The Safety Continuum – A Doctrine for Application

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INTRODUCTION

Beginning in 2012, the Aircraft Certification Service (AIR) began a conscious effort to increase awareness of the safety continuum amongst all Aircraft Certification employees. An increase in awareness is critical to achieving the next level of product safety. The safety continuum is a fundamental element of the AIR: 2018 Vision.

Title 49 USC, Chapter 447, Sec 44701 (the Act) provides a clear direction to the FAA as it relates to the continuum:

> When prescribing a regulation or standard under subsection (a) or (b) of this section or any of sections 44702-44716 of this title, the Administrator shall – (1) consider – (A) – the duty of an air carrier to provide service with the highest possible degree of safety in the public interest; and (B) **differences between air transportation and other air commerce** [emphasis added];…

The United States Congress laid the foundation for the safety continuum when they authorized/established the FAA. No attempt is made at a quantifiable definition. Instead, the FAA is encouraged to recognize that not all aircraft or aeronautical products are the same. Therefore, they should not be viewed in the same light or treated in the exact same manner.

DOCTRINE

As a service, AIR will balance the needs of our applicants, aircraft owners and operators with the public's demand for safety assurance. By constantly reaching this balance, we can continue to see the safety of aviation grow as we allow for the proper introduction and oversight of safety enhancing technologies.

AIR will establish standards, policy and oversight that are adaptable over a broad range of aircraft types and operations to achieve the next level of safety in a manner that is acceptable to public interest and air commerce. Failure to do so will result in an inadvertent decrease in safety by preventing safety improvements and stifling technological innovations that can enhance safety.

DISCUSSION

Proper execution of the safety continuum leads to a balance between safety and societal burden. While too little safety oversight is a clear threat to safety, too much rigor can prove to be an equal threat. As a service, AIR will balance the needs of our applicants, aircraft owners and operators with the public's demand for safety risk management and safety assurance. By constantly reaching for this balance, we can continue to see the safety of aviation grow through the proper introduction and oversight of safety enhancing technologies.

The philosophy of the Safety Continuum must be shared equally across the multiple products the FAA oversees (airplanes/engines/propellers/parts/appliances, etc). However, the Safety

Continuum does not demand a singular application across these products. Rather, each office or directorate should tailor the continuum consistent with their product of responsibility.

This tailoring should consider the intended use and operation of the product and the product's acceptable level of risk to the general public. This tailoring applies not only to the certification requirements established by each office or directorate, but also the regulatory model those entities choose to adopt. To be certain, the continuum focuses on establishing the proper level of certitude within the regulations/requirements. Once these are established, the applicant is expected to demonstrate **compliance** to all applicable regulations/requirements.

There is no closed algebraic expression for describing the continuum. The continuum is dependent upon multiple variables, including engineering judgment. To satisfy our Congressional mandate, AIR employees must recognize the following:

Level of Safety may be a function of complexity and performance, number of passengers, risk to people and property on the ground, risk assumed by the pilot/flight crew, risk assumed by the passenger(s), engineering judgment...this is not an exclusive list; other variables will affect the proper level of safety**.**

As described in Figure 1, society demands greater safety assurance as the type of vehicles and their operations become more complex, and as the occupants become further removed from understanding and managing the risks. That is, society demands a greater safety rigor for a transport airplane versus a 2 or 4 place general aviation aircraft.
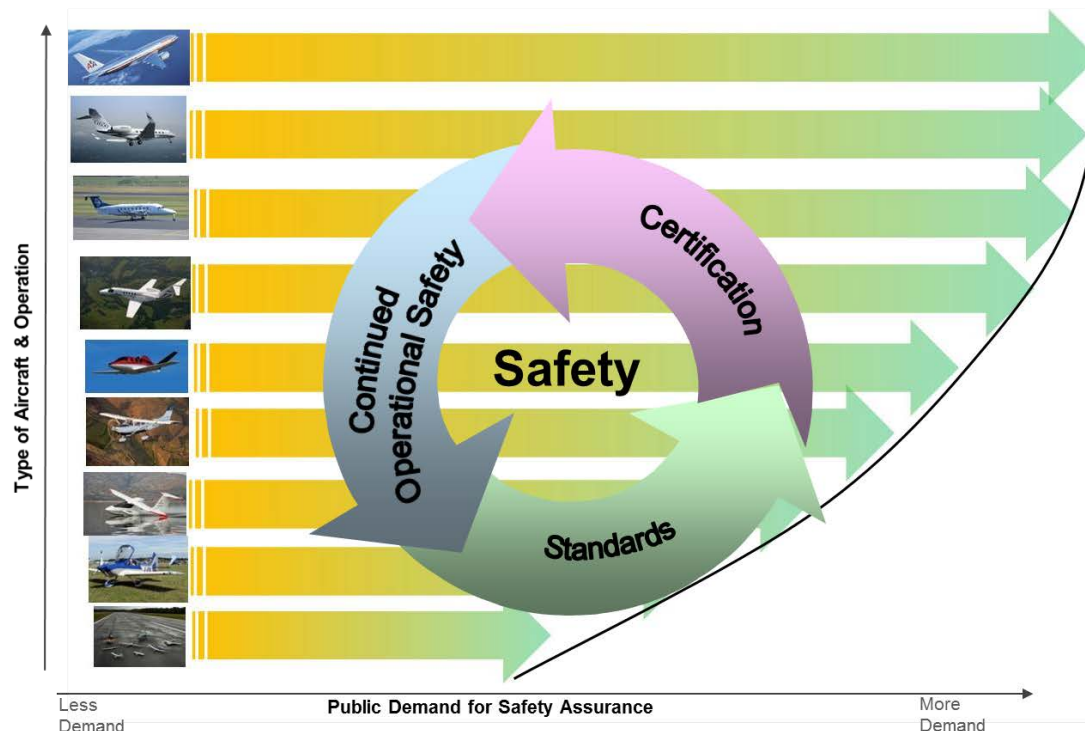

Figure 1, Safety Continuum and Societal Expectations

The FAA meets that demand in several ways including:

- Rigorous design standards in 14 CFR part 25
- Generally less rigorous but safe standards in 14 CFR part 23
- Differences between the operational rules of 14 CFR parts 91 and 121*
- Differences in flight crew qualifications, training and medical certification requirements
- Mandatory service difficulty reporting in 14 CFR 121*

* Safety is not achieved solely through certification standards.

The design, introduction, use and continued operational safety of an aircraft can be considered a "system." If AIR does not exercise safety oversight commensurate with the risk, there will be an inadvertant decrease to the safety of the system. Safety critical items "escape" and the rate of fatal accidents might increase. In Figure 2, this is shown on the left slide of the graph.

Equally challenging, however, is applying too much rigor, shown on the right side of the graph. If certifcation requirements and oversight are overly stringent, safety can be jeopardized because the burden of certification will prevent the adoption of safety enhancing technologies.
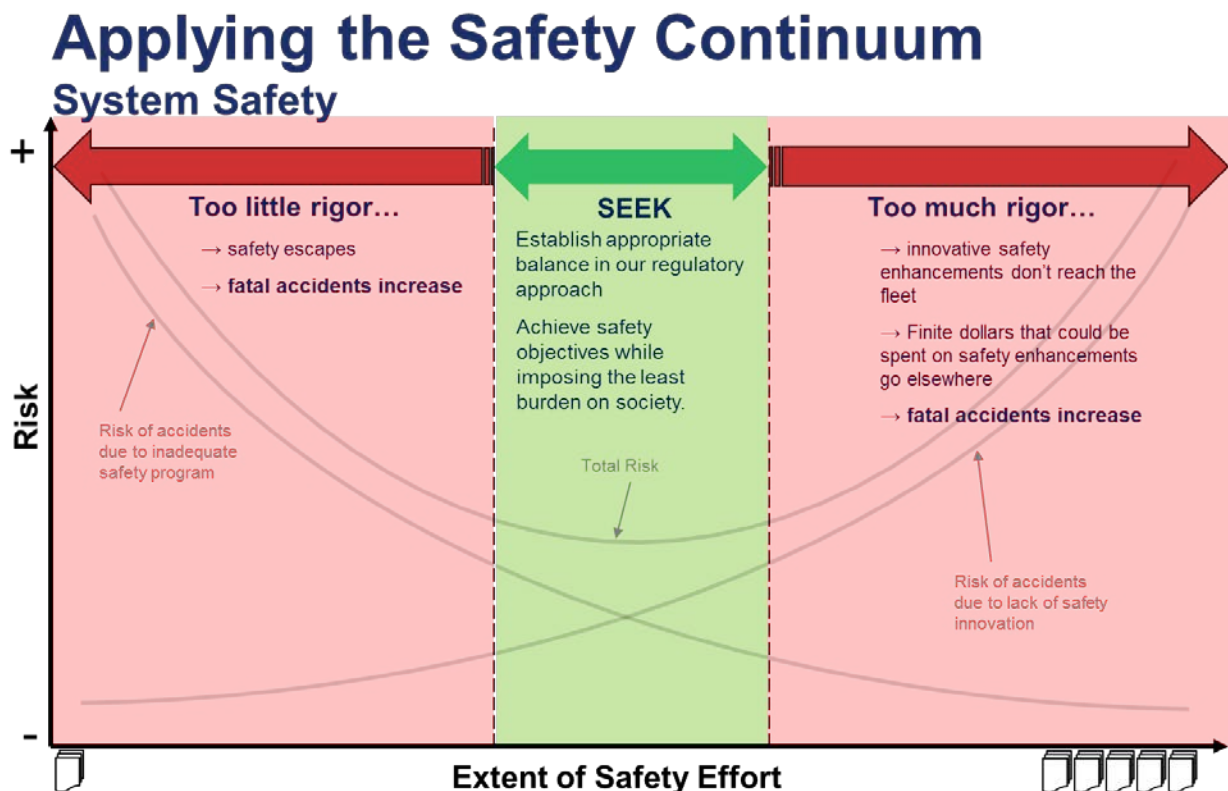

Figure 2, Safety Continuum Application

A **balanced** approach allows the FAA to meet and/or increase safety objectives while imposing the least burden on industry and society. This is shown in the green shaded area in the Figure above.