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SERVICE LETTER

In-Service
Engineering

CRJ700/705/900/1000-SL-21-029

ATA: 2124

DATE: 16 Apr. 13

SUBJECT: Cockpit Noise

MODEL: CL-600-2C10 (CRJ700), CL-600-2D15 (CRJ705), CL-600-2D24 (CRJ900) and CL-600-2E25 (CRJ1000)

APPLICABILITY: All

PURPOSE:

Some Operators have reported elevated noise levels within the cockpit on the CRJ700/900/1000. Bombardier initiated an in-depth investigation to determine the root cause of the noise. In addition Bombardier and one operator combined their efforts to validate the root causes and to establish a procedure to identify the noise source and a method to reduce the noise within the cockpit.

DISCUSSION:

On ground, noise within the cockpit environment is generated by the display cooling system and air conditioning system. In flight there is an additional contributor to the noise level, being aerodynamic noise. Aerodynamic noise is generated as the aircraft moves through the surrounding air. Several cockpit noise measurements were taken by Bombardier on new aircraft and also on in-service aircraft at Operators. One Operator also took several measurements on various CRJ aircraft. These measurements were analyzed and tabulated to show the maximum noise in flight and on ground. In all cases, the noise levels were below the established maximum range values. However, the investigation concluded that there was considerable spread in the measured noise levels of the different in-service aircraft.

The investigation also showed that very little benefit can be gained by attempting to reduce the air conditioning system and aerodynamic noise. However, there were substantial benefits to be gained by:

1. Replacing the display cooling filter when it is (partially or fully) clogged.
2. Using the alternate display cooling fan or replacing a noisy fan.
3. Reconnecting disconnected display cooling ducts.
4. Replacing or repairing of damaged display cooling ducts.

The line replaceable units (LRU) of the display cooling system are (See figure 1):

- The display fan and check valve (No. 1)
- The display fan and check valve (No. 2)
- The display air filter
- The environmental control system (ECS) alternate supply check valve
- The low flow sensor (LFS), and
- The low pressure ducting which connects the LRUs.

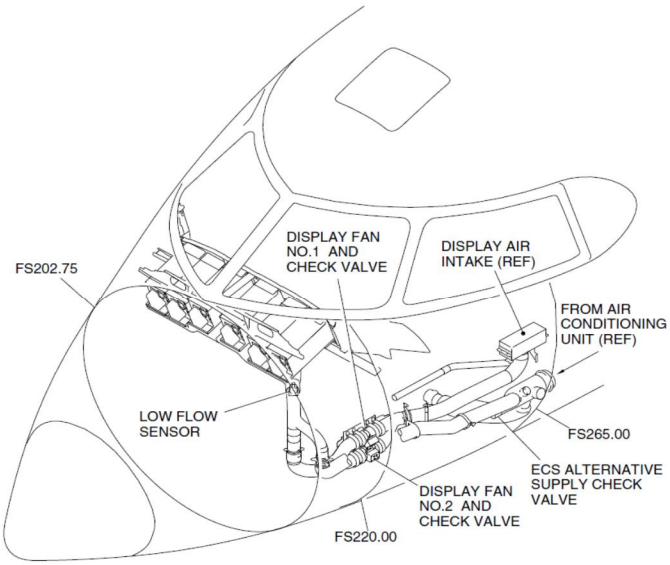

Figure 1: Display Cooling System

The display fans (No. 1 and No. 2) are activated from the cooling fan control panel located on the center pedestal as shown in figure 2. These fans operate one at a time and pull air from the cockpit through the display cooling filter. The filter is located on the floor on the left side of the cockpit.

The GRD ALTN position energizes the flight fan on ground. In NORM position the ground fan and flight fan operation is controlled as a function of weight on wheels (WOW). The FLT ALTN energizes the ground fan in flight. While in the STBY position, the ground fan and the flight fan are de-energized and conditioned air from the left air conditioning duct supplies ventilating air. This filter removes air borne particles from the air within the cockpit before the air goes into the cockpit displays. There is no filtering in the STBY mode,

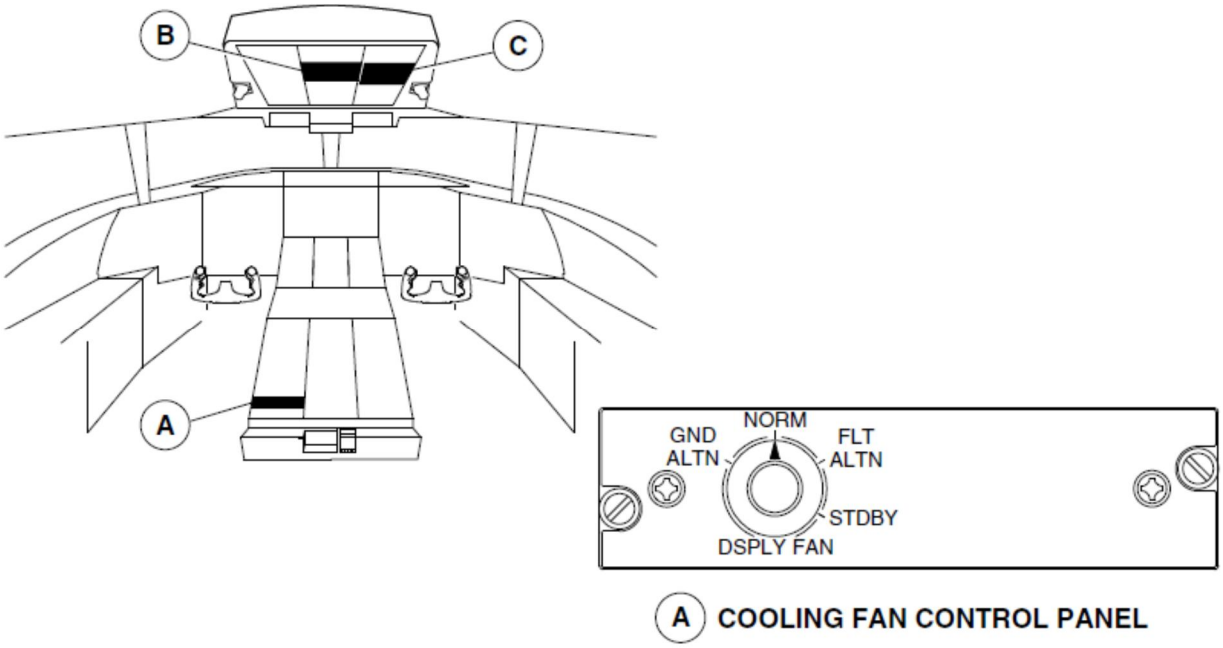

Figure 2: Cooling Fan Control Panel

The following action should be performed if there are crew complaints of abnormally high cockpit noise

The aircraft must be in the following configuration:

- Aircraft on ground
- APU on
- Both Packs on
- Recirculation Fan on
- All Gaspers (cockpit) open
- Cockpit door closed

Notes:

1. *Any exogenous noise (radio, galley loading, doors closing etc.) must be excluded from the noise measurement. If necessary restart the measurement.*
2. *The noise measuring time must be approximately 10 sec.*
3. *The noise measurement must be done with the display fan selector in the following position, depending on the crew complaint.*

Procedure

1. Display fan selector in “NORM” position if the complaint is a noisy cockpit on ground.
2. Display fan selector in “GND ALTN” position if the complaint is a noisy cockpit in flight.

Measure the cockpit noise as follows:

Note: All noise measurement must be done with a calibrated sound level meter located as shown in figure 3. That is, with the pilot’s seat at the lowest and rearmost position and the sound level meter positioned right next to the pilot’s headrest.

Figure 3: *Sound Level Meter Position*

The R0-1350 sound level meter or equivalent can be used to measure the noise level in the cockpit at the pilot's head as shown in figure 3. Configure the sound level meter as follows:

- Place function switch on "A" (500 to 10KHZ) position
- Place range switch on "LO" (35 to 90DB) position
- Place response switch on "SLOW" position.
-

Note: The sound level meter must be calibrated before each use in accordance with the user manual.

If there are complaints of excessive cockpit noise, the operator should measure and record the dB values by using the table below.

It is important to note that residual ambient noise is not unusual in the cockpit, with sound values up to 75 dB(A) +/- 5 dB(A).

Knob / **Location of Sound Meter**	**NORM (FAN#2)**	**GND ALT (FAN#1)**
Pilot seat Headrest	**dB(A)**	**dB(A)**

Troubleshooting Procedure/ Corrective Actions:

If the measured noise level is excessive at only one of the following positions:

"NORM" (Ground FAN#2) or "GND ALTN" (Flight FAN#1), then the identified fan must be replaced per AMM task 21-24-12-000/400-801. Refer to figure 4.

If the measured noise level is excessive at both of the following positions:

"NORM" (Ground FAN#2) and "GND ALTN" (Flight FAN#1), then the excessive noise source can be the display filter, the check valve, an unsecured duct or a disconnected/leaking duct. Troubleshoot as follows:

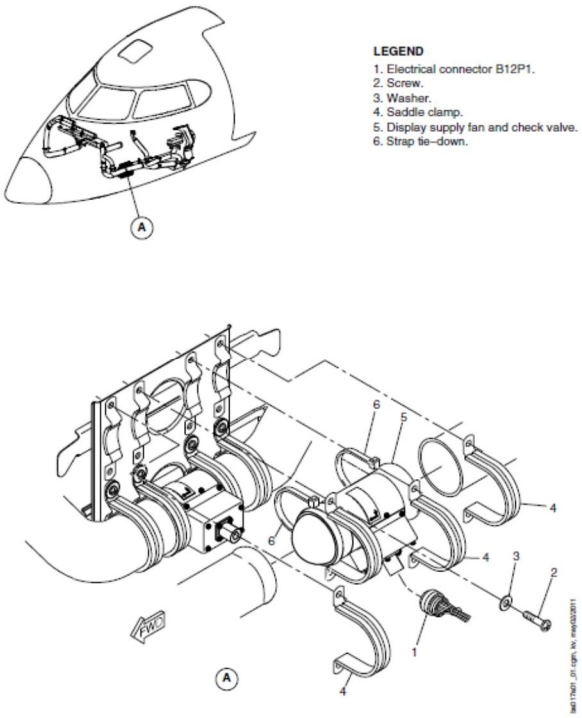

Figure 4: Display Cooling Fan

1. Do a general visual inspection (GVI) on the display cooling air-filter. If found clogged/dirty, replace the filter per AMM task 21-24-10-000/400-801. Refer to figure 5. Re-measure the noise level in the cockpit. If there was no reduction in the noise level then go to step 2, below.

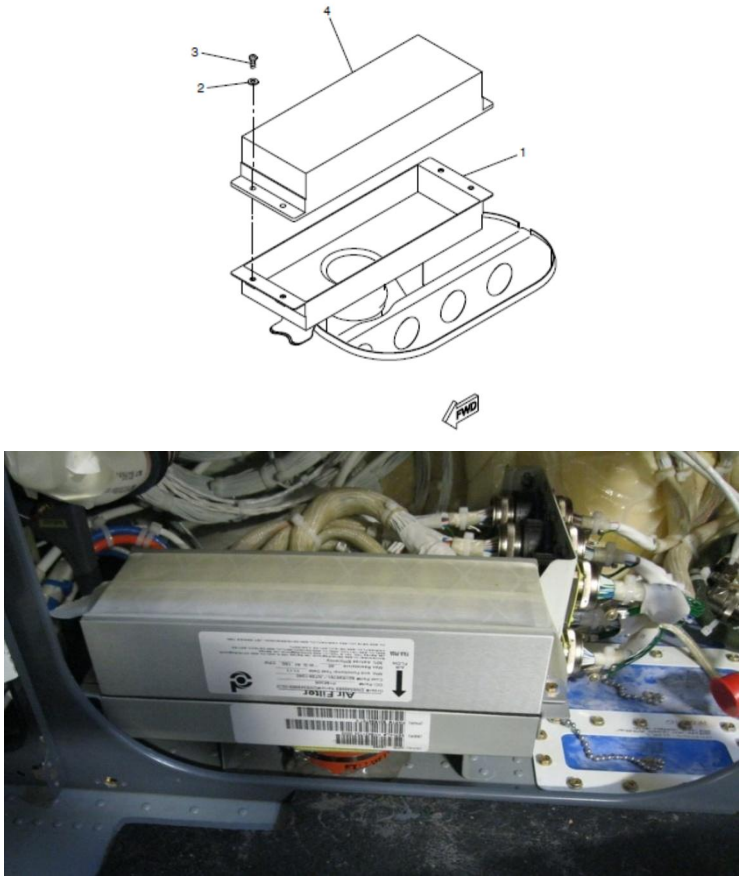

Figure 5: Display Cooling Air-Filter

2. Do a complete inspection of the following ducting:
   Refer to figures 6 to 13. If there are any disconnections, reconnect as per the AMM Tasks 21-24 XX. If there are any damaged ducts replace or repair them.

   Note: It is very important to make sure that all ducts are supported and correctly secured per the AMM, if not ducts may vibrate excessively and may be the source of additional noise.

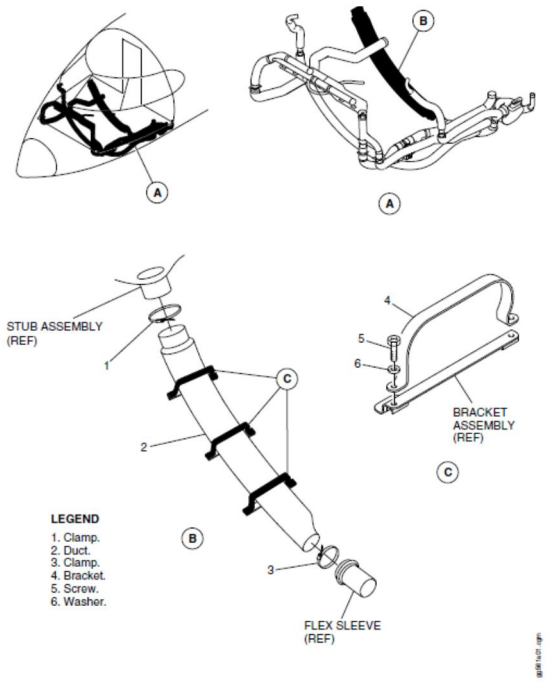

Figure 6: Below–Floor Right–Riser Supply–Duct FS276.25–Removal/Installation

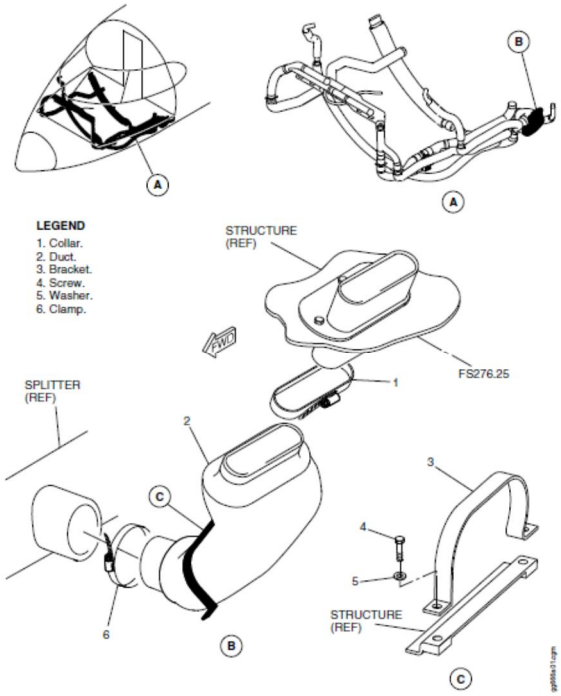

Figure 7: Below–Floor Left Riser Supply–Duct–Removal/Installation

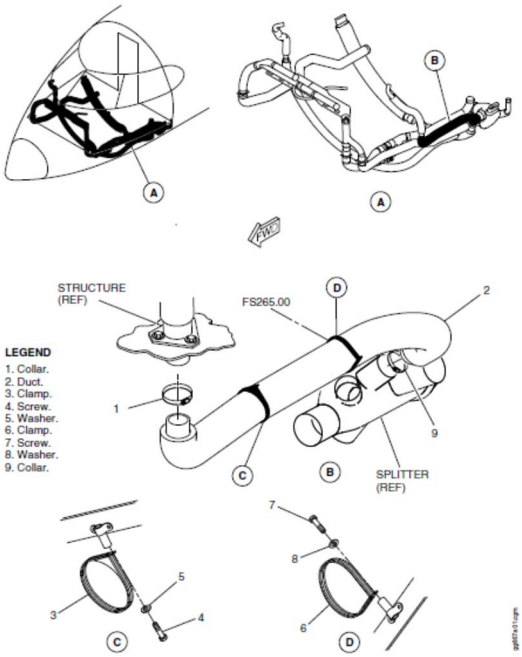

Figure 8: Below–Floor Left Overhead Ventilation–Duct FS237.12 to FS272.50–Removal/Installation

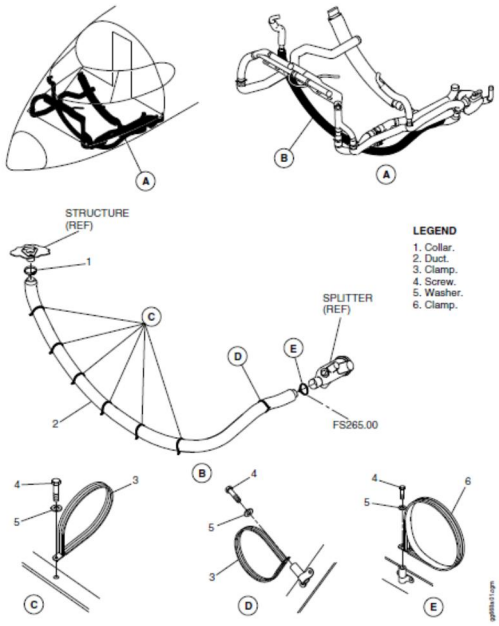

Figure 9: Below Floor Right Overhead–Ventilation Duct FS235.00 to FS265.00–Removal/Installation

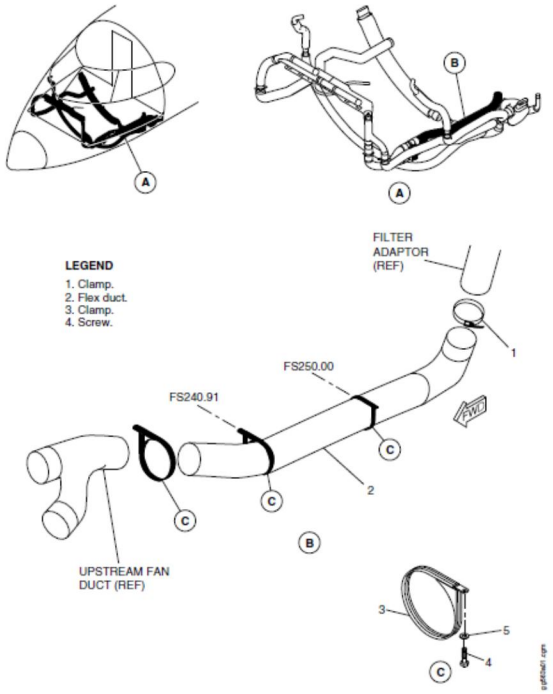

Figure 10: Below–Floor filter Flex–Duct FS238.02 to FS269.55–Removal/Installation

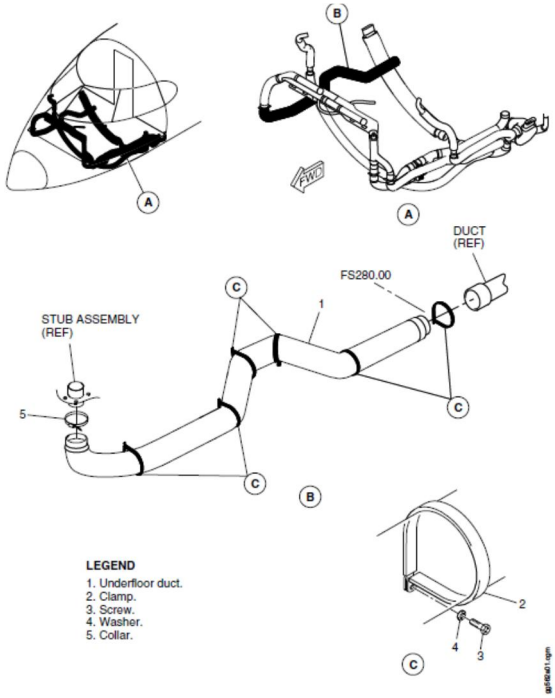

Figure 11: Below−Floor Display Extraction FS207.20 to FS281.50−Removal/Installation

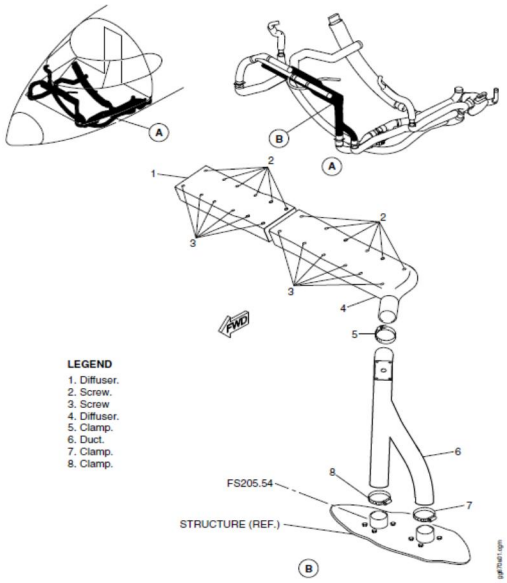

Figure 12: Above Floor Display–Ventilation FS207.00–Removal/Installation

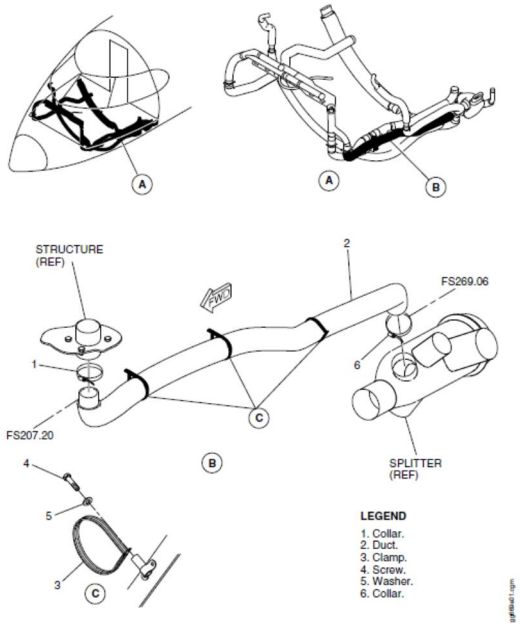

Figure 13: Below–Floor Display–Ventilation Duct FS207.20 to FS269.06–Removal/Installation

BOMBARDIER ACTION:

NA

OPERATOR ACTION:

If there are complaints of noise in the cockpit, Operators should measure the noise level, and if necessary then perform the Corrective Actions / Troubleshooting Procedure as shown above.

Please direct responses and inquiries regarding the content of this Service Letter to your Bombardier Aerospace Regional Aircraft Field Service Representative or the Technical Help Desk in Montreal at telephone number (514) 855-8500 or facsimile (514) 855-8501 or e-mail thd.crj@aero.bombardier.com

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