big push for certification.
7. For nearly all tests, even down to component levels, we will provide a Statement of Conformity, there will be a Conformity Inspection, THEN the test will proceed. When an airplane is sitting on the ramp waiting to fly and the conformity paperwork is not signed off, things come to a head, especially

when the inspection is delegated to a Boeing employee. Conformity inspection logistics may become an issue here because of the Boeing global supplier network.

8. Turn the crank, you know what you need to do, what the requirements are and what the schedule is.
9. Once the TC is issued the 7E7 will be added to the PC.

Wild cards, caveats, etc

- This could be the biggest caveat of them all. The culture and relationship between Boeing and the FAA is sometimes more of a driver than the regulations or policies. You will see some issues arise that have more to do with “managing the FAA” than the fundamental regulatory requirements. Here is where Boeing is sometimes tempted to try and drive things from the top down, when we may send somebody into Hickey’s DC office to “help”. In many, maybe most, cases, this rubs salt in old wounds here in Seattle, where victim-think prevails. This is more of an issue in the ACO than the CMO. I believe we are in a stereotypical *codependent* relationship with the SACO, based more on history, culture and personal relationships than the regulations and policies. The people in Boeing and the FAA who are responsible for the relationship tend to keep it that way because it’s all they really know. I believe it’s unhealthy and counterproductive, blurs lines of accountability and makes recourse difficult when we’re hit with an arbitrary edict. This is from my knothole, take it with a grain of salt, but be aware.
- Delegation will become an issue if we go for it. The FAA is a bit skeptical that Boeing will move out with delegation but I think maybe it’s looking more viable. I’m still skeptical but less than before. The FAA requirements will remain the same but the way we work to comply will change. That’s at the heart of delegation. Fully meet the requirements in a way that will be more economical. See Order 8100.9, it’s the authoritative delegation source.
- Go to the hyperlink waaay at the top of this document and navigate to the Advisory Circulars, where they’re listed sequentially, by number. Find the 25.xx AC’s and at least familiarize yourself with the titles because you will be working in many of those areas. You’ll see titles such as: “*Sustained Engine Imbalance*”, “*Damage Tolerance and Fatigue Evaluation of Structure*”, “*Means of Compliance with Section 23.629, ‘Flutter’*”, “*Instructions for Continued Airworthiness of Structural Repairs on Transport Airplanes*” and “*High-Speed Characteristics*” (aka flutter, vibration, buffeting, etc). The FAA will be very interested in these things if we use a lot of composites.
- Get to know Tom McSweeny, maybe take him to dinner next time he’s in town – tell him I asked you to. He REALLY knows his stuff, he has solid connections and he knows where the soft spots are in the FAA. He’s a bit frustrated because the folks here in Seattle run things their own way (see “managing the FAA” above) but he’s finding his way within Boeing. I think he’s an incredibly valuable but underutilized resource.
- Call me any time! But you already know that, don’t you?