



# Our Mission

- Our mission is to marry the best-in-class performance of modern engines with the world's most popular business jets.
- New technologies have been created since the original aircraft design. Some, such as avionics, have been widely incorporated. Other upgrades, such as new jet engine technologies, are missing.
- Clifford Development was formed for the sole purpose of correcting this situation. By designing superior products and marrying them with the services of a world class Service Center network— “Better Products and Service” is “Just-Around-The-Corner”!

# Market Reception – Excitement!

- “ I didn’t think the new engine would do what you were advertising, but after flying it I think you have under sold it”  
A/C Broker
- “I haven’t had this much fun since I flew military aircraft”  
Test Pilot
- “You don’t need to pay me to fly this aircraft – it is too much fun” Test Pilot
- “I have never been to 43,000 feet in my airplane – this will really save me fuel” A/C Owner



## CLIFFORD TRANSFORMS

*"Stunningly powerful. Clifford enhances the aircraft in ways that are virtually immeasurable."*

MARK DILULLO | PROFESSIONAL PILOT | FIRST FLIGHT AFTER CLIFFORD TRANSFORMATION



# C550

- One of the most popular series of business jet aircraft ever produced with 688 CII and 159 SII still in operation (excludes 340 Bravo's)
- Approximately 40% of the fleet is due for major engine maintenance within 5 years:
  - Costing up to **\$1 million** per aircraft
  - Adding little/no value to the aircraft
- The Williams engine replacement targeted at \$2.2 million per aircraft will:
  - Provide significant performance improvements
  - *Approximately double the aircraft resale value*
  - Upgrade for approximately half of a new aircraft

# The Aircraft & The Marriage

- Clifford Development is bringing the FJ44-3 with FADEC (same engine used in the CJ3) and the Citation II together in a certified modification that delivers:
  - 18% Faster High Speed Cruise
  - 59% Better NBAA IFR Range– 4 pass
  - 18% Reduction in Takeoff Field Length
  - 22 minutes directly to 43,000 ft in
  - 13% More Thrust
  - 34% Fuel Savings



# C550

**Projected Annual Flight Hours: 450**

### Annual Savings:

### Investment Payback :

<b>Years to Payback</b>
-------------------------

	DOC	Initial \$	JT-15 O/H	Net \$
C550/JT15	\$728,756	\$ -	\$ 850,000	\$ 850,000
C550/FJ44	<b>\$443,737</b>	\$ 2,275,000	\$ 850,000	\$ 1,425,000
<b>Total Annual Savings</b>	<b>\$285,020</b>			
<b>Total Savings by Overhaul</b>	<b>\$3,206,606</b>			

<b>5.0</b>
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Professional tax advice should be utilized when considering depreciation.

### Yearly Trip Profile:

# of Trips	Profile
10	500nm (1,000nm round trip)
10	1,000nm (2,000 nm round trip)
14	1,500nm (3,000nm round trip)
14	2,000nm (4,000nm round trip)

### Old Engine Airspeed & Fuel Flow:

Altitude	TAS	FF
25,000 ft	365	1,400
35,000 ft	370	1,055
Climb	200	1,350

### New Engine Airspeed & Fuel Flow:

Altitude	TAS	FF
25,000 ft	397	1,420
43,000 ft	376	700
Climb	220	1,153

### Engine TBO Cost Analysis

#### Standard Configuration (\$/hr)

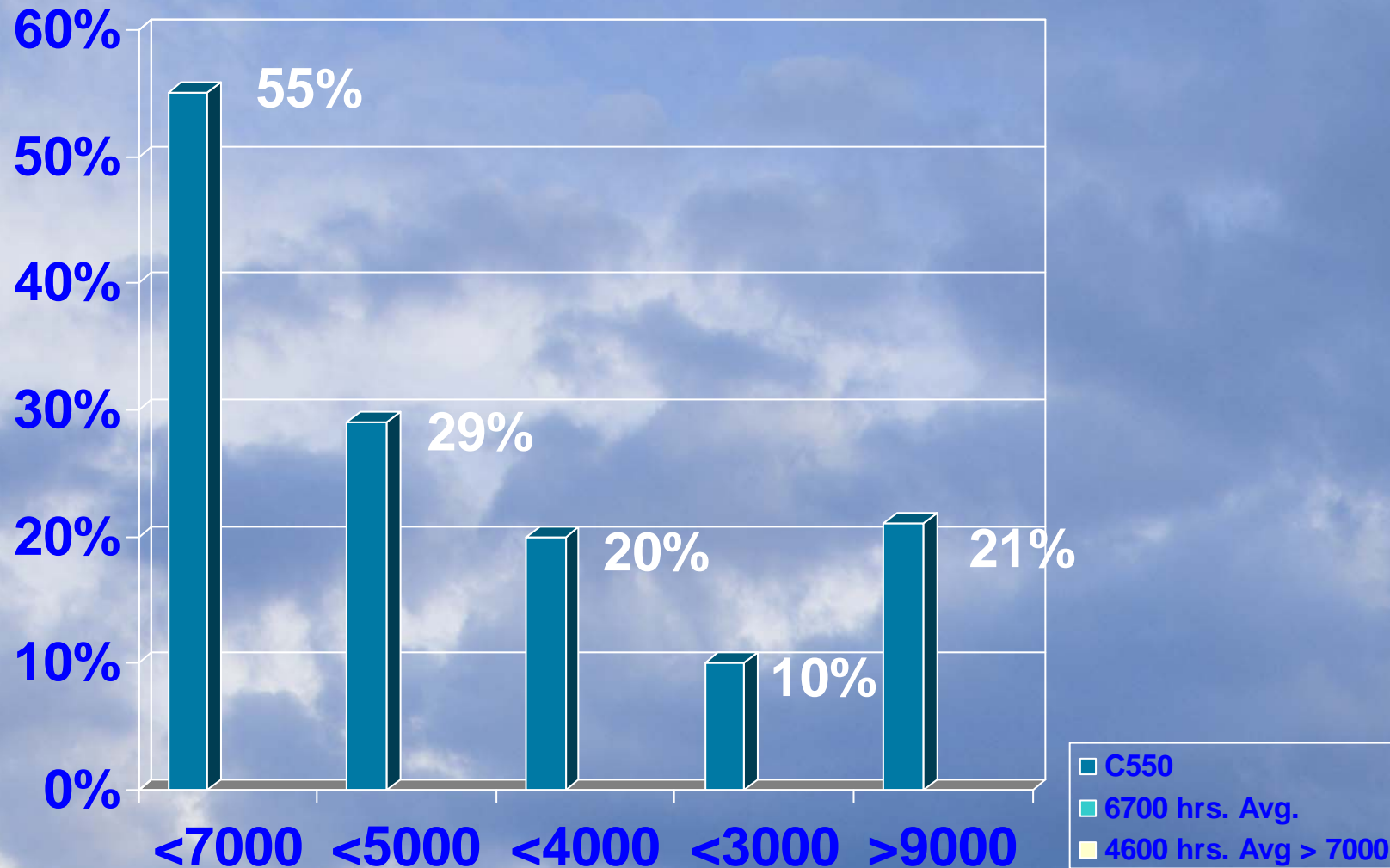
TBO	3500 Hours
Overhaul	\$ 425,000 /engine
Midlife Insp.	\$ 95,000 /engine
Engine Reserve	\$ <b>297.14</b>

#### FJ44 Configuration (\$/hr)

TBO	4000 Hours
Overhaul	\$ 325,000 /engine
Midlife Insp.	\$ 85,000 /engine
Engine Reserv	\$ <b>205.00</b>

<b>Fuel Savings</b>	<b>42%</b>
per Year	\$ 183,749

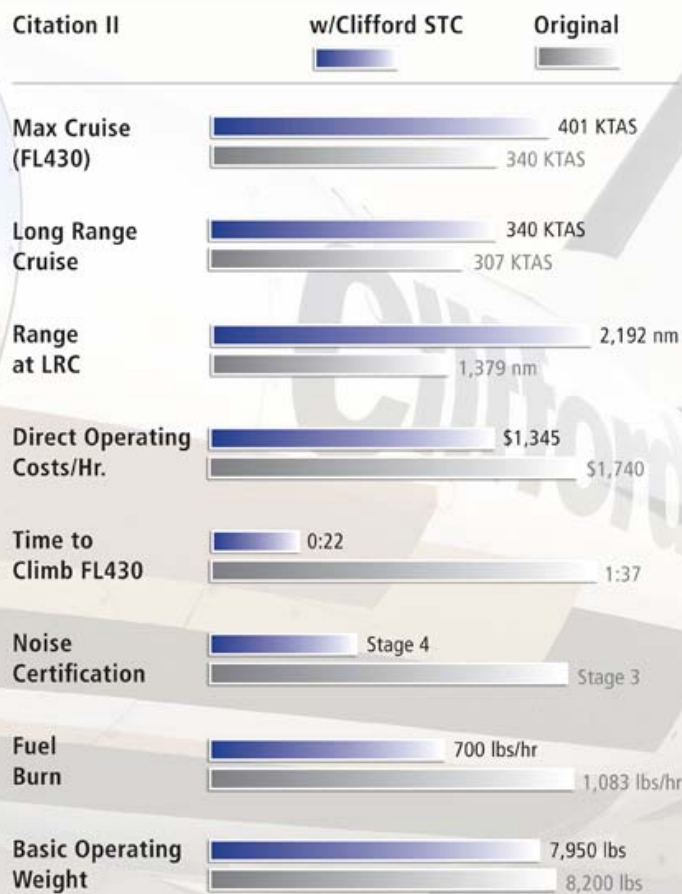
# Reported Fleet Hours by %





# Performance

## CITATION II COMPARISON



C550 data from BCA Purchase Planning Handbook and Cessna C550 flight manual  
C550 F344 data from Certification Test Flights

MISSION TYPE

TYPE AIRCRAFT

TYPE ENGINES

PREPARED BY

DATA VERIFIED BY FLIGHT

DATA NOT VERIFIED BY FLIGHT

DATE

CHECKED BY

MAX RANGE @ LONG RANGE CRUISE W 4 PASS.

C550	BOW	7950
FJ44-3A	PAYLOAD	800
WILCOX	INITIAL FUEL	4750
YES	TOTAL WT	13500
Minor	MAX RAMP WT	13500
9/7/2008	MZFW	11000
CLIFFORD	MTOW	13300

BCA DATA FOR BOW = 8200

FLIGHT SEGMENT	SEGMENT TIME	TOTAL TIME	BURN RATE	FUEL BURNED	FUEL REMAIN	NM FLOWN	TOTAL NM
TAXI	10	10		100	4650	0	0
TO & CLIMB TO CRUISE (FL430)	22	32	1153	423	4227	81	81
Long Range CRUISE @ 340 TAS	5.9	387	540	3196	1031	2012	2093
DESCENT ENROUTE TO SL	14	401	450	105	926	84	2177
INST APP (5000 FOR 5 MIN)	5	406	638	53	873	15	2192
HOLD FOR CLEARANCE (5000/5)	5	411	638	53	820	15	2207
CLIMB TO FL310	7	418	1348	157	663	26	2233
CRUISE @275TAS	26	444	618	264	399	117	2350
DESCENT ENROUTE TO SL	10	454	450	80	319	57	2407
LAND W 30 MIN RESERVE	30	484	638	319	0		
		7.6		4750		2192	
TRIP FUEL	3777						
BLOCK SPEED	324						
<b>NBAA (4 PASS) IFR RANGE</b>	<b>2192</b>	old A/C	1378	<b>59%</b>	<b>814</b>		

MISSION TYPE

TYPE AIRCRAFT

TYPE ENGINES

PREPARED BY

DATA VERIFIED BY FLIGHT

DATA NOT VERIFIED BY FLIGHT

DATE

CHECKED BY

MAX RANGE @ HIGH SPEED CRUISE W 4 PASS.

C550	BOW	7950
FJ44-3A	PAYLOAD	800
WILCOX	INITIAL FUEL	4750
YES	TOTAL WT	13500
Minor	MAX RAMP WT	13500
9/7/2008	MZFW	11000
CLIFFORD	MTOW	13300

BCA DATA FOR BOW = 8200

FLIGHT SEGMENT	SEGMENT TIME	TOTAL TIME	BURN RATE	FUEL BURNED	FUEL REMAIN	NM FLOWN	TOTAL NM
TAXI	10	10		100	4650	0	0
TO & CLIMB TO CRUISE (FL430)	22	32	1153	423	4227	81	81
HIGH SPEED CRUISE @ 375 TAS	4.6	306	699	3196	1031	1715	1795
DESCENT ENROUTE TO SL	14	320	450	105	926	84	1879
INST APP (5000 FOR 5 MIN)	5	325	638	53	873	15	1894
HOLD FOR CLEARANCE (5000/5)	5	330	638	53	820	15	1909
CLIMB TO FL310	7	337	1348	157	663	26	1935
CRUISE @275TAS	26	363	618	264	399	117	2052
DESCENT ENROUTE TO SL	10	373	450	80	319	57	2109
LAND W 30 MIN RESERVE	30	403	638	319	0		
		6.2		4750		1894	
TRIP FUEL	3777						
BLOCK SPEED	349						
<b>NBAA (4 PASS) IFR RANGE</b>	<b>1894</b>	old A/C	1378	37%	<b>516</b>		

S550

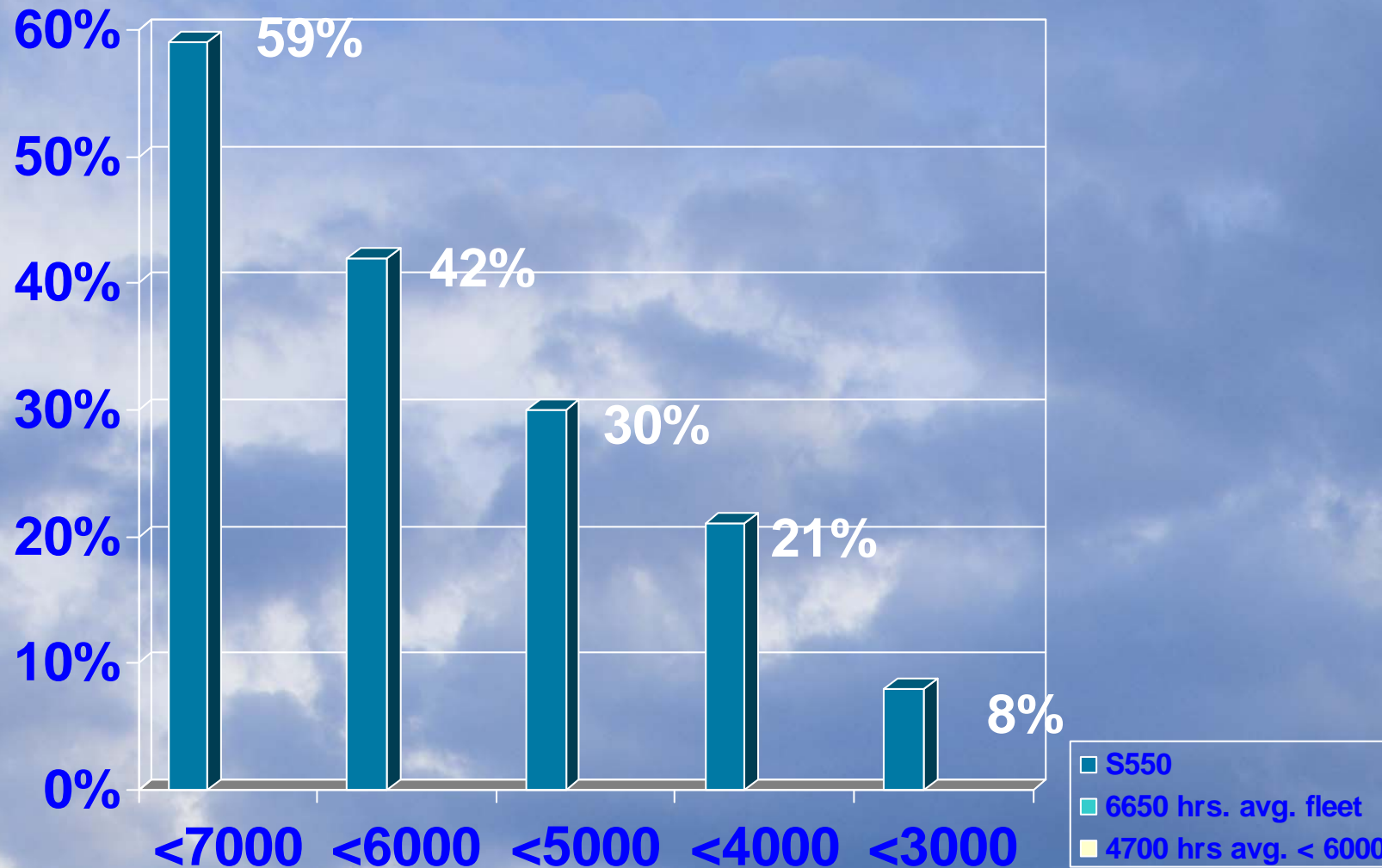
**Clifford**  
DEVELOPMENT



# The Aircraft & The Marriage

- Citation SII is a CII with a C560 like wing with TKS.
- Clifford Development is bringing the FJ44-3 with FADEC (same engine used in the CJ3) and the Citation SII together in a certified modification that delivers:
  - 20% Faster High Speed Cruise
  - 55% Better NBAA IFR Range– 4 pass
  - 27 minutes directly to 43,000 ft in
  - 13% More Thrust
  - 37% Fuel Savings

# Reported Fleet Hours by %





# S550

**Projected Annual Flight Hours: 450**

### Annual Savings:

	DOC
Standard	\$753,192
S550/FJ44	<b>\$419,700</b>
<b>Total Annual Savings</b>	<b>\$333,491</b>
<b>Total Savings by Overhaul</b>	<b>\$5,082,238</b>

### Investment Payback :

	Initial \$	JT-15 O/H	Net \$
Standard	\$ -	\$ 750,000	\$ 750,000
S550/FJ44	\$ 2,275,000	\$ 750,000	\$ 1,525,000

### Years to Payback

**4.6**

Professional tax advice should be utilized when considering depreciation.

### Yearly Trip Profile:

# of Trips	Profile
9	500nm (1,000nm round trip)
9	1,000nm (2,000 nm round trip)
13	1,500nm (3,000nm round trip)
12	2,500nm (5,000nm round trip)

### Old Engine Airspeed & Fuel Flow:

Altitude	TAS	FF
25,000 ft	370	1,450
39,000 ft	375	950
Climb	200	1,650

### New Engine Airspeed & Fuel Flow:

Altitude	TAS	FF
25,000 ft	390	1,550
43,000 ft	415	800
Climb	220	1,250

### Engine TBO Cost Analysis

#### Standard Configuration (\$/hr)

TBO	3500 Hours
Overhaul	\$ 375,000 /engine
Midlife Insp.	\$ 85,000 /engine
Engine Reserve	<b>\$ 262.86</b>

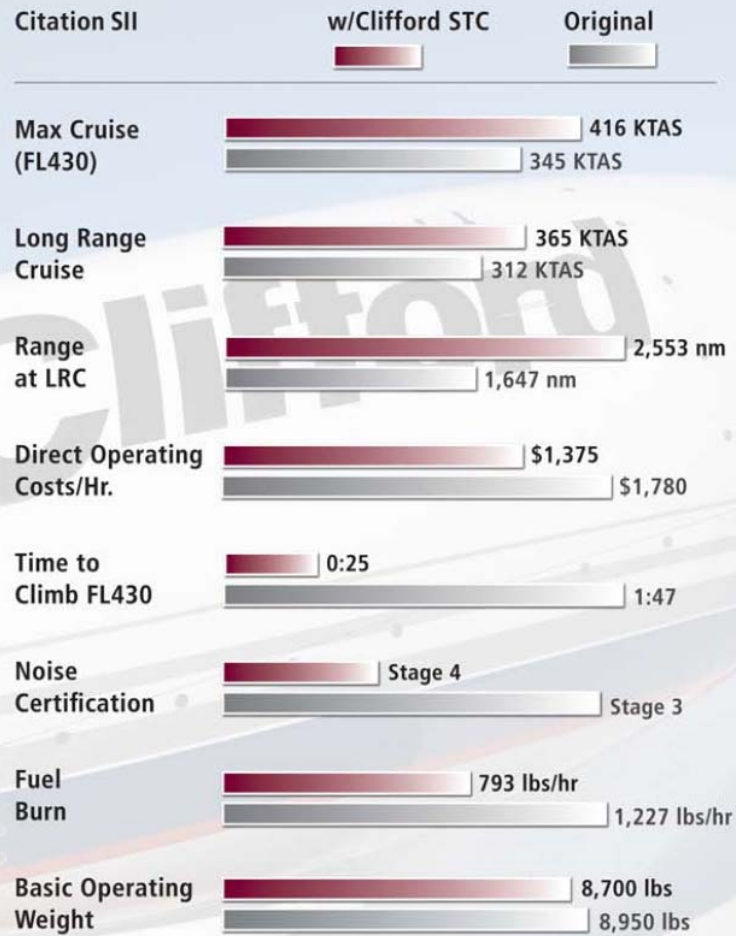
#### FJ44 Configuration (\$/hr)

TBO	4000 Hours
Overhaul	\$ 265,000 /engine
Midlife Insp.	\$ 65,000 /engine
Engine Reserv	<b>\$ 165.00</b>

**Fuel Savings 45%**  
per Year \$ 215,670

# Performance

## CITATION SII COMPARISON



S550 data from BCA Purchase Planning Handbook and Cessna S550 flight manual  
S550 FJ44 data from Certification Test Flights



**S550**

MISSION TYPE	MAX RANGE @ LONG RANGE CRUISE W 4 PASS.		
TYPE AIRCRAFT	C550	BOW	8700
TYPE ENGINES	FJ44-3A	PAYLOAD	800
PREPARED BY	WILCOX	INITIAL FUEL	5800
DATA VERIFIED BY FLIGHT	YES	TOTAL WT	15300
DATA NOT VERIFIED BY FLIGHT	Minor	MAX RAMP WT	15300
DATE	9/7/2008	MZFW	11200
CHECKED BY	CLIFFORD	MTOW	15100

BCA DATA FOR BOW = 8200

FLIGHT SEGMENT	SEGMENT TIME	TOTAL TIME	BURN RATE	FUEL BURNED	FUEL REMAIN	NM FLOWN	TOTAL NM
TAXI	10	10		100	5700	0	0
TO & CLIMB TO CRUISE (FL430)	27	37	1250	563	5138	99	99
Long Range CRUISE @ 365 TAS	6.4	424	620	3997	1141	2353	2452
DESCENT ENROUTE TO SL	14	438	450	105	1036	84	2536
INST APP (5000 FOR 5 MIN)	5	443	738	62	974	15	2551
HOLD FOR CLEARANCE (5000/5)	5	448	738	62	913	15	2566
CLIMB TO FL310	7	455	1348	157	755	26	2592
CRUISE @275TAS	26	480	718	306	449	117	2709
DESCENT ENROUTE TO SL	10	490	450	80	369	57	2766
LAND W 30 MIN RESERVE	30	520	738	369	0		
		8.2		5800		2551	
TRIP FUEL	4726						
BLOCK SPEED	346						
<b>NBAA (4 PASS) IFR RANGE</b>	<b>2551</b>	old A/C	1647	55%	<b>904</b>		

Estimated pending final FAA and Test Pilot review and approval

**S550**

MISSION TYPE  
 TYPE AIRCRAFT  
 TYPE ENGINES  
 PREPARED BY  
 DATA VERIFIED BY FLIGHT  
 DATA NOT VERIFIED BY FLIGHT  
 DATE  
 CHECKED BY

MAX RANGE @ HIGH SPEED CRUISE W 4 PASS.			
S550		BOW	8700
FJ44-3A		PAYLOAD	800
WILCOX		INITIAL FUEL	5800
YES		TOTAL WT	15300
Minor		MAX RAMP WT	15300
9/7/2008		MZFW	11200
CLIFFORD		MTOW	15100

BCA DATA FOR BOW = 8900

FLIGHT SEGMENT	SEGMENT TIME	TOTAL TIME	BURN RATE	FUEL BURNED	FUEL REMAIN	NM FLOWN	TOTAL NM
TAXI	10	10		100	5700	0	0
TO & CLIMB TO CRUISE (FL430)	27	37	1250	563	5138	99	99
HIGH SPEED CRUISE @ 415TAS	5.0	337	800	3997	1141	2073	2172
DESCENT ENROUTE TO SL	14	351	450	105	1036	84	2256
INST APP (5000 FOR 5 MIN)	5	356	738	62	974	15	2271
HOLD FOR CLEARANCE (5000/5)	5	361	738	62	913	15	2287
CLIMB TO FL310	7	368	1348	157	755	26	2312
CRUISE @275TAS	26	393	718	306	449	117	2430
DESCENT ENROUTE TO SL	10	403	450	80	369	57	2487
LAND W 30 MIN RESERVE	30	433	738	369	0		
		6.7		5800		2271	
TRIP FUEL	4726						
BLOCK SPEED	383						
<b>NBAA (4 PASS) IFR RANGE</b>	<b>2271</b>	old A/C	1647	38%	<b>624</b>		

Estimated pending final FAA and Test Pilot review and approval

# Performance

**Clifford**  
DEVELOPMENT



# The Team

- Personnel
  - With over 150 years of experience, managers for this project were selected for their expertise in particular areas of aviation. The Team has over 3000 STC's successfully certified.
  - **NO One** outside the Factory has more expertise on a Citation 500 series aircraft
  - Together they cover every area of aviation from engineering and manufacturing to field service and support as well as logging over 20,000 hours collective flying experience.

## **Jim Clifford – Founding Partner, Chief Executive Officer**

- **More than 35 years experience in aircraft and engine maintenance, engine replacement modifications, sales and marketing, and FBO services.**
- **Jim has held executive positions with National Flight Service, AvBase Aviation and Signature Flight Support, and spent 18 years with Kal-Aero – Duncan Aviation, where he rose through the ranks to Senior Executive Vice President.**
- **Jim has FAA ratings for: Airframe and Powerplant Mechanic, Inspection Authorization and Pilot, Single / Multi Engine Land**

## **Bruce Wilcox – Founding Partner, Chief Operating Officer**

- **45 years senior program mgmt experience.**
- **23 years Williams International executive positions in mfg, quality and product support.**
  - Govt procurement program manager (Cruise Missile Engs)
- **22 years in the USAF culminating as Chief of Staff Air Force Systems Command.**
  - 22 years as a rated USAF pilot
  - 12 years in weapon system acquisition
    - Program Director C17 Cargo Aircraft, Budget Director F15 aircraft procurement, SR71 Test Force Propulsion Engineer
- **Bruce holds an Airline Transport Pilot rating**

- **Mark Ash, CFO**
  - 17 years of financial services and accounting expertise
  - 10 years Aviation IT, production, product support, and inventory control background
  
- **Alden Andre, FJ44 Engine Sales Manager**
  - 24 years aviation sales and maintenance experience
    - 16 years U.S. Army as a helicopter pilot, flight instructor and mechanic
    - CFI, CI single/multi and rotor-wing engine jet

## **Western Michigan Aviation, LLC**

- **Members Have over 20 years of Venture Capital experience.**
- **Members investments include:**
  - **Banks**
  - **Real Estate**
  - **Manufacturing**
  - **Distributorships**
  - **Retail Operations**



## **Tod D. Anderson – GLAH President**

- An accomplished industry professional with 25 years of project management expertise in new technology applications, design implementation and team building.
- 22 years with Duncan Aviation where he earned the title of Vice President of Engineering.
- Tod is a FAA Designated Engineering Representative in Aircraft Structures, Mechanical Systems and Management

# Back Shop Experts!

- **Tod Anderson has assembled a formidable team of FAA DERs in disciplines necessary to develop this STC in the shortest time possible:**
  - *Adrian Honer* - Systems and Equipment, Management (former FAA engineer)
  - *Tom Richter* - Powerplant Installation, Engine (former FAA engineer/manager)
  - *Robert D. Marwill* – Powerplant Installation, Engine (previous Williams installation project engineer)
  - *Andrew K. Anderson* - Systems and Equipment, Flight Analyst
  - *Art Barth* - Flight Test
  - *Mark Reynolds* - DAR7 Conformity Inspector (former FAA DAS8 Administrator)

# **Clifford Development Group** **Service Centers**

## **Central Flying Service**

1501 Bond Street

Little Rock, Arkansas 72202

Phone #: 501-375-3245

Toll Free: 1-800-888-JETS

[www.central.aero](http://www.central.aero)

## **Great Lakes Aviation AZO LLC**

2422 E. Kilgore Rd.

Kalamazoo, Michigan 49002

Phone #: (269) 290-7300

[www.greatlakes.aero](http://www.greatlakes.aero)

## **Threshold Aviation Group**

8352 Kimball Avenue

Building F350 #3

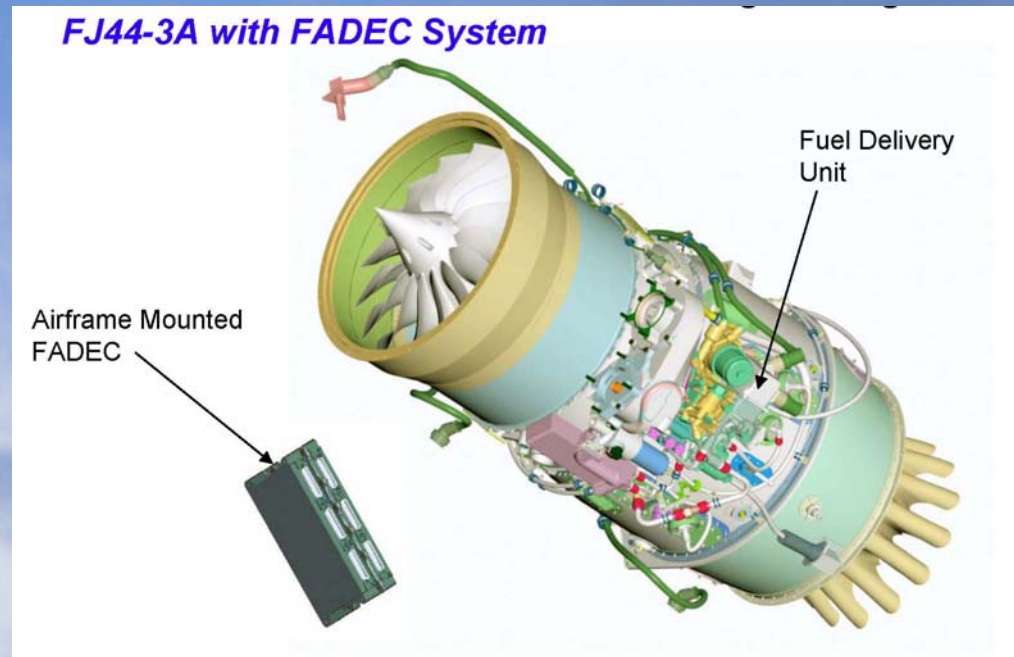
Chino, California 91710

Phone #: (909) 606-2504

[www.thresholdaviationgroup.com](http://www.thresholdaviationgroup.com)

# Williams' FJ44 the technology leader

**Clifford**  
DEVELOPMENT



- 4.0 million accident-free flying hours
- Thermo-dynamic engine rating 3000 lbs thrust with a 4000 hr. TBO
- Take-Off Thrust 2820 lbs thrust (+13%)
- "FADEC" for "fly-by-wire" engine control
- Certified to July 2007, P2T2 Redundant Safety Standard
- Lower idle thrust: 125 lbs per side vs. 450 lbs on JT15D-4

# Engine Installed

**Clifford**  
DEVELOPMENT



# Inlet and Exhaust Installed

**Clifford**  
DEVELOPMENT



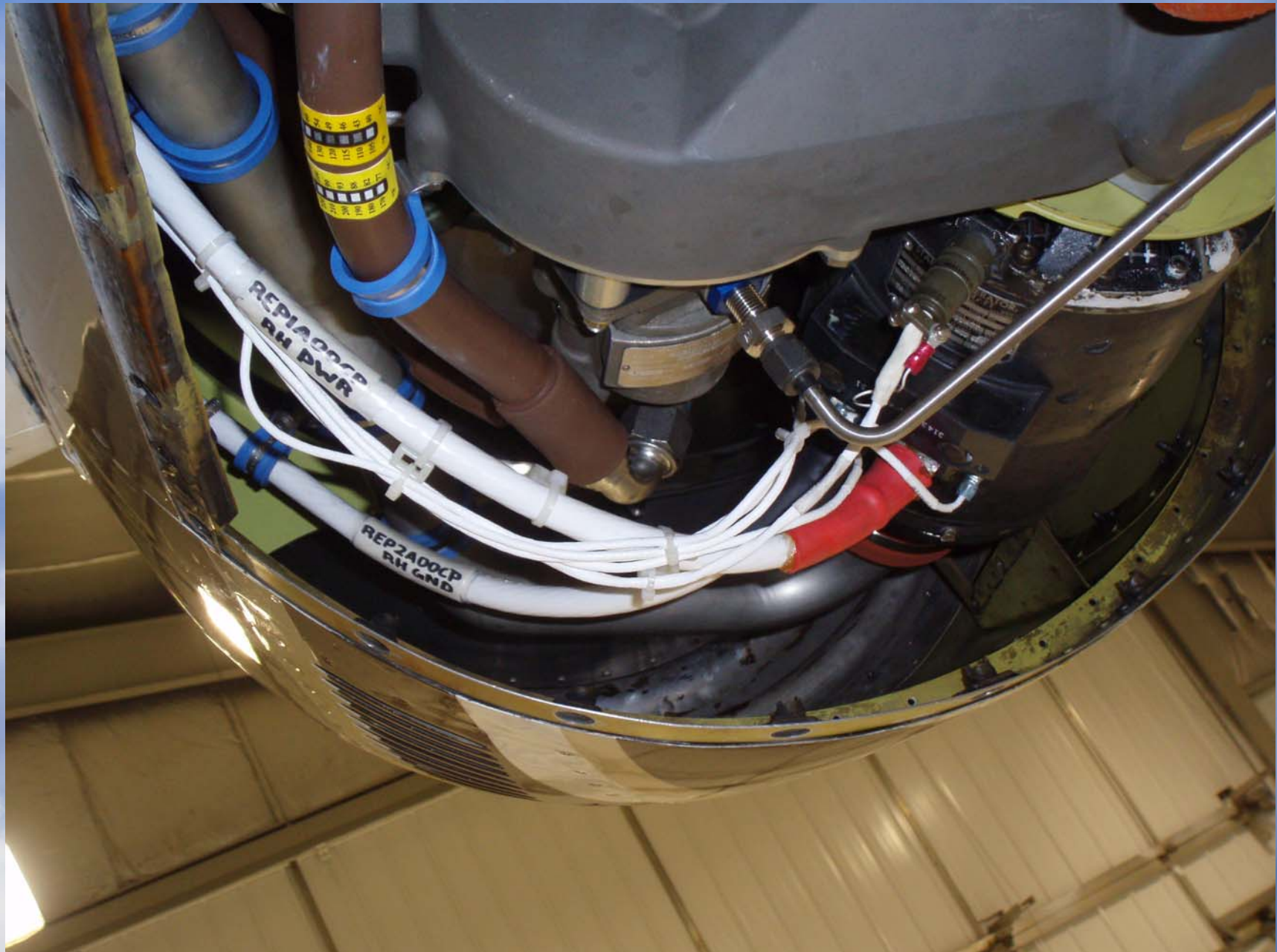
# Completed Installation

**Clifford**  
DEVELOPMENT



# Professional Looking Installation

**Clifford**  
DEVELOPMENT





# Carbon Fiber Aft Cowls

**Clifford**  
DEVELOPMENT



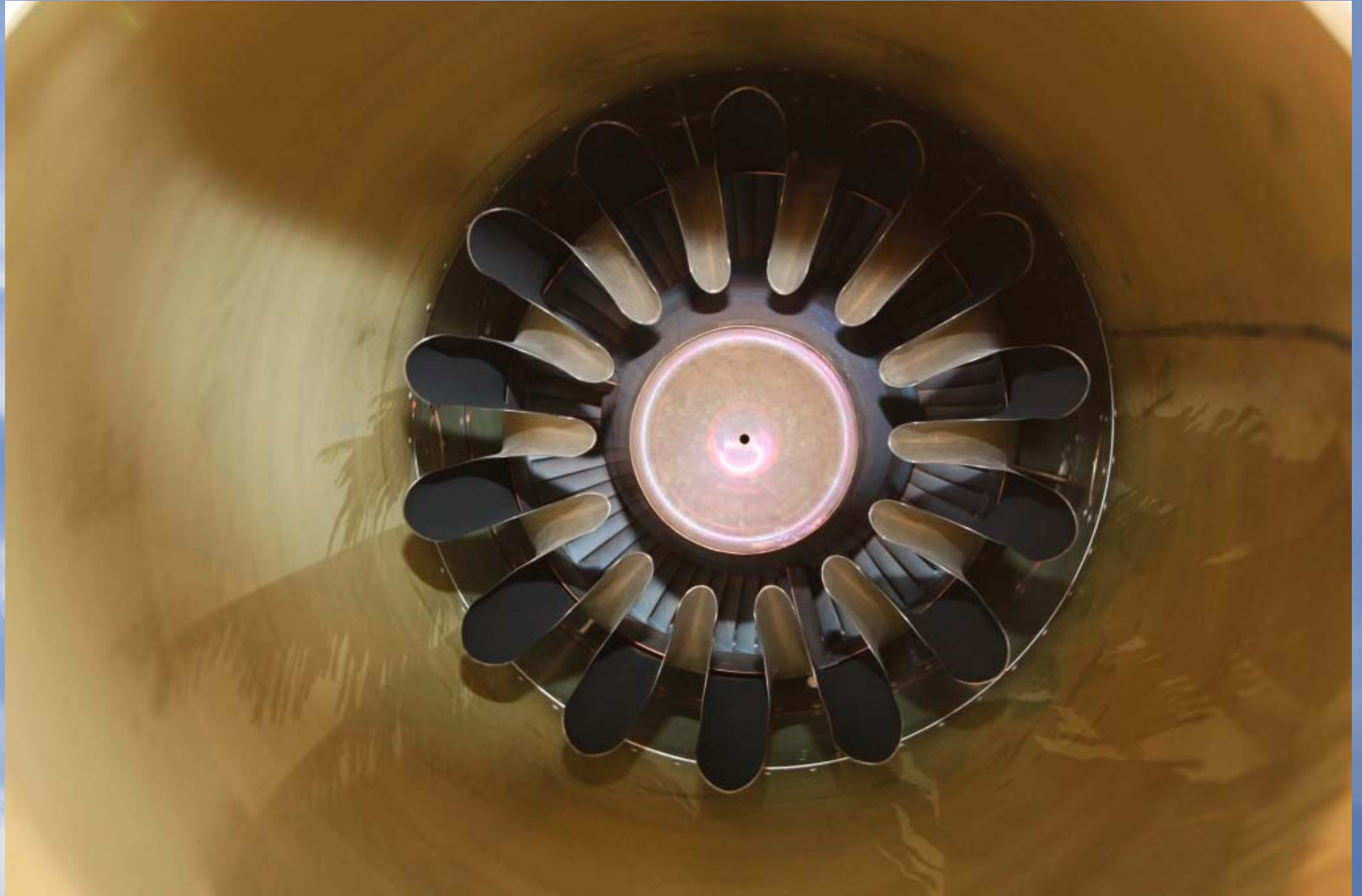
# Carbon Fiber Aft Cowls

**Clifford**  
DEVELOPMENT



# Lower Noise

**Clifford**  
DEVELOPMENT

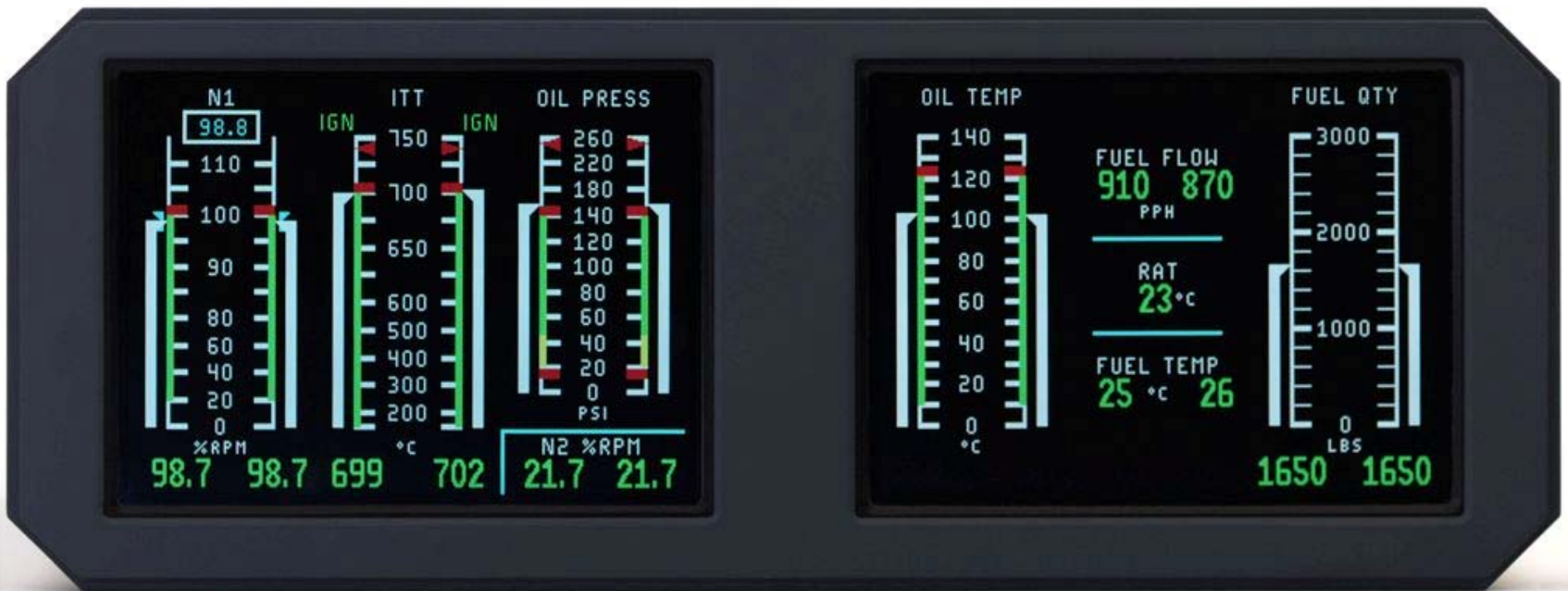


# Modified Inlet

**Clifford**  
DEVELOPMENT



# Ametek Solid State Digital Engine Display Incorporating Fuel Quantity and Ram Air Temp

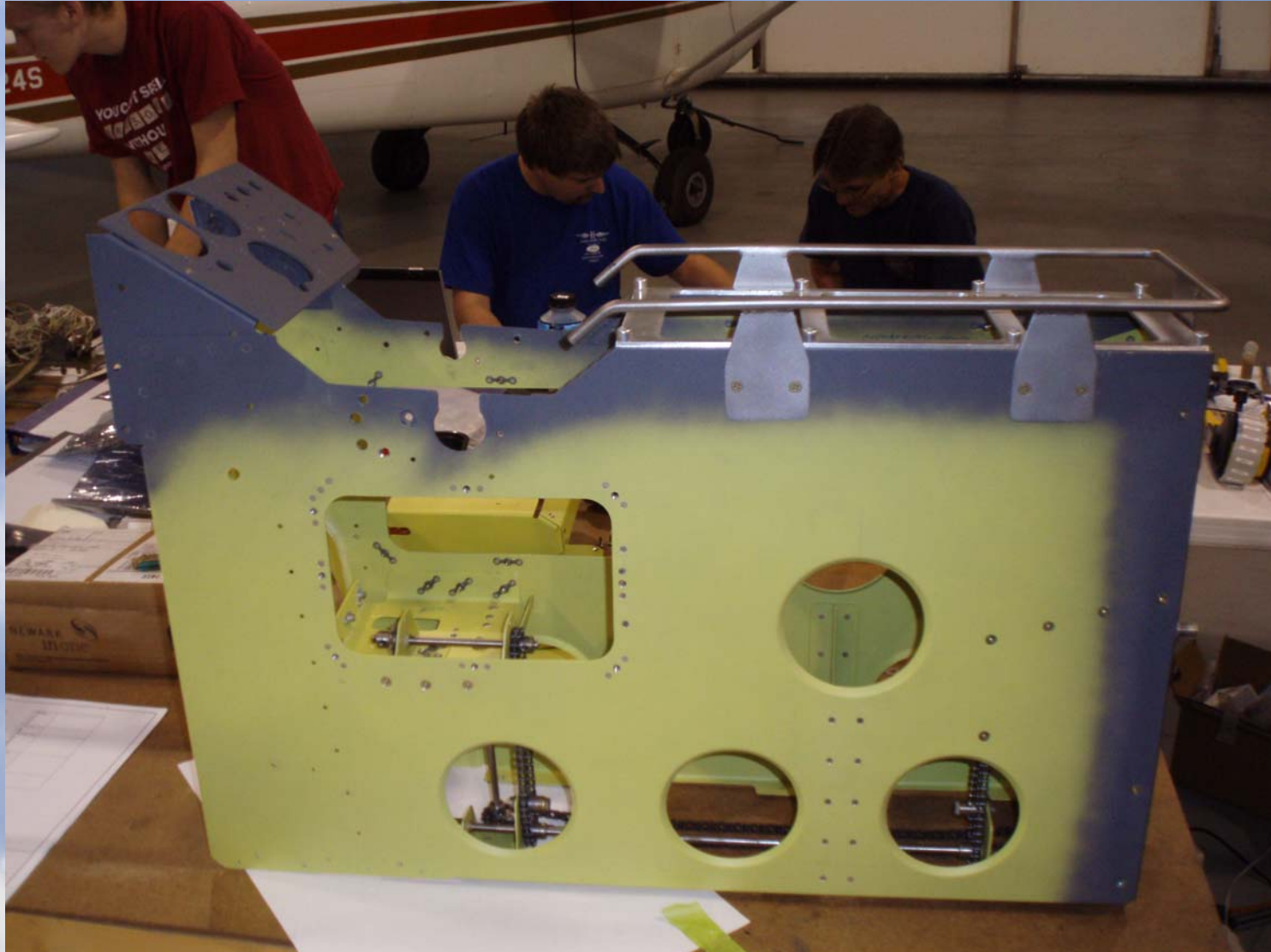


# Annunciator moved to Glare Shield



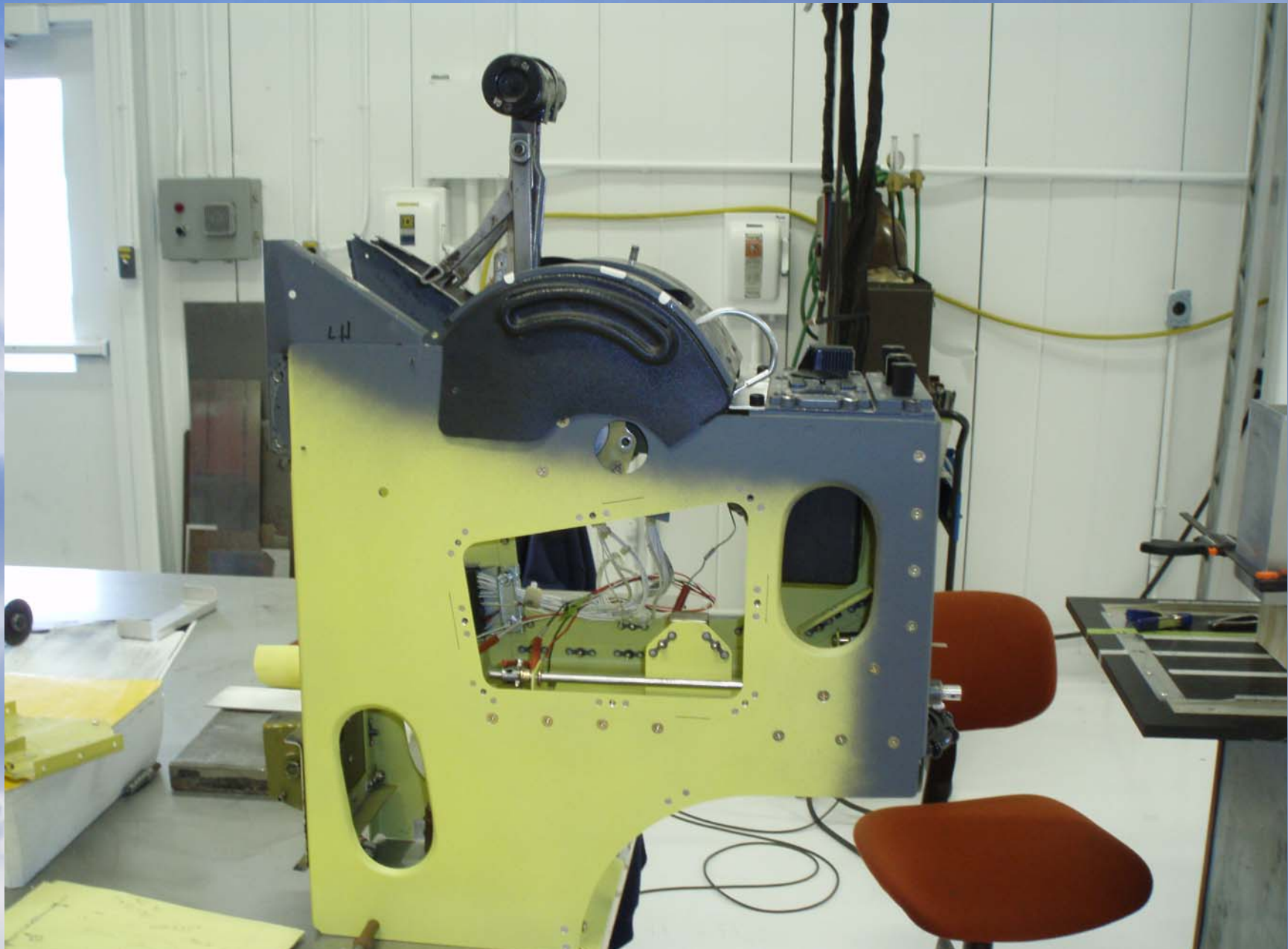
# New larger optional center pedestal can hold A/P components and 2 FMS size controllers

**Clifford**  
DEVELOPMENT



# Short center pedestal can hold A/P components

**Clifford**  
DEVELOPMENT





# Original Factory Firewall



**No major structural modifications  
uses the existing factory engine beams**

**Clifford**  
DEVELOPMENT



# Fuel and Hydraulic fittings changed to AN and MS so lines can't be crossed

**Clifford**  
DEVELOPMENT



S/G ground point relocated to reduce corrosion and grounding issues

# Firewall Inserts Close Old Openings



# OEM aluminum S/G cables replaced with copper for better starts.

**Clifford**  
DEVELOPMENT



# Pylon skins increased to 0.032 for longevity

**Clifford**  
DEVELOPMENT



## Quick Installation with Pre-Fabricated Components



## Quick Installation with Pre-Fabricated Components





# Neat Pre-Wired Harness



# FADEC System certified to July 2007 P2 / T2 Redundant Safety Standard

**Clifford**  
DEVELOPMENT

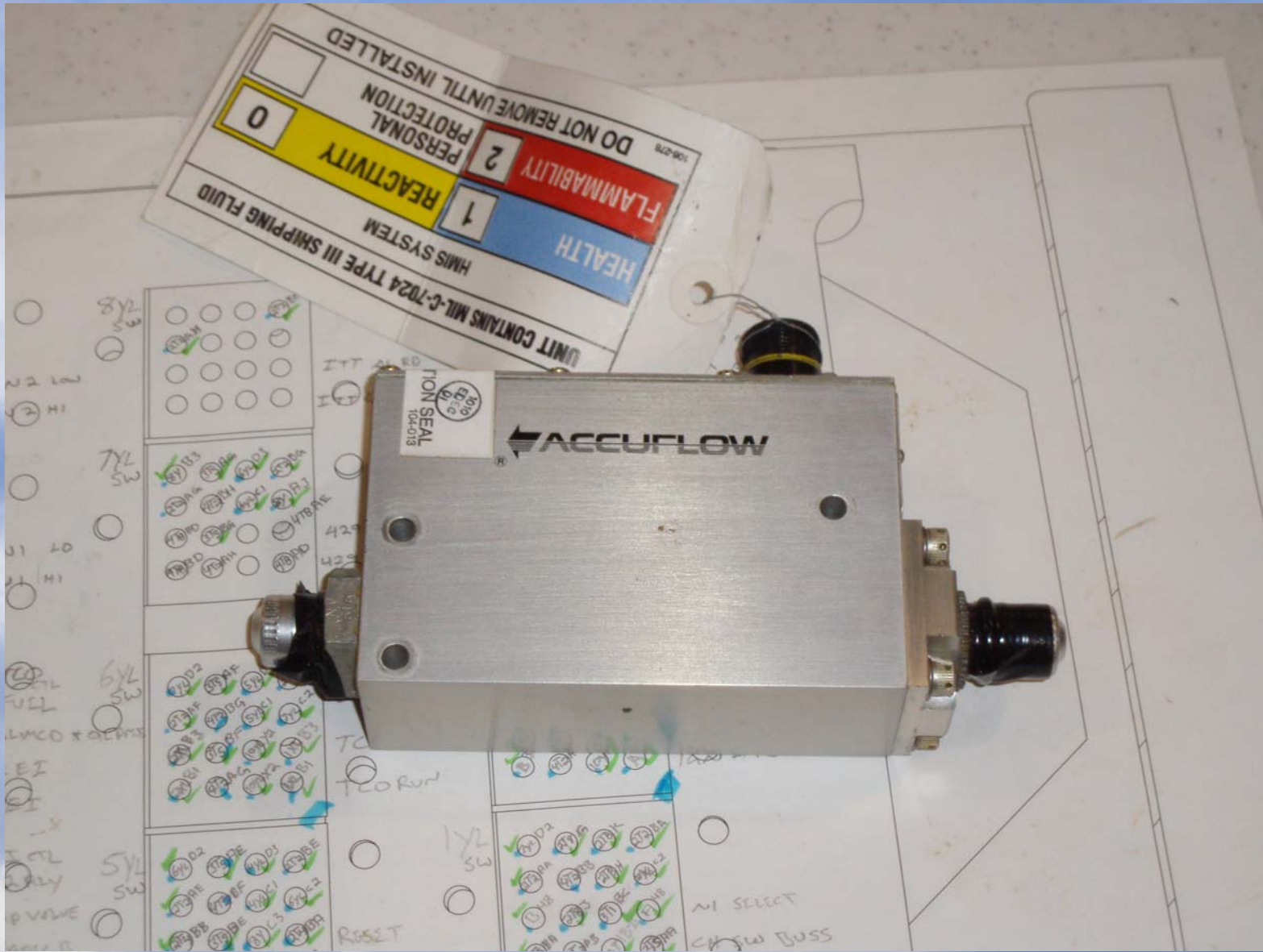


# FADEC System certified to July 2007 P2 / T2 Redundant Safety Standard

**Clifford**  
DEVELOPMENT



# New technology Fuel Flow Transmitter



# New Extremely Low Maintenance Battery

- Low Cost of Ownership compared to either lead calcium or NiCad products
- No capacity checks for the first 18 months or 4500 hours of operation for most aircraft.
- 30 Month Full Replacement Warranty
- Completely sealed – no maintenance to the battery itself is required.
- Quick Recovery / Recharge capability
- Superior cold and hot performance – greater cold cranking amps.
- Reblocking of old batteries to reduce replacement cost.



**Hawker 43 Ah**

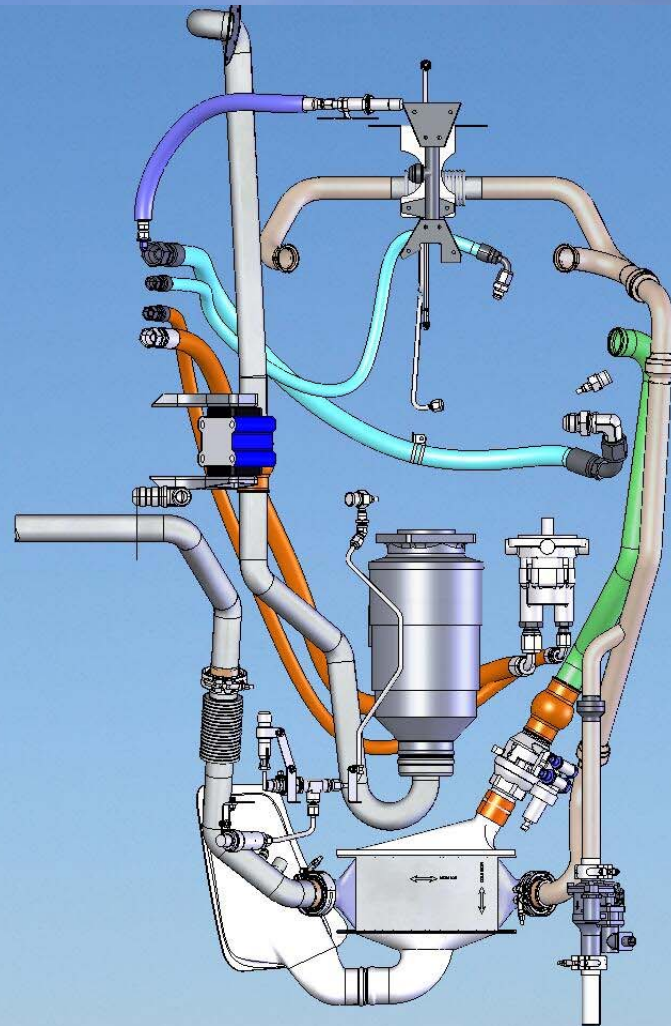
Part Number 9750W0370-xx



# Heavy Duty BFG Brakes New Wheels and Tires

**Clifford**  
DEVELOPMENT





**Peri-seals replaced with more reliable bellows seals  
S/G cooled with Fan-bypass air -- increased brush life**

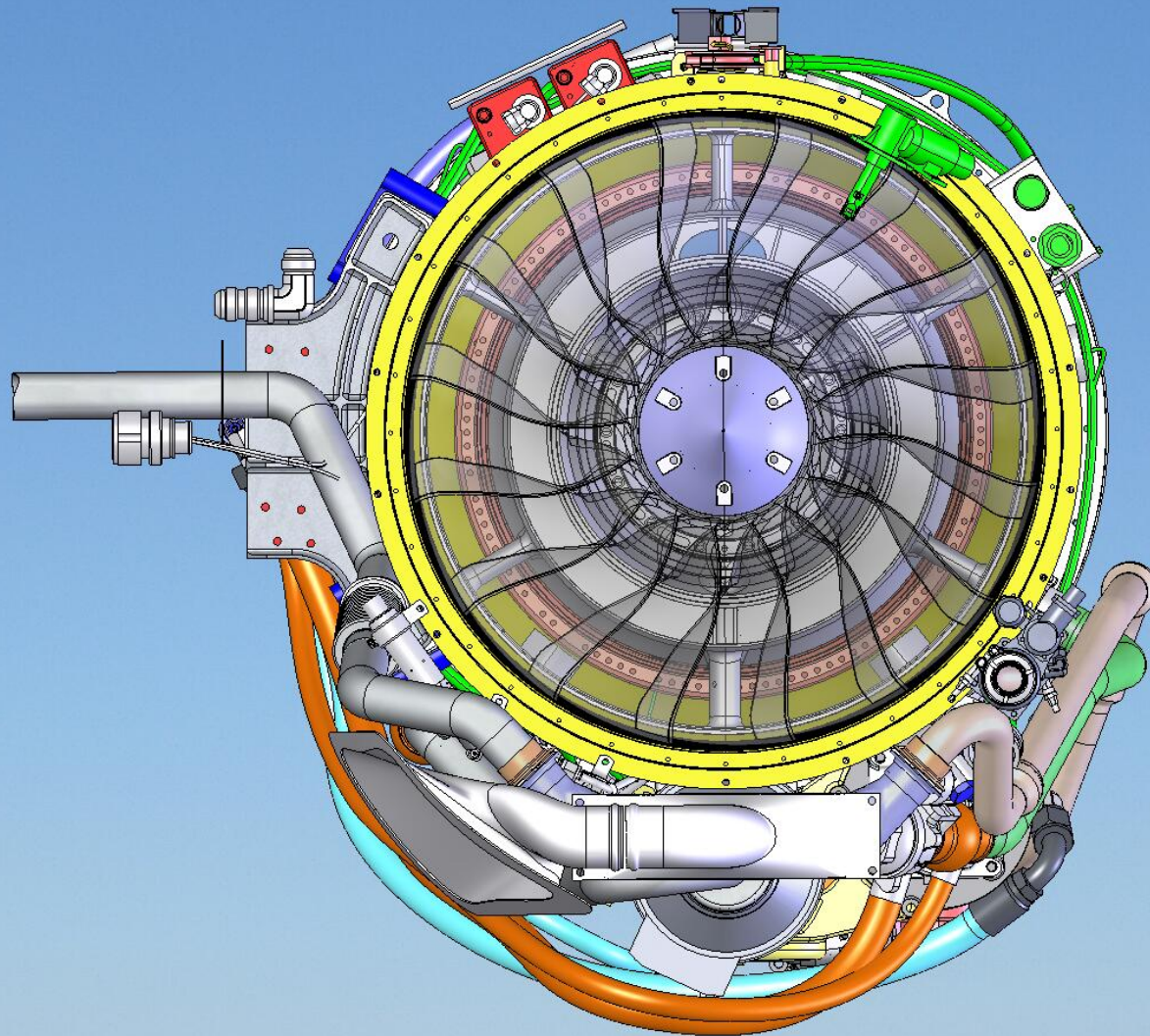


**Peri-seals replaced with more reliable bellows seals**



# New Bleed-Air Pre-Coolers and Control Valves Designed for the FJ44-3

**Clifford**  
DEVELOPMENT



# Other Noted Improvements

- Engine sync is electronic with no mechanical parts to maintain
- Mach warning box removed and replace with digital controller
- Gear Warning based on N1 not Power Lever position
- New Quick donning O2 masks, for a future service ceiling increase
- Lower ground idle speed for quieter, more efficient ground operations
- Improved Instrument panel cooling for longer component life
- New E/L and instrument panels as required (no patched panels)
- Removal of EPA equipment, requires lower maintenance
- More mass airflow for better ACM spool-up and heat at altitude
- Installation configuration allows for an average 2.5” forward CG shift

# Other Noted Improvements

- **Insurability-** Insurers have bought off no additional risk
- **Financing-** Available thru GE Finance
- **Training**
  - **Williams engine training free to owners/operators**
  - **Aircraft differences training provided at delivery**
- **Blue Book and Vref-** foot note “add value of FJ44 Mod to current value”
- **Full test flight program with computer data acquisition,**
- **New performance charts for the flight manual.**

*In life, the typical price of more power is less efficiency.*



***This is one of those rare and happy exceptions to the rule. Reinventing your Citation II and SII with the FJ44-3 delivers unprecedented performance, PLUS unexpected efficiency and economy.***