# Feedback

# Canadian Aviation Service Difficulty Reports

The following content was published between July 13, 2018 and September 30, 2018.

Table of Contents

# Heads Up

## Bombardier, CL600 2D15 (705), CL600 2C10 (700, 701, 7020 and CL600 2D24 (900)
## Frame corrosion under forward passenger door

**SDR #: 20170817016**

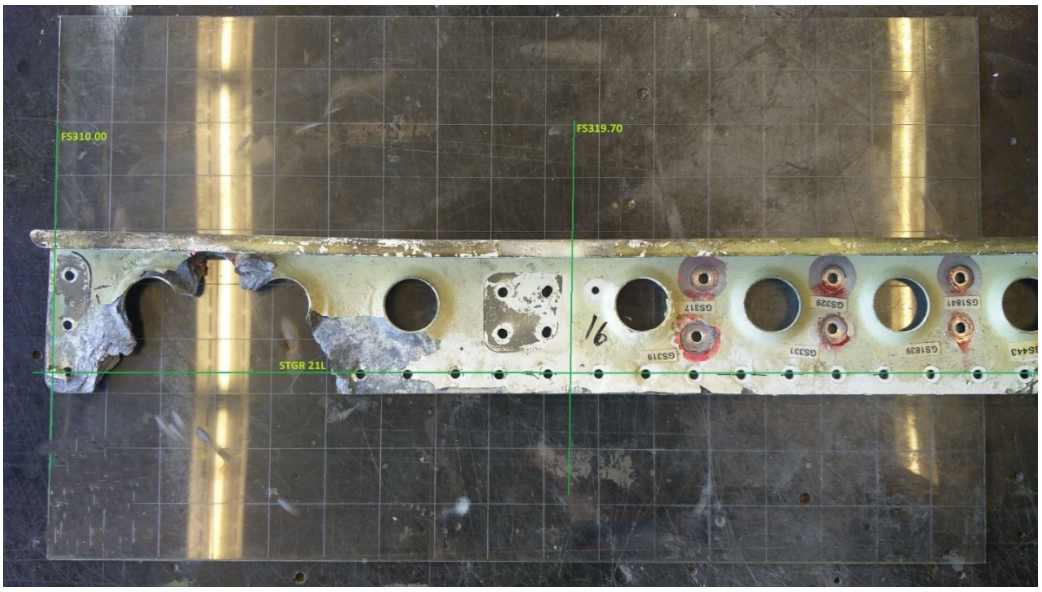
**Subject:**

While investigating an unrelated defect, corrosion was found in the area under the floor near the passenger door. Maintenance staff removed and replaced the intercostal from frame fuselage station (FS) 310 to 333.00 and from stringer (STR) 25L to 26L as per Structural Repair Manual (SRM) 51-00-00 and Bombardier Aerospace drawing number SH670-31810. Additional corrosion was discovered on the foot of the frame at FS 319.70 between STR 20L to 21L. This frame was also removed and replaced with a new frame as per SRM 51-00-00 and Bombardier Aerospace drawing number SH670-31810. Please see the attached pictures to view the damaged pieces and severity of the corrosion.

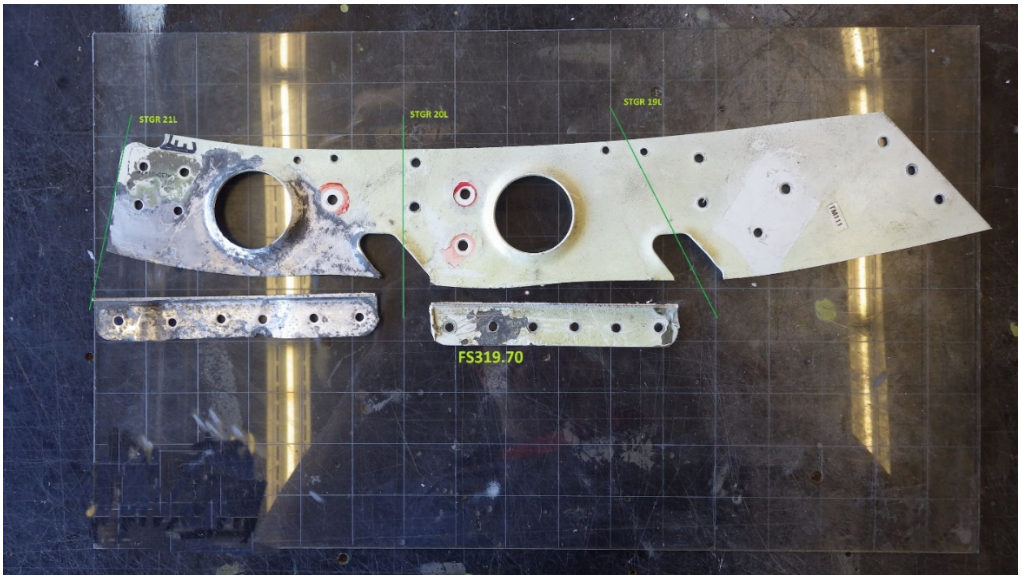
**Transport Canada Comments:**

While the submitter does not specify a cause, it is likely that the corrosion was the result of water and moisture that passed through the floor and accumulated in the bilge area. This location is susceptible to water ingress because it is a high traffic area and is often subjected to the outside elements such as rain and snow. When the stairs are raised, any water or melting snow will also drip onto the floor and may then pass through the floor seals. On many models of this aircraft a galley is also located nearby, providing opportunity for spilled liquids.

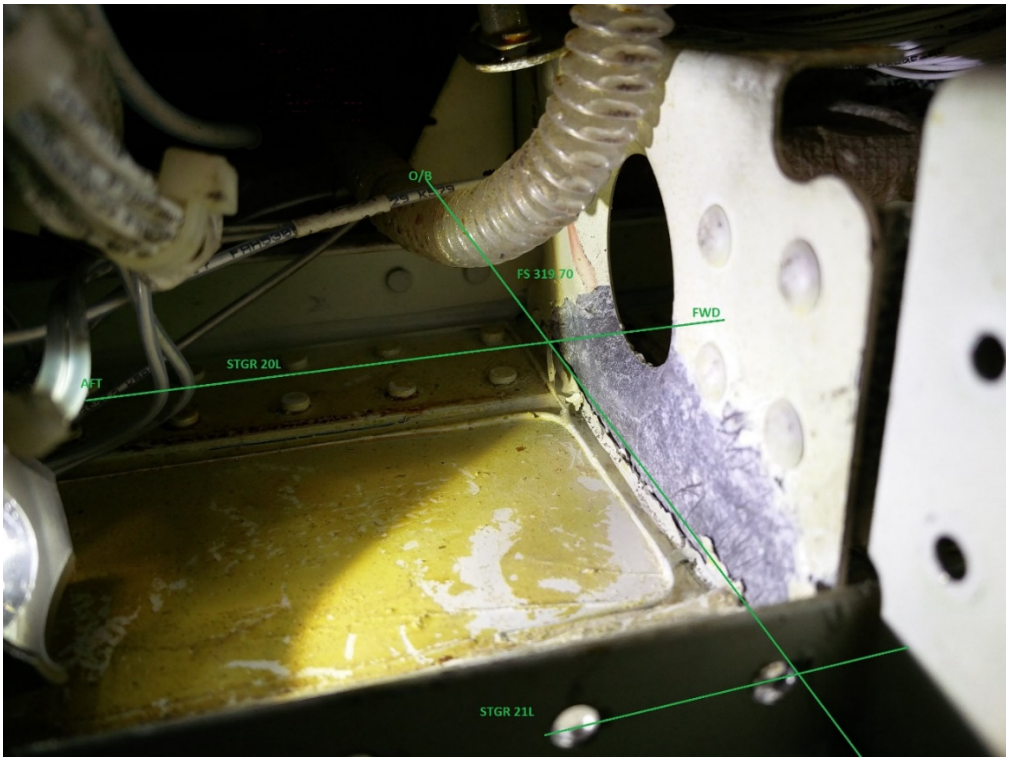
After discovering this corrosion, the operator chose to update its company's corrosion protection and control program, to better address this issue.




Corroded intercostal

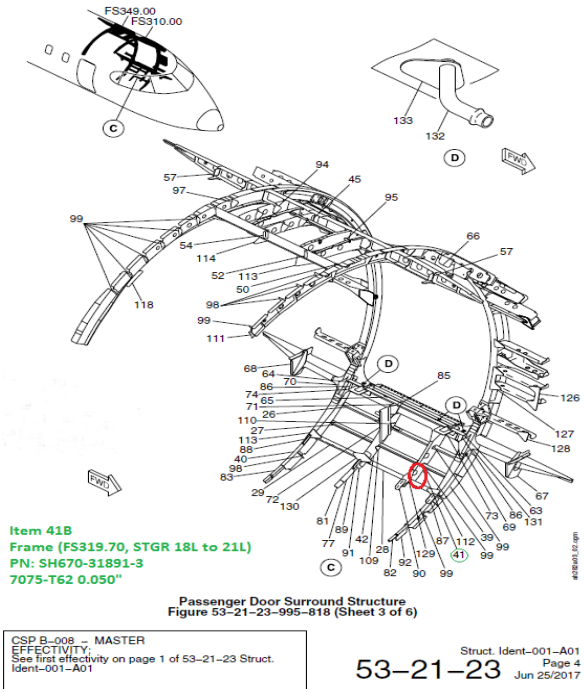



FS 319 frame corrosion




View of corrosion in situ


Heavily corroded structure




Illustrated parts catalogue (IPC) showing location

## Engines and APU's
## Oil Servicing Safety Issues

**SDR #: Not applicable**

**Subject:**

Oil servicing issues continue to occur in the aviation industry, including over and under servicing engines, failing to properly secure oil filler caps and failing to latch access doors/panels. These events can lead to loss of oil and engine shutdown, smoke or odors in the cabin and loss of panels in flight.

Human factors studies tell us that the reason for these events can include complacency, fatigue, distraction, a lack of experience, inadequate training, etc. A properly implemented Safety Management Systems (SMS) can help reduce occurrence rates.

When Transport Canada receives reports of these (and other) types of occurrences, the information is passed on to the type certificate holder (TCH) of the affected product. Transport Canada Continuing Airworthiness works with the TCH towards reducing both the rate of occurrence and the impact.

Some of the resulting corrective actions may include: design changes (such as check valve installation on oil filler necks), awareness campaigns through various publications and revised labeling and placarding.

Maintainers must remember that although oil servicing is a routine task, it is absolutely vital to flight safety. Servicing tasks (however routine they may seem) need to be carried out correctly and completely, in accordance with the latest manufacturer's instructions. It is worth noting that

manufacturers' websites are excellent resources for safety information regarding the operation and maintenance of their products.

## V-Band Couplings and Clamps
## Maintenance of V-Band Couplings and Clamps

**SDR #: 20170404021**

**Subject:**

Best Practices for Maintaining V-Band Couplings / Clamps

**Transport Canada Comments:**

V-band couplings and clamps can be found on many general aviation and commercial aircraft. These units are frequently used to attach exhaust and turbocharger assemblies. This important, yet often overlooked item, plays a critical role in the function and safe operation of the aircraft. Failure of these items has led to serious in flight emergencies including engine power loss, engine failure and in flight fire. The difficulty with these items is that due to the nature of the installations, they are often extremely hard to inspect. Some of the issues that can arise from normal operation (due to the harsh operating environment) can include cracking, loosening of fasteners and weld breaks. It has been reported to Transport Canada that some of these units from PMA (Parts Manufacturing Approval) manufacturers have failed even when new (as seen in the photo below –spot welds not holding together).

Recently the Federal Aviation Administration (FAA), in conjunction with an industry working group, released a 'best practices guide' regarding V-band couplings / clamps. This article contains a great deal of valuable information regarding the installation, inspection and maintenance of these units. Transport Canada recommends that operators and maintainers of aircraft equipped with these couplings review this article. The following is the link to the FAA best practice guide:
https://www.faa.gov/aircraft/air_cert/design_approvals/small_airplanes/cos/aging_aircraft/media/maintaining_exhaust_system_best_practices.pdf

V-Band Coupling and Clamp

## Diamond DA-20-C1
## Teledyne Continental Motors Ignition Switches

**SDR #: 20170623010**

**Subject:**

Note: TCCA has made minor editorial changes and additions to the original text of the SDR, for improved reading and better logic flow.

The aircraft was snagged for “engine won`t start”. Troubleshooting was carried out and maintenance found the ignition switch to be faulty. The switch was checked in accordance with Diamond DA20-C1 aircraft maintenance manual (AMM) chapter 74-00-00, p 201- ignition switch test #2, item number 3 on page 202. When tested in the “start” position, the left retard was found to be “open” which was correct, but it was also found that the left and right advance cable points were “open”. These contact points should have read zero ohms or “closed”. A new switch was obtained from the company’s primary base of operation. It was tested in accordance with the AMM, found serviceable and installed.

The defective switch had been replaced for troubleshooting purposes due to an “erratic starter engagement” the previous week. The switch was not checked for correct continuity at that time of installation and had accumulated 21.1 hours in service.

During the current snag troubleshooting, when the switch was found to be defective, there were no new switches in stock at the company’s sub base, so a serviceable switch was removed from an aircraft down for a 1500 hour inspection. When that switch was tested prior to the planned installation to rectify the snag, the then removed serviceable switch was found to have the same defect as the switch with the 21.1 hours in service. The total time in service of the removed serviceable switch is unknown at this time

and there is no record of replacement within the previous 6 months. The removed serviceable switch was red tagged and placed in quarantine stores.

**Transport Canada Comments:**

The original equipment switch part number (P/N) listed in the DA20-C1 Illustrated Parts Catalog (IPC) is shown as being P/N A-510-2. The latter is manufactured by ACS Products Company. In this particular SDR, the faulty ignition switch is identified as being P/N 10-357210-1. This ignition switch was previously manufactured by Bendix Engine Components Division (Bendix), now part of Teledyne Continental Motors (TCM). The DA20-C1 IPC specifies that the Bendix P/N 10-357210-1 ignition switch is an optional switch with a "push-to-start feature". It is eligible to be installed on the DA20-C1 by virtue of Diamond Service Bulletin (SB) DAC1-74-03, now at revision 2.

This SDR raises a potential airworthiness concern with respect to the possibility of a latent or hidden failure of the ignition switch. In this particular case, the switch failed to an open or no-start condition. TCCA searched the WSDRS database and found 6 SDRs between 1984 and 2010 related to the original ACS Products Co. P/N A-510-2 switch and 25 SDRs between 1975 and 2017 related to Bendix P/N 10-357210-1 switch. The problem descriptions of the SDRs reveal several potential failure types, including failed open / "no-start" failures, intermittently failed open / "erratic starter engagement" failures and failed closed / "hot start" failures. The latter are particularly problematic because such failures could result in an un-commanded start with potential death or serious injury to ground personnel due to unexpected propeller rotation.

The Federal Aviation Administration (FAA) issued Airworthiness Directive (AD) 76-07-12 on April 14 1976, against several Bendix part number ignition switches, including the P/N 10-357210-1 switch. The AD was subsequently amended effective August 30 1977. The AD requires an operational check of the ignition switch every 100 hours, by running the engine and rotating the ignition switch to the extreme "off" direction. If the engine keeps firing, it indicates a malfunctioning switch. The AD refers to Part III of Bendix SB No. 583, issued in April of 1976, for repair and replacement of the switch. In addition TCM issued SB 660 which addresses testing the Bendix switches every 100 hours or annual inspection.

The FAA also issued the very similar AD 93-05-06 against ACS Products Co. and Gerdes Products Co. ignition switches, including the ACS P/N A-510 series of switches. The AD is effective April 29 1993, and requires an inspection of the switch to detect wear and corrosion and to further disassemble and lubricate the switch, all in accordance with ACS SB 92-01, dated August 15 1992, or Cessna SB SE91-5, revision 1, dated June 14 1991. The AD requires a repeat inspection and lubrication of the switch every 2000 flight hours. It also requires a one-time inspection at the first 100 hours or next annual inspection to determine if a diode or surge suppressor is installed on the starter solenoid and, if not, to install one. Failure to install a diode or suppressor could accelerate damage to the switch contacts.

The DA20-C1 AMM incorporates ignition switch resistance and continuity testing requirements with an ohm meter in Chapter 74-00-00, every time the switch is replaced. It should be noted however that the specific types of ignition switches described in this article are not limited to the DA20-C1 aircraft model. They are commonly used on multiple aircraft models in the general aviation segment, including Diamond, Cessna, Piper, Schweizer, Grob-Woerke, American General, and Burkhart Grob. The underlying safety issue may potentially affect thousands of aircraft.

TCCA reminds general aviation aircraft owners, operators and maintainers of the potential for latent failures and the inherent safety risks of these types of ignition switches and to take the appropriate corresponding safety actions required by the relevant ADs and SBs.

# Fixed Wing

## Bombardier, CL600-2D24 (RJ900)
## Circuit Breaker Panel Burned Through

**SDR #20161121006**

**Subject:**

The left hand cockpit main circuit breaker panel was burned through when a foreign metal object contacted the windshield wiper circuit breaker and grounded to the panel door skin. The ensuing electrical arcing burned through the panel creating a hole.

**Transport Canada Comments:**

The burnt part of the panel is actually a door which hinges down in order to provide access to the circuit breakers for maintenance and inspections. It is likely that during some previous maintenance event that the foreign object was dropped or left inside the panel. The object then moved and shorted out the wiper circuit breaker causing the damage to the panel door.


Panel showing external hole width


Panel showing external hole height


Panel inside showing burnt rail hole size inside panel

# Bombardier, BD 700 1A10 - Global oxygen mask lanyard incorrectly installed

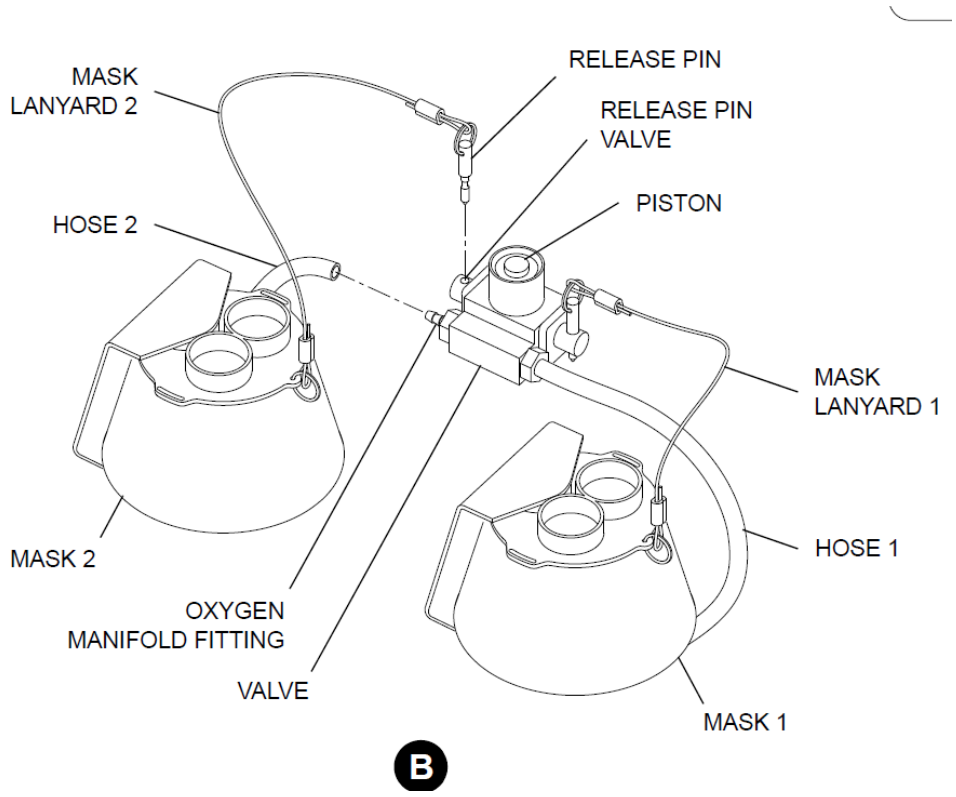
**SDR #: 20171128015**

**Subject:**

During a maintenance task, a technician of the operator organization found five passenger oxygen boxes where oxygen did not flow to the correct mask. It was reported that the mask lanyards were cross-connected to the oxygen supply valve and caused the oxygen to flow to the incorrect mask.

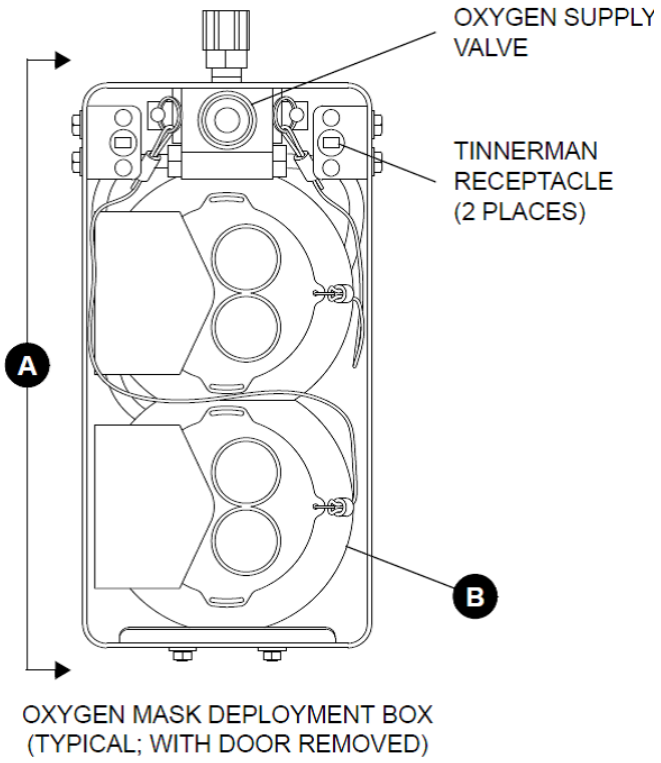
Transport Canada Comments:

This problem is self-explanatory. Follow maintenance manual instructions when working on any system to eliminate incorrect installation.




Images show the proper installation of the lanyard.

- Mask lanyard
- Hose
- Mask
- Oxygen manifold fitting
- Valve
- Piston
- Release pin




- Oxygen supply valve
- Tinnerman receptacle (2 places)
- Oxygen mask deployment box (Typical; with door removed)

## Boeing 737 8CT - Wheel assembly missing/broken tie bolts

**SDR #: 20160203026**

**Subject:**

During the take-off roll, at approximately 120 to 130 knots, the crew reported that they heard a bang followed by a vibration and decided to reject the take-off.

When maintenance arrived at the aircraft, they confirmed that the number 1 and 2 tires had blown and that damage was also found to the wheel halves. The cause of the tire blowout was unknown, but all affected components were changed out and sent to the appropriate vendor for assessment.

The number 1 and 2 wheel assembly halves were found still held together by the tie bolts. The number 1 wheel assembly had four sheared tie bolts and all the bolts appeared to be intact on the number 2 wheel assembly. The wheel fuse plugs on both wheel assemblies were inspected and found to be intact. The aircraft servicing history was reviewed and no abnormal servicing issues were noted since the installation of the wheel and tire assemblies.

All wheel assemblies and the number 1 and 2 brakes were replaced to return the aircraft to service. The service difficulty report (SDR) will be updated with all findings following vendor analysis.

Transport Canada Comments:

Investigation by the shop concluded all the bolts from this event were as follows:

1. All bolts were evaluated and met specifications for hardness, coating and material (H-11 steel) with no indications of a batch or quality issues.
2. The cause of the six fractured bolts was found to be fatigue. Four bolts were found with cracks initiating from the 8th to 9th thread root and two bolts were found with cracks initiating from the under-head radius transition area.
3. No abnormal cause of the fatigue cracking was detected (corrosion, mechanical damage).
4. Overload fractures detected on three of the six bolts were assumed to have occurred during the take-off roll.
5. No indication of bolt stretch was observed.

The original equipment manufacturer (OEM) was contacted and reported that they were unaware of any problems with tie bolts in industry. The operator initiated a fleet campaign replacement of all bolts, and limited the bolts to less than the OEM recommended service life, in an effort to prevent these issues. The reduced service life program has worked and reduced the failure frequency. One SDR has been reported since July 2016 where a loose bolt was found during maintenance.

Wheel showing wheel damage and missing tie bolts

Wheel and tire damage

Photo of a sheared tie bolt showing fracture at threads

# Boeing 737 8Q8 - Loose metal found in brake assembly

**SDR #: 20170419007**

**Subject:**

During a gear inspection, the maintenance staff noticed the appearance of loose metal inside the aperture of the rim. After removal of the wheel and brake assembly, the brake disk retainer was found loose and metal was also seen coming from the brake disks assembly. The metal brake disk retainer had started to wear a groove in the interior of the wheel rim and a piece of metal was removed from the brake disk assembly.

**Transport Canada Comments:**

It was not reported what caused these defects, but both issues were discovered when maintenance personnel found something that did not look right and investigated. If the defect had not been found, more extensive and costly repairs may have been needed and aircraft braking capability would have been adversely affected.

Figures 1a and 1b - Brake disk retainer showing the wheel assembly wear (location and close up)

Figures 2a and 2b - Loose metal found inside brake assembly (where found and what it looked like


## Bombardier CL600 2D15 (705) - RJ 705/900 - Passenger Door Aft Latch Fitting Sheared Bolts

**SDR #: 20170724005**

### Subject:

Maintenance heard an object falling inside the main cabin door when it was opened; which turned out to be a sheared bolt. Further investigation revealed that two (2) of the cabin door upper aft latch fitting (part number 601R31805-5) bolt heads had sheared off. These bolts are not normally visible as they are underneath the folding bottom step when the door is in the open position. The door fitting area was accessed and the broken bolts (part number NAS6605-14 and NAS6606-15) were replaced.

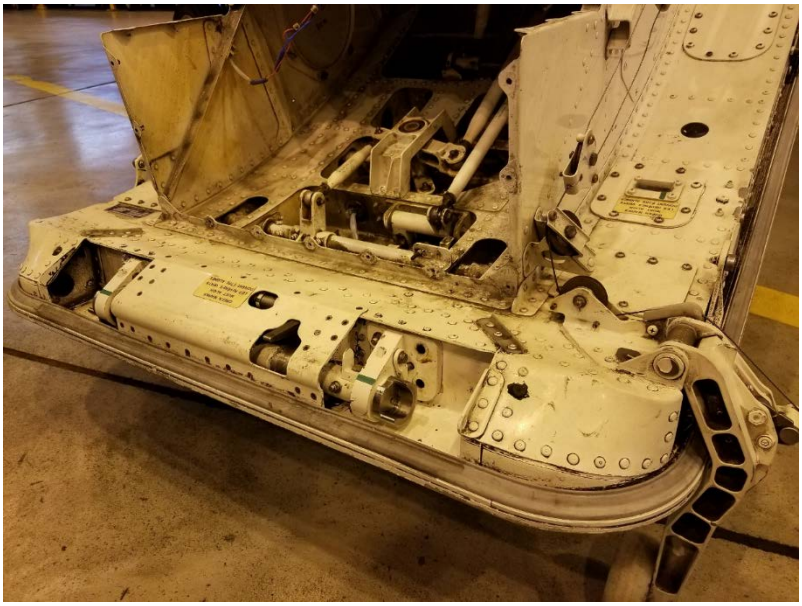
Transport Canada Comments:

The analysis of the damaged parts determined that the bolt heads failed due to corrosion. A safety assessment completed by Bombardier found that the bolts are part of a multi- load path and the remaining bolts and fittings are adequate to secure the door. The latest two (2) failures were found to occur between 18 000 Flight Cycles (FC) and 19 000 FC, but there have been three (3) similar Service Difficulty Report (SDR) events recorded in the Transport Canada Civil Aviation SDR database since 2014. The current inspection program was reviewed and the Maintenance Requirements Manual (MRM) prescribes a detailed visual inspection (DVI) of the backup structure at a threshold of 16 600 FC with a repeat interval of 6000 FC based on the initial investigation.

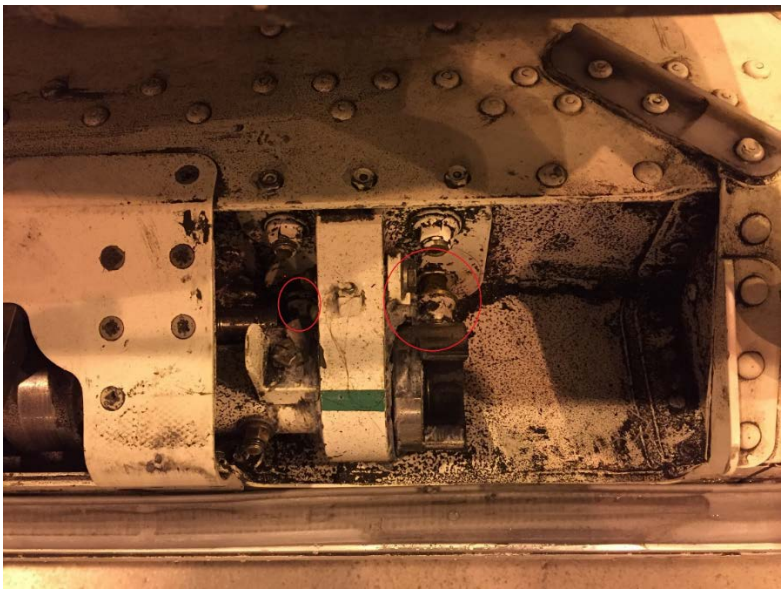
As the 2014 event occurred at 14 994 cycles (which is below the 16 600 FC inspection interval), a more detailed analysis of the failed bolts is underway and a fleet sampling program has been initiated to inspect for damaged bolts. The adequacy of the maintenance program intervals will be assessed as part of this analysis.

The current inspection task does not specify removal of the bolts, and operators may wish to consider removal of the bolts to allow a more detailed inspection for corrosion as the bolt heads, when installed, are hidden from view. These defects have all been reported on RJ705 aircraft and this model shares the same door with the RJ900 aircraft.

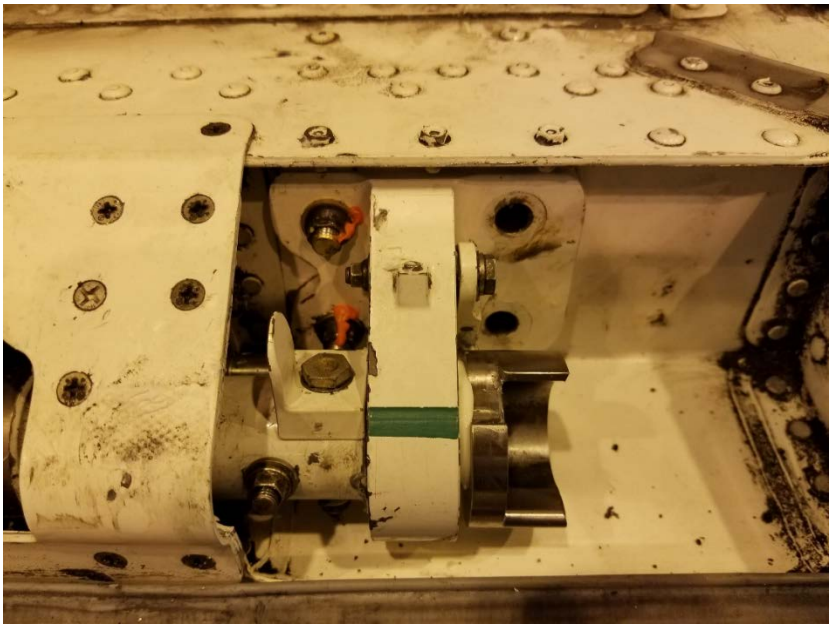
Transport Canada continues to monitor this issue, please report any failed bolts or excessive corrosion through the SDR program.



Upper aft fitting location

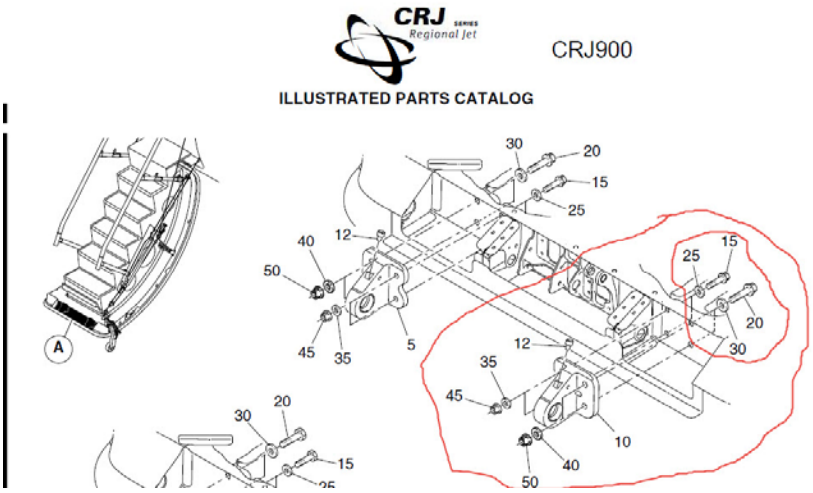


Upper fitting sheared bolts shown



Close up of fitting


Sheared bolts after removal




Parts diagram showing bolts

## Pilatus SW, PC 12 47E - Landing Gear - Electrical

**SDR # 20170928006**

**Subject:**

A pilot reported just before landing, a yellow advisory message "air/ground fail" and "RH weight on wheel fault". Upon inspection of the right hand (RH) weight on wheels switch, the cannon plug was found to be severely corroded and disintegrated into multiple pieces when trying to remove it. This

cannon plug was covered by heat shrink, well-sealed at both ends and showed no sign of any faults from an external visual inspection.

Transport Canada Comments:

This is a good reminder about landing gear electrical components and the effects that our Canadian climate can impose on them. Extra care should be taken when inspecting this area of the aircraft. If necessary, remove heat shrink and coverings to get a closer look.

Corroded pieces of cannon plug back shell.

## de Havilland-CAN, DHC 8 402 - Chafed hydraulic line

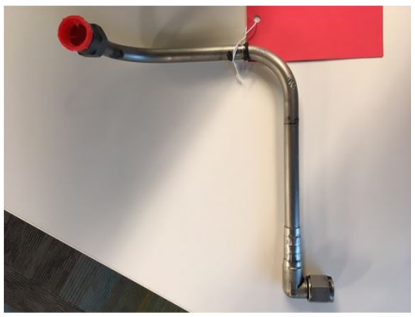
**SDR # 20170918004**

**Subject:**

The standby power unit to the reservoir hydraulic line was found with chafing damage. The line was replaced and the aircraft was subsequently released for service.

Transport Canada Comments:

When inspecting hydraulic lines, make sure that areas that are tight, or areas where lines may come in contact with other lines or structure, are protected from chafing.



Chafed line with damage almost through the wall thickness of the line.

## Douglas, DC3C - Attentive Walk Around Prevents Possible Incident

**SDR #: 20170614007 and 20171127017**

**Subject:**

During two separate incidents, an operator of the DC3C with the Basler turbo prop conversion has found cracked outboard elevator attachment hinge fittings. The first incident occurred during a pilot pre-flight walk around. The pilot was checking for free play at the left-hand elevator and noted a clunking sound while shaking the elevator. Further investigation found that the left-hand outboard elevator attachment hinge horn was broken at the bolt attachment.

The second incident occurred during a 150-hour inspection. A close visual inspection of the elevator attachment hinge fitting, located on the right-hand outboard stabilizer location, showed signs of cracked paint. The AME further examined the area closely with a borescope and detected a crack. The crack was not visually detectable without the aid of magnification, such as a borescope, due to the limited access while the elevator is installed.

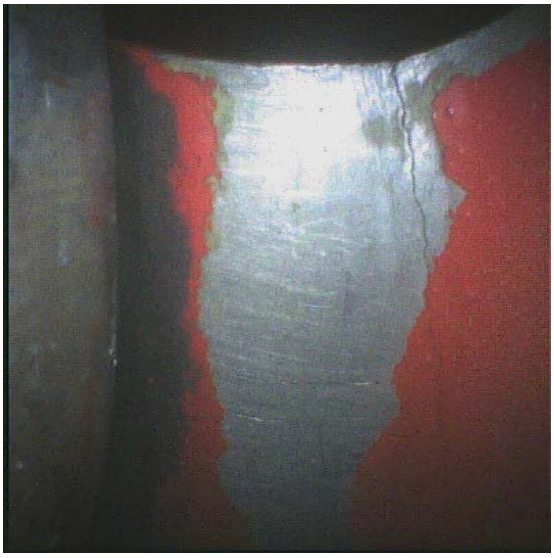
In both cases, the elevator attachment hinge was replaced with a serviceable part and the aircraft returned to service.

Transport Canada Comments:

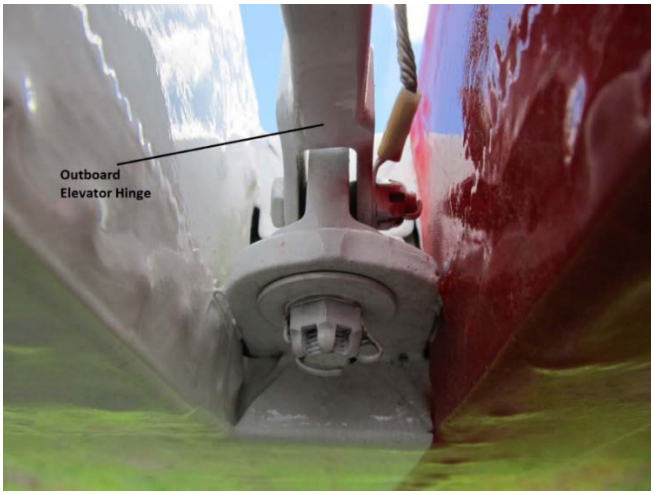
Had it not been for an attentive pilot performing the usual pre-flight walk around or an eager AME performing the same old 150-hour inspection, these snag may have gone unnoticed. Remember the dirty dozen and avoid complacency.

“Today is the day I will find something!”

Hinge with missing piece



Close up, borescope view of hinge end with crack




Ground view of outboard Elevator Hinge

# Rotorcraft

## Bell Textron – Canada, 407 - Expandable Main Rotor Blade Bolt Pivot Pin Movement

**SDR #20170209010**

**Subject:**

The pivot pin in the expandable blade bolt assembly was found out of position.

Transport Canada Comments:

Due to a lack of swaging, the expandable main rotor blade bolt pivot pins installed on some model 407 and 427 helicopters were found to have movement. The expandable main rotor blade bolt can be installed by either the Bell Helicopter Textron Kit Installation Instruction or the Paravion Technology Inc. aftermarket Supplemental Type Certificate (STC). Bell Helicopter Textron Canada has issued Alert Service Bulletins (ASB) 407-17-115 and& 427-17-41 to provide a detailed visual and load test inspection of the pivot pins.

## Equipment Airworthiness Directives (ADs)

Transport Canada (TC) endeavours to send copies of new Airworthiness Directives (ADs), which are applicable in Canada to the registered owners of the affected products. Equipment/appliance ADs are often only distributed to our regional offices because the owners of aircraft affected by this type of AD are not generally known.

Aircraft Maintenance Engineers (AMEs) and operators of the affected products are encouraged to obtain further information or a copy of the ADs from their regional TC office, their local Transport Canada Centre (TCC), their Principal Maintenance Inspector (PMI), or from the Civil Aviation AD website at: *www.tc.gc.ca/cawis-swimn*

To view the most recently published Equipment Airworthiness Directives (ADs), click here or go to this website http://www.tc.gc.ca/eng/civilaviation/certification/equipment-airworthiness-directives.html

## FAA Special Airworthiness Information Bulletins (SAIB)

A Federal Aviation Administration (FAA) SAIB is an information tool that alerts, educates, and makes recommendations to the general aviation community. It is non-regulatory information and guidance that does not meet the criteria for an Airworthiness Directive (AD).
www.faa.gov/aircraft/safety/alerts/SAIB/

To view the most recently published FAA Special Airworthiness Information Bulletins (SAIB), click here or go to this website http://www.tc.gc.ca/eng/civilaviation/certification/faa-special-airworthiness-information-bulletins.html

## EASA Safety Information Bulletin (SIB)

A European Aviation Safety Agency (EASA) SIB is an information tool that alerts, educates, and makes recommendations to the general aviation community. It is non-regulatory information and guidance that does not meet the criteria for an Airworthiness Directive (AD). http://ad.easa.europa.eu/sib-docs/page-1

To view the most recently published EASA Safety Information Bulletin (SIB), click here or go to this website http://www.tc.gc.ca/eng/civilaviation/certification/easa-safety-information-bulletin.html

## FAA Unapproved Parts Notifications (UPNs)

Unapproved Parts Notifications are published by: FAA, AIR-140, P.O. Box 26460, Oklahoma City, OK 73125. They are posted on the Internet at: http://www.faa.gov/aircraft/safety/programs/sups/upn/

To view the most recently published FAA Unapproved Parts Notifications (UPNs), click here or go to this website http://www.tc.gc.ca/eng/civilaviation/certification/faa-unapproved-parts-notifications.html

## Service Difficulty Reports (SDR)

Service Difficulty Reports are submitted by Aircraft Maintenance Engineers (AMEs), owners, operators and other sources to report problems, defects or occurrences that affect aircraft airworthiness in Canada.

To view the most recently published Service Difficulty Reports (SDR), click here or go to this website http://www.tc.gc.ca/eng/civilaviation/certification/service-difficulty-reports.html