Safety Communique

March 1998

SAFETY COMMUNIQUE

TO ALL RAYTHEON AIRCRAFT AUTHORIZED SERVICE CENTERS, INTERNATIONAL DEALERS, AND OPERATORS AND OWNERS OF RECORD FOR ALL BEECH BARON AIRPLANES.

SUBJECT: SPIN AVOIDANCE AND SPIN RECOVERY CHARACTERISTICS

Raytheon Aircraft Company (RAC) has developed a program designed to evaluate the spin avoidance and spin recovery characteristics of the Baron class of airplanes. The program has not been completed, but to date a total of 97 spins have been performed by a qualified RAC test pilot, flying a Model B55 Baron, instrumented to collect relevant data for analysis and evaluation. The 97 spin maneuvers have provided RAC engineers and test pilots with information which we believe should be related to owners and operators of Baron airplanes concerning the dangers of allowing twin-engine airplanes to enter a spin. The results of spin test data and analysis will be provided to the FAA.

In shortest terms, the spin tests performed to date confirm what has been known for decades about normal category, multi-engine (executive transport) airplanes: It is possible for multi-engine airplanes to enter a spin from which the airplane will not recover. Spin maneuvers are prohibited by FAA for normal category airplanes - including the Baron. Only qualified test pilots performing test maneuvers should spin these aircraft.

Some basic facts about spins may be of assistance in understanding this Safety Communique: A spin can occur whenever an airplane is stalled and is subject to yaw input. Yaw input can be provided by rudder, asymmetric power, aileron, p-factor, or any combination of these forces. Unless an airplane is stalled, a spin is not possible. One of the special dangers of low speed asymmetric flight in multi-engine airplanes is that the asymmetric power provides yaw input sufficient for spin entry if the airplane is allowed to stall.

It is for this reason that FAA regulations do not require pilots to perform single-engine stalls for training or pilot certification; and, in fact, describe specific procedures to avoid spin entry stalls as noted in the following:

1. The FAA Practical Test Standards for Airplane Multi-engine Land specifically notes that "[N]o stall shall be performed with one engine throttled or inoperative and the other engine(s) developing effective power."

2. The V_{MC} demonstration required by FAA Practical Test Standards suggests artificially limiting rudder travel (blocking the rudder pedals) to "...avoid the hazards of stalling one wing with maximum allowable power applied to the engine on the other wing." The FAA Flight Training Handbook (AC 61-21A), in the section on V_{MC} advises "...the airspeed should be reduced slowly with the elevators until directional

control no longer can be maintained. At this point, recovery should be initiated by simultaneously reducing power on the operative engine and reducing the angle of attack by lowering the nose."

The spin tests performed to date included various flight configurations of the aircraft (e.g. power on, power off, asymmetric power right and left, gear up, gear down, flaps up, and flaps down). In all but two of the spin maneuvers, the aircraft responded to the spin recovery technique described in the Baron flight manual -- that is, immediately move the control column full forward, apply full rudder opposite to the direction of spin, and reduce power on both engines to idle. In two of the test spin maneuvers, deployment of a spin chute by the test pilot was necessary to effect recovery at a predetermined safe altitude. Both of these spins were performed with power to the left engine at idle, propeller windmilling, maximum continuous power on the right engine throughout the stall, the spin entry and one 360 degree turn. The important fact demonstrated by these two spin tests is that any time asymmetric power is allowed to continue through spin entry and into a developed spin, a dangerous and possible unrecoverable spin could be encountered. RAC believes this is true any time asymmetric power is allowed to continue into a developed spin to the right or to the left.

From the test program to date, RAC has confirmed the following:

1. Recovery from a developed spin in a multi-engine airplane is, for a variety of reasons, unpredictable; it is possible, especially when the airplane is stalled under asymmetric power, to encounter a spin from which recovery cannot be effected. The greater the asymmetric thrust and the longer it is allowed to continue, the greater the chance that an unrecoverable spin could be encountered.

2. Failure to lower the nose and retard power <u>immediately</u> when a stall is encountered -- and especially, allowing power to remain on during spin entry or in a developed spin -- tends to raise the nose (increase the angle of attack) and result in a spin from which recovery is far more difficult and sometimes impossible.

3. Asymmetric power stalls must always be avoided. The V_{SSE} airspeed published in the manual must carefully be observed any time power to one engine is suddenly retarded. V_{SSE} is, by definition, an airspeed above which the airplane can safely be operated under asymmetric power and should faithfully be observed as a minimum speed during single engine flight.

4. The Model B55 Baron -- and we believe the other Baron models yet to be tested -- have good spin avoidance characteristics. At the point of stall -- even with asymmetric power -- if the control column is immediately and briskly moved forward, lowering the nose to regain flying speed, and the power is simultaneously retarded, the airplane will recover immediately, reliably, and smoothly. There is sufficient time to execute this control input even at the point of stall. A multi-engine pilot of ordinary skill can easily avoid an unintended spin.

5. Minimum Control Speed (V_{MCA}) is determined at an aft center of gravity, with sea level, standard day engine power. At forward centers of gravity, typical of most training flights, the aircraft will not experience a loss of directional control before a single-engine stall occurs. Unless recovery actions are promptly initiated (which are identical to the V_{MC} demonstration recovery -- immediately lower the nose and retard power on the operating engine) a dangerous spin entry is likely to occur. For more specific instruction, refer to the STALLS, SLOW FLIGHT, AND TRAINING advice provided in Section X of the manual. If operators follow the instructions in the manual, an unintended spin will be avoided.

6. During single-engine operation (actual or simulated), at the first indication of approach to a stall (the stall warning horn, buffeting, or both) stall recovery must be initiated immediately -- that is, simultaneously lower the nose and retard power. If this instruction is not followed, a stall will occur and a dangerous spin is likely to occur.

7. It is mandatory that the stall warning system be kept operational and in proper adjustment at all times. The stall warning horn must not be deactivated by interruption of circuits, circuit breakers or fuses.