



Nose gear inspection  
P180, S/N 1139 N168SL

APRO Jan 31,2012

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### **Scope of Work**

Piaggio P180, Avanti II Nose Landing Gear (NLG) steering test and inspection  
Based on the data collected after investigation in Flint Michigan, NTSB and Piaggio Aero requested respective checks on steering manifold, to determine if un-commanded steering movement / action may have occurred. The testing will be following procedures supplied by Piaggio Aero engineering Doc. N. 180-TRS-3250-04642, Messier Dowty LTD, CMM for the Steering Manifold, Steering Actuator, and NLG assembly Test on APRO compression test cell rig.

### **Location:**

APRO (Aero Precision Repair and Overhaul)  
580 South Military Trails  
Deerfield Beach, FL 33442  
Phone: 954 428 9500

### **Attendees**

**NTSB;** Aaron Sauer Sr. Air Safety Investigator  
**Piaggio America;** Chris Grinnell, Director of Customer Support  
**FAA;** South Florida Flight Standards District Office Aviation Safety inspectors Peter Snead, Edward Loop, Manuel Fernandez, Todd Landacre  
**SAFRAN Messier – Dowty;** Michael McIntosh Fr Field Support Engineer  
**APRO;** Director of Production Luis Gamoneda, Director of QA and engineering John Cowan Alex Tearle President, additionally multiple lab technicians

### **APRO Preliminary Receiving Inspection (WO 3032670)**

NLG; P/N 2010330002 S/N MDG225, TT 4420.6, TC 3411  
Steering Actuator; P/N 114068003, s/n SM-M-DG-0046  
Steering manifold; P/N 114180003, s/n SM272  
Servo Valve; p/n 4700201, s/n AH-0257  
Nose gear harness P/N 201023227, s/n 174, assembly date 10/06

Received with 2 each Hyd swivels and 2 each Hyd lines and 1 each bracket

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## **NLG Test Procedures**

The Nose gear was received in Wood crate, unopened and no damage to crate was detected. The Crate was opened with all participants present; nose gear was contained with care taken, to prevent damage during the shipments or movement of container. NLG removed from the crate and visually inspected on bench by APRO. Only minor scratches were noted and one bracket bent slightly supporting the nose steering actuator cannon plug. A group review of the test plan was completed and all agreed to test the NLG as received.

The NLG Assembly was installed onto the test fixture located within APRO test cell area of lab. Test was completed following the MDL CMM, and results recorded for evaluation by all. During the testing un-commanded right turn of the nose gear was resulted when nose steering engaged by APRO using APRO test equipment. Trouble shooting found NLG steering actuator Follow Up Potentiometer was damaged and Channel / one loop / track was open in the circuit. This component will be evaluated later in the investigation.

A group discussion was completed, and everyone agreed to install a replacement Steering actuator, and continue the testing of NLG and Steering functions. Results of test were recorded on APRO work sheets and show satisfactory results.

NLG was removed from the test cell fixture and APRO mechanically removed the steering manifold for detail testing as requested by Piaggio Aero and NTSB.

The NLG Steering Manifold was tested, results recorded by APRO on test sheets, supplied by Piaggio Aero, and extracted from the MDL CMM. The results were satisfactory, however some relieve valve leakage was detected during the testing. APRO explained most relief valves leak during the testing normally and require multiple activations before satisfactory results are achieved.

A mechanical disassembly of the Steering Actuator was completed and findings recorded by APRO on work sheets. Some water was detected internally within the actuator piston dry area containing the Follow Up Potentiometer. Minor scoring was found within the Steering actuator body caused from Piston contact and sharp edges from manufacturing designs of piston. The Feed Back Potentiometer was inspected for open Channel, finding impact damages to wiring and one wire indicated compression shearing separating the wiring within the insulation, preventing visual detection. APRO recorded this damage and took pictures during all the investigation process's.

The NLG was reassembled and returned to the Shipping crate. The Owner / Operator / Avantair took the NLG assembly back to their Clearwater Florida headquarters for storage.