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# ADVISORY CIRCULAR

## DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION

**SUBJECT:** THE ROLE OF SIMULATION IN THE AIRCRAFT CERTIFICATION PROCESS

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1. PURPOSE.


- a. This Advisory Circular is issued to inform the industry that the Federal Aviation Administration intends to conduct an exploratory program to determine the degree to which simulation can support the aircraft certification process. It is FAA's opinion that greater use of simulation could be cost effective and could improve the quality of certification for both industry and government. This is true, particularly where introduction of new technology is involved, and therefore should be exploited to the fullest extent practicable.
- b. Examination of compliance demonstrations through simulation will include, but is not limited to, structures, systems, performance, handling qualities, and operations. Particular attention will be directed at defining the technical criteria which simulators must meet to enable demonstration of compliance for any given design feature.

2. DISCUSSION.

- a. The use of simulation to demonstrate compliance has been used in cases where flight tests are considered to be hazardous or impossible; examples of this can be found in aircraft structures and systems compliance demonstrations. From these experiences it is concluded that demonstrations of compliance through simulation could be a useful alternative to some or perhaps most of the flight demonstrations in other cases. Further, early simulation studies could reduce the possibility of requiring design changes late in a development program. It is FAA's opinion that this alternative, if proven successful, should be available to industry.
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- b. Only limited guidelines exist for using simulation in the certification process. If the full range of possible alternatives is to be made available, expanded guidelines and formal recognition of simulation must be established. No explicit effort has been made to establish the most effective uses of simulation to assist the design development and certification processes. Limited experience indicates that the potential uses could be much more extensive than in current practice. It is possible that firm agreement on special conditions could be established before development was undertaken; that systems and structural compliance could be demonstrated during development prior to flight to a greater extent than at present; that preflight training and planning could reduce significantly the flight time required to complete certification. The combined effect of these actions could provide significant savings to industry and to government and therefore supports the need for a careful determination of how simulation could be used effectively in certification.
  - c. It is recognized that the requirements for achieving valid simulations for any specific purpose and for verifying the validity of the simulations are not established at this time. A primary objective of the exploratory program is to provide the information necessary to define procedures to meet both of these requirements.
3. PLANNED ACTION. To identify the roles that may be found possible and desirable for simulation in the certification process, two concurrent activities will be initiated:
- a. A collection and technical review of those cases where simulation has been used already in the certification process with the view toward standardizing the procedures.
  - b. Hopefully, an exploratory program with industry to investigate other potential uses of simulation in the certification process and to identify where it would be cost effective to overcome limitations presently preventing such uses.
- In both of these activities, close industry participation is solicited; since it is FAA's view that industry as well as government will gain if the objectives are realized.
4. OBJECTIVES. The following objectives are expected to be realized from these activities:
- a. Identification of current simulation activities adaptable to use in the certification process.
    - (1) For these cases specify the technical criteria required for application of the technique for certification purposes.

- (2) Develop the procedural modifications necessary to formalize inclusion in the current certification process, considering technical, regulatory, and legal aspects.
- b. Identification of those uses for which simulation, with further development, could enhance the certification process.
- (1) Conduct an exploratory program to substantiate and document the potential usefulness of these new applications.
  - (2) Define clearly the nature of any technical development required in simulation techniques to make new applications possible.

  
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