U.S. Department
of Transportation
**Federal Aviation
Administration**

General Aviation Airworthiness Alerts

AC No. 43-16

Alert No. 64
November 1983

Improve Reliability-Interchange Service Experience

C O N T E N T S

AIRCRAFT

ACCESSORIES

ENGINES

MAINTENANCE NOTES

BE AWARE

CAUTION

SOMETHING TO THINK ABOUT

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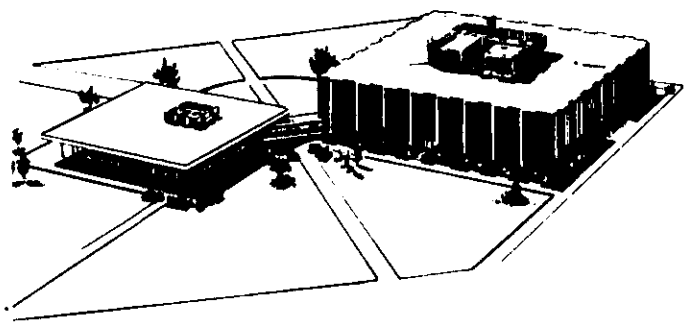
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
WASHINGTON, D.C. 20590

ADVISORY CIRCULAR
AC 43-16

GENERAL AVIATION AIRWORTHINESS ALERTS

NOVEMBER 1983



AVIATION STANDARDS NATIONAL FIELD OFFICE
MIKE MONRONEY AERONAUTICAL CENTER

The General Aviation Airworthiness Alerts provide a common communication channel through which the aviation community can economically interchange service experience and thereby cooperate in the improvement of aeronautical product durability, reliability, and safety. This publication is prepared from information submitted by those of you who operate and maintain civil aeronautical products. The contents include items that have been reported to be significant, but which have not been evaluated fully by the time the material went to press. As additional facts such as cause and corrective action are identified, the data will be published in subsequent issues of the Alerts. This procedure gives Alerts readers prompt notice of conditions reported via Malfunction or Defect Reports. Your comments and suggestions for improvement are always welcome. Send to: Aviation Standards National Field Office, Attn: AVN-110, P.O. Box 25082, Oklahoma City, Oklahoma 73125.

A I R C R A F T

A E R O S P A T I A L E

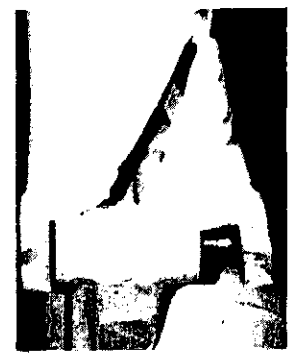
Aerospatiale Model AS-355F	Drive Shaft	The tail rotor drive shaft bearings were found rough from lack of lubrication. The submitter advises the ball bearings are not designed to be lubricated while in service. Part total time - 361 hours.

B E E C H

Beech
Model B23

Broken Gear

Results of a hard crosswind landing.



Beech Model 99A	Frozen Cables	The pilot was unable to change altitude during cruise because the elevators would not move. The aircraft was flown and landed using electric trim. Investigation revealed 1-1/2 inches of water in the fuselage aft section behind each circumferential bulkhead. The water had frozen and locked the elevator control cables. This report was received in February 1983.

Beech
Model 200

Improved Water Drainage from Aft Fuselage

Two recent instances of restriction to the elevator control system, during flight, due to ice accumulation in the aft fuselage section, have been reported. Beech Super King Air 200 Communiques Nos. 13 and 22 pertain to this subject and recommend special emphasis be directed to assure that aft fuselage drain holes are clean and open. An inspection of the drain holes has been included on the 100-hour inspection form to assure these drainage provisions are free from debris and corrosion.

Beechcraft Class II Service Instruction No. 0963 was issued to improve water drainage from the aft fuselage by providing three additional drain holes on the following Super King Air airplanes: Model 200, S/N's BB-2 through BB-185, BB-187 through BB-202, BB-204 through BB-269, BB-271 through BB-285; and Model 200T, S/N's BT-1 through BT-3.

NOTE: This article was published in Alerts No. 31, dated February 1981. There have been recent reports of restricted elevator control systems due to ice accumulation on Beech Models 200, 100 and 99 aircraft.

B E L L

Bell Model 214ST	Feathering Bearings P/N 205-012-710-1	During a post flight inspection, the tail rotor feathering bearings were found cracked. The unit was disassembled and four bearings required replacement because the spherical ball portion of the bearings had cracked. Part total time - 274 hours.

C E S S N A

Cessna Single-Engine Aircraft	Rudder Pedals	The holes in the rudder pedals, which are used to attach the brake master cylinders, are being found excessively worn. In several instances, the hole has torn out, causing loss of braking. The submitter recommends the rudder pedal/cylinder attach point be checked at each required inspection. NOTE: This article was previously published in Alerts No. 47, dated June 1982.
Cessna Models 150 through 150K, 172 through 172K, 175, and 182	Main Landing Gear U-Bolts, P/N's 0441161 and 0541153	Failures of the main landing gear U-bolts continue to be a problem. The failures occur primarily across the threads. The submitter recommends these bolts be checked during all inspections. Maintain torque values in accordance with the applicable Cessna Service Manual.

Cessna Model 150J	Corroded Spar	Removal of the cabin headliner and soundproofing revealed the front spar assembly was corroded through near the left wing attach point. The submitter advised the headliner and soundproofing had trapped water, which caused the corrosion problem. Inspection of other Model 150, 152, and 172 aircraft revealed water trapped in this same area. Time on the reported aircraft - 2,405 hours.
Cessna Model 182P	Water in Fuel Cells	Water had gotten into the fuel through leaking fuel caps. The caps were resealed and the system was drained. More water appeared after the aircraft was flown again. The tank's covers were removed and water was found trapped between wrinkles in the fuel cell. Holding the aircraft tail section to the ground and physically shaking the aircraft is the best method for dislodging the water. Then drain all the sumps, taking special precautions to drain at least 1 quart from the main fuel sump on the firewall. The submitter recommends this procedure be followed after the aircraft has been exposed to rain or snow or after any long periods of storage.
Cessna Model R182	Alternator Bracket P/N 76906	The alternator was found loose on its mounting during an inspection. Further investigation revealed the mount boltholes had elongated. Aircraft time - 205 hours.
Cessna Model P210N	Alternator Cooling Fan	The alternator cooling fan came apart and cut a 4-inch gash in the battery box. Pieces of the fan also hit a flexible fuel hose but did not cut through. Inspection of the fan pieces disclosed fatigue cracks in and around the areas where the blade was formed. The spot welds where the blade assembly was welded to the hub did not fail. Aircraft time - 440 hours.
Cessna Model P210N	Boot Assemblies P/Ns 1211360-5 and -6	The pilot reported the cabin pressure dropped 1,600 feet when the gear was extended for approach. Investigation disclosed both boots were cracked and torn next to the bulkhead at the downlock cylinder. There were two reports with aircraft times of 910 and 1,396 hours.
Cessna Model T210N	Alternator Through Bolts	The aircraft sustained complete alternator failure during flight in IFR conditions. The pilot made an unscheduled landing on battery power without incident. Investigation revealed the alternator through bolts had backed out, and the alternator came apart. A new alternator was ordered from a supplier with specific instructions that the through bolts be secured with some type of locking device. Inspection of the new alternator disclosed no locking device of any kind was used to secure the alternator through bolts. The submitter recommends that alternators be checked for some type of positive locking device for the through bolts.

Cessna Model T210N	Kinked Cable	An investigation of a gear up landing revealed the warning horn did not sound because of a kink in the control assembly follow-up cable. The kink would not allow full cable travel required to activate the gear warning horn microswitch.
Cessna Model 421C	Combustion Air Blower, P/N A-074D48	The ground crew observed dense smoke and fire in the aft area of the nose wheel as the aircraft taxi ed to the runway. Inspection revealed the smoke and fire emitted from the heater exhaust. Further investigation disclosed the combustion air motor had failed and the combustion air pressure switch had also failed in the closed position. The pressure switch controls the ignitor and fuel supply. Both systems continued to operate. Burning of the excessive rich fuel mixture created the dense smoke and fire from the heater exhaust.
Cessna Model 500	Cracked Turnbuckle Barrel	The primary elevator control cable turnbuckle barrel in the aft equipment bay was found cracked, laterally, from each threaded end. The submitter recommends a visual inspection for condition. Aircraft time - 3,525 hours.
E M B R A E R		
Embraer Model 110P1	Worn Bearing	The pilot advised there was excessive nose wheel shimmy and vibration. Investigation revealed the nose gear connecting rod bearing was severely worn and had excessive play. Installing a new bearing corrected the shimmy and vibration problem.
G A T E S L E A R J E T		
Gates Learjet	Accelerometer	The following information is contained in Gates Learjet Service News Letter No. 79, dated March 1983: Caution should be taken when performing the 150-hour accelerometer inspection/check to avoid breaking the coaxial cable/wire when rotating the unit per instructions. The most common mode of failure experienced if a wire is broken is lack of pusher. With no pusher, the stall warning system will fail the preflight test.
Gates Learjet All Models	Alcohol Anti-Ice System	With the onset of colder weather, operators are reminded of the importance of servicing the alcohol anti-ice system only with methyl alcohol (Methanol), Federal Specification O-M-232 Grade A, as stated in the maintenance and flight manuals. This is the only alcohol approved for this system.

GULFSTREAM AEROSPACE

Gulfstream Model 500U	Rod and End Assembly, P/N 5610252-39	One engine experienced a power loss during takeoff. The engine intake air was shut off due to separation of the butterfly valve linkage. The ball and socket of the rod and end assembly separated from the alternate air butterfly valve actuating arm. The weight of the arm that remained attached to the lower butterfly valve arm caused the lower butterfly valve to close, shutting off intake air to the engine.
Gulfstream Models 690A and 690B	Drag Link Support Structure	A mechanic found three separate aircraft with cracks along the lower forward section of the channel, P/N 310054-42. The cracks were at the channel attachment to the right side of the fuselage nose structure. The submitter recommends careful attention be given this area during inspection.
Gulfstream Model 690D	Chafed Torque Tube	Elevator torque tube damage has been reported on low time aircraft. Damage occurs from rubbing on a hydraulic line mount bracket. The bracket is used to support the hydraulic brake line and is mounted under the floor beneath the pilot's seat. The corrective action was to reposition the hydraulic line bracket and replace the damaged torque tube.

HUGHES

Hughes Model 369D	Blower Drive Belt P/N 369D25623	The pilot observed a burning rubber odor and (approximately 2 minutes later) a high frequency vibration developed. The inner cord of the blower drive belt separated and was drawn into the blower, causing the shaft to shear. The mechanic believes the belt became loose (or stretched) and rode up on the bracket, causing the failure. The belt had been installed and shimmed to maximum tension 47 hours previously. The submitter recommends the belt again be shimmed to maximum tension 25 hours after a new installation.
Hughes Model 369D	Rod End Bearing Failure	The pilot observed vibrations from the tail rotor during forward flight. He was aware of holding a 3-inch deflection forward of neutral on the left pedal in order to continue straight flight. An emergency was declared and a safe landing was accomplished. Investigation revealed the rod end bearing on one of the tail rotor pitch change links had failed. This failure allowed the pitch link to shift to the retaining bolt and nut assembly. The retaining bolt and nut assembly prevented complete loss of tail rotor control. The submitter advised the failed rod end appeared normal during a 100-hour inspection the previous day. Part total time - 500 hours.

The person who admits he has a lot to learn has already learned a lot.

I S R A E L A I R C R A F T

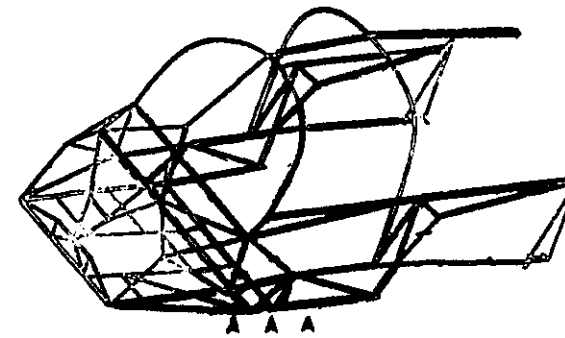
Israel Model 1124	Nose Wheel Steering Cable P/N 503028-535	Four of the seven strands of a 7x19 cable were found broken at Station 19.683. The submitter advised the broken strands were on the outside of the pulley between the pulley and the bulkhead, and the area is difficult to inspect. The area had been inspected 180 hours prior to finding the broken cable strands. The submitter recommends that 1124 operators be aware of close inspections required in this area.

M O O N E Y

Mooney
Model M20C

Rusted Longeron

The left lower longeron was found rusted from the inside out in several places. This was the second rusted longeron the submitting repair station has recently found. Mooney Service Bulletin M20-208 pertains to the problem.



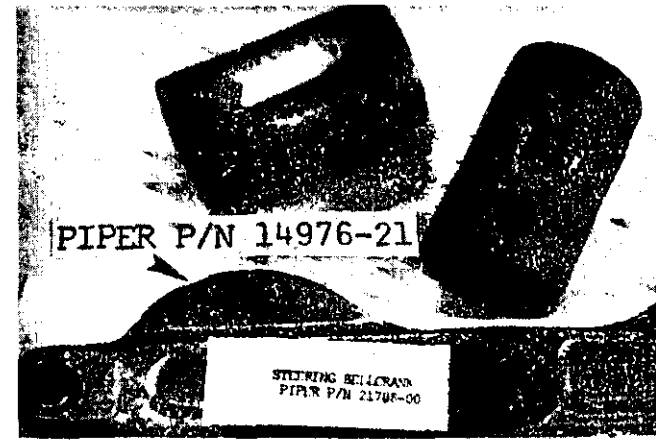
Problem Area
Left and Right

P I P E R

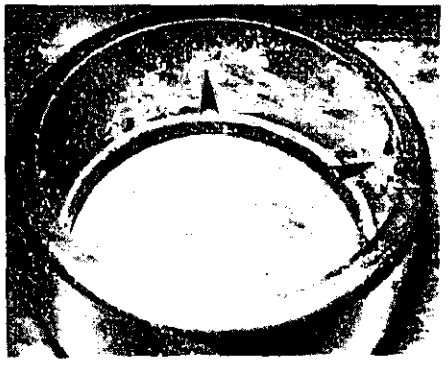
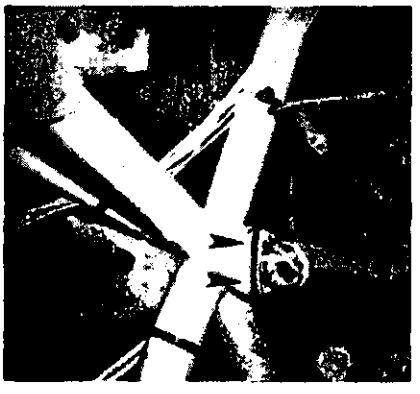
Piper
Model PA-24

Nose Steering
Bellcrank

The nose gear steering bellcrank indicated excessive wear on the cam faces. Investigation disclosed peening resulting from excessive clearance between the steering bellcrank and the steering arm bushings. Both steering arm bushings were worn to hourglass shapes, and one showed indications of not turning. The submitter advised this condition could be prevented by maintaining gap clearances between the bushings and bellcrank in accordance with Piper Comanche Service Manual, Chapter 6-16(a). The submitter also advised these parts are common to PA-30 and PA-39 aircraft.



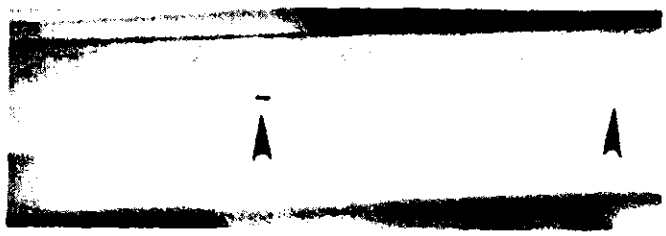
Piper Model PA-31	Flap Actuator P/N 451 813	The actuator worm shaft came out of the flex shaft gearbox and the flap dropped down during landing rollout. Disassembly of the flap actuator assembly revealed the worm shaft retaining nut had an improperly staked lock tab washer. This allowed the worm retaining nut to run loose on the threads. The threads were eventually worn to the point that the nut slipped off over the threads. Aircraft time, 1,253 hours.

Piper Model PA-31-300	Deteriorated Hose	The pilot advised of low pneumatic pressure. Investigation disclosed the hose coupling in front of the regulator assembly had deteriorated and one side had blown out. The submitter advises the hose was original equipment. Aircraft time - 1,966 hours.
Piper Model PA-31-325	Gear Door Actuator Hoses	The main gear tires can contact the gear door actuator hoses upon retraction. The submitter advised of one incident where the tire struck the hose and broke the fitting off the actuator, which resulted in loss of hydraulic fluid and an emergency landing. The hoses can be secured to other solid lines in the wheel well and the actuator fittings rotated to provide more clearance. The submitter suggests the hoses and fittings be checked during gear retraction with the aircraft on jacks to be positive of adequate clearance.
Piper Model PA-31-350	Sheared Bearing Retainer Pins	A torque link broke during takeoff. Disassembly of the right main gear strut assembly revealed that three of the pins had sheared and one was missing. This allowed the piston to extend and be held only by the torque links until one broke. 
Piper Model PA-34-200T	Pitot Head	The pitot head would not fully heat and froze over. The reporting repair station advised this was the fifth pitot head replaced within the past 6 months on low-time Piper aircraft because of the same problem. Time on reported aircraft - 149 hours.
Piper Model PA-36-300	Cracked Fittings	The left and right forward spar fuselage-to-wing attach fittings were found cracked. This area was inspected because the pilot reported he could hear a "thump" sound on landing. 
Piper Model PA-44-180	Carburetor Heat	Both carburetor heat boxes were found cracked and the air valve shafts were found worn severely during an annual inspection. Aircraft time - 738 hours.

Piper
Model PA-60-601P

Corroded Pushrods

The aileron pushrods were found corroded. There were some corroded spots through the tubes. The corrosion was located 51 to 72 inches from the inboard end of the tubes in the area just aft of the engines. Aircraft time - 1,088 hours.



Piper
Model PA-60-601P

Heater Relay

During an inspection, the heater relay was found separated from the mount bracket. The exposed terminals had shorted to the heater. The submitter recommends the terminals on the relay be covered and the wire bundle secured to prevent the relay from falling down on the heater.

S I A I - M A R C H E T T I

SIAI-Marchetti
Models F260, F260B
and F260C

Canopy Latch

The manufacturer has determined that the canopy tends to lift at "V_{ne}" (velocity never exceed = 225 knots) which may allow the canopy latch assembly, P/N 260-11-164-01, to unlock on certain SIAI-Marchetti Models F260, F260B and F260C airplanes. However, the manufacturer has determined that this condition does not involve opening of the canopy. SIAI-Marchetti has issued Service Bulletin No. 260B29, dated February 20, 1979, which provides instructions for replacing the canopy catch, P/N 260-11-129-11, with a longer canopy catch, P/N 260-11-129-13, to prevent accidental unlocking of the canopy.

S W E A R I N G E N

Swearingen
Model SA26-AT

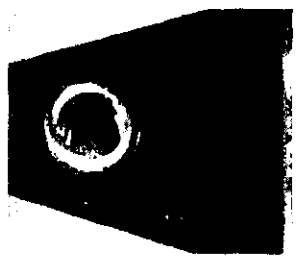
Corroded Wing Bolts

During compliance with Airworthiness Directive 81-26-05, the lower forward wing bolts on each wing were found defective. One bolt was severely corroded at the shank of the bolt. The other had small white marks in the metal, at the fillet, under the bolthead. Further inspection disclosed the white marks were intergranular corrosion. The submitter recommends close attention be given these areas during inspection.

Swearingen
Model SA226-TC

Elevator Bracket

During a routine inspection, the inner bearing and bracket on the left elevator were found worn beyond serviceable limits.



ACCESSORIES

BENDIX

Bendix Magneto	Distributor Block P/N 10-52958	Four new distributor blocks were found with cracked mounting ears at the screw holes when removed from the boxes. The cracks were cause for rejection in accordance with the overhaul instructions form L-527-4.

MARVEL-SCHEBLER

Marvel-Schebler Carburetor Model HA-6	Float Pin	The engine in a Cessna R182 began losing power while at 3,000 feet altitude. Investigation disclosed the carburetor was flooding due to worn float pin bosses. The pin had come out of one boss, preventing the float needle from properly seating. There was no indication of the condition prior to power loss. Time on the carburetor - 760 hours. NOTE: A related article appeared in Alerts No. 60, dated July 1983.

SLICK

Slick Magneto Model 4281R	Failed Bearing P/N M3006	The aircraft engine was hard to start. The magneto was disassembled and the rear bearing was found frozen and spinning in the bearing housing.

ENGINES

ALLISON GAS TURBINE OPERATIONS

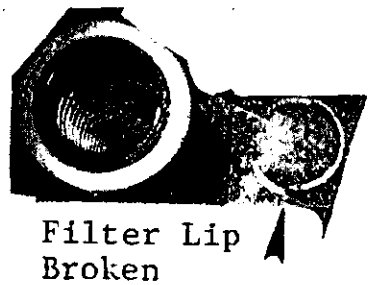
Allison Models 250-C28 and -C30 Series Engines	Compressor Mount Assembly

Compressor mount assembly, P/N's 6896021, 6898966 and 68998611 have experienced fatigue cracks in areas near the mounting pads. A new compressor mount assembly, P/N 23007217, is now available through Allison distributors to eliminate fatigue cracks. Allison Commercial Engine Bulletin CEB 72-2085/3085 provides the appropriate service information for replacement. Allison Commercial Engine Alert Bulletin CEB-A-72-2080/3081 and the appropriate operation and maintenance manual defines inspection intervals/criteria for continued airworthiness on existing compressor mount assembly part numbers that are superseded by P/N 23007217.

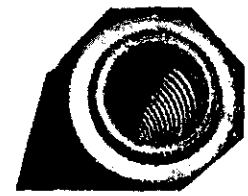
G A R R E T T

Garrett Engine Oil Filter
Model TPE-331-10U Torite 8113-21

The oil filter lip was found broken off when the filter was removed from the engine.



Filter Lip Broken



New Filter

M A I N T E N A N C E N O T E S

DRAIN HOLES

Numerous reports, received annually, identify structural corrosion problems and other types of hazardous conditions that have developed because drain holes in the aircraft were partially restricted or completely closed. Many of these reported problems required an appreciable period of time to reach the state of deterioration found. Therefore, it may be assumed the drain holes were also clogged for at least a comparable time interval.

Regardless of materials used to cover an aircraft, drain holes are necessary to prevent the accumulation of liquids and serve as air vents. To assure the satisfactory accomplishment of these functions, the manufacturer located these drains in specific locations at the low points of wings, control surfaces, fuel compartments, the fuselage belly, etc. Should it be necessary to replace the skin on an aircraft, it is essential that new drain holes be provided at these same locations. Failure to do this creates a suitable environment for future costly problems.

Once opened, drain holes require no maintenance other than a periodic check to determine that they have not become clogged. The skill and time involved in doing this would indeed be a small price to pay for preventing the development of a condition that may not be suspect or detected until too late.

NOTE: There was a recent report of plugged drain holes in a Cessna 150 aircraft. The aircraft had been stripped and repainted sometime prior to finding the drain holes plugged. It is recommended a thorough inspection of all aircraft openings (pitot static, airspeed, drain holes, etc.) be accomplished after aircraft appearance maintenance - cleaning, polish-wax, and painting.

B E A W A R E

ISOPROPYL ALCOHOL DEICE SYSTEMS WITH NON-METALLIC LINES IN THE CABIN

An in-flight fire in the cabin of a DeHavilland DHC-6 airplane was the result of failed tygon plastic (vinyl base) line in the isopropyl alcohol deice installation. Certain plastic tubing and components become brittle with service use, depending on how the tubing is secured or terminated, and also on the operating environment.

In view of the potential for leakage, the submitter recommends that all owners and operators continually monitor the serviceability of the in-cabin components of these systems.

C A U T I O N

EXPLODING TIRE

As the F-14 taxied to the catapult, a troubleshooter noticed that one of the tires showed some abnormal cuts. When he approached the tire assembly to examine the cuts, it exploded and caused the following to occur to our (fortunate) victim:

The sole and heel of one of the troubleshooter's day-old flight deck boots were partially blown off.

Three hundred fifty psi nitrogen escaping from the exploding tire inflated his left trouser leg and then shredded it.

He was knocked backwards approximately 5 feet, but not seriously injured due to the protection afforded by the required protective survival flight deck equipment which he was wearing.

More than 900 incidents of exploding tire/wheel assemblies have been reported during the past 5 years. Although the majority took place during takeoff or landing, 22 occurred while the aircraft was parked or under tow.

An inflated tire is potentially far more dangerous than a piece of ordnance because of the difficulty in recognizing an existing problem and the inability to safe or dearm it. An F-14 mainmount tire will release more than 340,000 pounds of energy while exploding. That's equal to the energy contained in half a stick of dynamite, or as much kinetic energy as a 3,000 pound automobile possesses at 58 mph!

Avoid the dangers that can result from an exploding tire:

Insure proper calibration and use of inflation equipment.

Identify and replace damaged tire/wheel assemblies.

Always follow the established safety procedures contained in the Maintenance Instruction Manual for your particular aircraft when handling tires.

Excerpted from U.S. Naval Safety Center Weekly Summary
July 10-16, 1983

S O M E T H I N G T O T H I N K A B O U T

Special Study; Loss of Control in Adverse Weather Accidents

The data obtained from the Accident/Incident Data System (AIDS) indicate the number of loss of control accidents in adverse weather has increased from 67 in 1977 to a peak of 90 in 1979, decreased to 72 in 1980, and then increased to 77 in 1981. The number of fatalities resulting from these accidents has increased from 108 in 1977 to a peak of 187 in 1979, then decreased to 157 in 1980, and increased to 164 in 1981. The number of estimated hours flown, which was obtained from the General Aviation Activity and Avionics Survey, dated 1981, was 35.8 million in 1977, increased to 43.3 million in 1979, then decreased to 41.0 million in 1980, and further decreased to 40.7 million in 1981.

The total number of loss of control accidents in adverse weather during the 5-year study period was 387 and the total number of fatalities was 796, resulting in a fatality rate of 2.05, which ranks number 1 in fatalities per accident. Of the total number of accidents, 342 (88 percent) were fatal and 291 (75 percent) were in instrument meteorological conditions. Only 136 (35 percent) of the pilots involved in these accidents were instrument rated.

Investigation of the data in the Enforcement Information System revealed that there were 355 enforcement actions initiated against pilots for operating in instrument weather conditions when they did not possess an instrument rating during the period from 1978 through 1981. Of the 355 enforcement actions initiated, 253 (71 percent) were concluded with a final enforcement action

against the pilot.

Loss of control accidents in adverse weather have a direct relation to seasonal weather changes. The high accident periods are in April and November.

This study reveals that complex high performance aircraft are more likely to be involved in this type of accident. A table of the most involved aircraft and accident rates based on aircraft population is included. Of the first four aircraft with the highest accident ratio, three are complex, high performance aircraft. This table is included to show the type of aircraft most involved in these accidents are faster, longer range aircraft, and not to imply that one aircraft is any safer than another.

AIRCRAFT MOST INVOLVED IN THIS TYPE ACCIDENT

RANK	MAKE	AIRCRAFT GROUP	NO. ACCIDENTS	NO. AIRCRAFT	ACCIDENT RATE
1	Beech	36	10	1869	.006
2	Cessna	210	29	6576	.004
3	Gulfstream	AA1, AA5	12	2986	.004
4	Beech	35	26	7117	.003
5	Piper	PA28	61	23094	.002
6	Mooney	M20	12	5990	.002
7	Cessna	172	35	25899	.001
8	Cessna	182	17	14254	.001
9	Cessna	150	22	20682	.001

Information obtained from General Aviation Activity and Avionics Survey (1981), and Census of U.S. Civil Aircraft (1981).

Adapted from Flight Safety Foundation, Inc., Aviation Mechanics Bulletin (Delta Airlines Tech Review)

DANGER - ENGINE INLET SUCTION!

One air carrier recently reported an incident involving an employee who ventured too close to the inlet of an operating jet engine despite all earlier warnings. In this case, the suction force pulled him toward the inlet. His hat and headphones were ingested, but, fortunately, he was able to save himself by hooking his elbow around the nose cowl lip. Damage to the engine exceeded $10,000. This incident, although not fatal, serves as a reminder that complacency can be very expensive.

Perhaps the lack of awareness of the powerful invisible forces surrounding a dangerous inlet fosters complacency. All personnel who may be in the area where engines are operated should be aware of the suction forces surrounding an engine inlet.

The accompanying figure illustrates the typical strength of the pulling force near the inlet of a wing-mounted jet engine operating near takeoff thrust. The pulling force felt over the body is the same force felt in a strong wind, except that a wind of 25 mph exerts a force of only 20 pounds on an average-size person. By comparison, a force of about 1,000 pounds is exerted on a person standing within a step in front of an engine operating at takeoff thrust. Even with an engine at idle, the pulling force is greater than 300 pounds. With nothing to hold on to, a person can offer only about 95 pounds of resistance by skidding on the bottom of his shoes. This means that the pulling force generated by an engine just at idle is enough to drag almost anyone into the spinning compressor and certainly, it is enough to pull in loose articles of clothing, rags, and loose objects from shirt pockets.

The graph also helps to illustrate the deceptive nature of the suction force. The suction generated by an engine operates in the same manner as the suction generated by a vacuum cleaner.

The pulling force increases rapidly as the distance decreases between the object and the inlet. This often tends to foster a false sense of security because very little suction may be noticed in the low-velocity area surrounding the inlet until there is a substantial force on the body. Then, the suction suddenly doubles with each half step. Merely turning the body 90° from profile could double the force, and standing up from a crouched position could triple the effect.

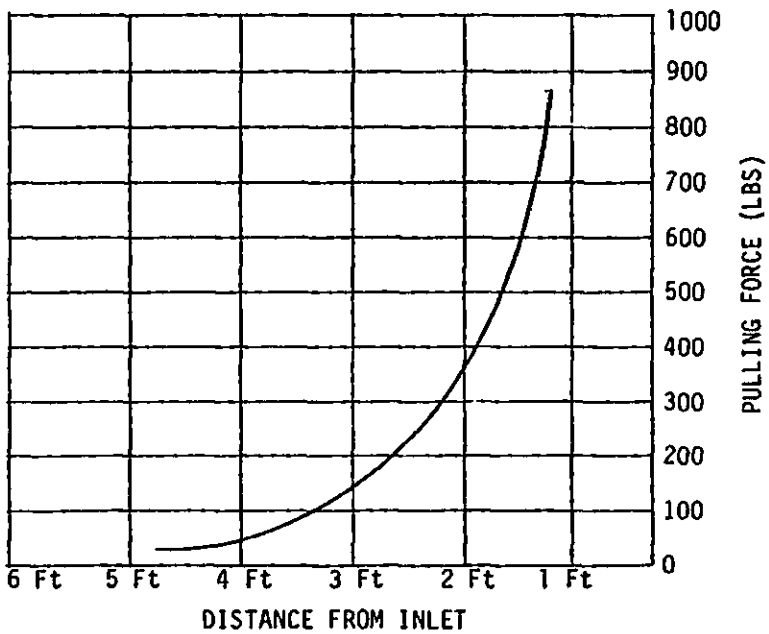
The following are some useful tips to keep in mind while working around operating jet engines: Not only do the pulling forces increase rapidly as the object moves toward the inlet, but the airflow directions change around the inlet. A body passing through the different airflows is subjected to twisting effects that could cause tumbling and a loss of body control. This effect is especially strong near the lower lip of the inlet.

The danger area around the inlet is much larger than that region of pulling forces shown in the graph. Natural winds and uneven forces from gusts increase the area of potential danger. Buildings and fences often create strong, highly localized wind forces. The aircraft fuselage and wings can also help create unpredictable wind shears that will add to the inlet-induced flow field. Additional margins should always be included for safety, such as the possibility of tripping, slipping, inattention or falling toward the inlet.

Relaxing caution because engines are small or because they are operating at idle is a mistake. Although the airflow of a smaller engine is less, the suction forces are just as powerful. Also, even though operation at high-thrust settings may not be anticipated in ramp areas, the throttles could be advanced with little or no warning.

Keep a mental picture of the danger areas in mind. There are no procedures requiring personnel to be in such areas during engine operation. Note that the restricted area for the inlet extends aft of the inlet opening as well as in front.

Wind blown hats or caps or loose articles from shirt pockets pose a particularly common and hazardous dilemma -- attempting to recover such an article could well result in putting you too close to the inlet. Avoid this problem by not wearing loose fitting headwear, clothing, raincoats, etc., if you may be in the vicinity of an operating engine. Do not carry loose articles in shirt pockets. Make sure gloves, scarves and rags are secure. Above all, KEEP YOUR DISTANCE!!!!



NOTICE TO READERS: The General Aviation Airworthiness Alerts are, for the most part, prepared from information supplied by those who operate and maintain aircraft. The FAA encourages the reporting of all malfunction or defects that come to the attention of service or operating personnel, even though the problem has been previously reported. FAA Form 8010-4, Malfunction or Defect Report, which supersedes FAA Form 8330-2, Malfunction or Defect Report, is available from the local General Aviation District Office and may be used for reporting purposes.

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