TAD-494.4

AC NO. 20-7N

GENERAL AVIATION inspection AIDS

SUPPLEMENT NO. 5

JANUARY 1977

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

Flight Standards Service

GENERAL AVIATION INSPECTION AIDS

CUMULATIVE INDEX

SEPTEMBER pp. 1-14 OCTOBER pp. 15-28 NOVEMBER pp 29-41 DECEMBER pp 43-55 JANUARY pp. 57-69
FEBRUARY MARCH APRIL MAY JUNE JULY

AIRCRAFT

BALLOON WORKS 15
BEAGLE AIRCRAFT LTD 29
BEECH 1-3, 16, 29-30, 57
BELL 16, 58
BELLANCA 3, 16, 30, 43-44, 58
BOEING 3
BOLKOW 17
CESSNA 3-4, 17-18, 30-31, 44, 58-59
CURTISS-WRIGHT 4
DeHAVILLAND 31-32, 45, 60
ENSTROM 45
FAIRCHILD INDUSTRIES 5, 18, 46, 60
GRUMMAN 46
GRUMMAN-AMERICAN 18, 32, 46-47, 61
HELIO 61
HILLER 19, 47
LEAR 19
MARTIN 5
McDONNELL DOUGLAS 61
MITSUBISHI 19, 32
MOONEY 5, 62
NORTH AMERICAN. 32
PIPER. 6-8, 19-21, 32-34, 47-49, 62-64
RAVEN 9
ROCKWELL INTERNATIONAL . . . 9, 34, 49, 65
SCHWEIZER 21, 65
SMITH. 9
STINSON. 21
SWEARINGEN. 9, 22, 35

AIRFRAME COMPONENTS

CLEVELAND 50
GOODYEAR 50

ACCESSORIES

BENDIX 10, 22, 35, 50, 66
EDO-AIRE 35
GERDES 22
LEAR SIEGLER 36
MARVEL-SCHEBLER 36
PRESTOLITE 36, 50, 67
SLICK 36
SORENSEN 36
TITAN 10

COMMUNICATION/NAVIGATION EQUIPMENT

DORNE AND MARGOLIN 10
NARCO 51
AIRCRAFT RADIO CORPORATION . . 22

EQUIPMENT

COMMUNICATION COMPONENTS CORPORATION 11
LEIGH SYSTEMS 37
NARCO 11
WALTER KIDDE 51

. . . . . Cumulative Index continued on page 11 (see last page) . . . . . .

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

GENERAL AVIATION INSPECTION AIDS

SUPPLEMENT No. 5
JANUARY 1977

This is the home of the General Aviation Inspection Aids. The publication is prepared from information submitted by those of you who operate and maintain civil aeronautical products. The content of this publication includes select items that have been reported to be significant but were not fully evaluated by the time the material went to press. As additional facts, such as cause and corrective action, are identified, the data will be brought to your attention in subsequent issues of the Aids. This action has been implemented to give Aids' readers the earliest notice of reported conditions received via Malfunction or Defect Report, FAA 8330-2. Computers will constantly monitor these conditions during the period of evaluation for cause and corrective action. Your comments and suggestions for improvement are always welcome. If you wish to share in such material, please send to: FAA, Flight Standards Technical Division, Attn: AAC-236, P.O. Box 25082, Oklahoma City, Oklahoma 73125.

AIRCRAFT

BEECH

BEECH MODELS B19, C23, A24, A24R, AND B24R AIRCRAFT -- INDUCTION AIR FILTER

The following information is contained in Beechcraft Executive Airplane Service Communique No. 24, dated September 13, 1976:

"Failure to properly tighten the screws attaching the induction air filter to the cowling or fuel injector air box can result in the filter gasket becoming loose and separating from the induction air filter. If this should occur, it is possible for the air filter gasket to be sucked into the induction air system resulting in a reduction of engine power.

For this reason, the induction air filter must be inspected for condition, and for a snug and secure fit to the cowling or fuel injector air box any time the induction air filter is replaced or reinstalled, and as a part of pre-flight inspections."

Aircraft affected: Model B19, S/N's MB-481 and after; C23, S/N's M-1285 and after; A24, S/N's MA-364 through MA-368; A24R and B24R, S/N's MC-2 and after.

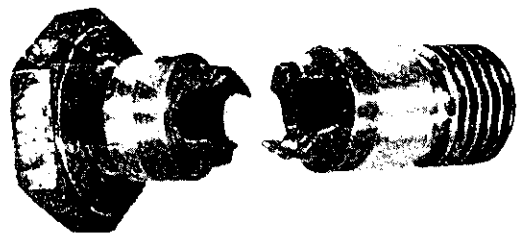
SAFETY is the Responsibility of Everyone in Aviation.

BELL

Bell
Model 47G-2

Boost Cylinder
Bolt, P/N 47-691093-5

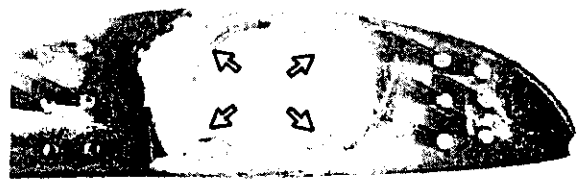
The pilot reported fore and aft cyclic control feedback. Inspection disclosed that the boost cylinder bolt was broken.



Bell
Model 206B

Horizontal Stabilizer
Rib, P/N 206-020-119-52

During inspection, the right horizontal stabilizer inboard rib was found to be cracked. Total time in service - 590 hours. AD 76-05-01 relates to this subject.

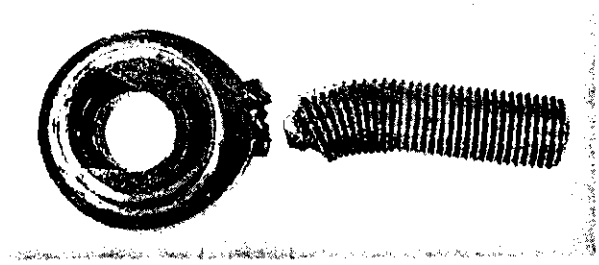


BELLANCA

Bellanca
Model 17-30A

Nose Gear Actuator
Rod End

The nose gear actuator rod end failed during gear extension. Inspection disclosed that the ball joint was seized due to the lack of lubrication.



CESSNA

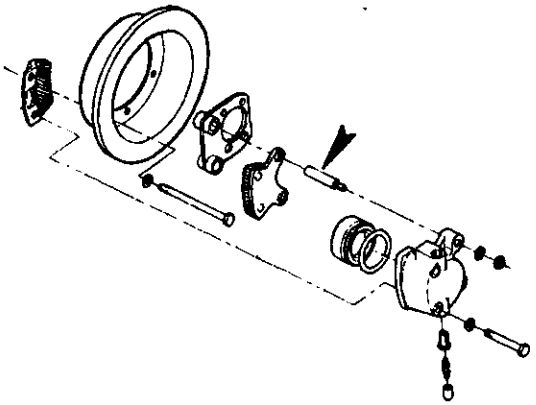
Cessna
Single Engine
Models

Auxiliary Power
Unit Receptacle

Several reports have been received which describe cracks found in the firewall around and under the auxiliary power unit receptacle. It is believed these cracks are caused by side and/or down loads applied to the receptacle when removing the auxiliary power cable. It is recommended this cable be pulled straight out during removal.

Cessna
Models 150, A150
and 172

Brake Guide Pin,
P/N A30023
(McCauley Brakes)

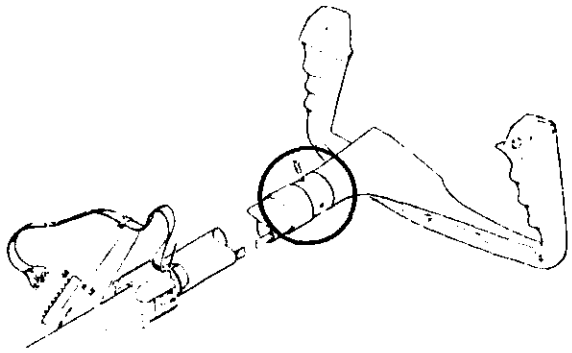


The guide pins in the brake cylinder are reported to be corroding and seizing in the torque plate. This condition is more likely to exist if the aircraft has been inactive for an extended period. The brake manufacturer advises that the plating on later guide pins has been improved which reduces this problem.

It is suggested that these brake assembly guide pins be inspected each 50 hours of operation. Aircraft affected are: Model 150, S/N's 15072004 and on; Model A150, S/N's 1500227 and on; and Model 172, S/N's 17260835 and on.

Cessna
Model 182, 206, 207
and 210 Series

Control Wheel
Attach Screws



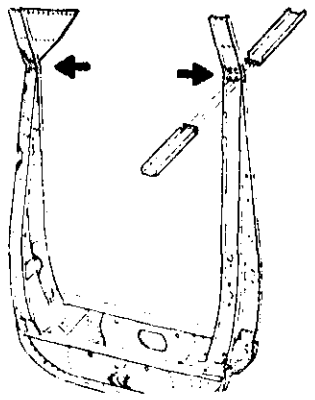
Several reports have been received which describe loose or missing screws which attach the control wheel adapter to the tube assembly.

It is recommended that the control wheel adapter cover be pulled back and the attaching screws periodically checked for tightness. The screws should be tightened to 20-25 inch pounds torque or as an alternate method, a thread locking material such as "Loc-tite" can be used.

The use of screws for this application was discontinued on the Model 210, beginning with the 1972 model year and on; Models 182, 206 and 207 at the beginning of the 1976 model year. These newer model airplanes use AN3 bolts instead of screws. The proper torque value for these bolts is 30 inch pounds.

Cessna
Models 190 and
195 Series

Fuselage
Door Frames



Inspections have revealed cracks emanating from the door post bulkhead (fuselage frame) upper attach rivets. The cracks have been found in the front and rear door posts on both the left and right sides of the aircraft. The area involved is adjacent to the location described in AD No. 63-20-2. Any previous involvement in a ground loop or other operational damage to the wing tip could have transmitted excessive loads to this area. Cessna Service Letter SE 73-15 dated June 22, 1973 outlines an inspection procedure.

Cessna
Model 337

Aileron Pulley Bracket,
P/N 1513507-1

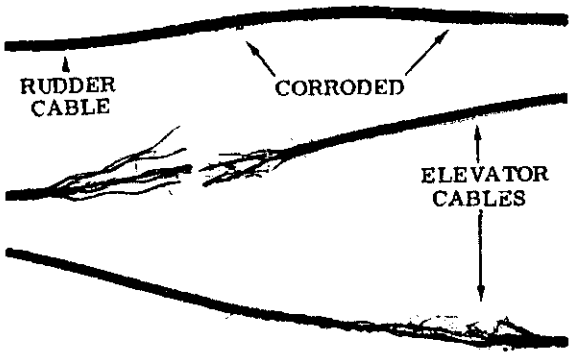
Cessna Service Letter No. ME74-5 dated April 12, 1974, recommended a one-time inspection of the aileron pulley bracket, P/N 1513507-1, for possible misalignment in aircraft S/N's 33701399 through 33701550. Cessna has since determined that S/N's 33701348 through 33701398 should also be included in this inspection, and issued Service Letter No. ME-76-21 on September 27, 1976. It is recommended that owners of these airplanes comply with Service Letter ME76-21. In addition, there have been a few reports of cracks being found in some of the other control system brackets located in the same general area. It is suggested that all pulley brackets be checked for condition during the inspection specified in the Cessna Service Letters.

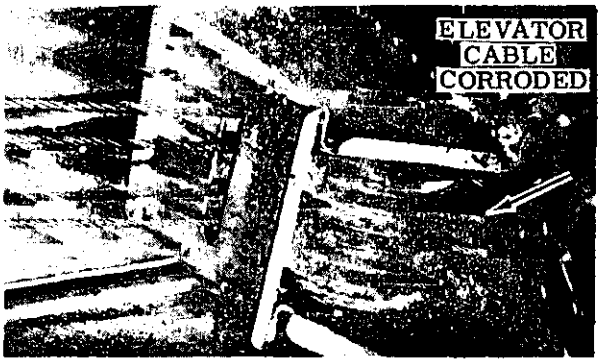
DeHAVILLAND

DeHavilland Model DHC-6

Elevator and Rudder Control Cables

A pilot reported loss of elevator control during takeoff roll. Investigation revealed separation of the elevator control cable and severe corrosion of both the elevator and rudder cables between fuselage stations 353 and 377. The aircraft time in service was 9300 hours. Inspection of another aircraft with 8400 hours time in service disclosed control cable corrosion in the same area, but not as severe.





FAIRCHILD INDUSTRIES

Fairchild Industries Model F-27

Nose Gear Cable Pulley, P/N 9009Y16

A loud bang was heard when the landing gear was extended. During a subsequent retraction attempt, the nose gear remained extended. Inspection revealed the nose gear cable attachment lug on the pulley, P/N 9009Y16, had failed.

Fairchild Industries Model FH-1100

Seatbelt and Shoulder Harness Buckle

During operation on uneven terrain, an FH-1100 helicopter rolled over, leaving the pilot hanging by his seatbelt and shoulder harness. He could not release the buckle until he pressed his feet against something to relieve the load on the harness. Investigation revealed a Pacific Scientific Company F-A1101051-15 restraint system incorporating an old style rotary two-wing five-point buckle was installed. Test of the harness revealed the buckle no longer met TSO release force requirements when a belt load of 170 lbs. and a shoulder harness load of 20 lbs. were applied simultaneously. A new buckle, P/N 1101550, that incorporates a guard to prevent the belt fitting from contacting the rotary handle was made available by Pacific Scientific Company in 1970. Tests show these buckles release easily under combined seatbelt and shoulder harness loads, and it is recommended old style buckles be replaced with the new type as soon as possible.

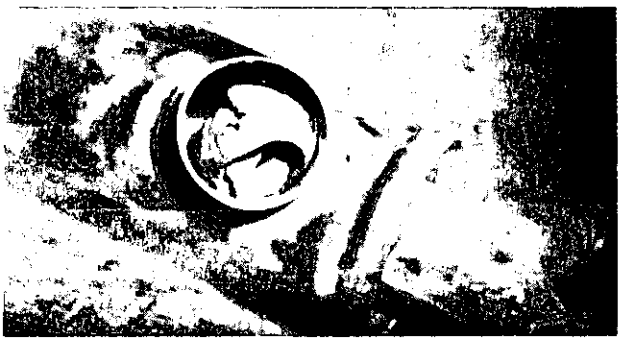
DON'T PUT IT OFF ANY LONGER

If you have experienced mechanical difficulties or problems with an aeronautical product and have not reported it yet, please do so now and help your fellow airmen. FAA Form 8330-2, available from your local General Aviation District Office, may be used for this purpose. The form requires no postage and is preaddressed to receive prompt handling.

GRUMMAN - AMERICAN

Grumman - American Muffler
Model AA-5

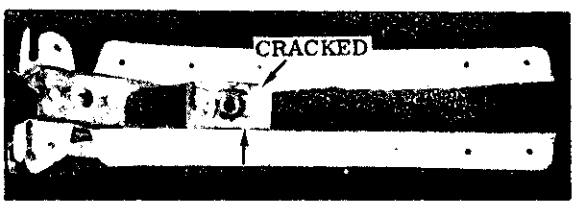
The engine would not develop full power during climb. Investigation disclosed that the baffle inside the muffler had broken and was blocking the exhaust outlet. Total time in service - 1480 hours.

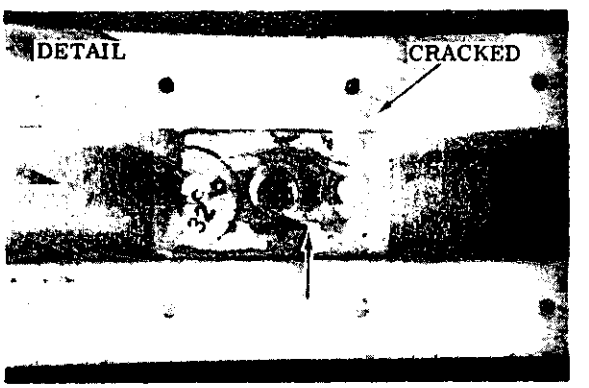


HELIO

Helio Wing Leading Edge Rib
Model H-391B

The wing leading edge rib assemblies were found to be cracked and corroded.

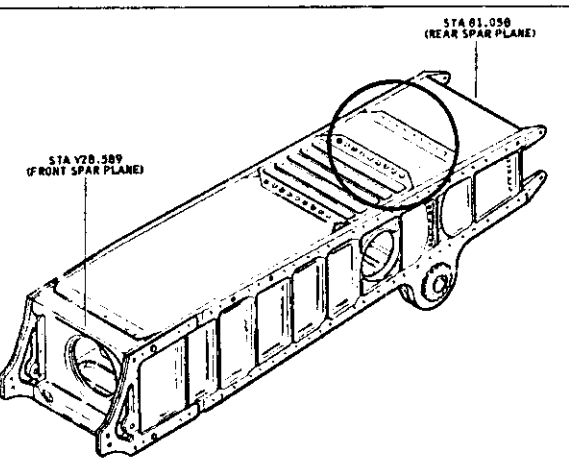




McDONNELL DOUGLAS

McDonnell Douglas Fitting, P/N 5918098
Model DC-9

During inspection, the horizontal stabilizer center section fitting was found to be cracked. The crack extended 6-3/4 inches.



MOONEY

Mooney Model M20	Landing Gear Handle, P/N 5059	During takeoff, the landing gear retraction handle broke above the weld. Inspection of the break showed indications of a previous crack. Total time in service - 1843 hours.

PIPER

Piper Model PA-11, PA-12, PA-14, PA-16, PA-18, PA-20, and PA-22 Series	Fuel Tank Vent	Collapse of wing mounted fuel tanks have occurred because of inadequate venting. Piper Service Bulletin No. 522, dated September 28, 1976, calls for modification of P/N 15296-02 fuel tank caps and inspection for proper installation of filler neck seals prior to next flight. The bulletin also requires the addition of ventholes in the cap flange perpendicular to the ventslots presently provided.

Piper
Model PA-23-250

Nose Landing Gear
Fork, P/N 31793-03

During inspection, the nose landing gear fork was found to be cracked. The crack was located at the collar adjacent to the fork-to-piston attachment bolthole.

Piper Model PA-23-250	Landing Gear Control Lever, P/N 752303	When attempting to retract the landing gear, following takeoff, the control lever broke completely off. The failure occurred at the first 90 degree radius from the aft end of the lever. Close examination revealed the lower 1/8 inch of the fracture area was dark (grease or dirt inclusion) indicating the presence of a previous crack.
Piper Model PA-23-250	Horizontal Stabilizer Skin	Inspection at 1200 hours aircraft time in service revealed cracks in the lower skin of the left stabilator. The cracks extended fore and aft over the second and third rib outboard of the fuselage and were two inches and five inches in length respectively.
Piper Model PA-23-250 (Aztec "F")	Stabilator Counterweight Shaft	The right stabilator counterweight cover was found to be badly cracked during preflight inspection. Further investigation revealed the counterweight shaft had failed, and the counterweight was laying in the cover. Total time in service - 350 hours.

Piper Model PA-23-250 (Aztec "F")	Wing Tip Navigation Light Wiring	Persistent navigation light circuit breaker tripping was found to have been caused by short circuiting of the wing tip strobe navigation light wire against the wing tip rib. This condition could lead to electrical arcing which would present an explosion hazard in the event fuel fumes were present inside the wing. Piper Service Bulletin No. 486, dated October 11, 1976, calls for the application of additional insulating material, on the subject wiring within the next 50 hours of operation, to preclude chafing of the wire on the adjacent wing tip rib. The bulletin provides aircraft serial number applicability.

Piper Model PA-23-250	Nose Landing Gear Strut Housing, P/N 751930

The nose landing gear strut housing was found to be cracked approximately halfway around its circumference at the lower end under the steering collar. Exceeding turning limits during ground towing operation was the cause for the housing failure.

Piper Models PA-23-250, PA-31, PA-31-325, PA-31-350, PA-31P, and PA-31T	Cigar Lighter Element	Reports received describe a tendency of the cigar lighter element coils to become detached and uncoil when the lighter is withdrawn from its mating receptacle. Detachment of the red-hot coil presents a potentially hazardous condition in the cabin area. Piper Service Bulletin No. 523, dated October 8, 1976, calls for replacement of existing 24 volt cigar lighter elements in certain aircraft within the next 25 hours of aircraft operation. The subject lighter elements, located in the instrument panel, control pedestal, or folding table, should be replaced with new elements, P/N 55674-02, which include positive heating coil retention security.
Piper Model PA-31	Elevator Tab Hinge Bolts	A mechanic has reported loose elevator tab hinge bolts (inboard, center and outboard) detected during inspection of several PA-31 series aircraft. Some bolts were found to be loose, and some were found to have backed almost completely out of their self-locking plate nuts.
Piper Models PA-31 and PA-31-300	Landing Gear Restrictor Valve	A gear-up landing occurred when the main landing gear doors failed to open during gear extension. Investigation revealed the probable cause to be internal failure of the "door close" hydraulic line restrictor valve. It was also determined a second restrictor valve, installed in the "gear-up" hydraulic line, could also be subject to similar internal failure, depending upon the type of valve installed. Piper Service Letter No. 784, dated September 27, 1976, applicable to aircraft serial number 31-2 to 31-694 inclusive, calls for replacement of the "door close" restrictor valve with a AN815-4D union and replacement of TACTAIR "gear-up" restrictor valve with TAVCO, P/N 484459, restrictor valve.

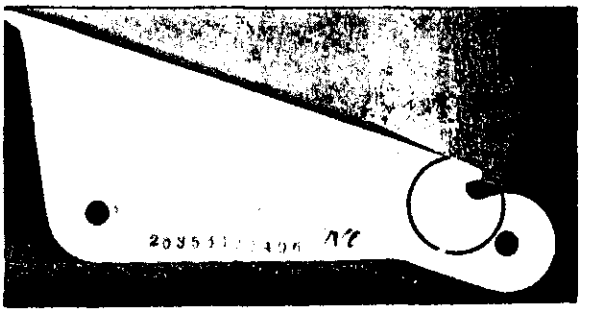
SAFETY is a Responsibility, Not a Task!

Piper Models PA-31, PA-31-325 and PA-31-350	Horizontal Stabilizer	It has been determined that an inadequate number of rivets may have been used to attach the stringers to the top and bottom horizontal stabilizer skin panels. An inadequate number of rivets may permit local buckling of the skin between rivets. Piper Service Bulletin No. 521, applicable to certain serial number aircraft, was issued September 20, 1976. The bulletin calls for inspection and rework as necessary within the next 50 hours of operation.
Piper Model PA-31P	Throttle Control Rod End, P/N 469142	The throttle control for the left engine disconnected during ground runup. Inspection revealed the rod end ball became disengaged from its mating socket allowing the rod end to slip over its attachment bolthead decoupling the control linkage. Piper Service Bulletin No. 407, dated November 14, 1973, provided inspection procedures to insure that the control rod ball joints cannot become disengaged from their mating sockets. Piper Service Bulletin No. 497, dated March 29, 1976, calls for replacement of the throttle and propeller control rod ends with a new type provided in kit, P/N 761031, within the next 100 hours of operation.
Piper Model PA-31P	Fuel Boost Pump Piston Assembly, P/N 757329	The pilot reported the right engine would lose power when the electric fuel pump was shutoff. Investigation revealed the nylon piston assembly, in the fuel pump, was stuck in the closed position. The piston appeared to be swollen and was binding in its guide requiring fuel to be drawn through the electric fuel pump when turned off reducing fuel flow to the engine.
Piper Model PA-31T	Engine Oil Temperature Gauge Placard	The oil temperature gauges installed in PA-31T aircraft, serial number 31T-7620012 to 31T-7620050 inclusive, are not identified as to function. Piper Service Bulletin No. 517, dated October 5, 1976, advises that placards, P/N 757 487, are available for these aircraft, free of charge, through Piper Field Service facilities.
Piper Model PA-36-285	Mixture Control Cable	After approximately 370 hours time in service, the mixture control would not go to full rich position. Internal binding of the cable inside the housing could not be corrected and required replacement of the assembly. Similar problems were experienced with three other aircraft at between 370 and 600 hours in service.
Piper Model PA-36-285	Flap Control Bellcrank Grease Fitting	Piper Service Letter No. 776, dated October 11, 1976, announces the availability of a kit, P/N 761068, for the installation of a grease fitting on the flap torque tube. This modification is provided to reduce binding and wear of the flap torque tube due to accumulation of chemicals and other foreign material.

Safety Is No Accident

ROCKWELL INTERNATIONAL

Rockwell International Model S-2R	Aileron Hinge Bracket, P/N's 20354T-1, -2, -3, and -4	Several aileron hinge brackets were found to be cracked. Total time in service range from 342 hours to 1004 hours.



Rockwell International Model NA-265-60	Nosewheel Steering Bellcrank, P/N 3010812-5	The nosewheel steering bellcrank was found to be sheared at the serrated end. Also, a radial crack was found which extended two-thirds of the way around the shaft and into the machined radius. Total time in service - 1337 hours.

SCHWEIZER

Schweizer Model SGU 2-22E	Fuselage Longeron	During compliance with AD 76-13-11, a black moist substance was found in the aft fuselage longerons. X-ray inspection disclosed indications of rust flakes approximately 1/4-inch deep in the aft end of the longerons.
Schweizer Model SGS 2-33A	Vertical Stabilizer Spar End Assembly	When at approximately 2,000 feet altitude under tow, the pilot reported hearing a loud noise followed by loss of rudder control. The glider was immediately released from tow and descended in a spiral, under partial control. Subsequent investigation revealed the vertical stabilizer spar end assembly had failed approximately 9/16-inch above the two upper spar-to-fuselage attachment bolts. Laboratory analysis revealed the spar had failed due to fatigue. Record review revealed the glider had major repair work performed, on five occasions, between July 1969 and August 1976, due to accident damage.

SAFETY IS NO ACCIDENT

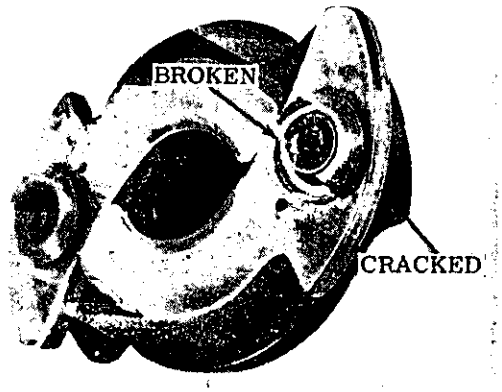
BENDIX

BENDIX MAGNETO IMPULSE COUPLING MAINTENANCE

One of the most important engine accessories is the magneto impulse coupling. The unit is unusually reliable and is able to withstand considerable abuse; however, for the most part there is a lack of a sense of awareness as to the maintenance needs of this part.

The inattention and mishandling many magneto impulse couplings receive is substantiated by service difficulty reports. In some instances, when magnetos are removed for maintenance/overhaul the couplings are not disassembled for inspection and receive no more attention than a "wash down." They are then reinstalled in an "as is" condition. This situation is further magnified by the abuse the unit receives through various unorthodox removal methods. Quite often this results in hidden damage which if not detected can lead to in-flight engine failure.

Sometimes impulse couplings are found broken and cracked as shown in the accompanying picture. In this instance, the damage is believed to have resulted from the use of gear pullers. Careful attachment of pullers used to remove the impulse coupling must be exercised to avoid damage.

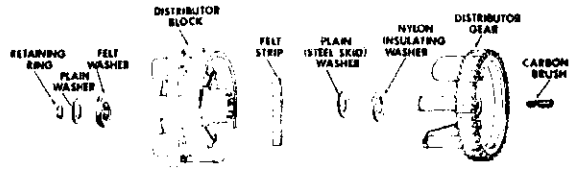


To help all persons to better understand the purpose, operation, and care of aircraft magneto impulse couplings, the Bendix Corporation has prepared a booklet related to this subject. The title of the publication is "I Am Your Impulse Coupling." The caption on the booklet face is "Nobody Pays Any Attention to Me." Copies of the publication may be procured free from: The Bendix Corporation, Electrical Components Division, Product Support Department, Sidney, New York 13838.

Bendix
Magneto
Model S-1200 Series

Distributor Gear

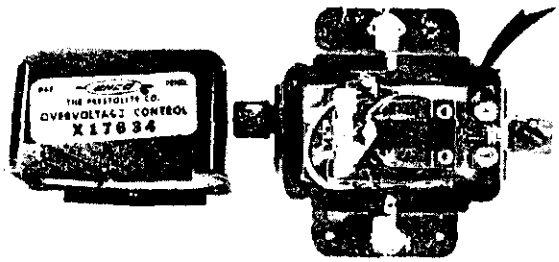
A recent report, which is typical of other reports received, advised of a distributor gear failure at approximately 215 hours time since magneto overhaul. The gear shaft was heat discolored, and the nylon gear had melted allowing separation of the gear from its shaft. In order to prevent this type failure, Bendix Service Bulletin No. 566, was issued in January 1974. This bulletin called for rework of the distributor block and installation of a steel skid washer and a nylon insulating washer between the gear shaft and the distributor block bushing, to reduce the possibility of lubricant deterioration and seizure of the shaft within the bushing.



PRESTOLITE

Prestolite Overvoltage Control Model X17634 — Contact Plate

The overvoltage control failed. Investigation disclosed that the contact plate was broken.

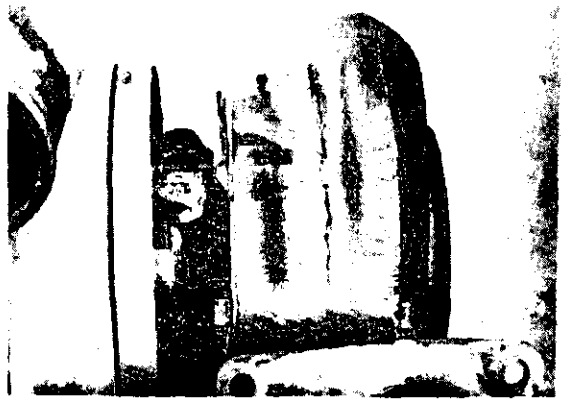


ENGINES

CONTINENTAL

Continental Model GTSIO-520H — Turbosupercharger, P/N 637364-1

During engine change, the turbosupercharger was found to be cracked. Total time in service - 1202 hours.



LYCOMING

Lycoming Model O-320-H2AD — Oil Dipstick

A flight in a Cessna Model 172A aircraft was discontinued due to loss of engine oil pressure. Investigation revealed that the engine oil was lost due to improper installation of the oil dipstick. When inserted, the dipstick entered a hole in the forward side of the dipstick tube assembly where it was mangled by contact with internal engine parts. This caused metal contamination of the oil system. Also, the dipstick backed out which resulted in the loss of engine oil. Extreme care should be exercised to assure the oil dipstick is properly inserted following oil quantity checks or oil system servicing.

SAFETY is the Responsibility of Everyone in Aviation.

Lycoming Model AEIO Series Aerobatic Engines	Engine Oil	Unless an adequate quantity of lubricating oil is maintained in the sump of these engines, oil starvation and loss of oil pressure can occur during extreme attitudes of flight such as steep dives. The risk of the oil not covering the inlet to the oil pump increases as the quantity of oil decreases and the angle of decent increases. It is vitally important to assure a sufficient quantity of oil is in the engine prior to takeoff. Avco Lycoming Service Bulletin No. 399, dated May 14, 1976, pertains to this subject and makes reference to paragraph 3-9 of the Operators Manual, No. 60297-21, for procedures to determine the normal engine oil level. The quantity of oil considered to be not useable is significantly greater for AEIO series aerobatic engines than for nonaerobatic IO series engines.
Lycoming Model HIO-360-D1A	Valve Tappet Clearance	Avco Lycoming Service Bulletin No. 402, dated August 27, 1976, calls for increased dry tappet clearance for HIO-360-D1A engines with P/N LW-13356 camshafts installed. In order to improve valve action and initial starting characteristics, the bulletin calls for increasing the dry tappet clearance from .028/.080 inch to .070/.105 inch within the next 10 hours time in service. Additionally, the bulletin provides instructions for grinding rocker arms if interference with the cylinder occurs when the dry tappet clearance is increased.
Lycoming Model HIO-360-D1A	Camshaft	The proper camshaft for installation in the subject engine is P/N LW-13356. Avco Lycoming Service Bulletin No. 396, dated May 14, 1976, directs attention to incorrect part numbers listed in the parts catalog, for this engine, and provides a corrected parts listing. The bulletin further recommends immediate replacement of P/N 78717 or P/N 76097 camshafts, inadvertently installed in these engines during overhaul, with the correct camshaft, P/N LW-13356.
Lycoming Model TC-360-C1A6D	Engine Oil	Seven quarts of oil were lost during flight in a Rockwell Model 112TC aircraft. Investigation revealed the vacuum pump mounting nuts became loose during operation allowing the vacuum pump to separate from its engine mounting pad, resulting in depletion of the engine oil supply. Inspection revealed a turbocharger bracket also utilized the vacuum mounting studs, limiting the stud length available, which prevented adequate stud penetration through the self-locking nuts, allowing them to loosen during operation.
Lycoming Model TIO-360-C1A6D	Turbocharger Induction Air Hose	The pilot reported loss of engine power during climb, immediately following takeoff. Investigation revealed that the induction air rubber hose, P/N 784277A, that connects the turbocharger to the fuel injector air inlet had split open allowing loss of supercharged air.
Lycoming Model IGO-540-B1A	Oil Slinger, P/N 68572	At approximately 5 hours time in service, a portion of the oil slinger, which is attached to the tachometer drive idler gear, was found in the lower accessory case. Faulty spotwelds are believed to be the cause of failure.

UNITED AIRCRAFT OF CANADA

United Aircraft of Canada Model JT15D-1	Bearing	A slight rumbling noise was reported during operation at 40 to 50 percent RPM. A subsequent inspection revealed metal particles in the engine oil screen. Further examination revealed partial failure of the No. 3 1/2 bearing (chipped). Total time in service - 563 hours.

MAINTENANCE NOTES

NICK-KNOCKED PROPS

The metal propeller appears to be one of the most durable parts of the modern light aircraft, and indeed it is, when properly maintained. But as an instrument of thrust it has more pressure exerted against it than any other part of the aircraft. The blades are designed and constructed in such a manner as to withstand maximum power loading, but when the shape of the blade is marred or disturbed, its inherent strength can be reduced to a point where blade failure in flight is possible. Such failure can take place entirely without warning.

Most pilots find it hard to believe that a small cut or nick in a sturdy metal propeller can lead to a broken prop. To understand how this is possible, it helps to know something about the stress and force to which a propeller in action is subjected.

The most obvious force is centrifugal - the rotating action which exerts an outward pull on the blades. If you imagine an enormous giant trying to draw your arm out of your socket, exerting a force some 7,500 times the weight of your arm, you can appreciate the strain on the blade.

The revolving blade is also subject to a centrifugal twisting force, which may be visualized as the effect of a gigantic hand attempting to flatten the blade, exerting a force as high as 20,000 lbs. per sq. in. Again, the thrust exerted by the propeller results in a forward pull of the blades. Straining the engine to pull the plane out of a mudhole can result in an out-of-track prop. These two kinds of stress produce lines of force running across the face of the blade.

But the kind of stress which is believed responsible for most blade failures in conjunction with surface damage in piston-driven aircraft is the vibratory stress set up by the engine forces conveyed to the propeller by the crankshaft to which it is bolted. This produces oscillating forces within the blade which change patterns as the engine RPM changes. The locations on the surface of the blade where maximum bending occurs are called nodes; at these locations the greatest amount of stress occurs. Even slight damage at these points can seriously weaken the propeller.

Any mechanical damage to the prop creates an opportunity for blade failure. Nicks, cuts, or corrosion pits can set up stress points by interrupting line of force. Certificated mechanics are trained to round out depressions in the blade in such a manner as to minimize the concentration force at a given point.

The ordinary preflight inspection tends to scant the propeller. The pilot may do nothing more than run his eye down the leading edge of the blade and, if nothing catches his attention, move on. What he should do realizing the consequences of an inflight propeller failure, is to scrutinize and feel - with clean, dry hands - the entire surface of the blade. Nicks or cuts that escape the eye are often easily perceptible to the fingers. Inspection is easier and more accurate if the blade is kept clean. This is facilitated by occasional waxing with a paste wax, which helps prevent corrosion. Decals on a prop, incidentally, have been known to permit the accumulation of hidden corrosion.

Note that the removal of small nicks or defects is not "preventive maintenance," which may be performed by the pilot or owner, but is defined in FAR Part 43 as "minor repairs," and requires the service of a qualified mechanic.

One little nick could knock you out of the sky.

Skywriter
(Oklahoma Aeronautics Commission)

SAFETY is the responsibility of everyone in Aviation.

GENERAL AVIATION INSPECTION AIDS

CUMULATIVE INDEX (Con.)

SEPTEMBER pp. 1-14 OCTOBER pp. 15-28 NOVEMBER pp. 29-41 DECEMBER pp 43-55 JANUARY pp.57-69
FEBRUARY MARCH APRIL MAY JUNE JULY

INSTRUMENTS

ELECTRICGYRO 37

ENGINES

CONTINENTAL 11, 67
LYCOMING 12-13, 23-24, 37-38, 51-52, 67-68
UNITED AIRCRAFT OF CANADA. . . 13, 24, 38, 52, 69

PROPELLERS

HAMILTON STANDARD 39
HARTZELL 24, 53
Mc CAULEY 24-25, 39

PARA-AIDS

PIONEER. 39

MAINTENANCE NOTES

AIRCRAFT WIRING HARNESS SPIRAL WARPPING 13
CARBURETOR CLEANING 14
CONTINENTAL AND LYCOMING ENGINES USING CRANKSHAFT DAMPERS 14
CORROSION. 14
ENGINE HOSES 25
FLEXIBLE FUEL CELLS 53
FLEXIBLE THROTTLE CONTROL CABLE ASSEMBLIES 53
FUEL CONTAMINATION INSPECTION 53
GROUND SERVICE EQUIPMENT BATTERY CARE 54
NICK-KNOCKED PROPS 69
OVERHEATED NICKEL - CADMIUM BATTERIES 54
TIRE AND WHEEL INSPECTION 40
TIRE PRESSURE GAUGE PRACTICE 55
WHAT'S THE DIFFERENCE BETWEEN AVIATION & AUTOMOTIVE GASOLINE? 25

OF INTEREST

BEECH MODEL 18 AND C45 SERIES AIRCRAFT -- WING STRUCTURE 40-41

SOMETHING TO THINK ABOUT

B-NUTS 28
CAUSES OF CORROSION 27
COLD WEATHER MAINTENANCE 55
COMMON TYPES OF CORROSION 26
CORROSION CONTROL. 27
CORROSION INSPECTION. 26
ENVIRONMENT VS. CORROSION. 26
FLOW DIRECTION 27
FROST COSTS 55
PART MISSING? FIND IT! 27
PREVENTATIVE MAINTENANCE AND TIPS ON WINTER OPERATION 28
SUPPORT OF FITTINGS USED IN THE REPAIR OF FUEL AND HYDRAULIC RIGID LINES. 27

U. S. GOVERNMENT PRINTING OFFICE : 1978 O - 225-742