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ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

SUBJECT: ENGINE POWER-LOSS ACCIDENT PREVENTION

1. PURPOSE. This advisory circular brings to the attention of aircraft owners, operators, manufacturers, and maintenance personnel the circumstances surrounding engine power-loss accidents with recommendations on how, through individual effort and consideration, those accidents can be prevented.

2. BACKGROUND. A review of National Transportation Safety Board briefs of general aviation accidents for the years 1973, 1974, and 1975, that list engine failure as a cause, showed a total of 1,694 accidents. Those accidents resulted in 237 fatalities and 283 serious injuries. For several years, "power loss" has been the greatest single type of general aviation accidents and accounts for between 21 and 23 percent of all accidents. Analysis shows that accidents have resulted from:

a. Personnel Errors.

(1) Operations which exceeded the limitations of the powerplant.

(2) Failure of maintenance personnel to utilize acceptable maintenance procedures.

b. Failure of Engine, Engine Part, or System Component.

(1) Engines were operated beyond the overhaul time recommended by the manufacturer.

(2) There was noncompliance with airworthiness requirements regarding inspection, overhaul, repair, preservation, and/or replacement of parts.

(3) Design changes and alterations were completed without engineering evaluation and approval.

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(4) Parts failed due to operation outside operating limitations; i.e., overtemp, overboost, low oil pressure, etc.

c. Fuel Starvation and Exhaustion.

(1) Fuel starvation (fuel on board the aircraft but not supplied to the engine(s)) and fuel exhaustion (no fuel available on board the aircraft) resulted in 19 percent of the engine power-loss accidents. This usually results from improper preflight planning or improper fuel management procedures.

(2) Contamination continues to be a notable factor in fuel starvation accidents. Advisory Circular 20-43C, Aircraft Fuel Control, contains valuable information that alerts the aviation community of the inadvertent mixing or contamination of turbine and piston fuel and provides recommended servicing procedures.

d. Fuel System Design. Accidents have resulted because pilots and maintenance personnel failed to become familiar with the different fuel systems and operating procedures. Design changes, accomplished without proper evaluation, the lack of standardization of controls configuration among aircraft, plus the peculiarities in aircraft fuel system designs, have contributed to power-loss accidents.

3. RECOMMENDATIONS. The following are recommended operating practices that could help reduce engine power-loss accidents:

a. General.

(1) Know the limitations of the aircraft and aircraft powerplant. Avoid operating in excess of those limitations. Be sure all engine(s) are within acceptable operating parameters prior to takeoff. Keep proficient in all engine and systems operating procedures, including emergency procedures. Use the checklist during normal and emergency operations.

(2) Follow the manufacturer's operating instructions. Have a qualified person investigate all abnormal engine operating conditions (oil and fuel consumption, low power, vibration, engine instrument readings, etc.).

(3) Positively utilize a powerplant and propeller maintenance program which gives full consideration to the FARs and manufacturer's recommendations.

(4) Keep abreast of technical information related to the aircraft fuel, oil, parts, airworthiness directives, manufacturer's technical publications, etc.

(5) Know proper procedures when engine inlet or carburetor icing conditions are encountered.

(6) Follow engine manufacturer's inspection procedures following propeller strike or engine sudden stoppage.

(7) Operate engine controls smoothly, abrupt movements can result in engine malfunction and power loss.

(8) Avoid overspeed, overboost, and overheat.

b. Fuel Management

(1) In relation to airplane performance, the fuel quantity on board the aircraft is only "time in your tanks." Management of that time should rank high on the list of a pilot's priorities. Be fully familiar with the aircraft fuel system and fuel management procedures.

(2) Make adequate preflight preparations to ensure that sufficient clean fuel is on board the aircraft for the time to destination, plus an adequate reserve, predicated on airplane performance.

(3) Know and understand the positions of the aircraft fuel selector valves. Markings should be legible, valve should be easy and smooth to operate and with positive detent action.

(4) Be familiar with the sequence for selecting fuel tanks of the aircraft. The use of fuel from tank(s) other than as recommended (especially during takeoff and landing) can result in eventual fuel starvation. Many aircraft return unused fuel from the carburetor to a tank. If the tank is full, the fuel goes overboard through the vent and is lost, thus reducing range.

(5) A pilot should know the total USABLE fuel on board the aircraft before flying. The UNUSABLE fuel should not be considered when planning a flight.

(6) Make a visual inspection to assure that the fuel tanks are full. If you are in the habit of flying with partial fuel loads, use positive means to know the quantity of fuel on board the aircraft before flight. Complete trust in fuel gauges has often resulted in fuel depletion short of destination and accidents.

(7) Make a thorough fuel drain check of all sumps before flight. Consult the owner's manual for proper procedures.

(8) During preflight inspection, determine that all tank vent openings are clear of obstructions.

(9) Check fuel flow from each tank to engine(s) prior to taxi.

(10) Determine that hand primers are closed and locked in the detent after use.

(11) Be fully familiar with fuel boost pump operating procedures.

(12) When switching tanks, visually check the fuel selector position and the fuel quantity in the selected tank after moving the selector.

(13) After switching tanks, monitor the fuel pressure until you are sure there is fuel flow from the tank.

c. Maintenance

(1) Maintenance should include inspection of fuel cells and tanks for discrepancies such as collapse, contamination, vent obstruction, internal damage, security, leaks, gauge accuracy, and general condition.

(2) Periodically make a visual check of the fuel filter for condition and/or contamination.

(3) Check operation and security of fuel selector and system control handles and/or knobs.

(4) During maintenance, a detailed inspection should be made of fuel quantity indicating system wiring, components, and calibration.

(5) Design changes and alterations to aircraft engines should be done with approved data.

(6) Replacement of engine parts should be completed following manufacturer's instructions.

(7) Maintenance should be accomplished in accordance with the manufacturer's recommendations.

(8) Dress out propeller blade nicks, dents, scratches, etc., as necessary, to prevent fatigue cracks that could cause propeller blade failure resulting in power-loss.

4. SUMMARY. Through the individual and collective efforts of the aviation community, we hope to eliminate factors that have caused engine power-loss accidents. This advisory circular is one of many efforts to try to reduce the "power loss" type of accidents. The simple act of "keeping the engine running" could appreciably reduce the number of accidents.

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