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For Open Publication

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Department of War  
OFFICE OF PREPUBLICATION AND SECURITY REVIEW

# C5 Horizontal Stabilizer EWIS Analysis, AWT Testing, and Physical Audit



# Contents

- Horizontal Stabilizer Maintenance Background
  - Data Analysis Ground Rules and EWIS Work Unit Code
  - REMIS data investigation
  - Cannot Duplicate, by the TO and not
- Horizontal Stabilizer AWTs Testing and Data Analysis
- Physical Audit
- Next Steps and Conclusion



# Horizontal Stabilizer Maintenance Background Pitch Axis, Pitch Trim System, Horizontal Stab

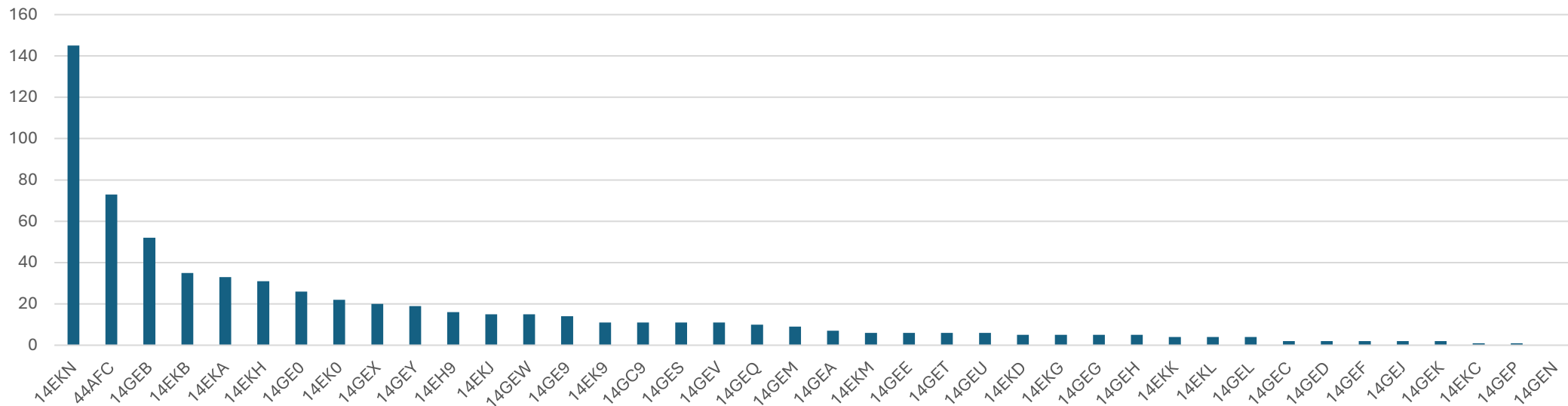
- Work Unit Codes considered:
  - 14G00 - Pitch Trim System, Horizontal Stab
  - 14GE0 Series – Pitch Trim System, Horizontal Stab – Electrical Components
  - 35140 Series – EWIS Flight Controls
  - 14EK0 Series – Pitch Axis, Electrical Components
- Filtering Data to 2017-2025 across the Fleet Use both TO definition of CND and other investigative methods catch stray CND
- Currently only 18 write ups in 35000 Work Unit Code Series
- All 35000 events have been at Programmed Depot Maintenance 12 Inspections, 2 Clamp write ups, 2 missing backshell, 2 Chaffe Wraps  
Cut/Torn/Chaffed/Frayed/Worn
- Horizontal Stab has EWIS problems, they are currently not being captured in the EWIS WUC Series
  - This may not be a bad thing...



# Horizontal Stabilizer Maintenance Background

## Pitch Axis, Pitch Trim System, Horizontal Stab – Electrical Components

C-5 Pitch EWIS Failures 2017-2025

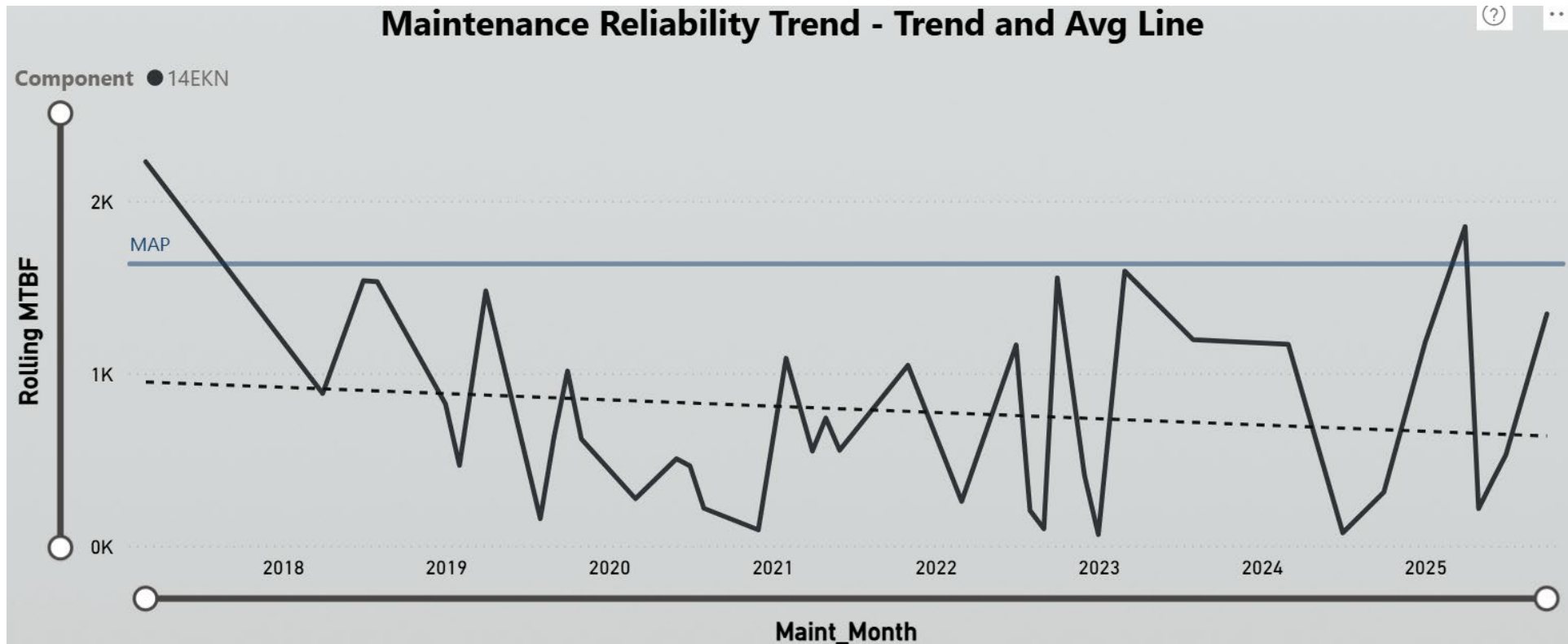


- Pitch Trim System Wiring and Connectors (14GEW) and Stabilizer Trim Position Indicator (14GEX) lead write ups
- Total Maintenance Manhours: 2,873
- While write ups have decreased over Study period, reliability is decreasing as well



# Horizontal Stabilizer Maintenance Background

## 14EKN – Elevator Control Wiring and Connectors

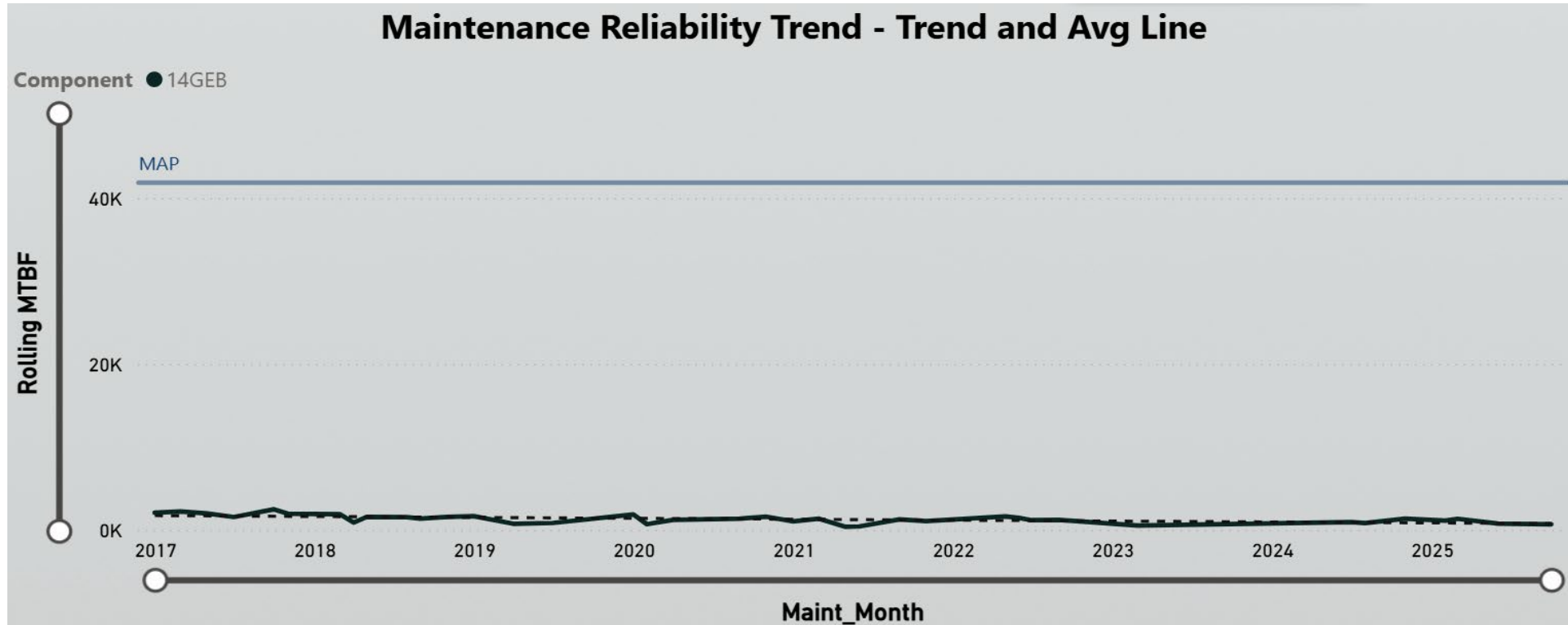


- Elevator Control Wiring Reliability shows steady decreasing trend (dotted line) across study period
- Consistently fails our Minimal Acceptable Performance (MAP) level as shown by solid blue line



# Horizontal Stabilizer Maintenance Background

## 14GEB – Stab Trim Position Transmitter

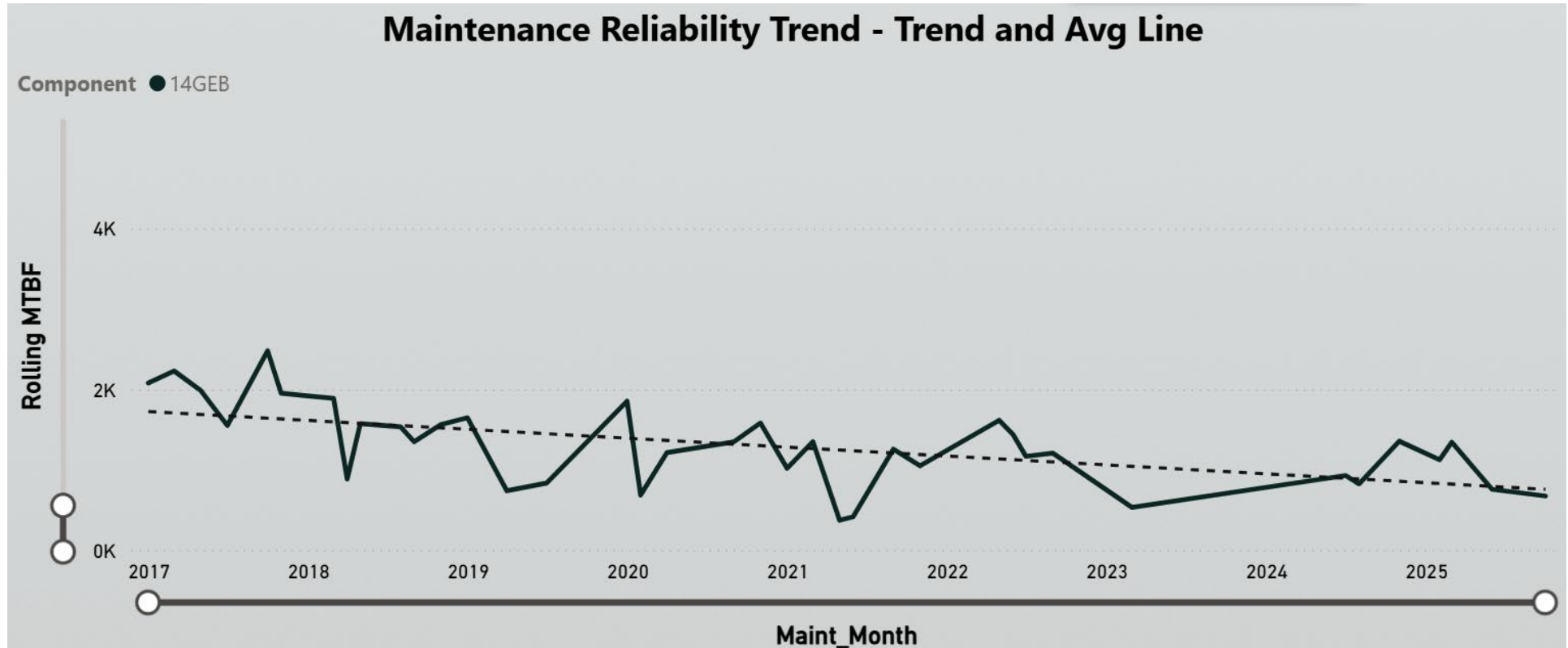


- Stab Trim Position Transmitter significantly below target set by SPO



# Horizontal Stabilizer Maintenance Background

## 14GEB – Stab Trim Position Transmitter

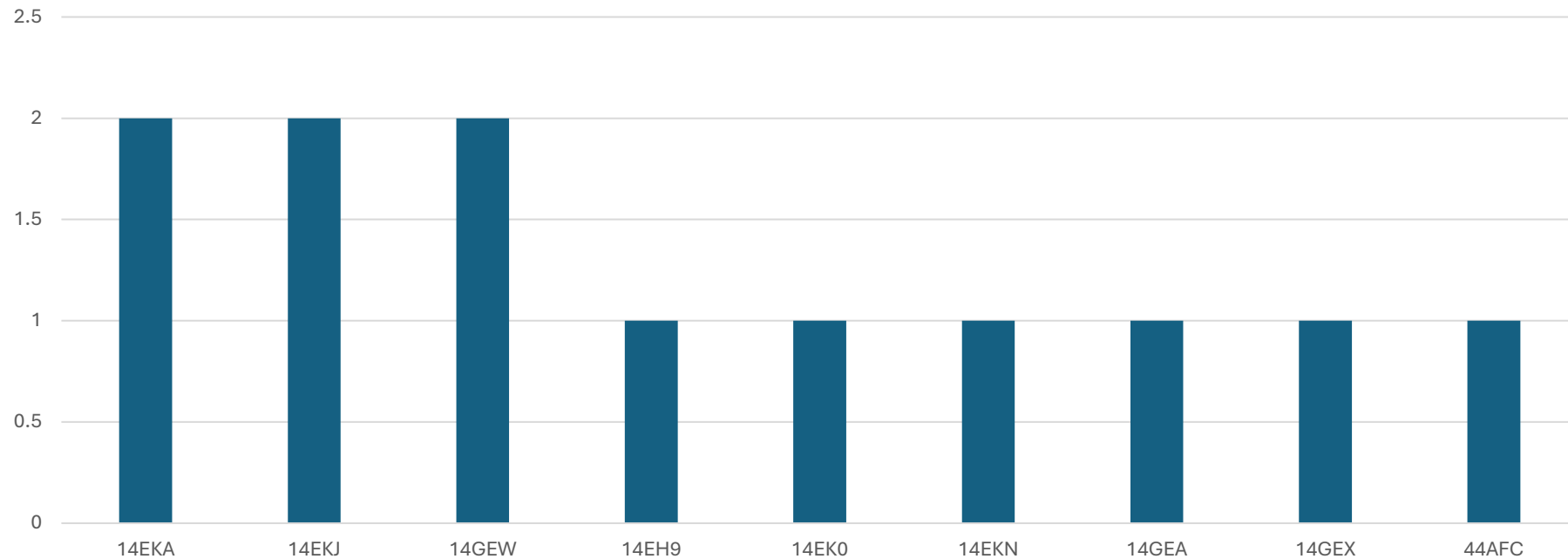


- Stab Trim Position Transmitter significantly below target set by SPO study in 2020
- Steadily decreasing reliability



# Horizontal Stabilizer Maintenance Background Pitch Axis, Pitch Trim System, Horizontal Stab CNDs

C5 Pitch Axis and HS CNDs by TO 00-20-02  
2017-2025



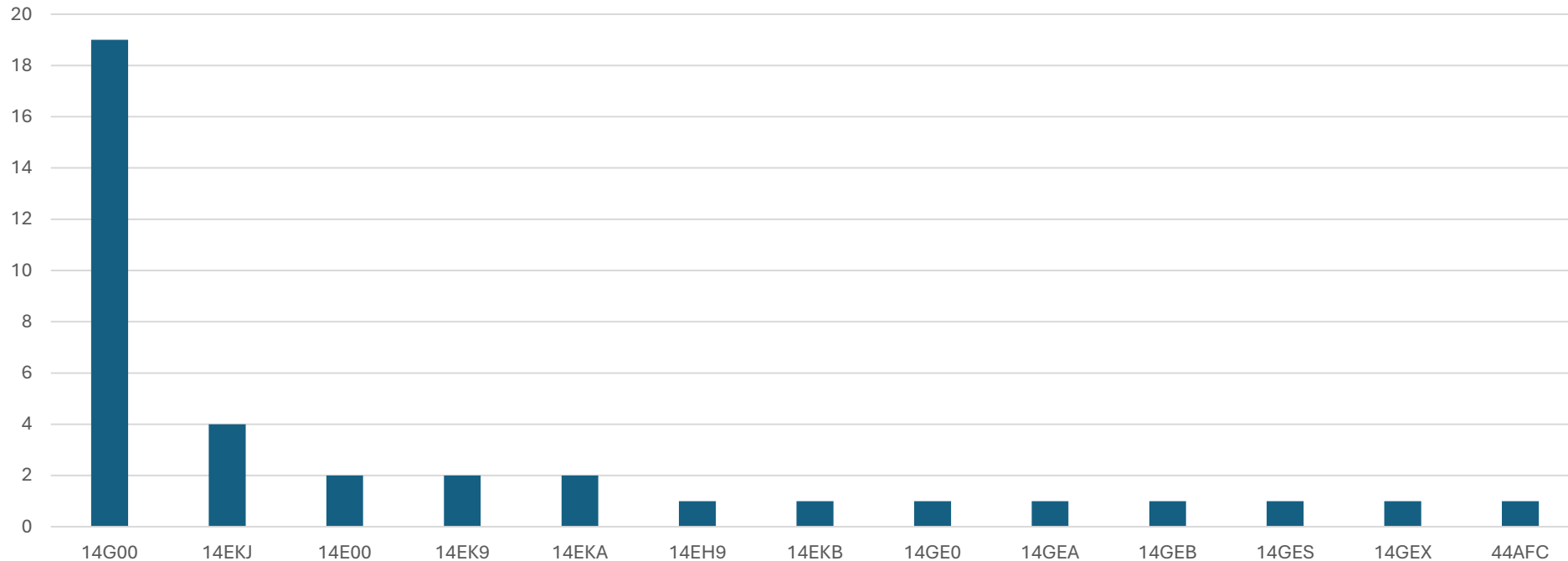
- Gathered using TO 00-20-2 guidance for CND's:
- Action Taken H
- How Mal Codes: 672, 799, 812, 948
- Total Man Hours: 72.8



# Horizontal Stabilizer Maintenance Background

## 14G00 – Pitch Trim System, Horizontal Stab CNDs

C5 Pitch Axis and Pitch Trim CND Search  
2017-2025



- Searching Corrective Actions for “CND uncovers additional write-ups
- Most of these write-ups are excluded by To 00-20-2, recorded under Action Taken X
- Total Maintenance Man Hours: 303



# Horizontal Stabilizer Maintenance Background

## 14G00 – Pitch Trim System, Horizontal Stab CND Write Ups

| Discrepancy                                                                                                                                      | Corrective Action                                                           | SN     |
|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------|
| (/) ELEVATOR FEEL CWA DISPLAYED WHEN BOTH HYD SYS PRESSURES ARE MORE THAN 2100 PSI; BOTH SYS SWITCHES ARE IN NORM POS AND BOTH ELE FEEL LTS OFFS | OPERATED ELEVATORS IAW 1C-5M-2-9FI-1 FIG 4-18 BLOCK 3. OPS CK GOOD. CND     | Tail 4 |
| (/) NORMAL PITCH TRIM INTERMITTENTLY FAILS TO TRIM                                                                                               | CNDCYCPITCHTRIMINNORM6CYCWITHP/COPTHUMBWHEEL,&MANTRIMHANDLECYCW/ALTELECSTAB | Tail 3 |
| (X) ALT PITCH TRIM INOP                                                                                                                          | "CND " PREFORM ALTERNATE SYSTEM SCREW DRIVE TRIM TEST, UP&DOWN;PITCHAUTO MT | Tail 1 |
| (/) ANTI COLLISION EMPENNAGE LIGHT WONT ILLUMINATE                                                                                               | CND--MOC GOOD                                                               | Tail 4 |



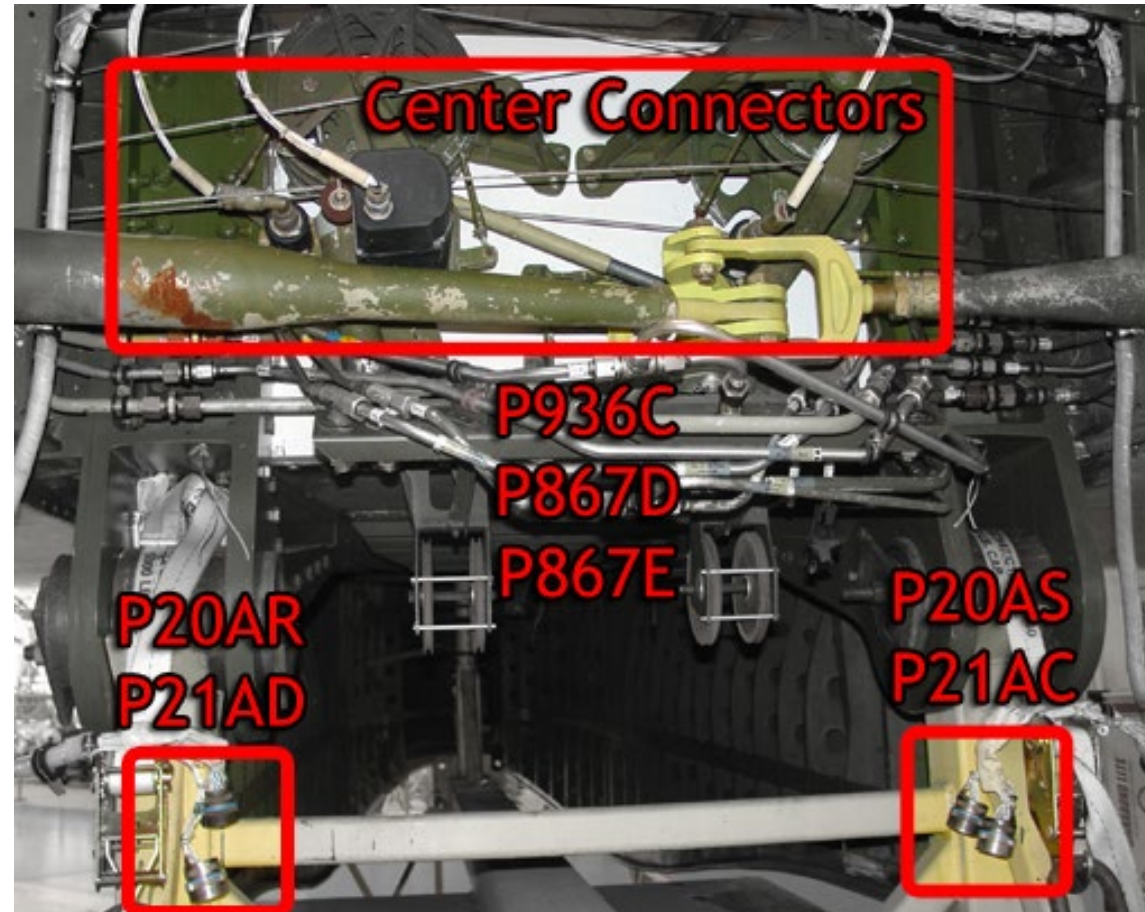
# Horizontal Stabilizer AWTs Test Data

- 4 Tails tested
  - Currently don't have the ERX files for Tail 4
- Horizontal Stab AWTs test typically run after Stability Augmentation Sub-System AWTs test indicates failures for Pitch/Yaw Sub-Sub-Systems
- Tests ran while Horizontal Stab was removed from Aircraft during PDM cycle
- Each tail tested multiple times, in attempt to condition/clean connections
- Tests Accompanied by Detailed Visual Inspections of Empennage, with test and discrepancy reports provided to SPO Engineering
- Further testing and inspection required as more tails move through PDM



# Horizontal Stabilizer AWTs Test Data

## Central Horizontal Stab Connectors

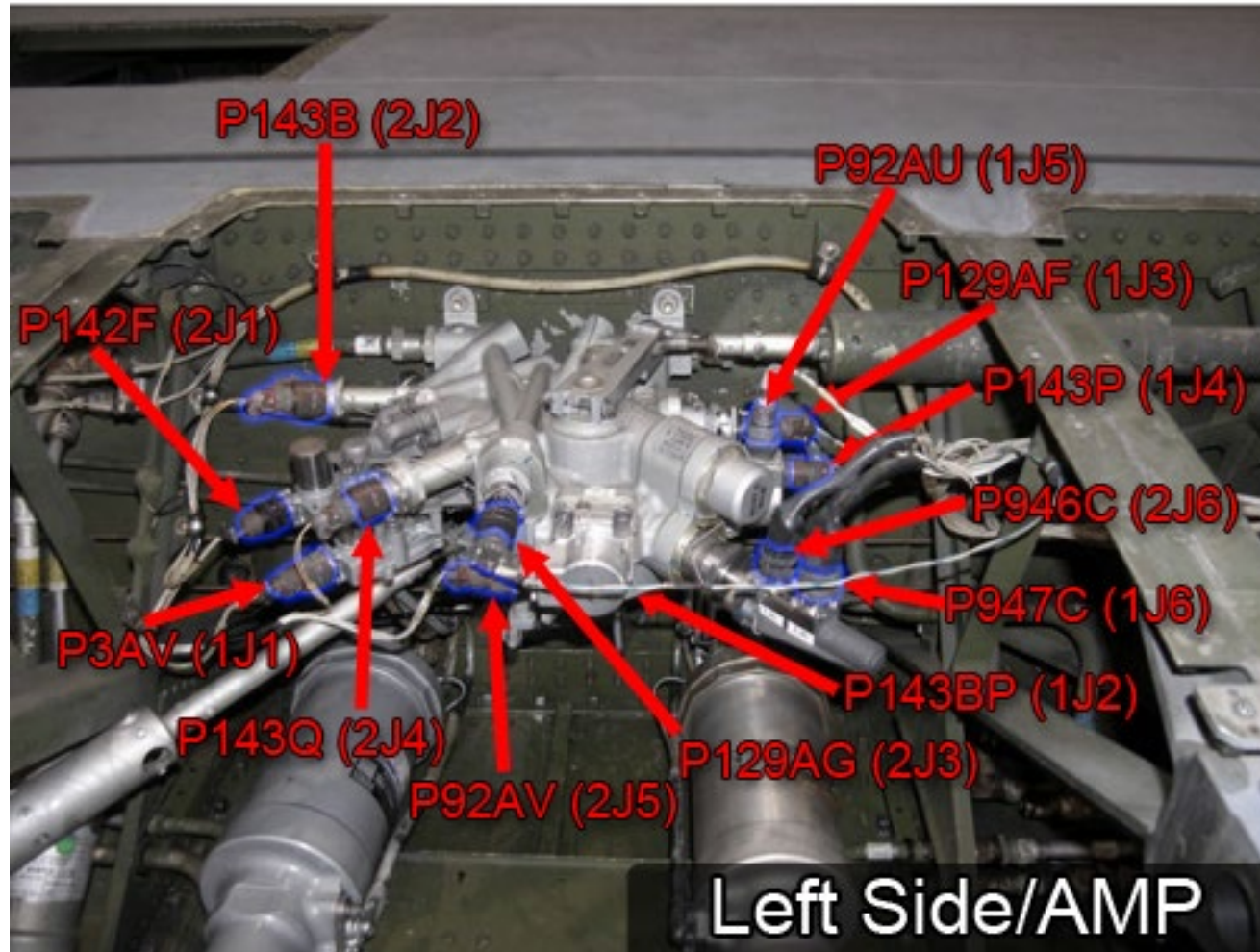




# Horizontal Stabilizer AWTs Test Data

## Left Side Inboard Connectors

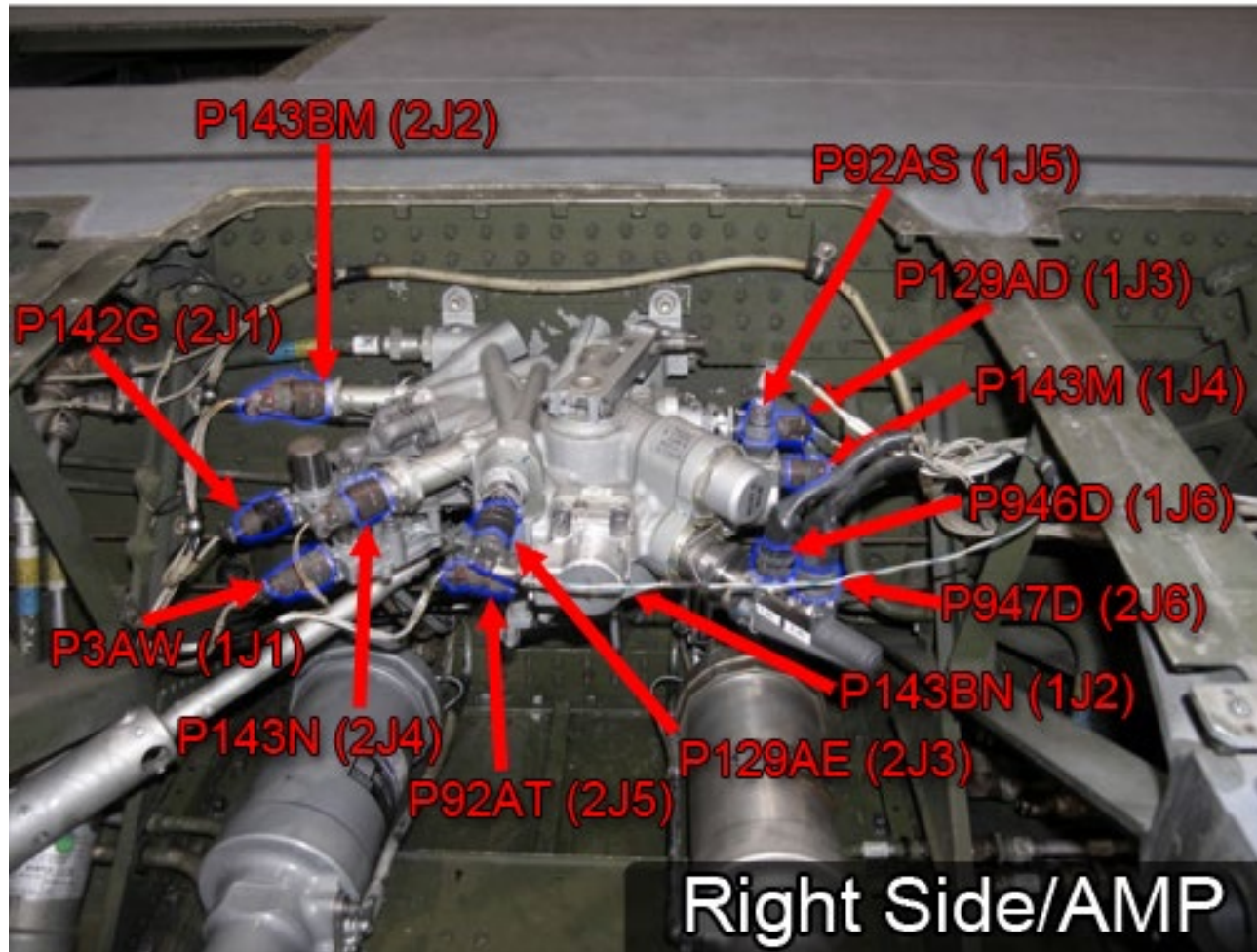
### Horizontal Stabilizer Inboard Connections





# Horizontal Stabilizer AWTs Test Data Right Side Inboard Connectors

## Horizontal Stabilizer Inboard Connections



## ***Horizontal Stabilizer AWTs Test Data Tail 1 UUT Continuity Failures***

Expected value for all measurements is 3  $\Omega$



| Test Name      | Circuit Identifier   | Pass/Fail | Result | From Address  | To Address    | Measured Value ( $\Omega$ ) |
|----------------|----------------------|-----------|--------|---------------|---------------|-----------------------------|
| UUT Continuity | BACKSHELL CONTINUITY | FAILED    | HIGH   | P20AS-36      | GROUND-GROUND | 3.6773                      |
| UUT Continuity | BACKSHELL CONTINUITY | FAILED    | HIGH   | P20AS-36      | GROUND-GROUND | 18520376                    |
| UUT Continuity | BACKSHELL CONTINUITY | FAILED    | HIGH   | P20AS-52      | GROUND-GROUND | 3.6182                      |
| UUT Continuity | BACKSHELL CONTINUITY | FAILED    | HIGH   | P20AS-52      | GROUND-GROUND | 19489034                    |
| UUT Continuity | BACKSHELL CONTINUITY | FAILED    | HIGH   | P21AD-24      | GROUND-GROUND | 4.694                       |
| UUT Continuity | BACKSHELL CONTINUITY | FAILED    | HIGH   | P21AD-28      | GROUND-GROUND | 4.6075                      |
| UUT Continuity | ELEVATOR CONTROL     | FAILED    | HIGH   | GROUND-GROUND | P143BN-3      | 3509050400                  |
| UUT Continuity | ELEVATOR CONTROL     | FAILED    | HIGH   | GROUND-GROUND | P143BN-3      | 5955684900                  |
| UUT Continuity | ELEVATOR CONTROL     | FAILED    | HIGH   | GROUND-GROUND | P3HN-2        | 3.1761                      |
| UUT Continuity | ELEVATOR CONTROL     | FAILED    | HIGH   | P20AS-8       | P143BN-2      | 6103692800                  |
| UUT Continuity | ELEVATOR CONTROL     | FAILED    | HIGH   | P20AS-8       | P143BN-2      | 1.10056E+13                 |
| UUT Continuity | PITCH AUGMENTATION   | FAILED    | HIGH   | P20AR-23      | P143N-1       | 4945243100                  |
| UUT Continuity | PITCH AUGMENTATION   | FAILED    | HIGH   | P20AR-23      | P143N-1       | 11537567000                 |
| UUT Continuity | PITCH AUGMENTATION   | FAILED    | HIGH   | P20AR-34      | P143N-2       | 5681900000                  |
| UUT Continuity | PITCH AUGMENTATION   | FAILED    | HIGH   | P20AR-34      | P143N-2       | 1.10054E+13                 |

## ***Horizontal Stabilizer AWTs Test Data Tail 2 UUT Continuity Failures***

Expected value for all measurements is 3  $\Omega$



| Test Name      | Circuit Identifier             | Pass/Fail | Result | From Address  | To Address    | Measured Value (Ω) |
|----------------|--------------------------------|-----------|--------|---------------|---------------|--------------------|
| UUT Continuity | BACKSHELL CONTINUITY           | FAILED    | HIGH   | P20AS-36      | GROUND-GROUND | 3152374300         |
| UUT Continuity | BACKSHELL CONTINUITY           | FAILED    | HIGH   | P20AS-52      | GROUND-GROUND | 4558522900         |
| UUT Continuity | BACKSHELL CONTINUITY           | FAILED    | HIGH   | P21AD-24      | GROUND-GROUND | 1.1318E+11         |
| UUT Continuity | BACKSHELL CONTINUITY           | FAILED    | HIGH   | P21AD-28      | GROUND-GROUND | 18081741000        |
| UUT Continuity | PITCH AUGMENTATION             | FAILED    | HIGH   | P20AR-42      | P92AT-4       | 963854720          |
| UUT Continuity | PITCH AUGMENTATION             | FAILED    | HIGH   | P20AR-42      | P92AT-4       | 1071997000         |
| UUT Continuity | PITCH AUGMENTATION             | FAILED    | HIGH   | P20AR-42      | P92AT-4       | 1187594500         |
| UUT Continuity | PITCH AUGMENTATION             | FAILED    | HIGH   | P20AR-43      | P92AT-1       | 894616830          |
| UUT Continuity | PITCH AUGMENTATION             | FAILED    | HIGH   | P20AR-43      | P92AT-1       | 997099330          |
| UUT Continuity | PITCH AUGMENTATION             | FAILED    | HIGH   | P20AR-43      | P92AT-1       | 1130462500         |
| UUT Continuity | PITCH AUGMENTATION             | FAILED    | HIGH   | P20AR-48      | P92AV-4       | 5154363900         |
| UUT Continuity | PITCH AUGMENTATION             | FAILED    | HIGH   | P20AR-48      | P92AV-4       | 5491606000         |
| UUT Continuity | PITCH AUGMENTATION             | FAILED    | HIGH   | P20AR-48      | P92AV-4       | 5890156500         |
| UUT Continuity | PITCH AUGMENTATION             | FAILED    | HIGH   | P20AR-49      | P92AV-1       | 4606500400         |
| UUT Continuity | PITCH AUGMENTATION             | FAILED    | HIGH   | P20AR-49      | P92AV-1       | 4673901600         |
| UUT Continuity | PITCH AUGMENTATION             | FAILED    | HIGH   | P20AR-49      | P92AV-1       | 4783620100         |
| UUT Continuity | PITCH, ROLL, AND YAW AUTOPILOT | FAILED    | HIGH   | GROUND-GROUND | P867D-21      | 217652.61          |



## ***Horizontal Stabilizer AWTs Test Data Tail 3 UUT Continuity Failures***

Expected value for all measurements is 3  $\Omega$



| Test Name      | Circuit Identifier             | Pass/Fail | Result | From Address      | To Address        | Measured Value (Ω) |
|----------------|--------------------------------|-----------|--------|-------------------|-------------------|--------------------|
| UUT Continuity | BACKSHELL CONTINUITY           | FAILED    | HIGH   | P20AS-36          | GROUND-<br>GROUND | 4.787              |
| UUT Continuity | BACKSHELL CONTINUITY           | FAILED    | HIGH   | P20AS-36          | GROUND-<br>GROUND | 4.9921             |
| UUT Continuity | BACKSHELL CONTINUITY           | FAILED    | HIGH   | P20AS-52          | GROUND-<br>GROUND | 4.7674             |
| UUT Continuity | BACKSHELL CONTINUITY           | FAILED    | HIGH   | P20AS-52          | GROUND-<br>GROUND | 6.7275             |
| UUT Continuity | BACKSHELL CONTINUITY           | FAILED    | HIGH   | P21AD-24          | GROUND-<br>GROUND | 7.2371             |
| UUT Continuity | BACKSHELL CONTINUITY           | FAILED    | HIGH   | P21AD-28          | GROUND-<br>GROUND | 5.0068             |
| UUT Continuity | ELEVATOR CONTROL               | FAILED    | HIGH   | GROUND-<br>GROUND | P143BN-3          | 462672960          |
| UUT Continuity | ELEVATOR CONTROL               | FAILED    | HIGH   | GROUND-<br>GROUND | P143BN-3          | 467910850          |
| UUT Continuity | ELEVATOR CONTROL               | FAILED    | HIGH   | P20AS-3           | P143BL-2          | 2883357400         |
| UUT Continuity | ELEVATOR CONTROL               | FAILED    | HIGH   | P20AS-3           | P143BL-2          | 3229387000         |
| UUT Continuity | ELEVATOR CONTROL               | FAILED    | HIGH   | P20AS-8           | P143BN-2          | 2370613500         |
| UUT Continuity | ELEVATOR CONTROL               | FAILED    | HIGH   | P20AS-8           | P143BN-2          | 2507088600         |
| UUT Continuity | PITCH AUGMENTATION             | FAILED    | HIGH   | P20AR-23          | P143N-1           | 1766227200         |
| UUT Continuity | PITCH AUGMENTATION             | FAILED    | HIGH   | P20AR-23          | P143N-1           | 1963906600         |
| UUT Continuity | PITCH AUGMENTATION             | FAILED    | HIGH   | P20AR-34          | P143N-2           | 2765513000         |
| UUT Continuity | PITCH AUGMENTATION             | FAILED    | HIGH   | P20AR-34          | P143N-2           | 2956149800         |
| UUT Continuity | PITCH AUGMENTATION             | FAILED    | HIGH   | P20AS-47          | P92AU-1           | 2503179000         |
| UUT Continuity | PITCH AUGMENTATION             | FAILED    | HIGH   | P20AS-47          | P92AU-1           | 2747529500         |
| UUT Continuity | PITCH, ROLL, AND YAW AUTOPILOT | FAILED    | HIGH   | P21AC-10          | P867D-8           | 4.1474             |
| UUT Continuity | PITCH, ROLL, AND YAW AUTOPILOT | FAILED    | HIGH   | P21AC-10          | P867D-8           | 4.1632             |
| UUT Continuity | PITCH, ROLL, AND YAW AUTOPILOT | FAILED    | HIGH   | P867E-22          | GROUND-<br>GROUND | 5516689900         |
| UUT Continuity | PITCH, ROLL, AND YAW AUTOPILOT | FAILED    | HIGH   | P867E-22          | GROUND-<br>GROUND | 1.10072E+13        |

## ***Horizontal Stabilizer AWTs Test Data Tail 1 Insulation Failure Results***

Expected Value is between 99 K $\Omega$  and 100 M $\Omega$



# Horizontal Stabilizer AWTs Test Data

## Tail 1 Insulation/Isolation Failure Results

| Work Unit Code | Test Name      | ci                      | Pass/Fail | Result | From Address | To Address     | Measured Value ( $\Omega$ ) |
|----------------|----------------|-------------------------|-----------|--------|--------------|----------------|-----------------------------|
| 14G00          | UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-41     |                | 16329706                    |
| 14G00          | UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-41     |                | 16571294                    |
| 14G00          | UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-41     | P20AR-44       | 23897496                    |
| 14G00          | UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-41     | P20AR-44       | 24066644                    |
| 14G00          | UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P21AD-24     |                | 2.1718                      |
| 14G00          | UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P21AD-24     | GROUND2-GROUND | 2.1679                      |
| 14G00          | UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P21AD-28     |                | 2.1434                      |
| 14G00          | UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P21AD-28     | GROUND2-GROUND | 2.1243                      |
| 14G00          | UUT Isolation  | LOW VOLTAGE ISOLATION   | FAILED    | LOW    | P21AC-9      |                | 13.5404                     |
| 14G00          | UUT Isolation  | LOW VOLTAGE ISOLATION   | FAILED    | LOW    | P21AD-24     |                | 3.0881                      |
| 14G00          | UUT Isolation  | LOW VOLTAGE ISOLATION   | FAILED    | LOW    | P21AD-24     | GROUND2-GROUND | 3.0785                      |
| 14G00          | UUT Isolation  | LOW VOLTAGE ISOLATION   | FAILED    | LOW    | P21AD-28     |                | 3.0352                      |
| 14G00          | UUT Isolation  | LOW VOLTAGE ISOLATION   | FAILED    | LOW    | P21AD-28     | GROUND2-GROUND | 3.0342                      |

- Insulation Failure failures between Central Connectors
- Expected Value is between 99 K $\Omega$  and 100 M $\Omega$  for above measurements



# Horizontal Stabilizer AWTs Test Data

## Tail 2 Insulation Failure Results

| Test Name      | Circuit Identifier      | Pass/Fail | Result | From Address | To Address | Measured Value ( $\Omega$ ) |
|----------------|-------------------------|-----------|--------|--------------|------------|-----------------------------|
| UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-2      |            | 3385482.3                   |
| UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-2      | P20AR-1    | 3233918.3                   |
| UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-3      |            | 2261984.8                   |
| UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-3      | P20AR-1    | 3773678                     |
| UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-3      | P20AR-2    | 2770402.3                   |
| UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-4      |            | 1603279.8                   |
| UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-4      | P20AR-1    | 4039433.3                   |
| UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-4      | P20AR-2    | 2362106.3                   |
| UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-4      | P20AR-3    | 2316170.5                   |
| UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-5      |            | 1485361.8                   |
| UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-5      | P20AR-1    | 4346341.5                   |
| UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-5      | P20AR-2    | 2331896.3                   |
| UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-5      | P20AR-3    | 3118184.3                   |
| UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-5      | P20AR-4    | 2297555.5                   |
| UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-6      |            | 1116612                     |
| UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-6      | P20AR-1    | 4173591.8                   |
| UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-6      | P20AR-2    | 1714305.8                   |
| UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-6      | P20AR-3    | 3002908                     |
| UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-6      | P20AR-4    | 2463516                     |
| UUT Insulation | HIGH VOLTAGE INSULATION | FAILED    | LOW    | P20AR-6      | P20AR-5    | 1925808.5                   |



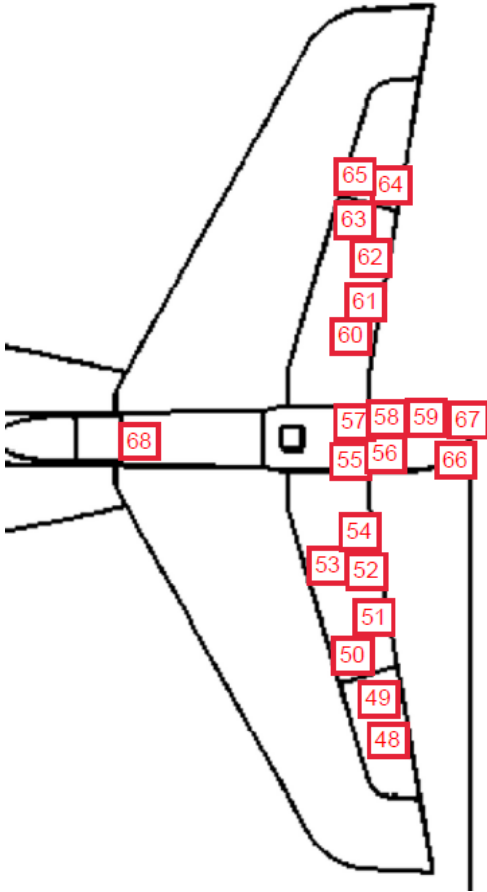
# EWIS Physical Audit

7/13/2026

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# Horizontal Stabilizer AWTs Test Data Tail 3 Physical Audit HS Finding Map



- 21 findings were attributed to the Horizontal Stabilizer of Tail 3
- Common findings were improper splices, Corrosion, brittle wiring, damaged insulation
- Cannon plugs connecting Horizontal Stab to Vertical Stab showed particularly bad corrosion, evidence of water submersion
- AWTs Test finding corresponded to audit findings



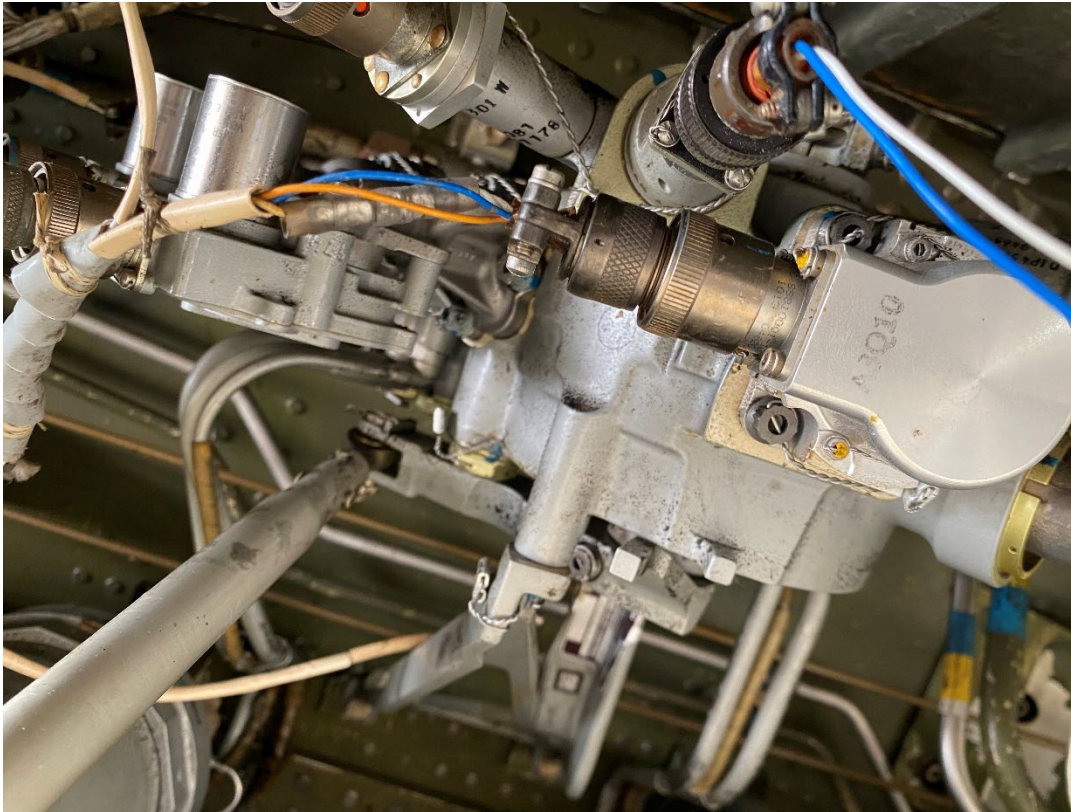
# Horizontal Stabilizer AWTs Test Data Tail 3 Physical Audit HS Discrep. #66



- Connector P20AS (Central connector)
- Shows heavy corrosion, signs of water submersion
- This finding corroborates results from AWTs Tests



## *Horizontal Stabilizer AWTs Test Data Tail 3 Physical Audit HS Discreps. CONT.*



Discrepancy 52 – incorrect splice  
and torn insulation



Discrepancy 32 – Extremely  
Severe cable bend could lead to  
premature conductor damage



## *Conclusion*

- REMIS data shows some intermittent failures with the Pitch Axis and Pitch Trim Sub-System contained within the Horizontal Stab
- Faults that are present do indicate potential EWIS issues
- AWTs Testing uncovered evidence of corrosion, old wiring and degraded insulation
- Physical Audit found heavy corrosion on central connectors, at least partially due to insufficient environmental protection once Horizontal Stab is disconnected
- Additionally, audit uncovered aged, brittle wiring. Wiring often with extremely tight bends, incorrect splicing
- Extreme cases led to wiring breaking upon any manipulation from SME's/Engineers during inspection or testing
- SPO has developed new wire harness to replace all aged wire during PDM cycle
- Continuing to test and inspect tails as they come available at PDM