

# United States Army Special Operations Aviation Command

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SLIDES ONLY  
NO SCRIPT PROVIDED

## 160<sup>th</sup> SOAR(A)

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Department of Defense  
OFFICE OF PREPUBLICATION AND SECURITY REVIEW

### Automatic Wire Test Set (AWTS)

### JSWAG 2025

### Presented by: TAG Team





# Topics

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- AWTs Hardware
- Test Applications and Interface.
- AWTs Phase Layout.
- CTP Breakdown.
- Pathway Conditioning.
- Fault Examples.
- AWTs Repair Flight Data.
- AWTs Health Dashboard.
- References.



# Hardware

## Eclipse Hardware

- Computer
- Test Control Unit (TCU)
- Switch Module (SM)



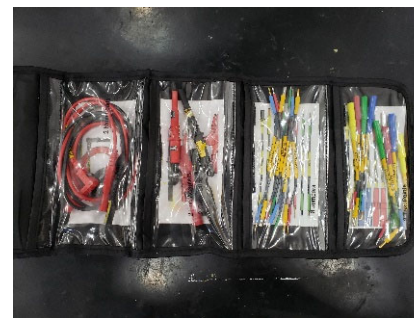
## Interconnecting Hardware

- Test Adapter Cables (TAC)
- Probe TAC



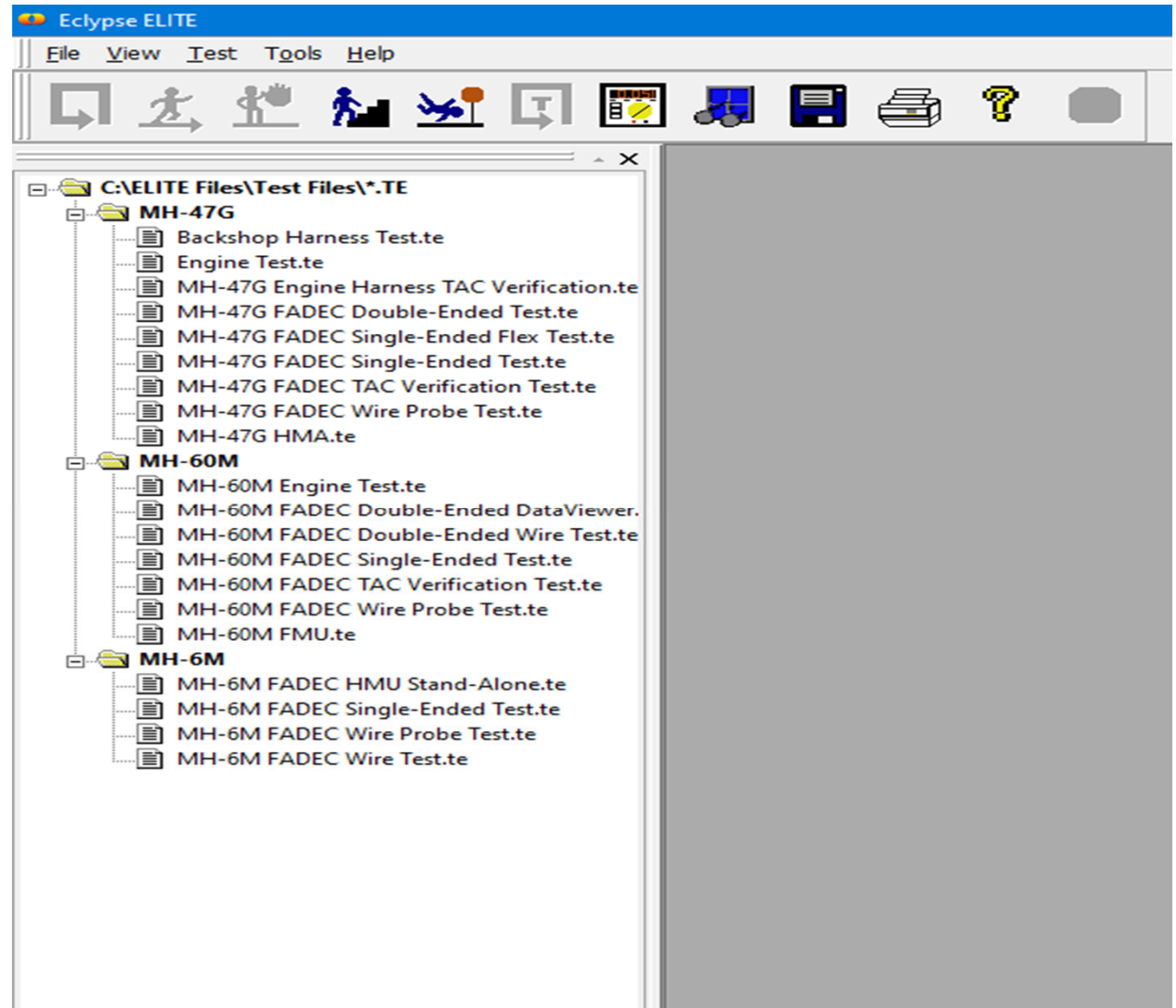
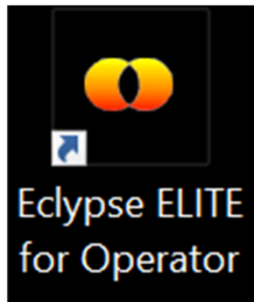
## Technicians Hardware

- Black Test Lead Kit
- Tools





# Eclipse Interface





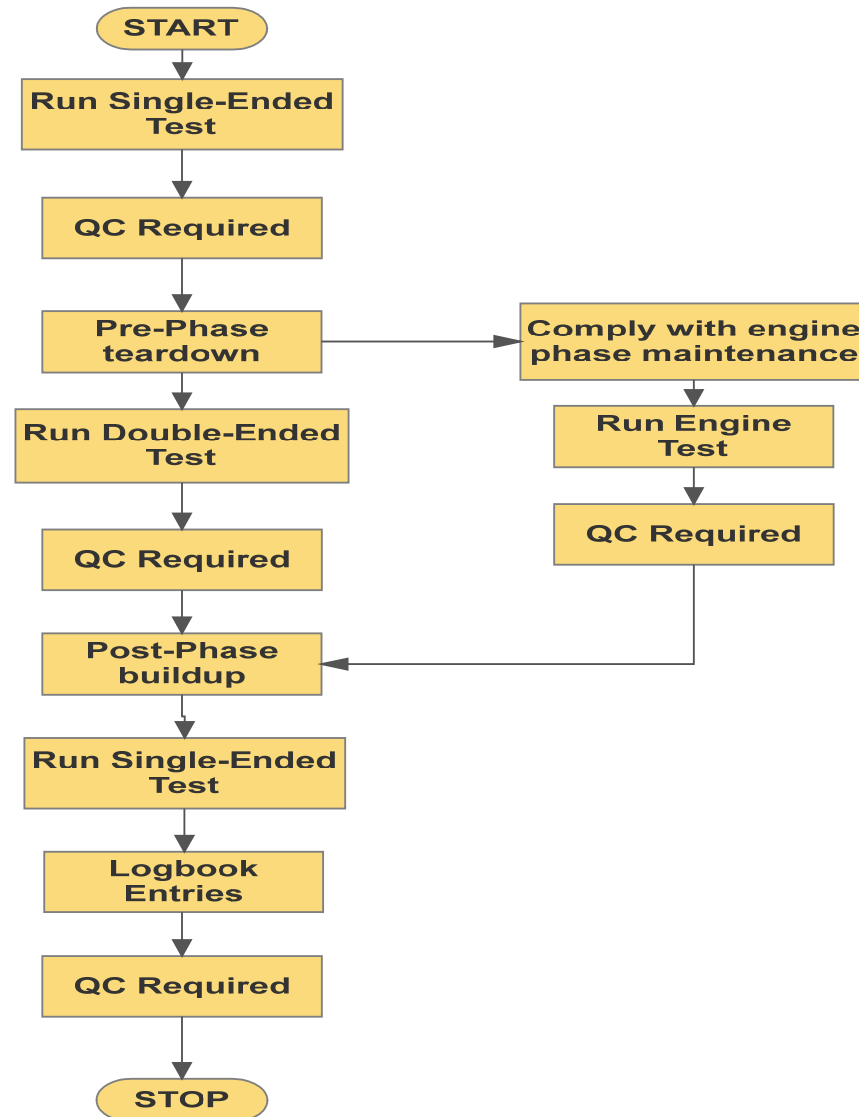
# Test Applications

- **Aircraft Test (single ended)**
  - AWTS is connected to the Engine Control Unit (ECU) aircraft connectors. Intent is to minimize the disturbance of the EWIS while evaluating FADEC peripheral components (e.g. mono-pole sensors, Hydro-Mechanical Assembly, FADEC Control Panel, Engine Condition Levers)
- **Aircraft wiring test (double ended)**
  - Evaluates the EWIS as an LRU or WRA. Establishes individual conductor and harness condition and ensures material uniformity using a multiple stimuli known as the Certification Test Protocol (CTP) with pass/fail criteria.
- **Single-Ended Flex Test (Unscheduled Maintenance)**
  - Developed for troubleshooting intermittent wire faults. Test program allows operator to monitor specific wire paths while flexing the harness under test.
- **Engine Test**
  - Tests the engine components prior to installing on-wing.
- **Engine Harness Test**
  - Tests all engine harnesses depending on platform.
- **HMA\HMU\FMU Test**
  - Tests the Fuel Control prior to installation on-engine.



# AWTS Phase Flowchart

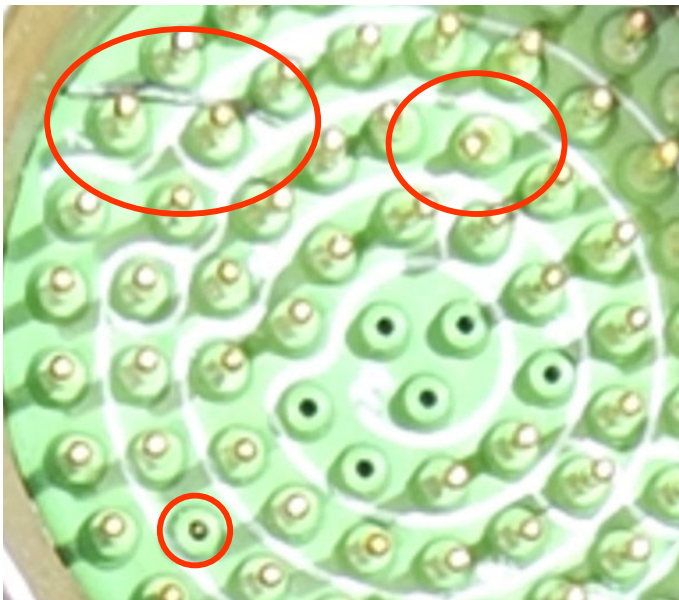
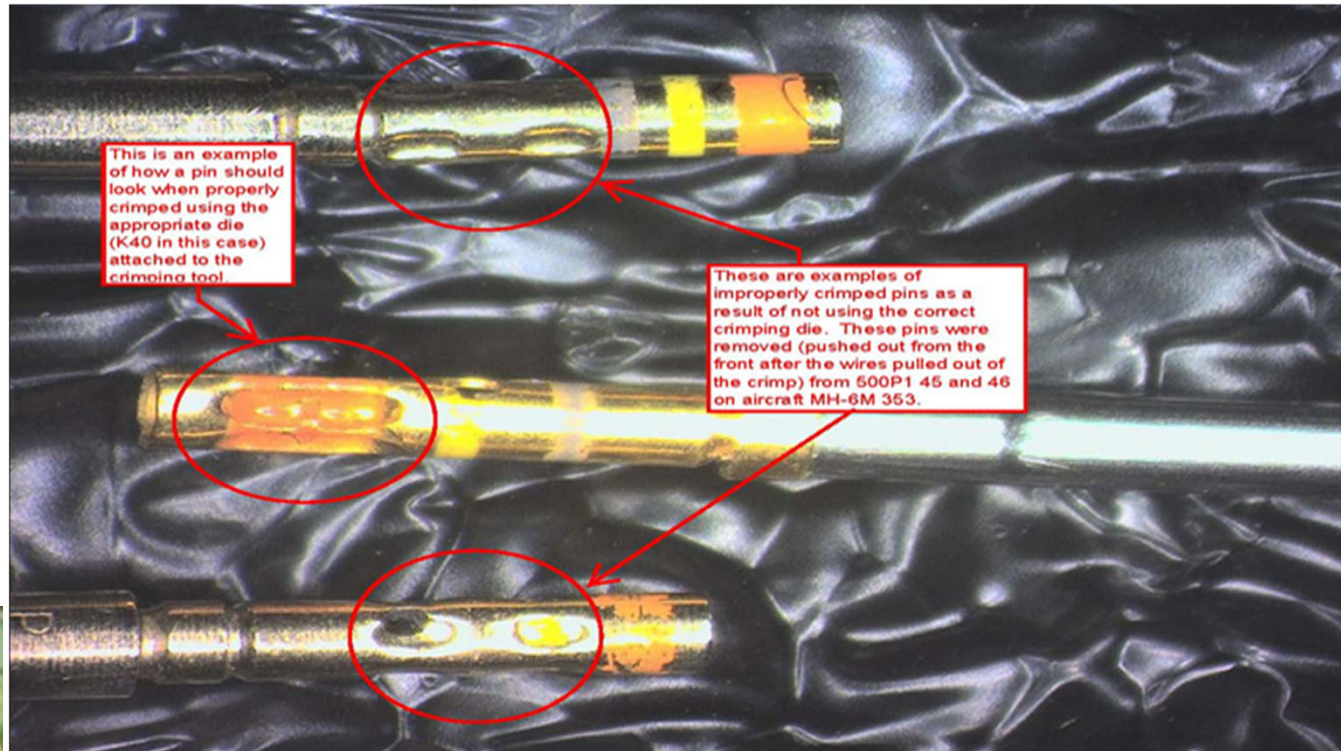
- MH-6M, MH-60M and MH-47G aircraft have adapted to this chart.
- All compliance is instructed through our Special Operations Maintenance Message (SOMM).





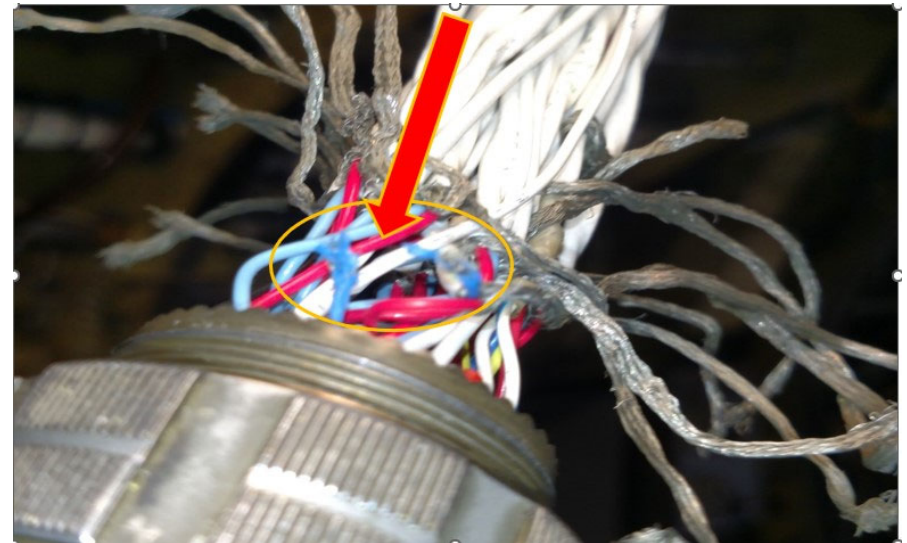
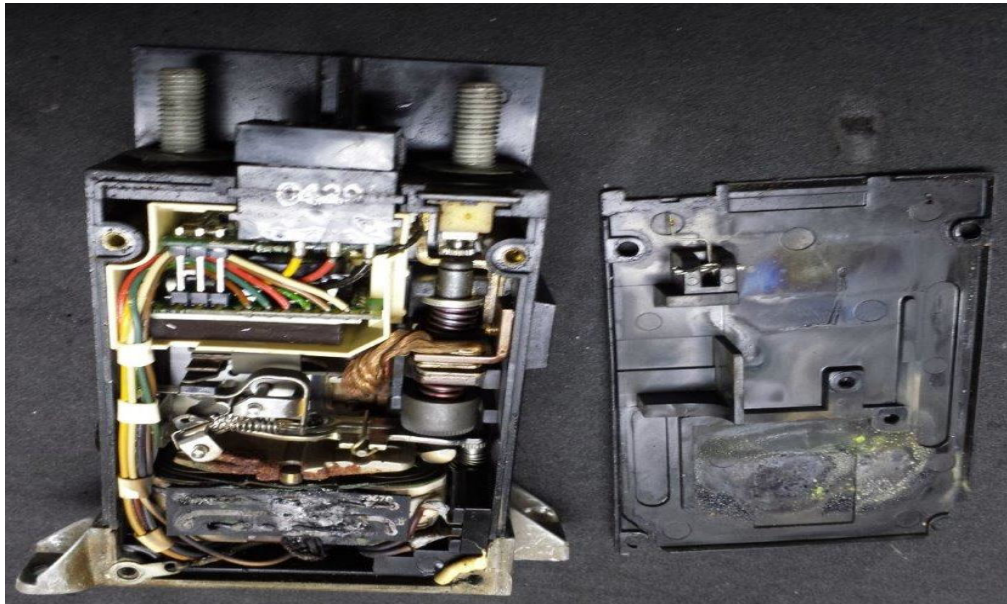


# Continuity Failure Examples





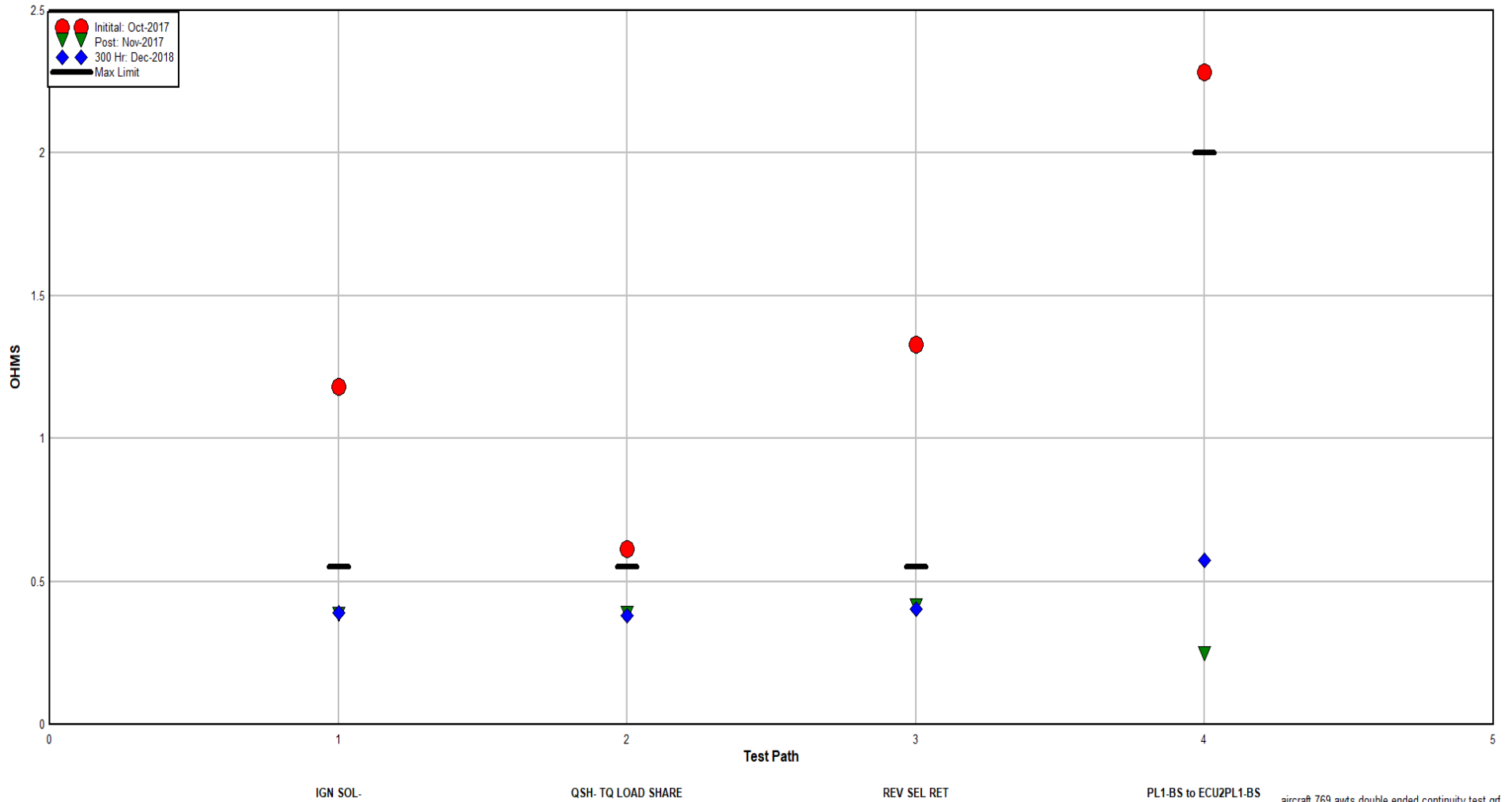
# Isolation Failure Examples





# MH-47G Repair Example

Aircraft 769  
AWTS Double Ended Continuity Test  
100 milli-amps

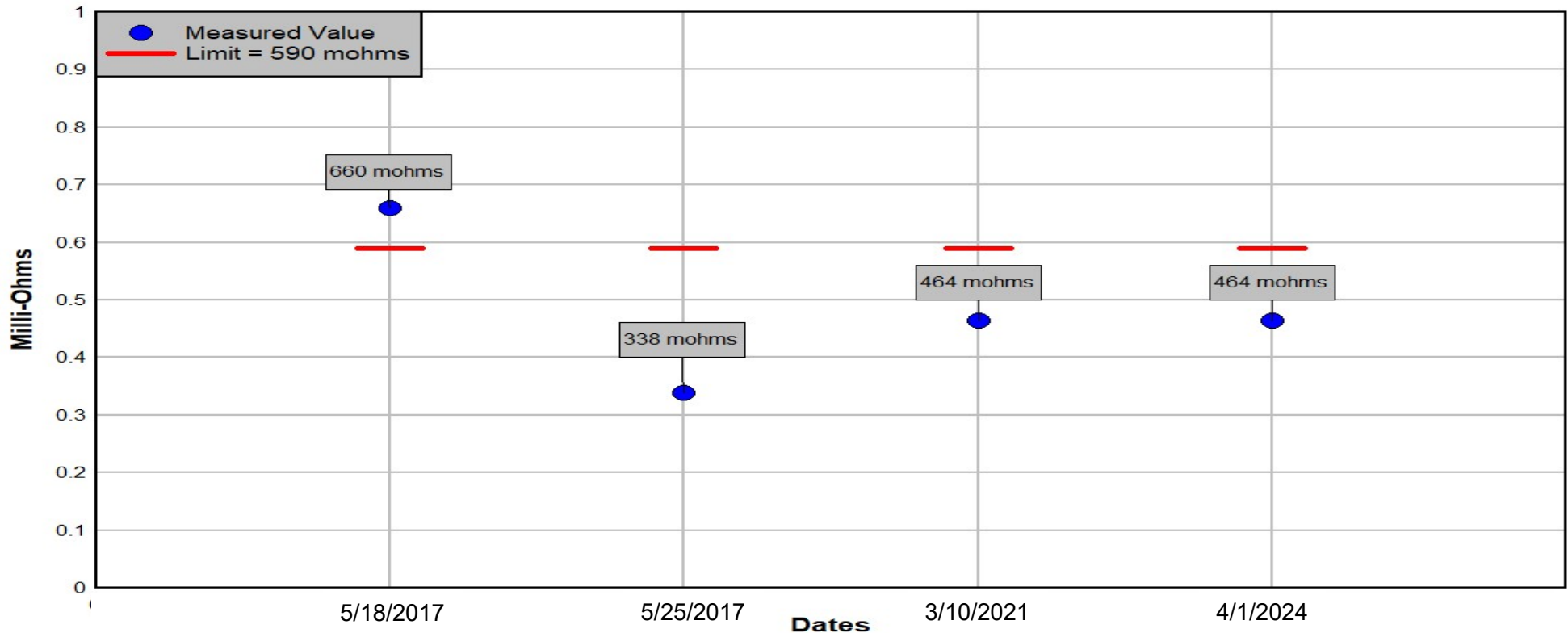


aircraft 769 awts double ended continuity test.grf



# MH-47G Repair Example #2

MH-47G Aircraft 732  
#1 Side  
PL1-J to RDPS P2-K

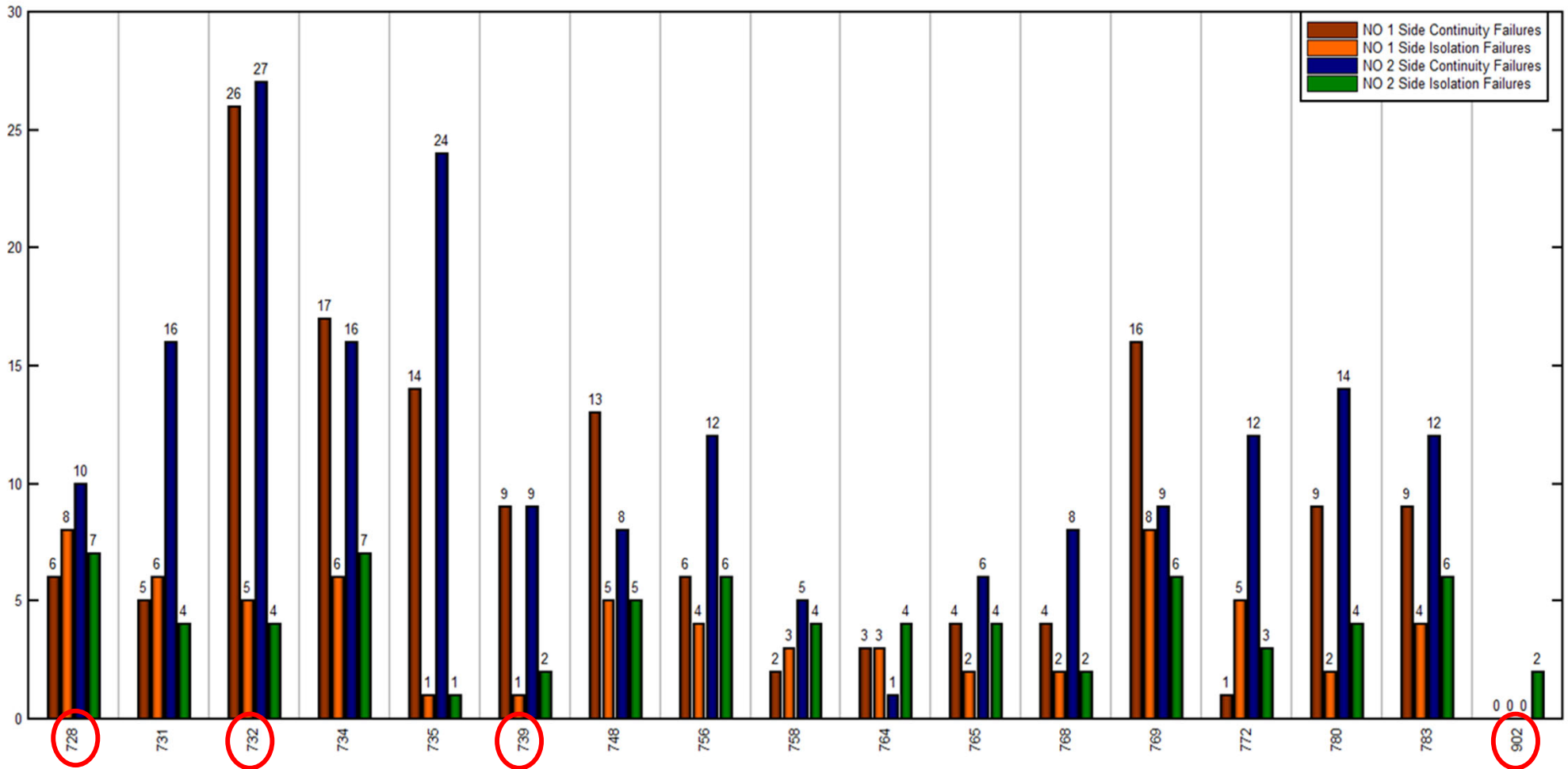


- Aircraft had been in service for 14 years prior to first test.
- TRQ HI pathway had seen high resistance during 5/18/2017 test.
- Both PL3 Pin J and RDPS P2 Pin K were replaced on before 5/25/2017 test.
- Measurement raised ~120 mohms over 4 years and stayed consistent for 3 more years.



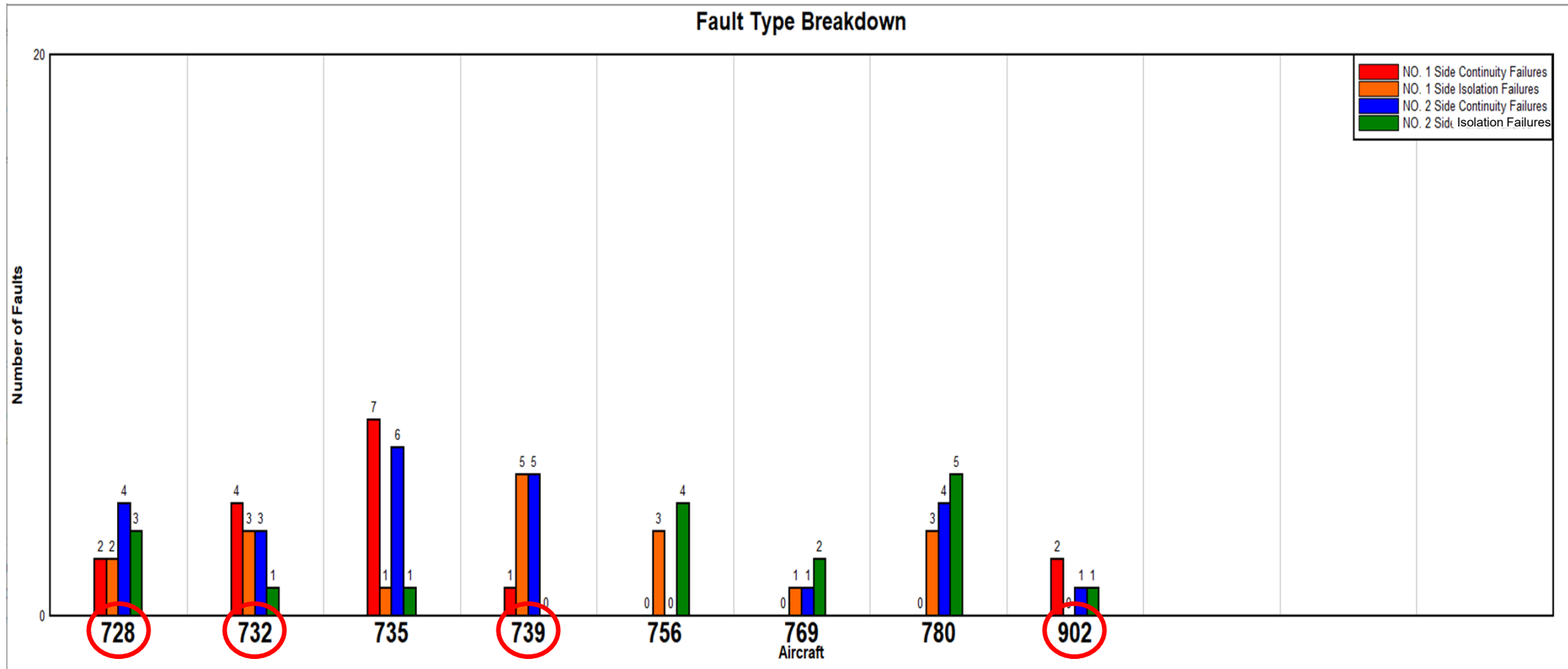
# Initial Fault Breakdown

Fault Type Breakdown





# Fault Breakdown Cont.



2017~2020:116 Faults

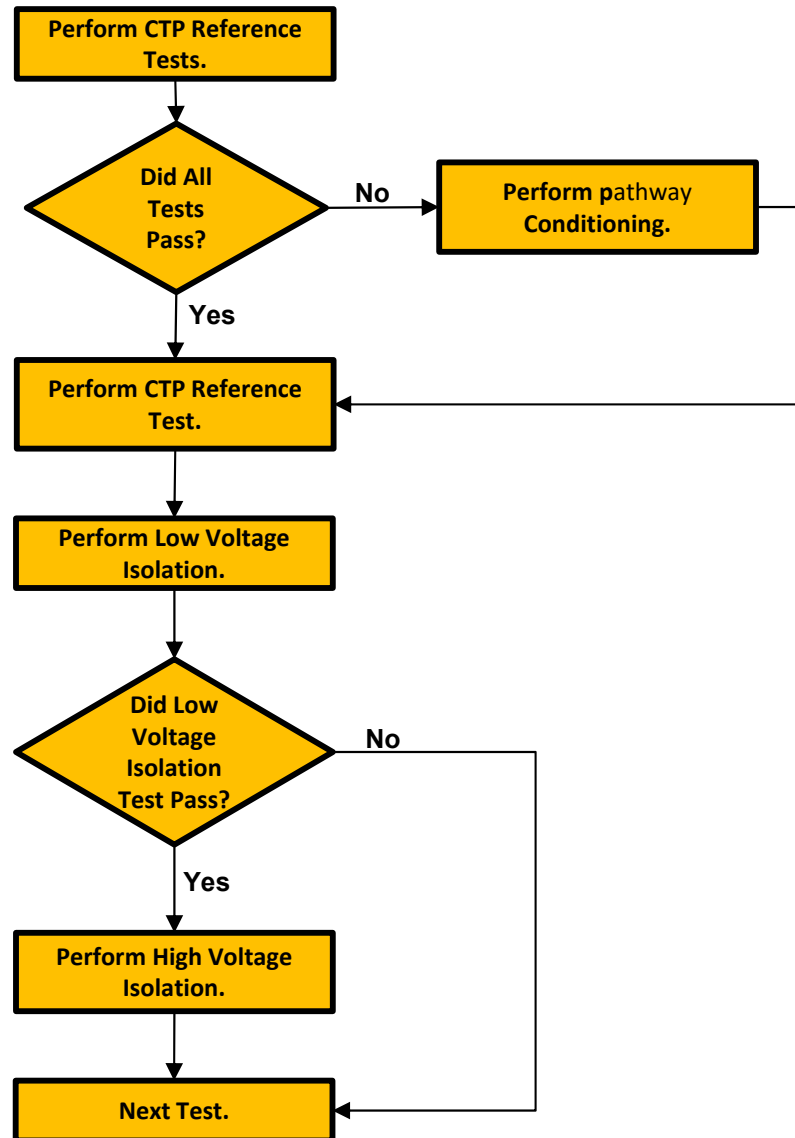
2020~2023:37 Faults

2024-Present:15 Faults



# Certification Test Protocol Flowchart

- This chart operates within 1 to 10 secs per functional pathway.
- This occurs in the background without any action from user.

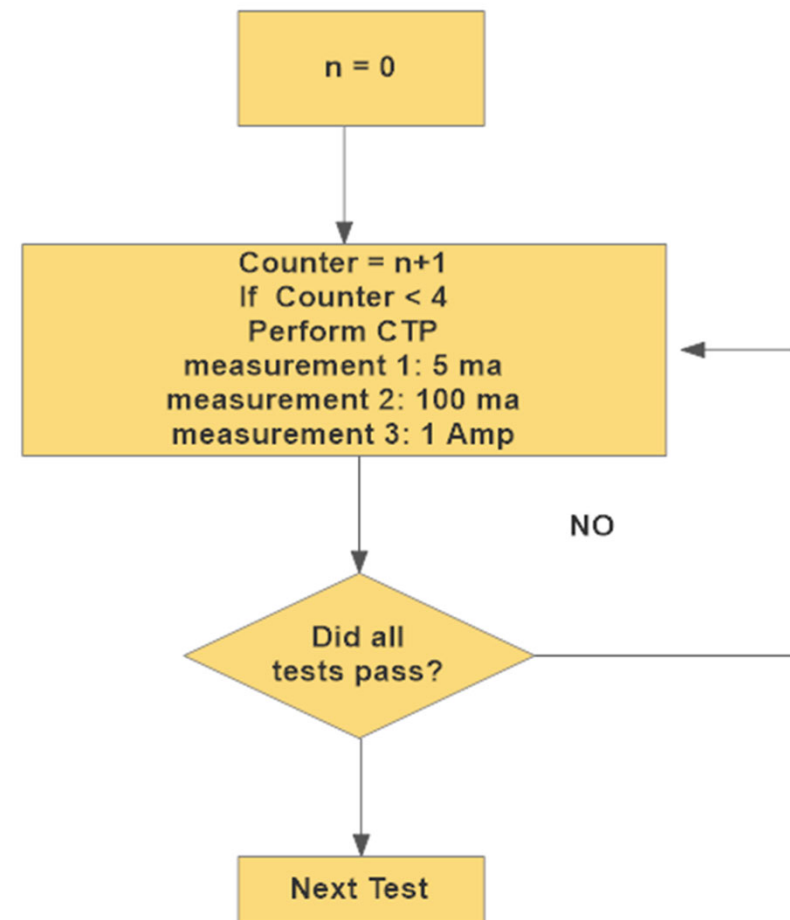




# Certification Test Protocol Improvement

- Pathway Conditioning:

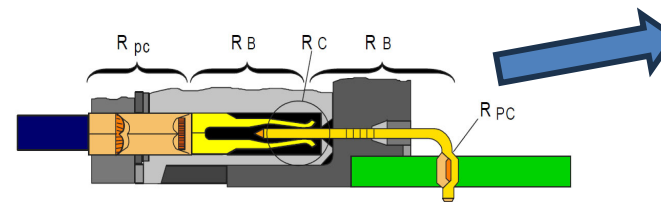
- Pathway measurement is less than 10 ohms but failed the original limit.
- Dwell time for all test measurement is 360 milliseconds total.
- Failed measurements are retested 3 times (1 second each) to recondition the pathway with the 1 Amp stimulus.
- If the pathway passes after, a variable is set to query for data analysis later.



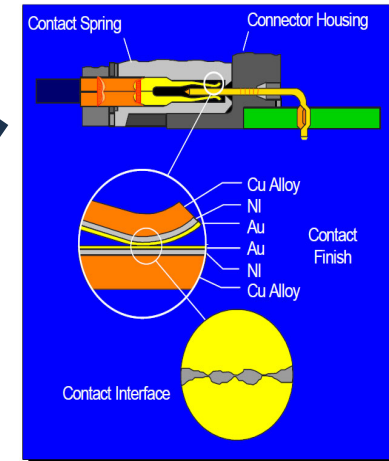


# Why Condition?

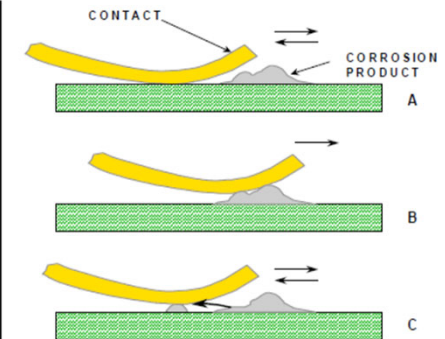
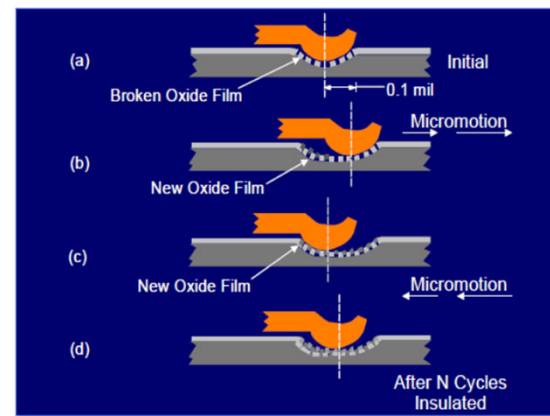
- Pins and sockets over time will wear and tear.
- Sockets can also retain corrosion products or other contaminants.
- Every time a pin or socket is extracted can lead to damage of the wire or connector.



$$R_O = 2R_{P.C.} + 2R_{BULK} + R_C$$



G333338





# Why Condition? Cont.

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- Conditioning attempts to repair the functional pathway using level working current to remove light corrosion or contaminants.
- This reduces the maintenance needed while keeping the pathway in operation.
- If the functional pathway measurement does not improve, then the electrician will need to make repairs.



# Pathway Conditioning Total

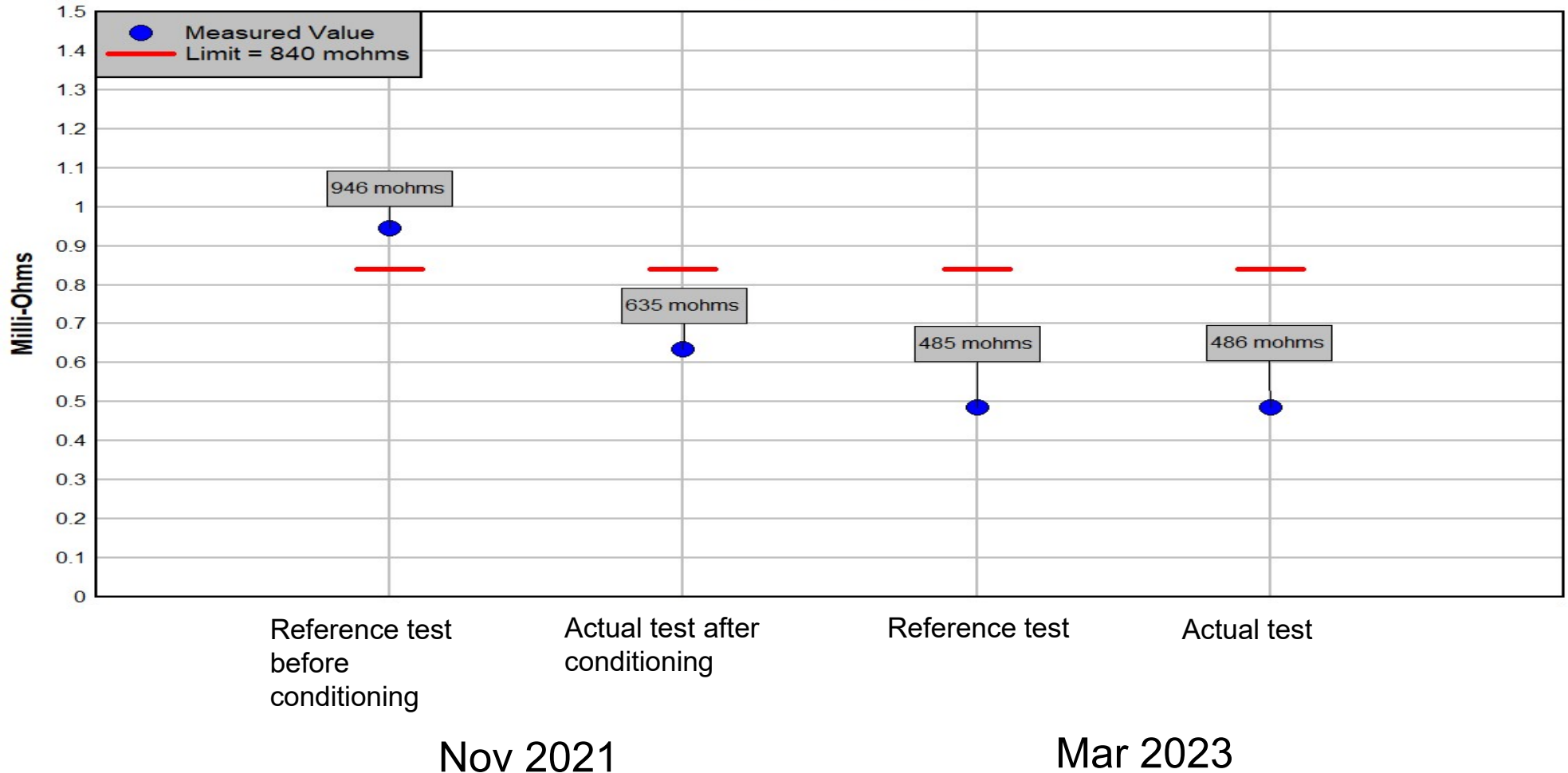


- MH-47G FADEC Double-Ended
  - Pathways conditioned: 225
  - Pathways passed after conditioning: 71
- MH-47G B2 FADEC Double-Ended
  - Pathways conditioned: 55
  - Pathways passed after conditioning: 0
- MH-60M FADEC Double-Ended
  - Pathways conditioned: 2657
  - Pathways passed after conditioning: 342
- MH-6M FADEC Double-Ended
  - Pathways conditioned: 517
  - Pathways passed after conditioning: 243



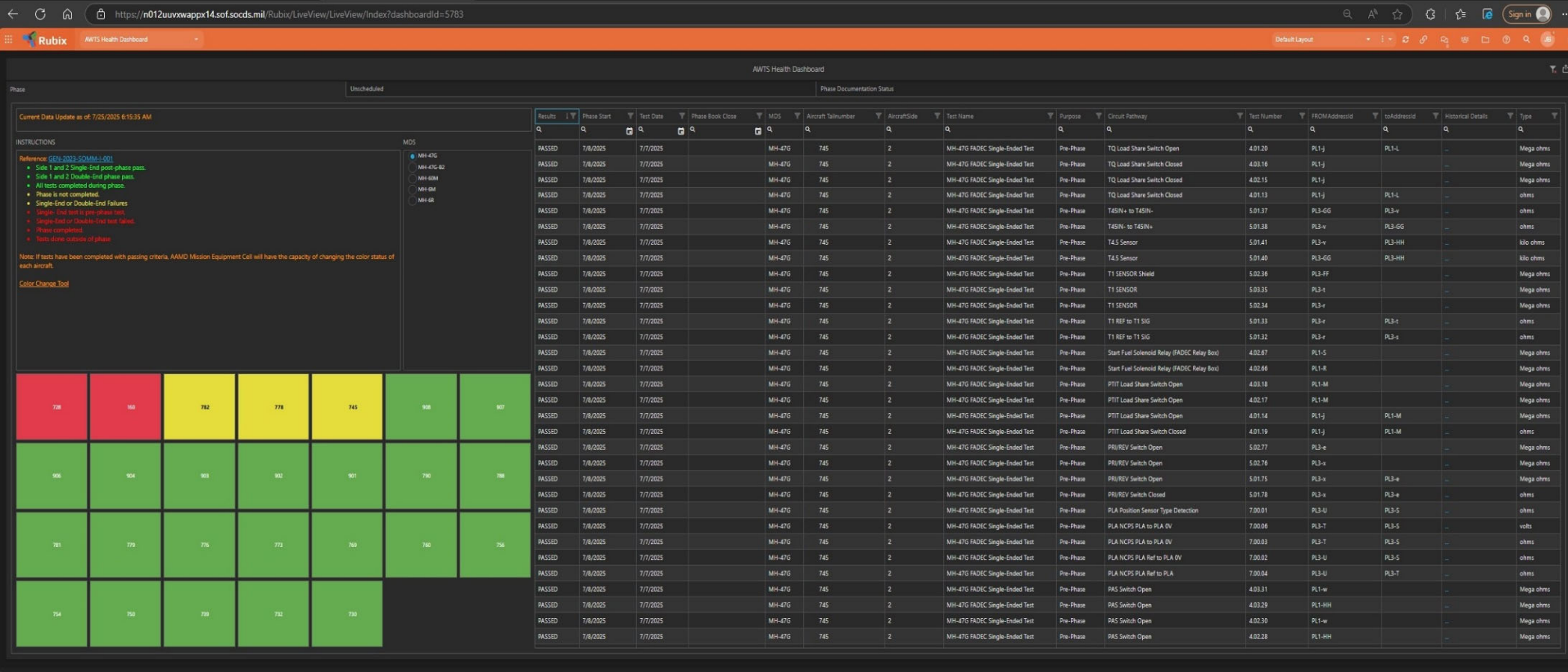
# Pathway Conditioning Example

MH-47G Aircraft 739  
#2 Side  
NR+ Pathway





# AWTS Health Dashboard



- All testing is done with the aircraft logbook.
- All result data is collected into a cloud repository.
- Only the last test performed (for each test) is displayed here.
- Shows all individual tests passing or failing per platform or each aircraft.



# AWTS Health Dashboard Cont.

Rubix AWTS Health Dashboard

AWTS Health Dashboard

Phase: Unschedule Phase Documentation Status

Legend:  
BLUE - No tests associated with this tail number.  
RED - The tests associated with this tail number are out of tolerance with the SOMM or are failures.  
YELLOW - The tests associated with this tail number are a failure during the phase window.  
GREEN - The tests associated with this tail number meet the SOMM and are passing.

MDS	Serial Number	Phase Start	Phase End	#1 Single Prephase Date	#1 Single Prephase Results	#1 Double Prephase Date	#1 Double Prephase Results	#2 Single Prephase Date	#2 Single Prephase Results	#2 Double Prephase Date	#2 Double Prephase Results	#1 Single Postphase Date	#1 Single Postphase Results	#1 Double Postphase Date	#1 Double Postphase Results	#2 Single Postphase Date	#2 Single Postphase Results	#2 Double Postphase Date	#2 Double Postphase Results
MH-60M	371	7/16/2025						7/14/2025	FAIL	7/15/2025	FAIL								
MH-60M	247	7/21/2025		7/16/2025	FAIL	7/21/2025	PASS	7/16/2025	FAIL	7/21/2025	PASS								
MH-60M	224	6/12/2025		6/12/2025	PASS			6/12/2025	PASS			7/10/2025	FAIL					7/11/2025	FAIL
MH-60M	018	6/24/2025				6/20/2025	FAIL	6/20/2025	FAIL	6/20/2025	FAIL								
MH-60M	011	5/1/2025						4/29/2025	FAIL										
MH-60M	095	3/4/2024	4/30/2024							3/19/2024	PASS	4/10/2024	PASS	3/19/2024	PASS	4/10/2024	PASS		
MH-60M	543	2/7/2023	3/29/2023			2/16/2023	FAIL			2/21/2023	FAIL	3/23/2023	PASS			3/23/2023	PASS		
MH-60M	491	11/14/2023	2/21/2024							2/1/2024	PASS	2/1/2024	PASS	2/1/2024	PASS			2/1/2024	PASS
MH-60M	476	5/19/2025	7/24/2025			7/3/2025	FAIL			7/7/2025	PASS					7/7/2025	PASS	7/7/2025	PASS
MH-60M	473	1/9/2024	3/25/2024							3/7/2024	PASS	3/8/2024	PASS	3/8/2024	PASS	3/7/2024	PASS	3/7/2024	PASS
MH-60M	222	12/11/2023	2/26/2024			2/6/2024	PASS	12/8/2023	FAIL	2/5/2024	PASS	2/9/2024	PASS			2/9/2024	PASS		
MH-60M	020	7/9/2024	10/18/2024					8/14/2024	PASS			9/26/2024	PASS	9/3/2024	PASS	9/26/2024	PASS	9/3/2024	PASS
MH-60M	009	6/3/2024	8/23/2024							8/15/2024	PASS	8/14/2024	PASS	8/14/2024	PASS	8/2/2024	PASS	8/8/2024	PASS
MH-60M	007	7/11/2023	9/26/2023			8/25/2023	PASS			8/25/2023	PASS	9/21/2023	PASS			9/21/2023	PASS		
MH-60M	003	1/8/2024	3/22/2024							3/4/2024	PASS	3/4/2024	PASS	3/4/2024	PASS	3/4/2024	PASS	3/4/2024	PASS
MH-60M	002	2/2/2024	4/12/2024			2/8/2024	FAIL	2/1/2024	PASS	2/8/2024	FAIL	4/8/2024	PASS			4/8/2024	PASS		

- General summary of each test performed during phase.
- Selectable by platform.

### Color Legend

Green= Pass

Yellow= In Phase

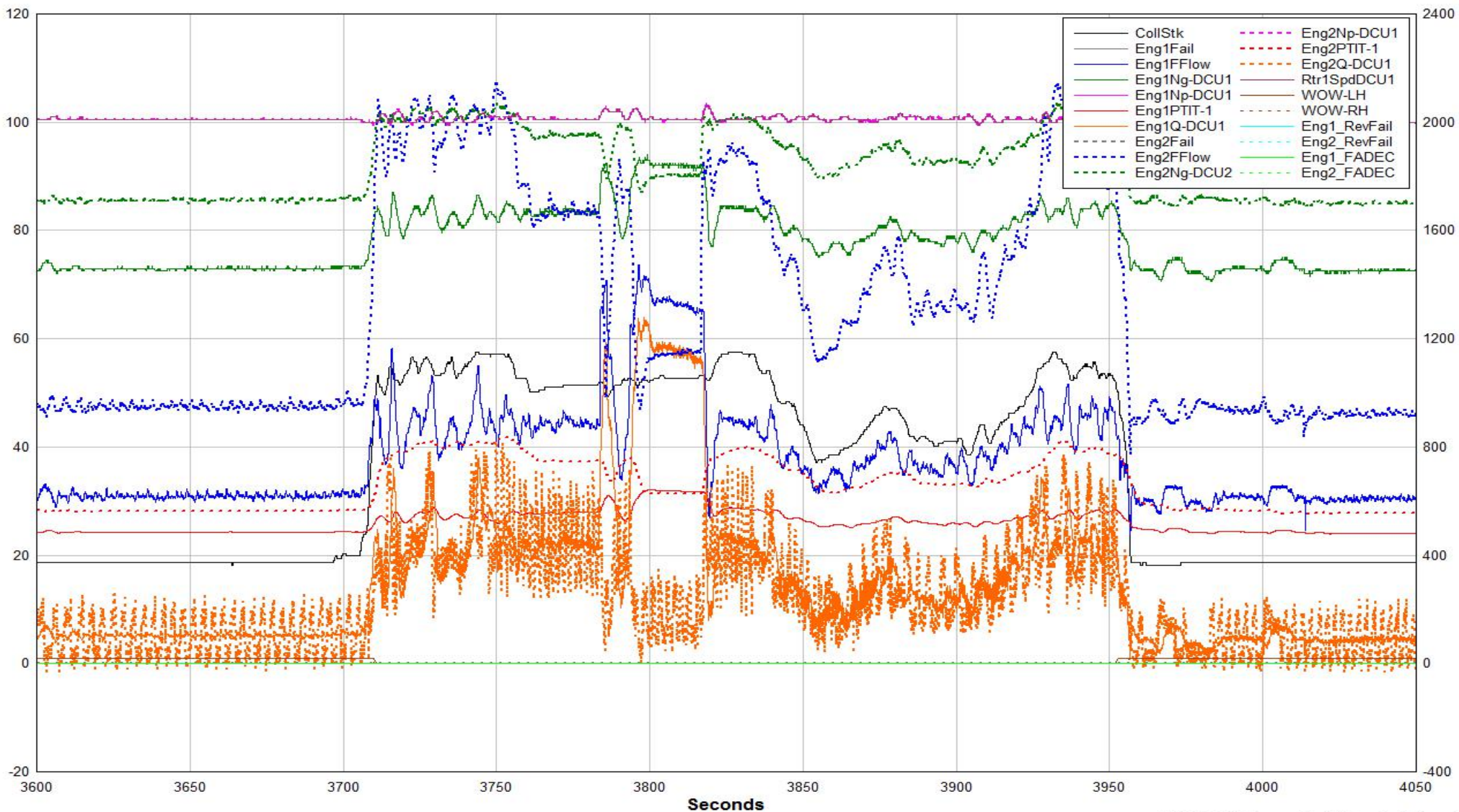
Red = Exited Phase with failures

Blue = Not Tested



# Pre-Phase MTF

ACFT 739  
RS170

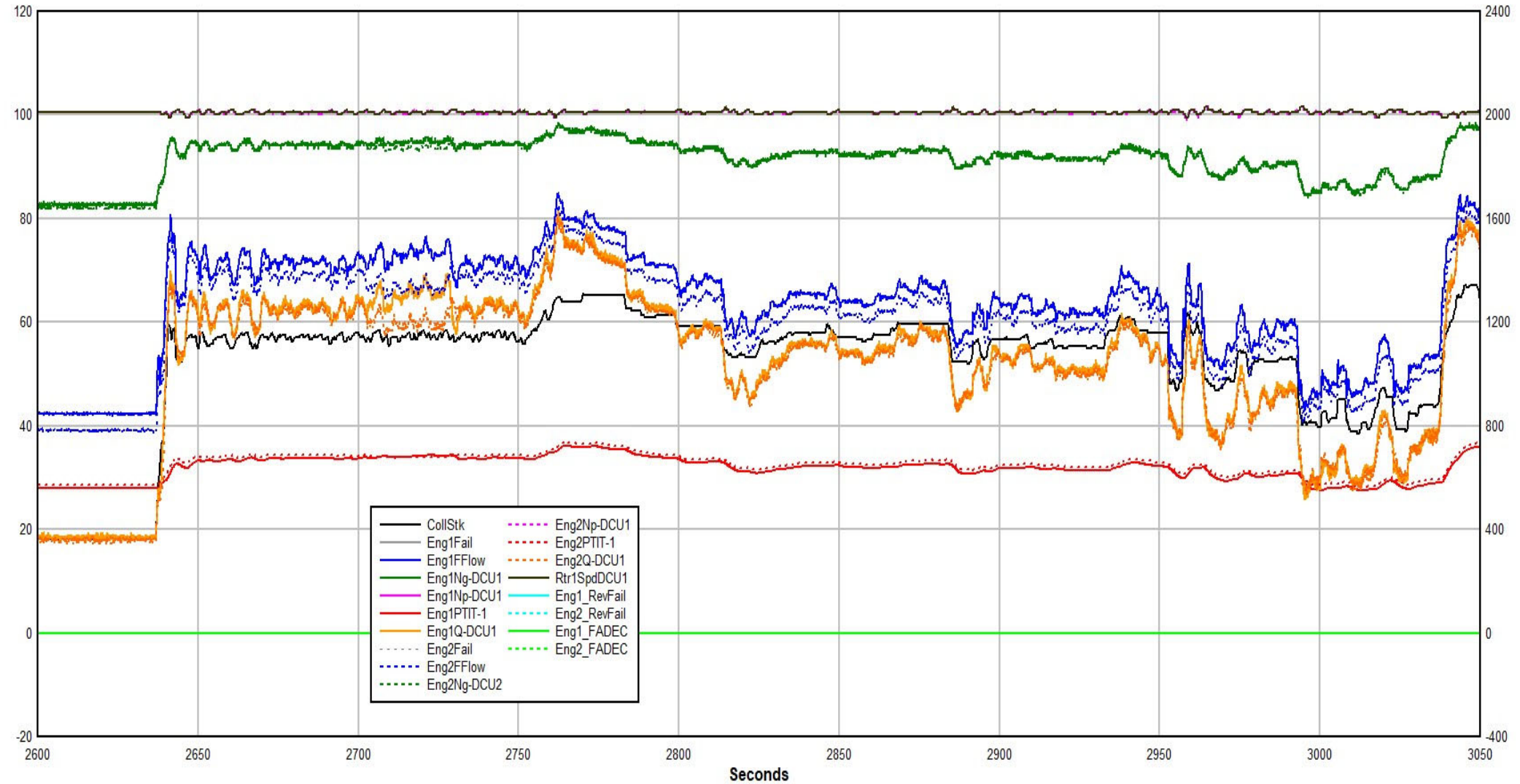


739 NG Split-Torque Pscillations & Splits.grf



# Post-Phase MTF

Aircraft 739 MTF After AWTS



Aircraft 739 MTF After AWTS Tes.grf1



# References

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- TO 33D7-28-34-1 (Automatic Wire Test Set)
- GEN-2023-SOMM-I-001 (AUTOMATIC WIRE TEST SET(AWTS) IMPLEMENTATION) FINAL
- TM 1-1500-323-24 (AIRCRAFT ELECTRIC AND ELECTRONIC WIRING)



# Certification Test Protocol

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QUESTIONS?