



CLEARED
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V22 AWTs Program Overview

2026 AWTs TIM 18-20 August

Dave Droke, V22 FST



Distribution: A



V22 Phase Program Overview

- Background
- Hardware
- Software
- Logistics
- Phase Testing
- Certification Test Protocol (CTP) Testing
- Challenges
- Over the Horizon





Background

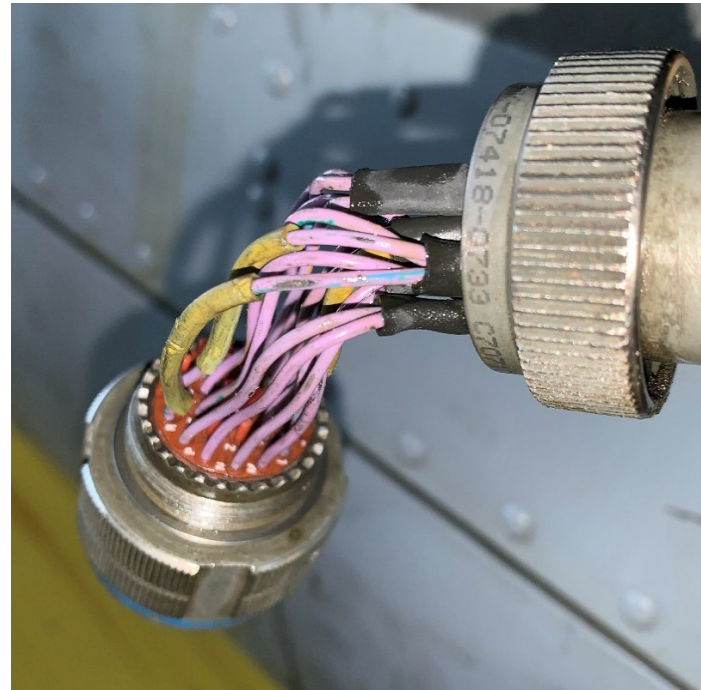


- Deliver AWTs and Associated Test Program Sets to perform Periodic Wiring Health Assessment of targeted systems tested at the O Level
- Intended to reduce intermittent faults, mission aborts, unscheduled maintenance
- Interval: Phase B (560 hour) and D (1120 hour) inspections
- Non Deployed Units Only: Shipboard and forward deployed units exempt
- Harnesses chosen for inspection were based on known degraders for FADEC and Flight Control Wiring – Not Fully Data Driven
- Phase Requirement Started in 2nd Quarter of FY 2020

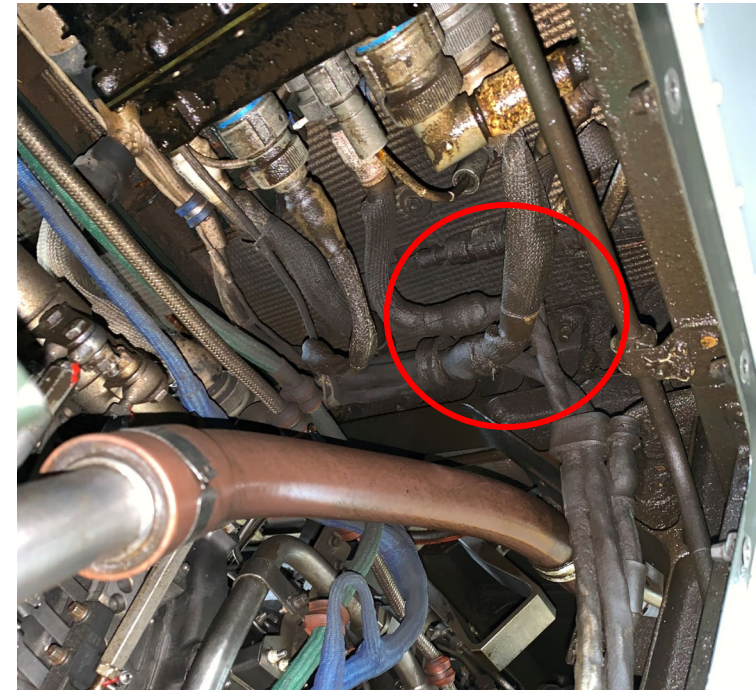


Background (Continued)

- Use Phase to Groom Wiring
- Create an Electrical inspection of wiring associated with FADEC B Engine shutdown in flight
- Expand testing to include Flight Control Wiring



Wire to Adapter Chafing



Harness to Harness Chafing



Hardware



- Utilize the 100000-02 500V AWTS
 - PMA 275 Procured initial Assets for V22
 - Follow on items procured and managed by PMA 260 (Common)
- Test Program Sets
 - FADEC Wiring
 - 3 RH/3 LH
 - Flight Control Wiring and WIAs
 - 5 LH/6 RH
- Incorporate 4 Wire (Kelvin) Testing
 - 2 wire TACS Require CTP Adapters





V22 AWTs Phase TPSs



FADEC



Flight Control



Accessory





Software

- Test Programs
 - Developed by Eclipse, delivered to NAVAIR with full data rights
 - Managed and updated by LKE (Joe Cuomo)
- Accurate data entry vital to Data Collection and Review
- Combined programs allow for flexibility
 - FADEC A Test Program has Left/Right dropdown
 - Individual Harness/ WIA have multiple P/N

The screenshot shows a software window titled "Eclipse ELITE". Inside the window is a form titled "Operator Input". The form is divided into three sections: "Step 1: Enter Aircraft Information", "Step 2: Select Purpose of Test", and "Step 3: Enter Test Information".
Step 1 contains two fields: "Aircraft BUNO:" with the value "168643" and a red asterisk, and "Model:" with a dropdown menu showing "MV" and a red asterisk.
Step 2 contains three radio button options: "Phase B" (selected), "Phase D", and "Troubleshoot".
Step 3 contains five fields: "Operator Name:" with the value "J. RIG" and a red asterisk; "Job Control Number:" with the value "JCN123456" and a red asterisk; "Nacelle (L/R):" with a dropdown menu showing "Left Nacelle" and a red asterisk; "Inlet Panel:" with a dropdown menu showing "Removed" and a red asterisk; and "Flight Hours:" with the value "1234.5" and a red asterisk. There is also a "Comment:" field with a text area.
At the bottom of the form are three buttons: "Exit", "Help", and "Continue".



Logistics



- Hardware: E Coded assets assigned to each supporting MALS/I Level
 - I Level Responsible for storage, care, upkeep, repair of AWTs and TACs
- O Level Tasks in IETM for Phase
 - Electrical inspection (Run All Test)
 - **PHASE B FADEC AND FLIGHT CONTROLS AUTOMATED WIRING TEST (NON-DEPLOYMENT USE ONLY)**
 - Additional O Level Tasks for troubleshooting
- I Level Tasks in IETM for individual harnesses and wiring components
- Supplemental Instruction Guide
 - (A1-V22AB-TIS-000-S2/ TO-1V-22(C)B-2-DB-1)



Logistics (Continued)



- Software Repository managed by AWSEC LKE
- SPORK */spôrk/ noun*
 - A NAVAIR git repository for version control, code collaboration, and continuous integration/deployment
 - <https://spork.navair1.navy.mil>
- Software Delivery managed by V22 FST
- NDDS Cloud
 - <https://nddscloud.navair.navy.mil>





Logistics (NDDDS Delivery)



- Single .zip file including 4 Folders:
 - AWTs Information
 - Supplemental Instruction Guide
 - File Management (How To Guide)
 - Complete TPS List (Configuration/Revision Management)
 - V22 PHASE
 - All Test Programs required for B or D Phase
 - V22 TPSs
 - All V22 Test Programs (O and I Level)
 - Test Adapter Cables
 - All Cable Drawings



Phase Testing



All IETM Tasks Have Same Steps

- Connect harnesses under test to AWTs TACS, run AWTs TPS, and record results (A1-V22AB-TIS-000-S2 / TO-1V-22(C)B-2-DB-1)
- Verify all AWTs TPS results
- Disconnect harnesses under test from AWTs TACS

Dialog B. Select applicable automated wiring test.

- LEFT ENGINE FADEC A AUTOMATED WIRING TEST (LEFT ENGINE FADEC A AUTOMATED WIRING TEST)
- LEFT ENGINE FADEC B AUTOMATED WIRING TEST (LEFT ENGINE FADEC B AUTOMATED WIRING TEST)
- LEFT FADEC CROSS TALK AUTOMATED WIRING TEST (LEFT FADEC CROSS TALK AUTOMATED WIRING TEST)
- LEFT FLIGHT CONTROL AUTOMATED WIRING TEST (LEFT FLIGHT CONTROL AUTOMATED WIRING TEST)
- W963 HARNESS AUTOMATED WIRING TEST (W963 HARNESS AUTOMATED WIRING TEST)
- W952 HARNESS AUTOMATED WIRING TEST (W952 HARNESS AUTOMATED WIRING TEST)
- WIRING INTEGRATION ASSEMBLY WA69 AUTOMATED WIRING TEST (WIRING INTEGRATION ASSEMBLY WA69 AUTOMATED WIRING TEST)
- WIRING INTEGRATION ASSEMBLY WA75 AUTOMATED WIRING TEST (WIRING INTEGRATION ASSEMBLY WA75 AUTOMATED WIRING TEST)
- RIGHT ENGINE FADEC A AUTOMATED WIRING TEST (RIGHT ENGINE FADEC A AUTOMATED WIRING TEST)
- RIGHT ENGINE FADEC B AUTOMATED WIRING TEST (RIGHT ENGINE FADEC B AUTOMATED WIRING TEST)
- RIGHT FADEC CROSS TALK AUTOMATED WIRING TEST (RIGHT FADEC CROSS TALK AUTOMATED WIRING TEST)
- RIGHT FLIGHT CONTROL AUTOMATED WIRING TEST (RIGHT FLIGHT CONTROL AUTOMATED WIRING TEST)
- W971 HARNESS AUTOMATED WIRING TEST (W971 HARNESS AUTOMATED WIRING TEST)
- W972 HARNESS AUTOMATED WIRING TEST (W972 HARNESS AUTOMATED WIRING TEST)
- W954 HARNESS AUTOMATED WIRING TEST (W954 HARNESS AUTOMATED WIRING TEST)
- WIRING INTEGRATION ASSEMBLY WA68 AUTOMATED WIRING TEST (WIRING INTEGRATION ASSEMBLY WA68 AUTOMATED WIRING TEST)
- WIRING INTEGRATION ASSEMBLY WA72 AUTOMATED WIRING TEST (WIRING INTEGRATION ASSEMBLY WA72 AUTOMATED WIRING TEST)



V22 AWTs Supplemental

A1-V22AB-TIS-000-S2 / TO-1V-22(C)B-2-DB-1

TAC	TAC refdes	UUT refdes	Comment
Figure 53		W716/W717/W718	Harness Diagram
4055AS5004-1			
Figure 54	W4J1	W717/4296UP148	RH Engine, W5J1 (Yellow Harness) Disc.
	W4J2 to W6P1		
Figure 55	W4J3	W717/7631UCM52P6	RH FADEC B, J6
4055AS5005-1			
Figure 56	W5J1	W716/4296UP170	RH FPMU, P13 Disc.
Figure 57	W5J2	W716/7631UCM52P5	Routing W5 from FPMU to FADEC B
4055AS5006-1			
Figure 58	W6	Routing	Routing W6 from FADEC B to Torque Sensor
Figure 59	W6J1	W718/7740USU54P1	Torque Sensor, P1 (inlet panel removed)

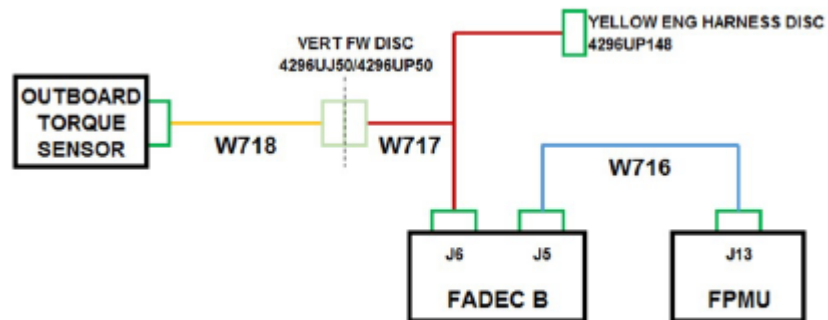
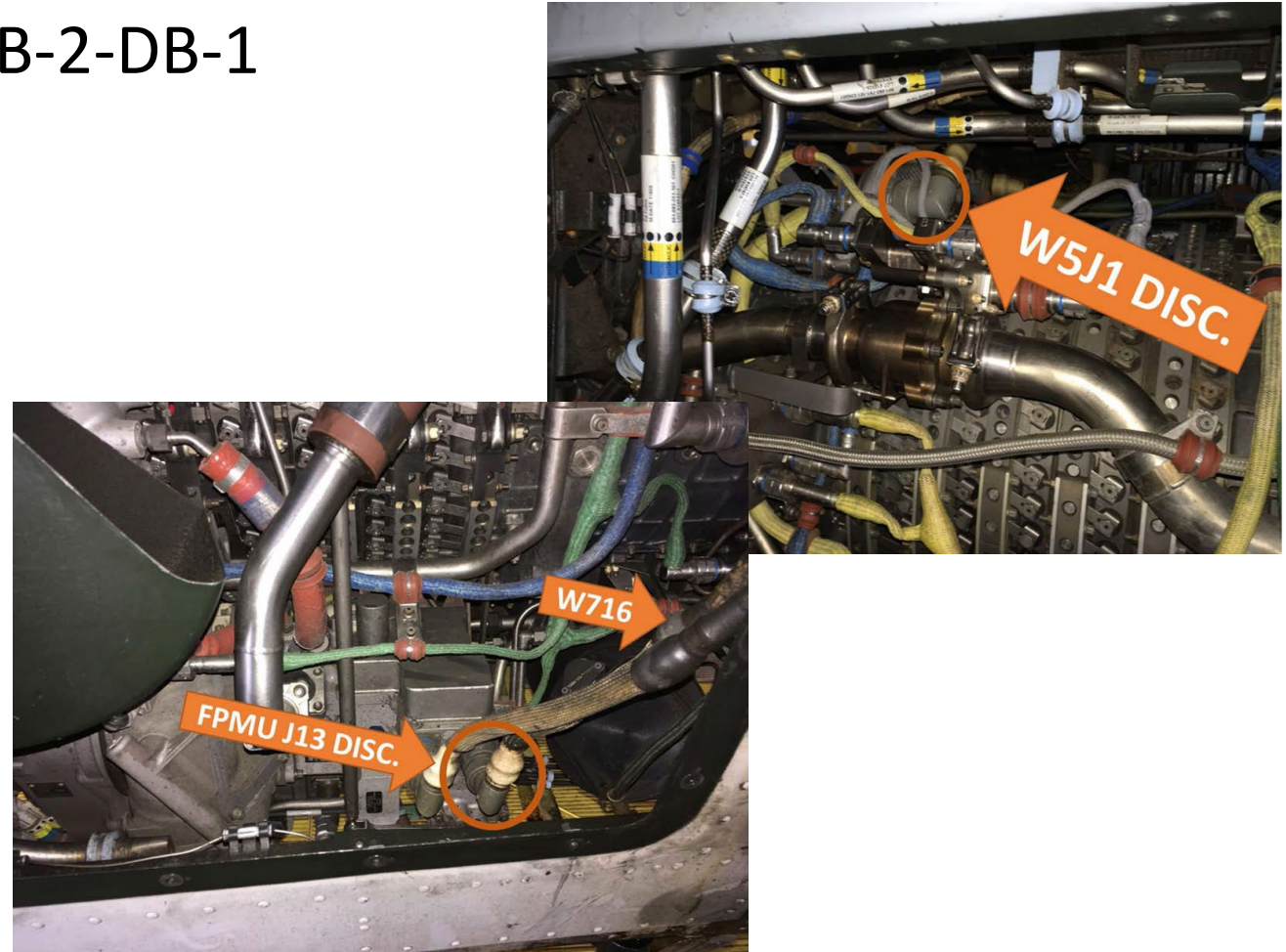


Figure 53. FADEC B Right - W716/W717/W718 Harness Diagram





V22 AWTs Phase Checklist



V22 AWTs PHASE TESTING CHECKLIST			
DATE			
PLATFORM (CV/MV/CMV)	BUNO	UNIT	
JCN			
OPERATOR(S)			
REASON FOR TEST			
FLIGHT HOURS			
LEFT NACELLE			
	ALL PASS	CTP DEG	FAIL
FADEC A (W711/W712/W751)	☐	☐	☐
FADEC B (W713/W714/W715)	☐	☐	☐
FADEC XTALK (W709/W710)	☐	☐	☐
FLIGHT CONTROL (W519/W957)	☐	☐	☐
W963	☐	☐	☐
W952	☐	☐	☐
WIA 69	☐	☐	☐
WIA 75	☐	☐	☐
RIGHT NACELLE			
	ALL PASS	CTP DEG	FAIL
FADEC A (W719/W720/W721)	☐	☐	☐
FADEC B (W716/W717/W718)	☐	☐	☐
FADEC XTALK (W722/W723)	☐	☐	☐
FLIGHT CONTROL (W539/W966)	☐	☐	☐
W971	☐	☐	☐
W972	☐	☐	☐
W954	☐	☐	☐
WIA 72	☐	☐	☐
WIA 68	☐	☐	☐



V22 Phase Test

- All Phase Tests Include:
 - TAC Loopback (Optional)
 - Hookup Procedures (Optional)
 - Safe to Turn on Test
 - Unused Pin
 - Continuity
 - Continuity CTP
 - Isolation
 - Insulation
- Phase Requirement – Run All Tests
- Troubleshoot – Select Individual Tests

The screenshot shows the "Eclipse ELITE" software interface. The title bar says "Eclipse ELITE". The main window is titled "Main Menu".

Test Information

Aircraft No.	MV 168643
Test Purpose	Phase B
Operator	J RIG
JCN	JCN123456
Nacelle	Left
Inlet Panel	Removed
Flight Hours	1234.5

Test Status

TAC Loopback	UNTESTED
Unused Pin	UNTESTED
Continuity	UNTESTED
Continuity Back	UNTESTED
Continuity CTP	UNTESTED
Isolation	UNTESTED
Insulation	UNTESTED

Step 1 Optional

TAC Loopback

Step 2 Optional

Hookup Instructions

Step 3 Select Test Options

☒ Show Only Failures ☐ Show All Test Results ☐ Hold On Fail ☒ Continuity CTP

Step 4 Select Test

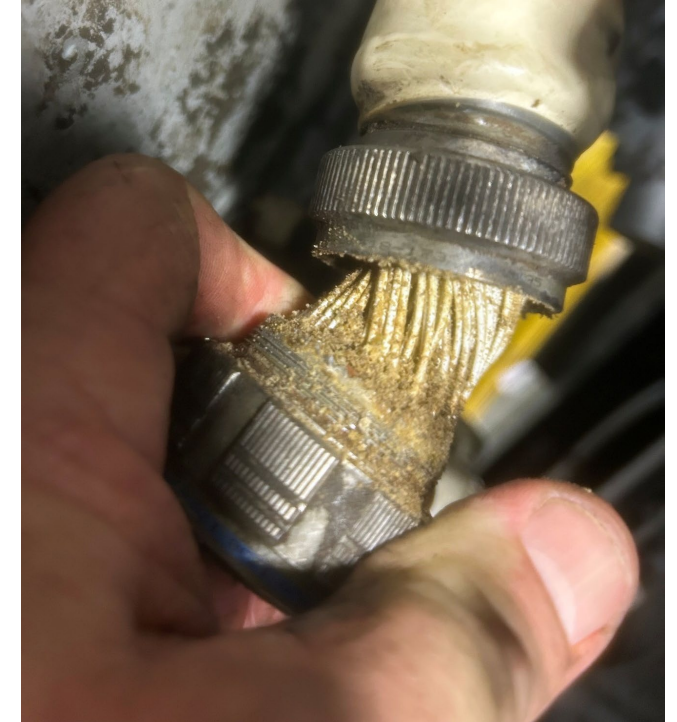
Run All Tests Unused Pin Continuity Isolation

Help View Test Results ☐ Exit After Run All Exit



Continuity CTP Testing

- Continuity CTP Testing (Wire Conductor Status)
 - a) 10mA
 - b) 100mA
 - c) 1A
 - d) 10mA
 - e) b – c (linearity test) less than 50mohm
 - f) d – a (stability test) less than 50mohm
- Expected Values based on wire type, gauge and length
- Return Value Determines Degradation
 - Corrosion, Contamination, Recessed Contacts, improper crimp, missing wire strands
- Results Interpretation (Separate Brief)





CTP Results (Passed/Degraded/Failed)



Passed

* Stimulus: 0.010A Expected: <2.000ohm				
* Result	From	To	Measured	
* PASSED	7631UCM50P6-Z	4296UP146-L	=127.7mohm	
* Continuity CTP ***** PASSED *****				
* Circuit: Wire 22AWG Test: Continuity Certification				
* From: 7631UCM50P6-Z TO: 4296UP146-L				
* Test Number	Note	Result	Expected	Measured
* 4.041	a) 0.01A Stim	PASSED	<2.00ohm	=127.7mohm
* 4.041.CTP1	b) 0.10A Stim	PASSED	<470mohm	=128.6mohm
* 4.041.CTP2	c) 1.00A Stim	PASSED	<470mohm	=128.7mohm
* 4.041.CTP3	d) 0.01A Stim	PASSED	<485mohm	=127.6mohm
* 4.041.CTP4	e) b - c	PASSED	>-50.0mohm, <50.0mohm	=0.000ohm
* 4.041.CTP5	f) d - a	PASSED	>-50.0mohm, <50.0mohm	=0.000ohm
* 4.042 ***** PASSED *****				
* Circuit: Wire 22AWG Test: Continuity				
* Stimulus: 0.010A Expected: <2.000ohm				
* Result	From	To	Measured	
* PASSED	7631UCM50P6-a	4296UP146-C	=121.3mohm	
* Continuity CTP ***** PASSED *****				
* Circuit: Wire 22AWG Test: Continuity Certification				
* From: 7631UCM50P6-a TO: 4296UP146-C				
* Test Number	Note	Result	Expected	Measured
* 4.042	a) 0.01A Stim	PASSED	<2.00ohm	=121.3mohm
* 4.042.CTP1	b) 0.10A Stim	PASSED	<470mohm	=122.0mohm
* 4.042.CTP2	c) 1.00A Stim	PASSED	<470mohm	=122.2mohm
* 4.042.CTP3	d) 0.01A Stim	PASSED	<485mohm	=121.5mohm
* 4.042.CTP4	e) b - c	PASSED	>-50.0mohm, <50.0mohm	=0.000ohm
* 4.042.CTP5	f) d - a	PASSED	>-50.0mohm, <50.0mohm	=0.000ohm
* 4.043 ***** PASSED *****				
* Circuit: Wire 22AWG Test: Continuity				
* Stimulus: 0.010A Expected: <2.000ohm				
* Result	From	To	Measured	
* PASSED	7631UCM50P6-b	4296UP146-W	=308.1mohm	

Degraded

* 4.001 ***** PASSED *****				
* Circuit: Test: Continuity Backshell				
* Stimulus: 1.000A Expected: <5.000ohm				
* Result	From	To	Measured	
* PASSED	4270NMA69P2-BS	4296RJ175-BS	=1.685ohm	
* 4.002 ***** PASSED *****				
* Circuit: Test: Continuity				
* Stimulus: 0.010A Expected: <2.000ohm				
* Result	From	To	Measured	
* PASSED	4270NMA69P2-1	4296RJ175-1	=685.4mohm	
* Continuity CTP ***** DEGRADED *****				
* Circuit: Wire 24AWG Test: Continuity Certification				
* From: 4270NMA69P2-1 TO: 4296RJ175-1				
* Test Number	Note	Result	Expected	Measured
* 4.002	a) 0.01A Stim	PASSED	<2.00ohm	=685.4mohm
* 4.002.CTP1	b) 0.10A Stim	DEGRADED-HIGH	<585mohm	=885.4mohm
* 4.002.CTP2	c) 1.00A Stim	DEGRADED-HIGH	<585mohm	=885.4mohm
* 4.002.CTP3	d) 0.01A Stim	PASSED	<585mohm	=5.400mohm
* 4.002.CTP4	e) b - c	PASSED	>-50.0mohm, <50.0mohm	=0.000ohm
* 4.002.CTP5	f) d - a	PASSED	>-50.0mohm, <50.0mohm	=0.000ohm
* DEGRADED CONTINUITY				
* Review results for details				
* - Continuity Certification includes 5 tests				
* - CTP1 Tests with Stimulus = 0.1A				
* - CTP2 Tests with Stimulus = 1.0A				
* - CTP3 Tests with Stimulus = 0.01A				
* - CTP4 Tests resistance linearity (b - c)				
* - Measured resistance should not change				
* - between 0.10A and 1.00A stimulus				
* - b - c should be approximately 0 ohms				
* - CTP5 Tests resistance stability				
* - Repeat measurements with 0.01A stimulus				
* - should not change after 1A stimulus.				
* - d - a should be approximately 0 ohms				
* - These results indicate degraded continuity from 4270NMA69P2-1 to 4296RJ175-1.				
* - Inspect aircraft connectors for fluid/contamination/corrosion/				
* - recessed contacts/improper crimps.				
* - It is strongly encouraged to clean the aircraft connector(s)				
* - and retest if this failure was not encountered on a previous run.				
* 4.003 ***** PASSED *****				
* Circuit: Wire 24AWG Test: Continuity				
* Stimulus: 0.010A Expected: <2.000ohm				
* Result	From	To	Measured	

Failed

* PASSED 4296UP84-126 ---> BULKED =1.0066ohm				
* 6.097.2 ***** PASSED *****				
* Circuit: Wire Test: Insulation High Voltage Resistance				
* Stimulus: 500.000V Expected: >350.0Mohm				
* Result	From	To	Measured	
* PASSED	4296TP50-126	BULKED	=1.3016ohm	
* 6.098.1 ***** PASSED *****				
* Circuit: Wire Test: Insulation High Voltage Resistance				
* Stimulus: 500.000V Expected: >350.0Mohm				
* Result	From	To	Measured	
* PASSED	4296UP84-127	BULKED	=919.9Mohm	
* 6.098.2 ***** PASSED *****				
* Circuit: Wire Test: Insulation High Voltage Resistance				
* Stimulus: 500.000V Expected: >350.0Mohm				
* Result	From	To	Measured	
* PASSED	4296TP50-127	BULKED	=1.1636ohm	
* 6.099.1 ***** FAILED *****				
* Circuit: Wire Test: Insulation High Voltage Resistance				
* Stimulus: 500.000V Expected: >350.0Mohm				
* Result	From	To	Measured	
* FAILED - LOW	4296UP84-128	BULKED	=22.14kohm	
* FAILED INSULATION HIGH VOLTAGE RESISTANCE				
* - Review results for details				
* - Bulk Error Scan may appear below with more information.				
* - Hint: Resistances between 30Mohm and 500Mohm				
* - can be a result of dirty TACs or				
* - test set internal switch cards.				
* - Run "TAC Loopback" as required.				
* - Repair as required by procedures.				
* 6.099.2 ***** PASSED *****				
* Circuit: Wire Test: Insulation High Voltage Resistance				
* Stimulus: 500.000V Expected: >350.0Mohm				



Challenges



- Where do we put the inspection? (Phase-O Level, PMI-D Level)
 - Delivery and management of assets across 3 services (USMC/USAF/USN)
- Who performs the Inspection?
- Sequencing the inspection during the Phase
- Logistics Required (A/C Configuration/prep/stands/technicians)
- Training: Initial training conducted at all V22 sites for O and I Level
- Follow On Training and Support via local FST/FSR/NATEC
- Repair and Upkeep of TACS – Requires good O/I Level communication
- Data Collection and Review (Separate Brief by Matt Jackson)



With or Without Phase Stands





V22 AWTS – What's Next

- Improve and Update All Phase Programs
 - Data Collection Lessons Learned
 - Fleet Feedback
 - Simplify Data Entry to once per BUNO
- WIA 56/57 Cable and Program Update for ODSSHI (I Level Only)
 - Developed and Tested
 - Under Contract
- Cyclic and Thrust Control Lever (I Level Only)
 - Prototype Developed & Tested
 - Changes Implemented, Software Updated, now under Contract





V22 AWTs – What's Next (Cont.)

- Phase Test for Swashplate Actuators and Wiring
 - Legacy Nacelles
 - Nacelle Improvement
 - Single Box of TACs Added to Current Phase Kit
 - Will include 1 Bag of TAC Hooks
- Add CTP Adapters to WIA 76/77/78/79 (I Level)
- Nacelle Ice Protection System Test
- Nacelle Improvement Junction Boxes (2)
- Slip Ring – In work (FST/BCMI)





Questions





Points of Contact



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