

Honeywell Powered

SUPERVAN 900

by



Presentation Agenda

- Who is Texas Turbine Conversions, Inc?
- Introduction to the *SUPERVAN 900* engine conversion for the Cessna Caravan
- Operational cost savings/analysis
- Question & Answer Period

Texas Turbine Conversions, Inc.

- Created the company in 1997 after determining a need for a turbine Otter to serve multiple markets.
- TTC, Inc. holds STC engine conversion approvals for the De Havilland DHC-3 Otter and the Cessna 208/208B Caravan.
- Converted 43 DHC-3 Otters with the Honeywell TPE331-10/-12 engines since 2001.

Bobby Bishop

- President, Texas Turbine Conversions, Inc.
- ATP pilot with over 7000 hours with type ratings in the DeHavilland DHC-4 Caribou & Douglas DC-3
- Other Aircraft: MD-80, F-100, DO-328, DHC-6, DHC-3, PC-6 Porter, SC-7 Skyvan, Caravan, etc.
- Company Flight Test Pilot
- A&P/IA Mechanic
- Degree in Electrical Engineering

Caravan Conversion

- Certified on the 208 and 208B models
- To date - Converted +40 Cessna 208/208B Caravans for both wheel and float applications since 2009
- Known Ice certified on both models
- FAA, EASA, and ANAC certified

SUPERVAN 900

Our Customers

SUPERVAN 900 Theatre of Operations



Suriname



Soldotna, Alaska



Switzerland



Saarlouis, Germany



Sydney, Australia



Warszawa, Poland



Queenstown, NZ



Africa



Brazil



SUPERVAN 900

Conversion

TPE331 Engine Features

- 900 shp for takeoff and continuous operation (1150+ shp thermo)
- 7000 hr TBO for all commercial operators
- 2500 hr – 5 year warranty (non pro-rated)
- Auto-start & single red line (SRL) computer standard
- Torque/Temperature limiter standard

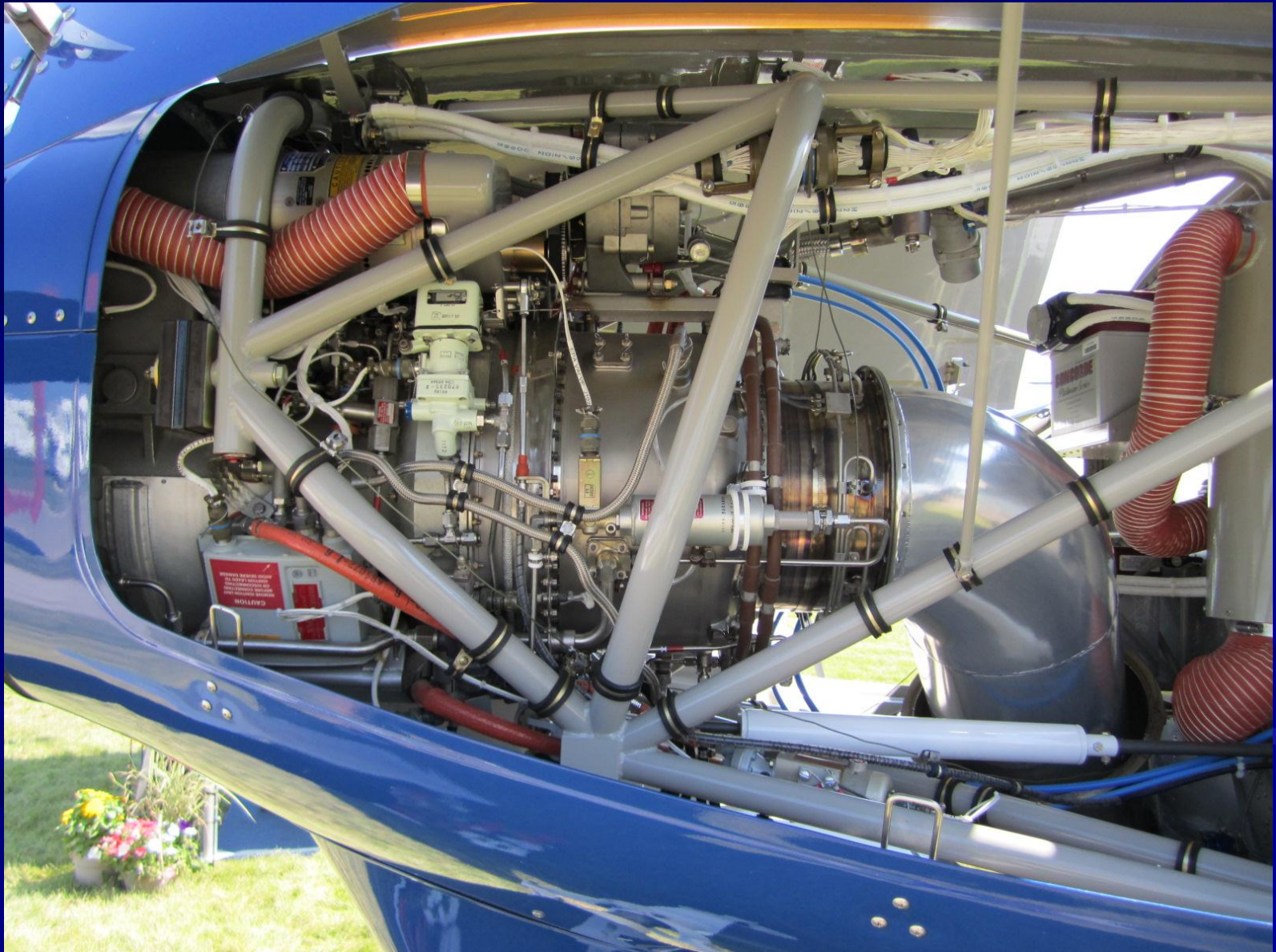
New Engine Installation



New Engine Installation



New Engine Installation



Engine Instruments

Original Instruments



New Analog-Digital Instruments



Caravan Start Panel

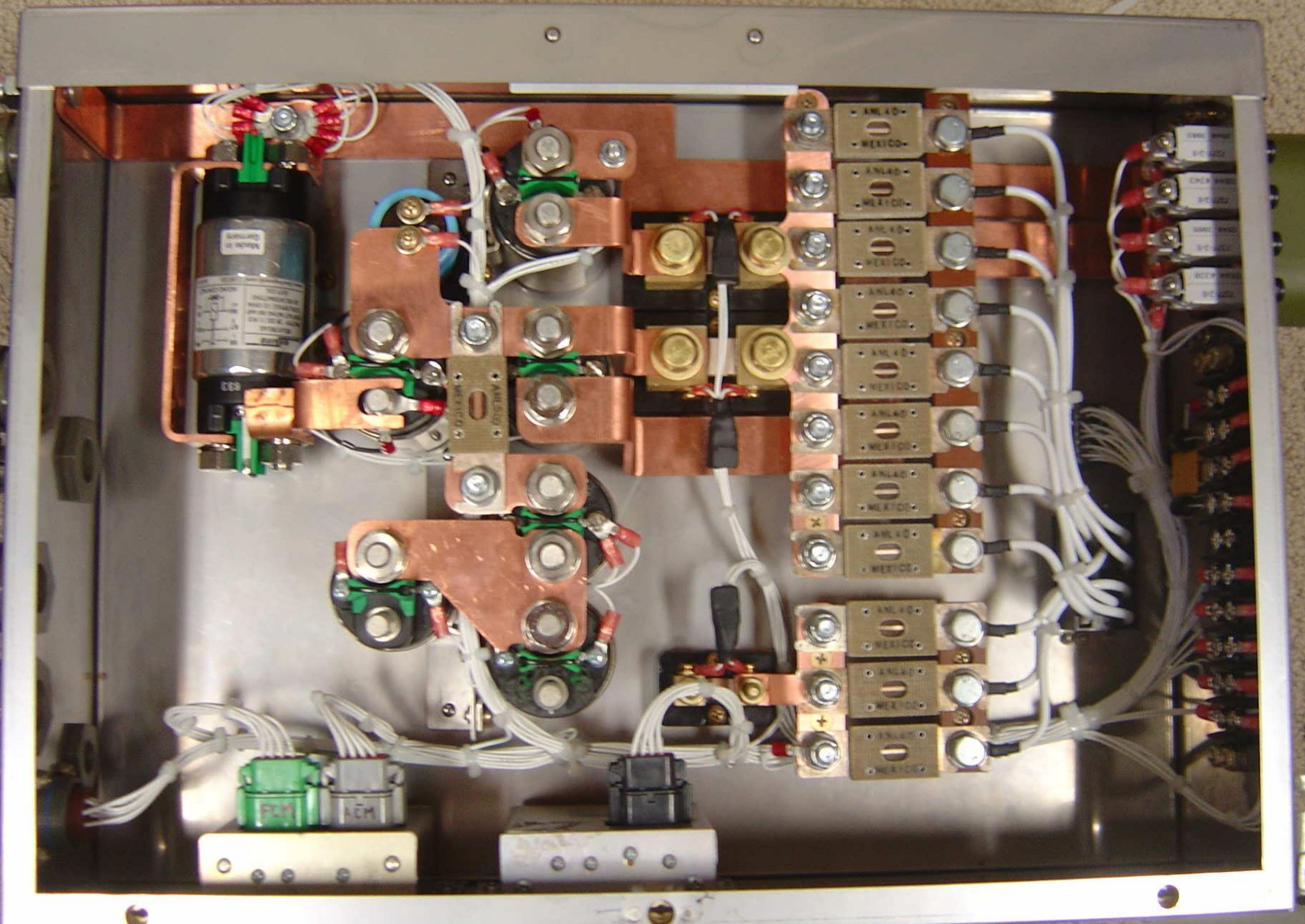
Original Start Panel



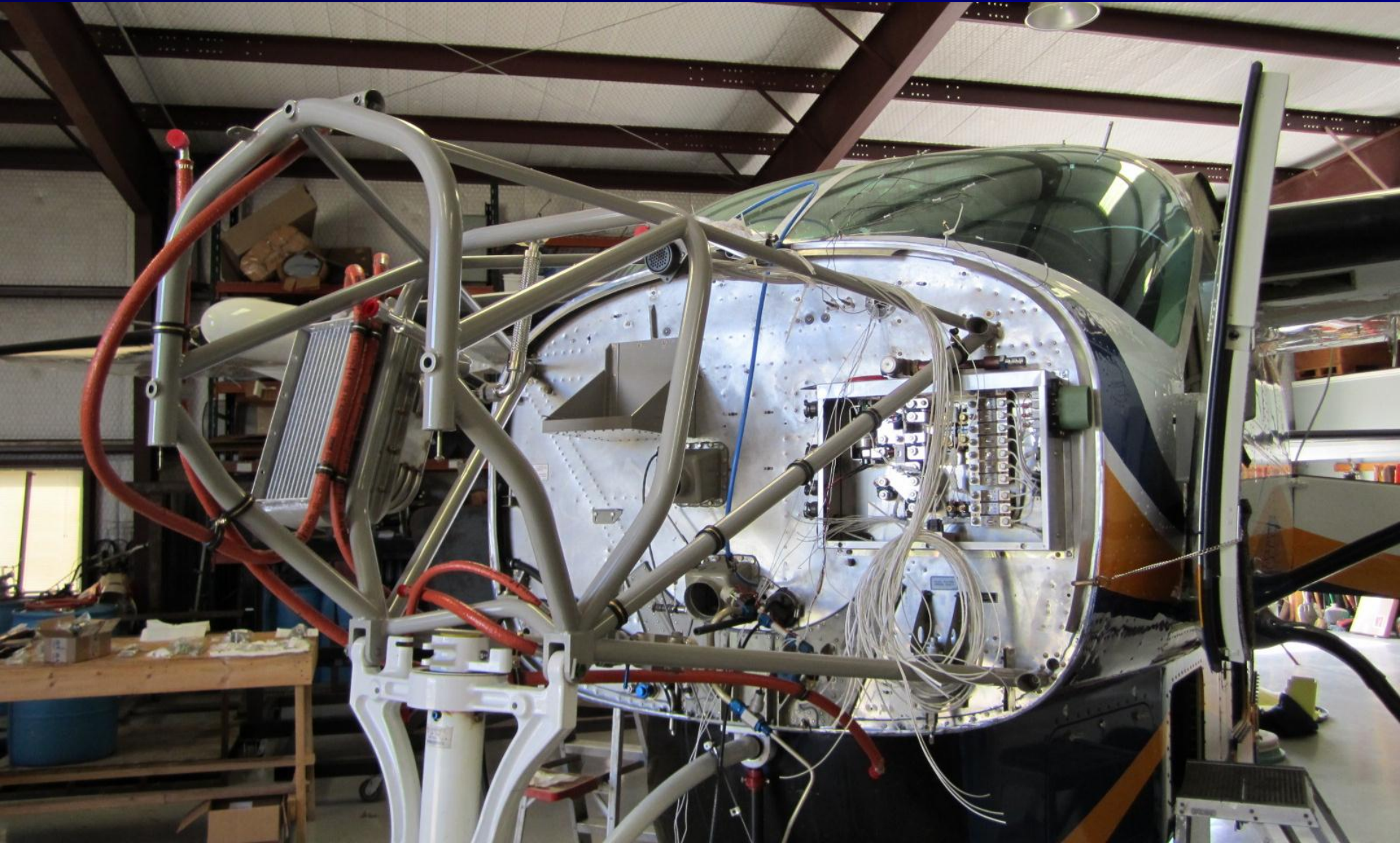
New Start Panel



New Electrical Panel



SUPERVAN 900 Engine Mount



New Cowlings



SUPERVAN 900

Performance

SUPERVAN 900 Benefits

- Lower hourly operating cost
- Lower fuel burn for the same speed
- Provide more power and performance
- Equal or better reliability
- Clean & simple modification
- Reasonable price

SUPERVAN 900 Performance

- Greatly improved performance in icing conditions
- Doubles the rate-of-climb
- 35-40 knot higher cruise speed
- 14 knots faster for the same fuel flow
- 4-6 gal/hr fuel savings for the same speed
- 40-50% Shorter Takeoff Distance

SUPERVAN 900 Performance

Comparative Analysis
TPE331-12JR vs. PT6A-114A

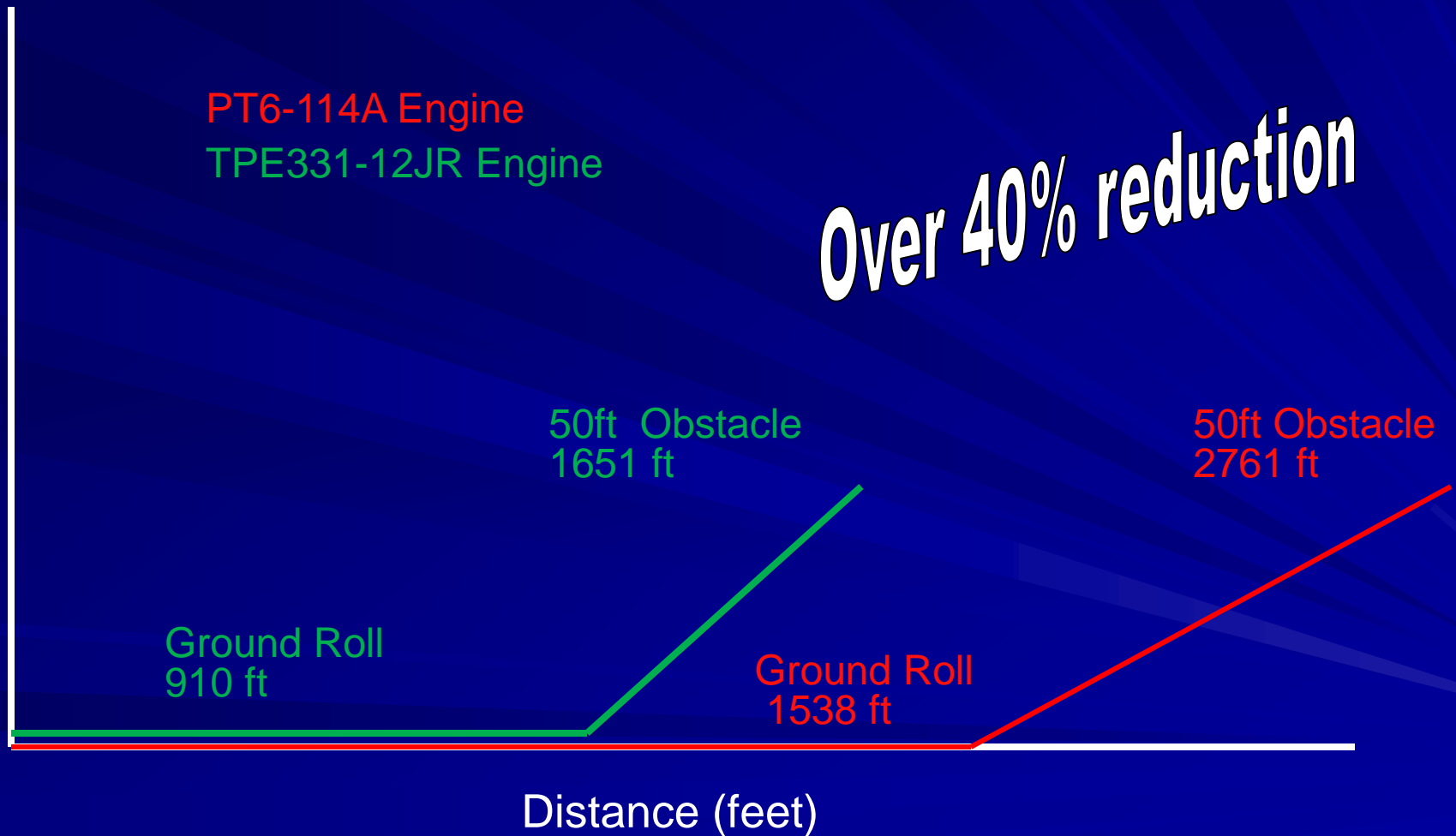
Comparative Analysis

TPE331-12JR vs. PT6A-114A

- Takeoff performance
- Climb performance
- Flight Profile- Same speed for fuel savings
- Flight Profile- Max cruise for time savings
- Life-Limited Parts Cost Comparison

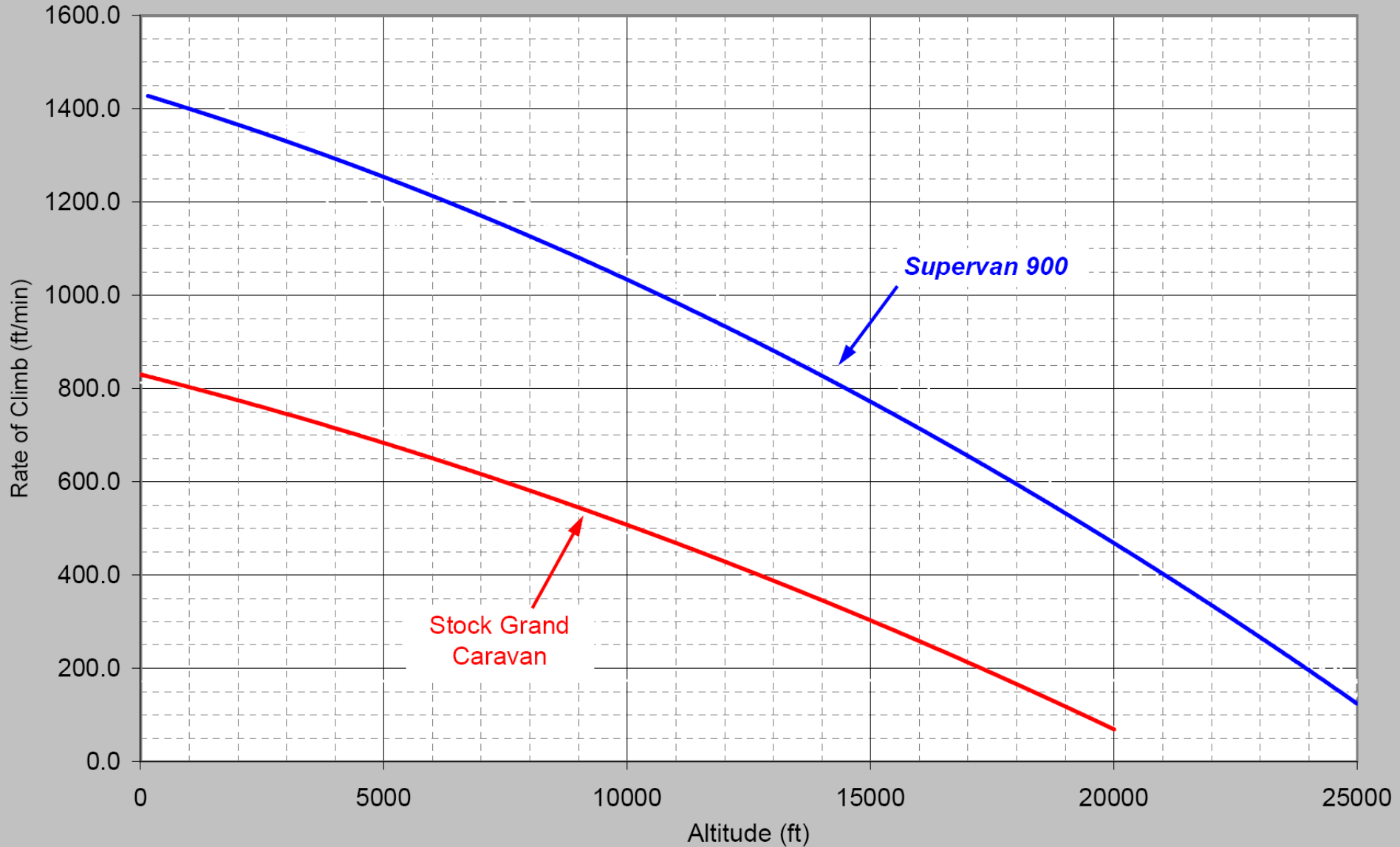
Takeoff Distance- Sea Level, ISA

(Flaps 20, with Cargo Pod, No Wind, 9062 lbs)



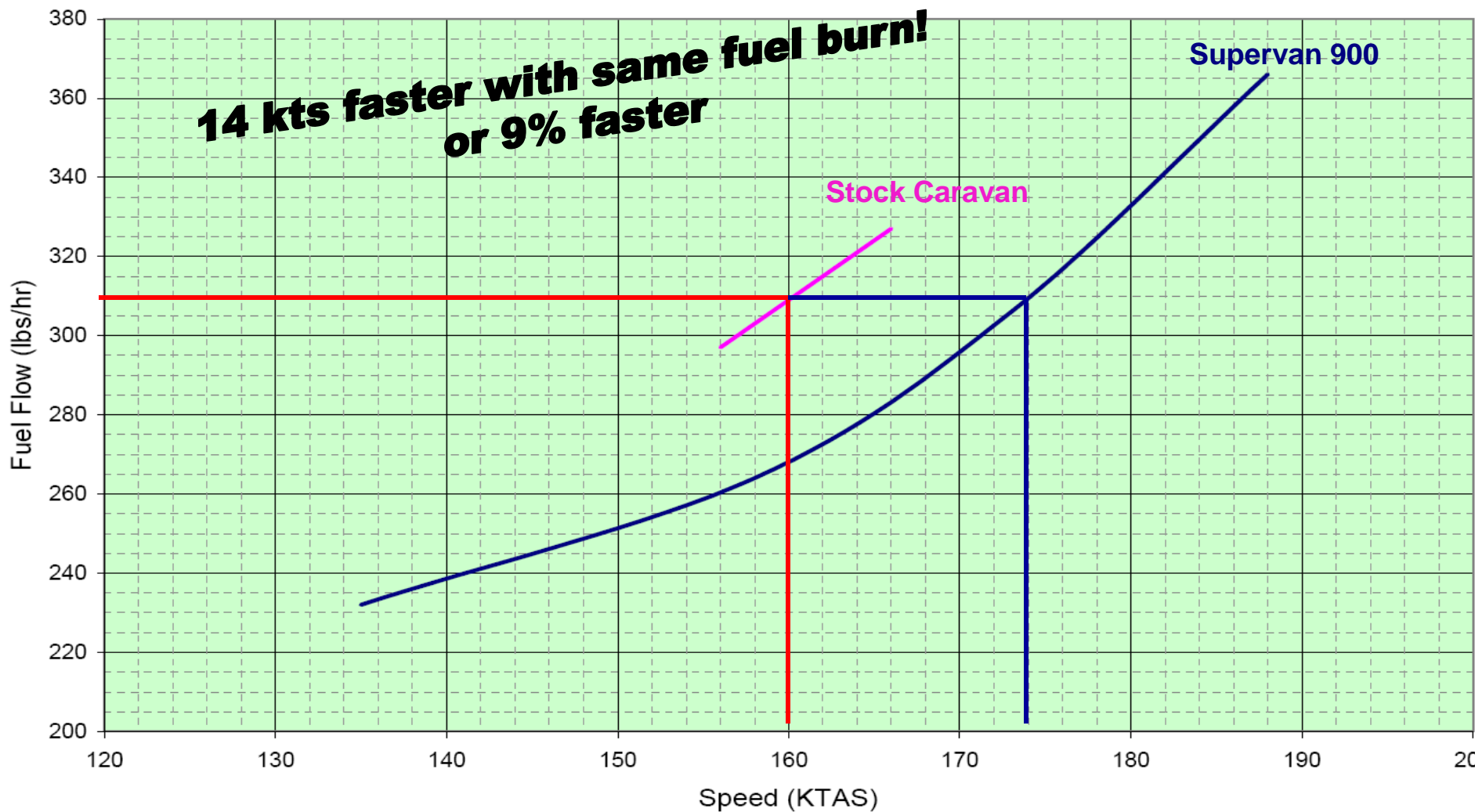
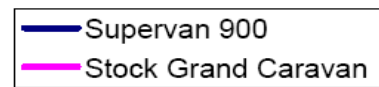
Rate of Climb

Supervan 900 vs. Stock Grand Caravan
Rate of Climb- Hot Day (ISA+15C)



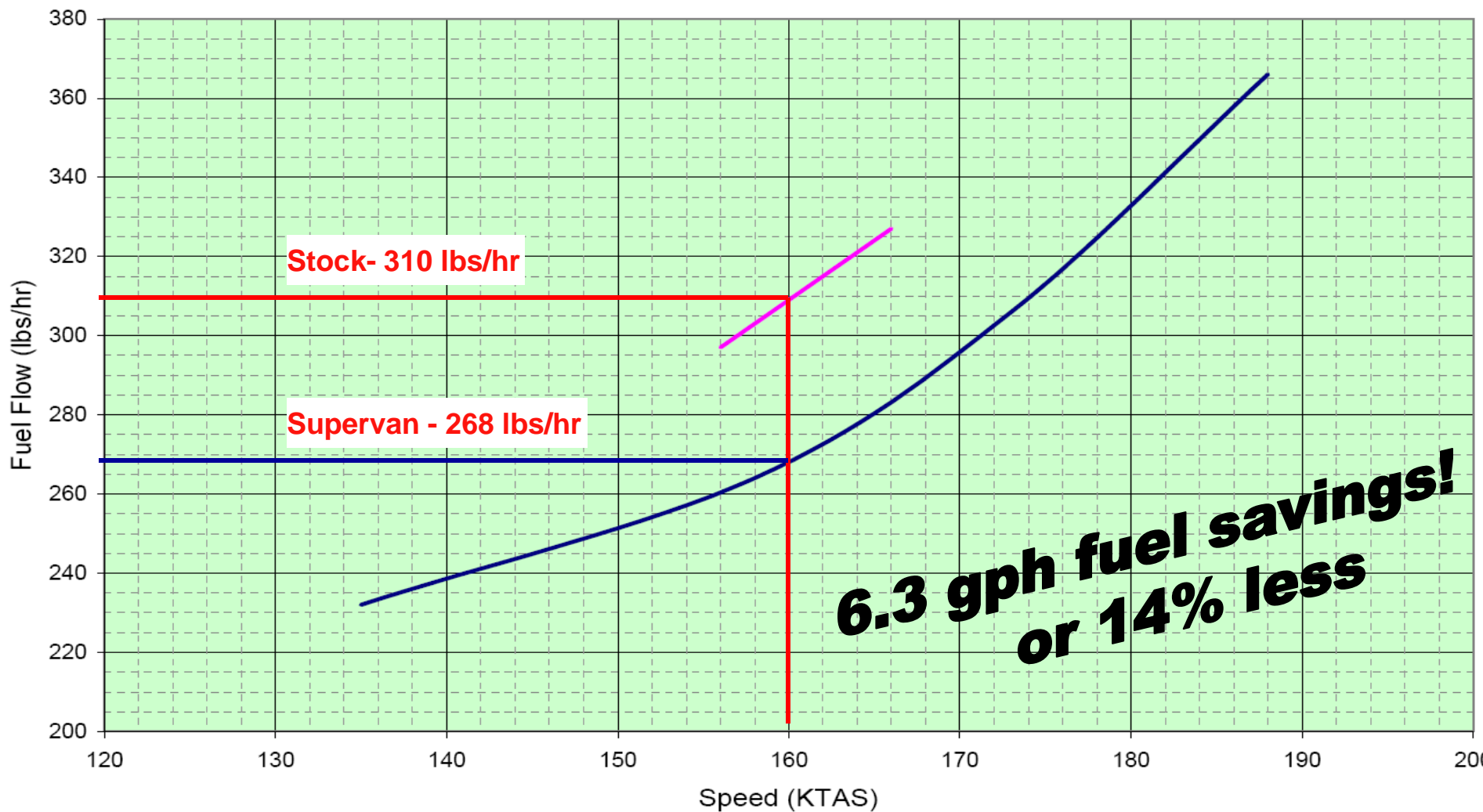
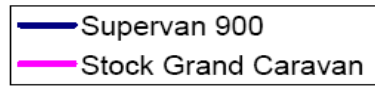
Cruise Speed- Same Fuel Flow

Fuel Flow vs. Speed (13K @ -5C and 96% rpm)



Fuel Flow- Same Cruise Speed

Fuel Flow vs. Speed (13K @ -5C and 96% rpm)



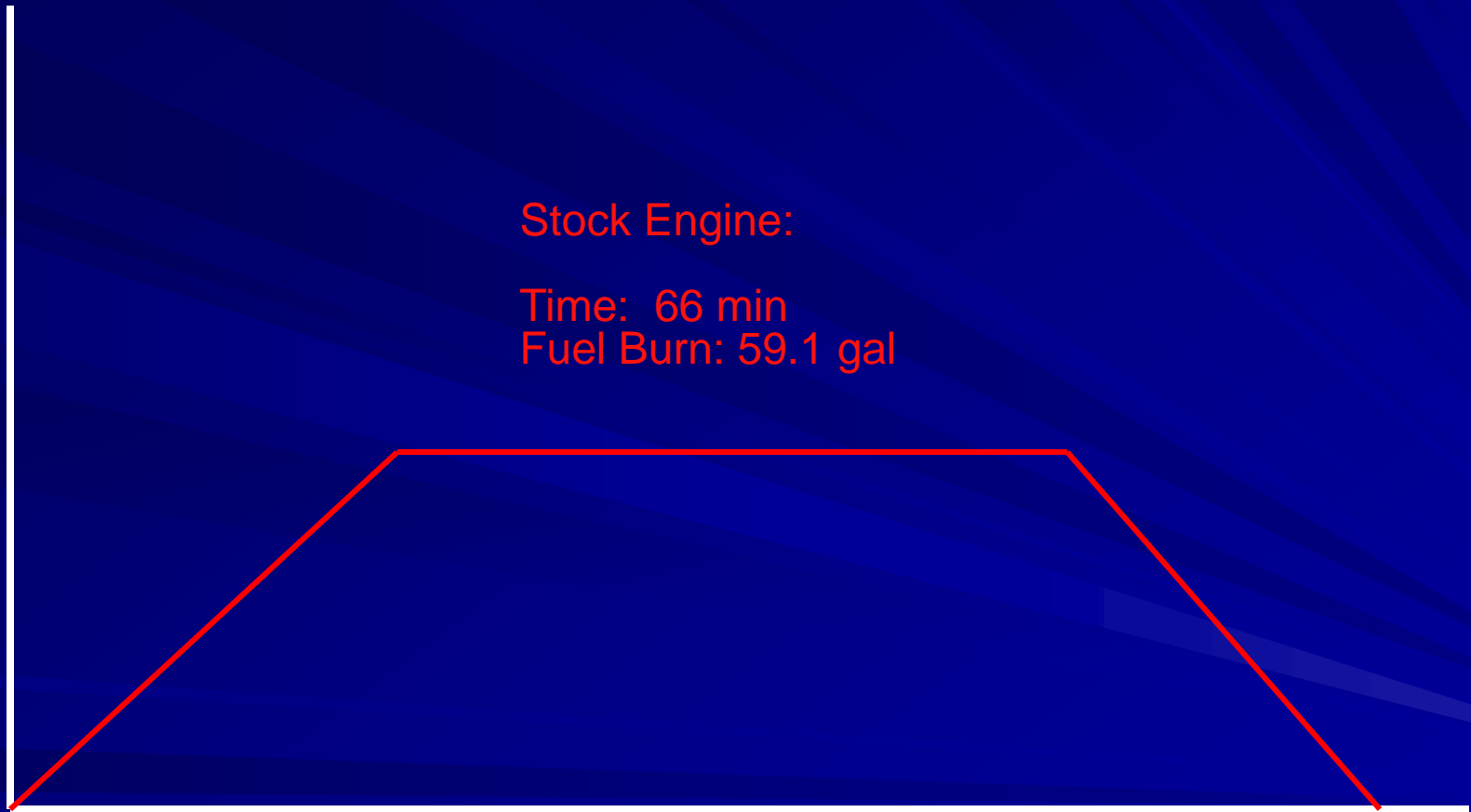
Flight Profile 10,000ft – Fuel

(Same 173 KTAS Cruise Speed)

Stock Engine:

Time: 66 min

Fuel Burn: 59.1 gal



175 nm Leg

Flight Profile 10,000ft – Fuel

(Same 173 KTAS Cruise Speed)

5.9 gal or 10% fuel savings

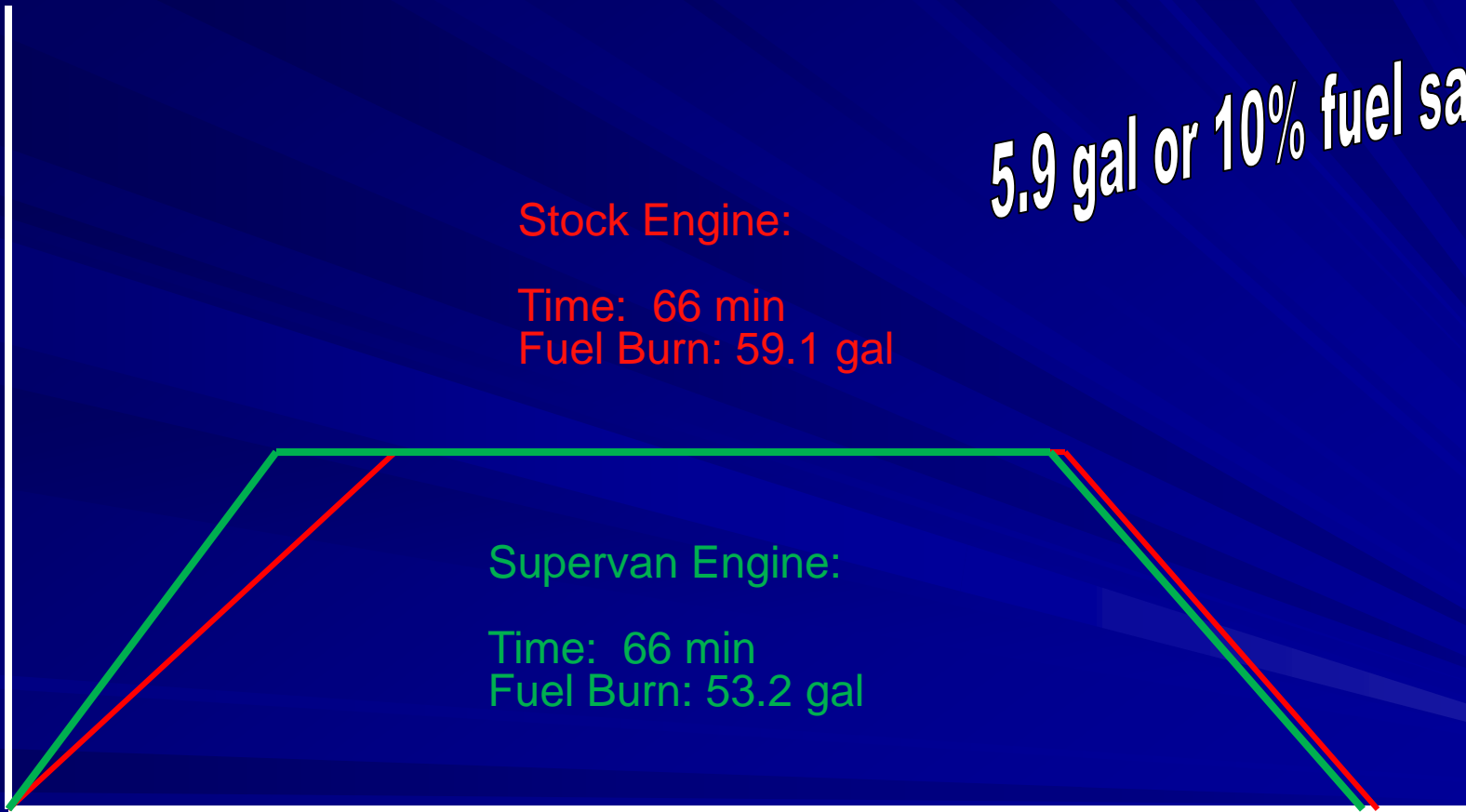
Stock Engine:

Time: 66 min
Fuel Burn: 59.1 gal

Supervan Engine:

Time: 66 min
Fuel Burn: 53.2 gal

175 nm Leg



Fuel Savings Over 7000 hrs

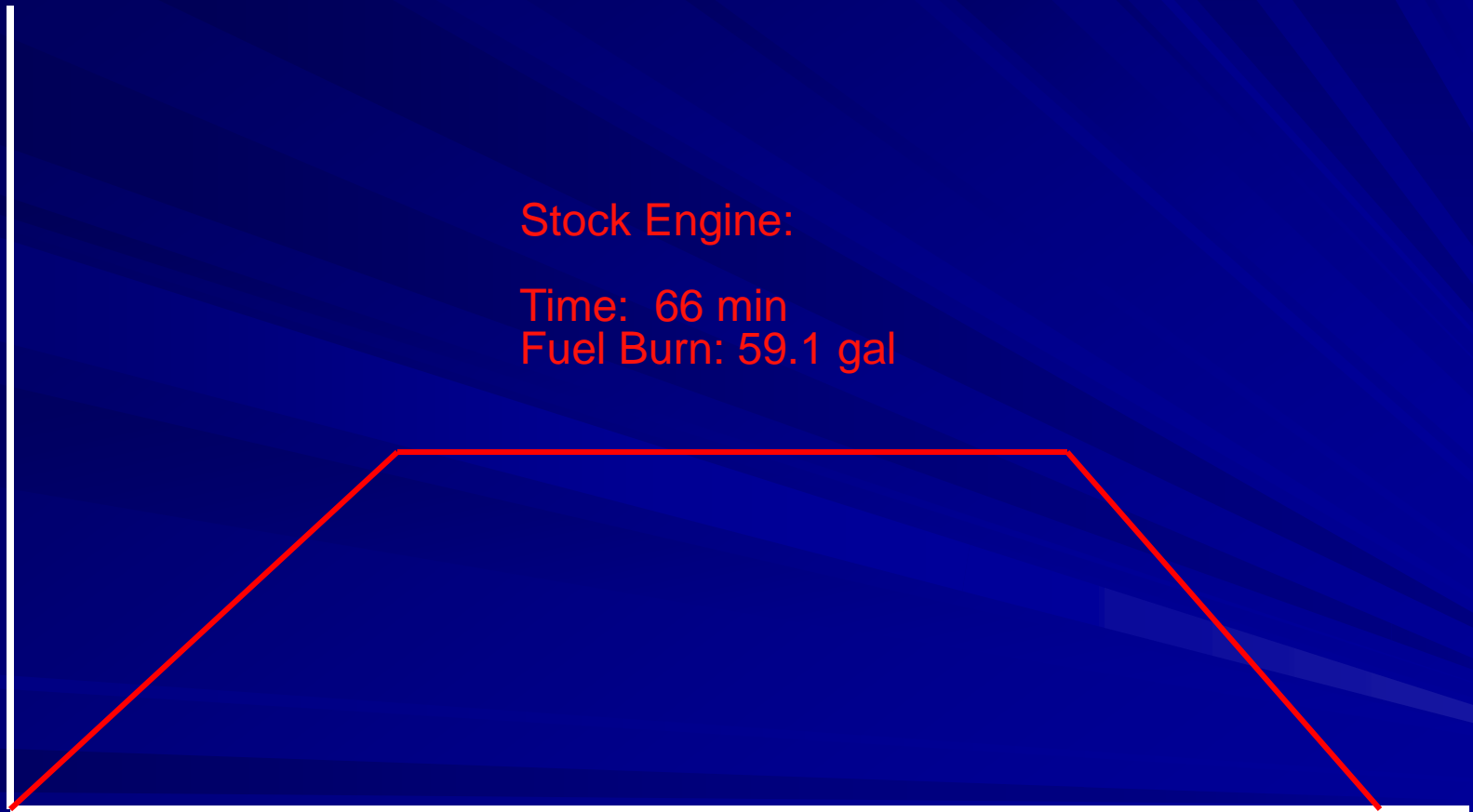
$6 \text{ gal/hr} \times 7000 \text{ hrs} = 42,000 \text{ gallons}$

$42,000 \text{ gallons} \times \$4.50/\text{gallon} = \$189,000$

This savings offsets the cost of the conversion and you get the added benefit of the increased performance.

Flight Profile 10,000ft – Speed

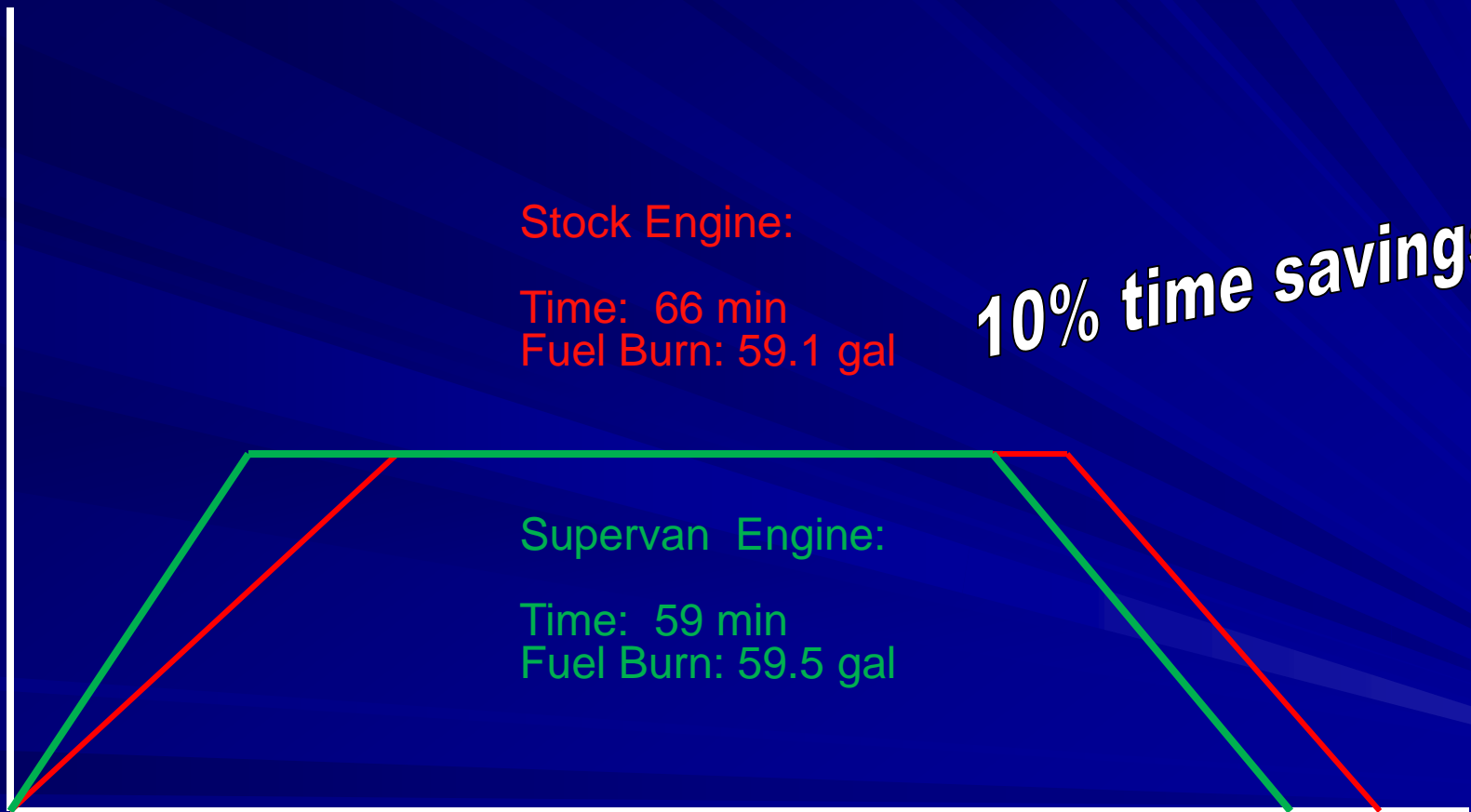
(Max Cruise Speed)



175 nm Leg

Flight Profile 10,000ft – Speed

(Max Cruise Speed)



10% time savings

175 nm Leg

Time Savings Over 7000 hrs

$$10\% \times 7000 \text{ hrs} = 700 \text{ hours}$$

Allows the aircraft to operate an additional 10% more hours for the same cost or lowers the operational cost during the given overhaul period.

Life Limited Parts Cost Comparison

(2011 Pricing for Honeywell and Pratt & Whitney)

TPE331-12JR Life Limited Parts Cost Breakdown								
Individual Cycle Limited Components								Honeywell Overhaul Kit Replacement Cost (includes all life-limited items and blades)
Cycle Lived	Qty	P/N	Cycle Limit	List Cost	Avg Cost Honeywell Service Center	Cost/ Cycle	Replacement Cost (if bought individually)	
1st Impeller	1	3108259-1	30,000	\$70,436	\$38,973	\$1.30	\$38,973	\$157,797
2nd Impeller	1	3103254-4	30,000	\$67,234	\$26,310	\$0.88	\$26,310	
1st Air Seal	1	3103839-3	20,000	\$20,884	\$6,243	\$0.31	\$6,243	
2nd Seal Plate	1	3103921-1	30,000	\$13,990	\$5,980	\$0.20	\$5,980	
1st Turbine Disc	1	3103836-3	20,000	\$23,393	\$7,578	\$0.38	\$7,578	
1st Blades	32	3108126-1		\$1,653	\$768		\$24,576	
2nd Turbine Disc	1	3103923-2	15,000	\$23,891	\$17,234	\$1.15	\$17,234	
2nd Blades	33	3103925-2		\$1,193	\$569		\$18,777	
3rd Turbine Wheel	1	3103838-2	12,000	\$25,692	\$12,126	\$1.01	\$12,126	
Total Cost						\$5.23	\$157,797	\$157,797
Avg. Discount (new parts)		N/A						

PT6A-114A Life Limited Parts Cost Breakdown								
Individual Cycle Limited Components								Pratt & Whitney Overhaul Kit Replacement Cost
Cycle Lived	Qty	P/N	Cycle Limit	List Cost	Avg Cost Pratt Service Center	Cost/ Cycle	Replacement Cost	
Hub/1st Disc Assy	1	3013821	19,000	\$29,346	\$22,010	\$1.16	\$22,010	Doesn't Exist
2nd Stage Disc	1	3013712	24,000	\$8,141	\$6,106	\$0.25	\$6,106	
3rd Stage Disc	1	3011713	25,000	\$8,998	\$6,749	\$0.27	\$6,749	
Impeller	1	3027798	19,000	\$82,002	\$61,502	\$3.24	\$61,502	
CT Turbine Disc	1	3013411	16,000	\$55,389	\$41,542	\$2.60	\$41,542	
CT Blades	58	3039901		\$541	\$406		\$23,534	
PT Turbine Disc	1	3026812	20,000	\$48,607	\$36,455	\$1.82	\$36,455	
PT Blades	41	3115902-01		\$1,381	\$1,036		\$42,466	
Total Cost						\$9.34	\$240,362	
Avg. Discount (new parts)		25%						

SUPERVAN 900 Performance

Comparative Analysis
TPE331-12JR vs. PT6A-42A

Comparative Analysis

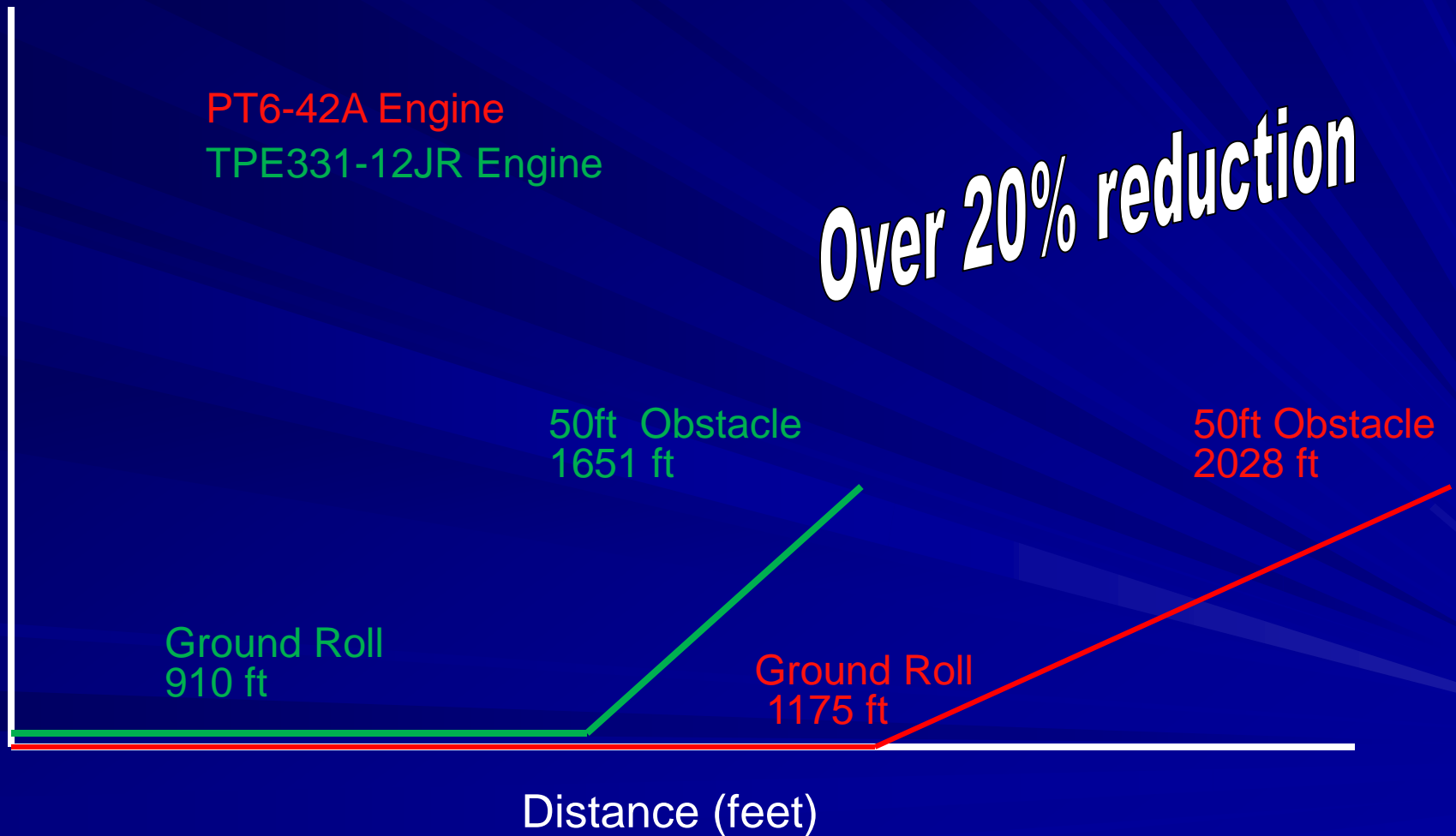
TPE331-12JR vs. PT6A-42A

- Takeoff performance
- Climb performance
- Flight Profile- 2,000 ft cruise fuel burn
- Flight Profile- 10,000 ft cruise fuel burn
- Life-limited parts cost

SUPERVAN 900

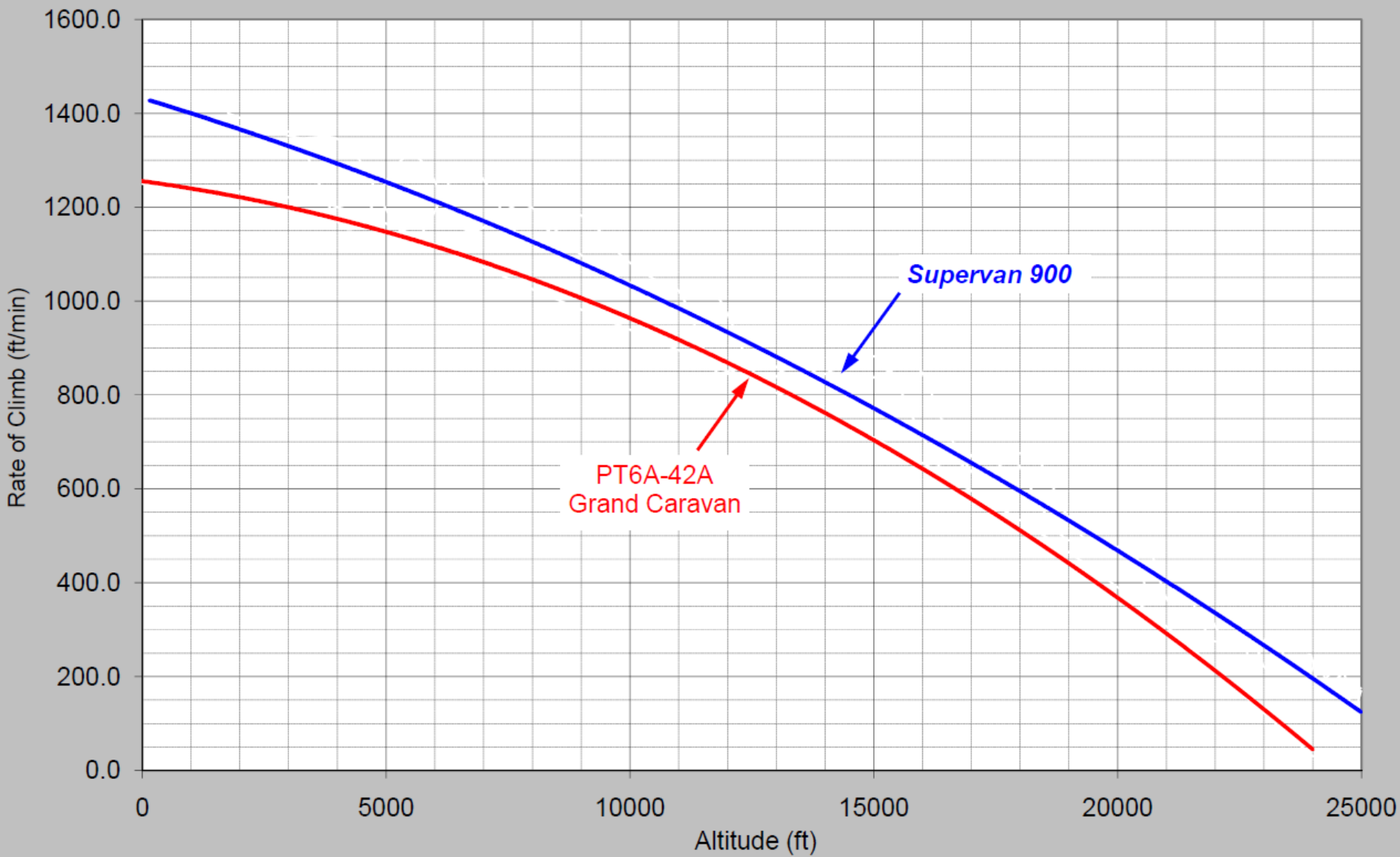
Takeoff Distance- Sea Level, ISA

(Flaps 20, with Cargo Pod, No Wind, 9062 lbs)



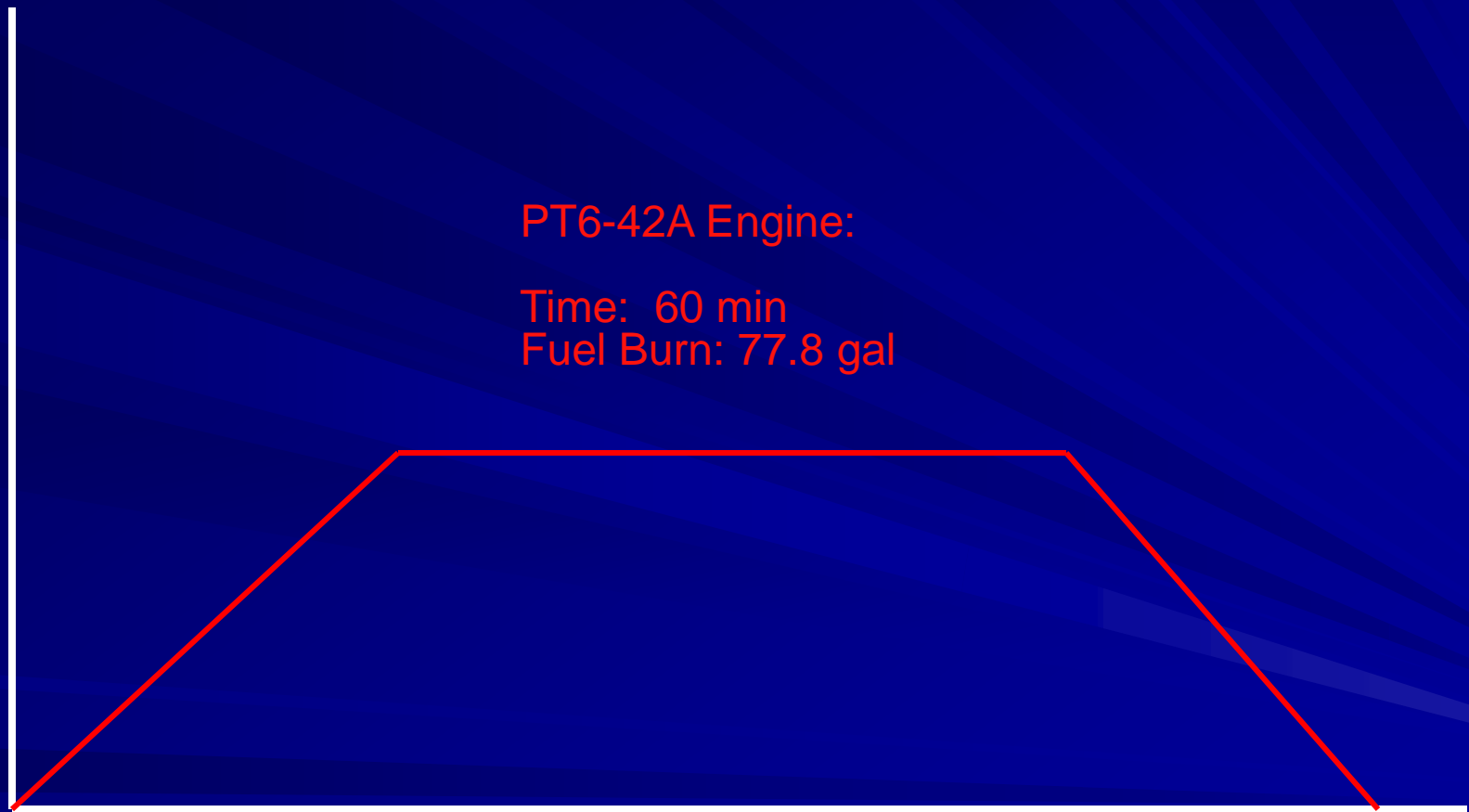
Rate of Climb- TPE331-12JR vs. PT6A-42A

Supervan 900 vs. PT6A-42A Grand Caravan- Rate of Climb, Hot Day
S/L to 25,000 ft, 8750 lbs, ISA+15C



Flight Profile 2,000ft – Fuel Burn

(Same 179 KTAS Cruise Speed- Standard Day)



175 nm Leg

Flight Profile 2,000ft – Fuel Burn

(Same 179 KTAS Cruise Speed- Standard Day)

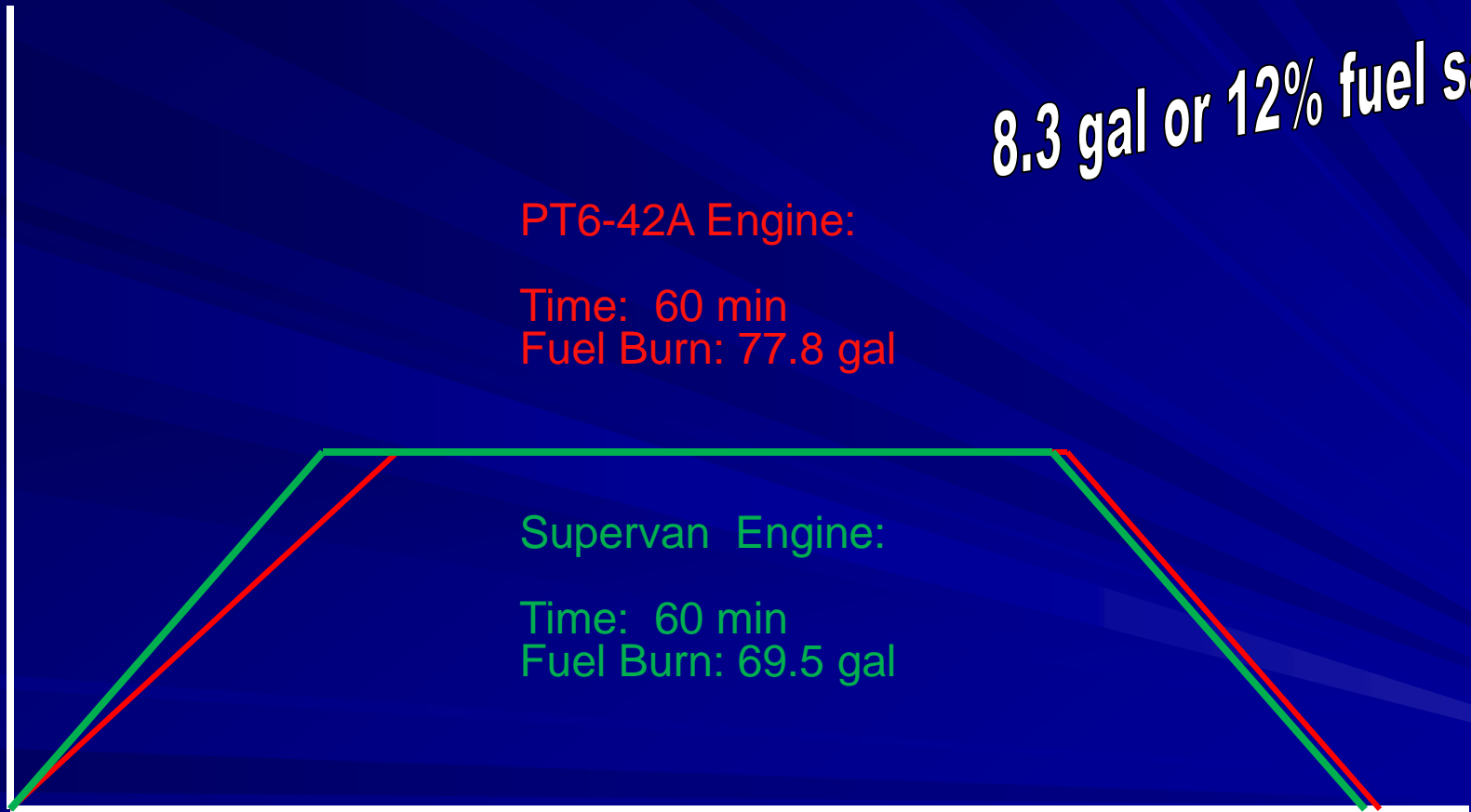
8.3 gal or 12% fuel savings

PT6-42A Engine:

Time: 60 min
Fuel Burn: 77.8 gal

Supervan Engine:

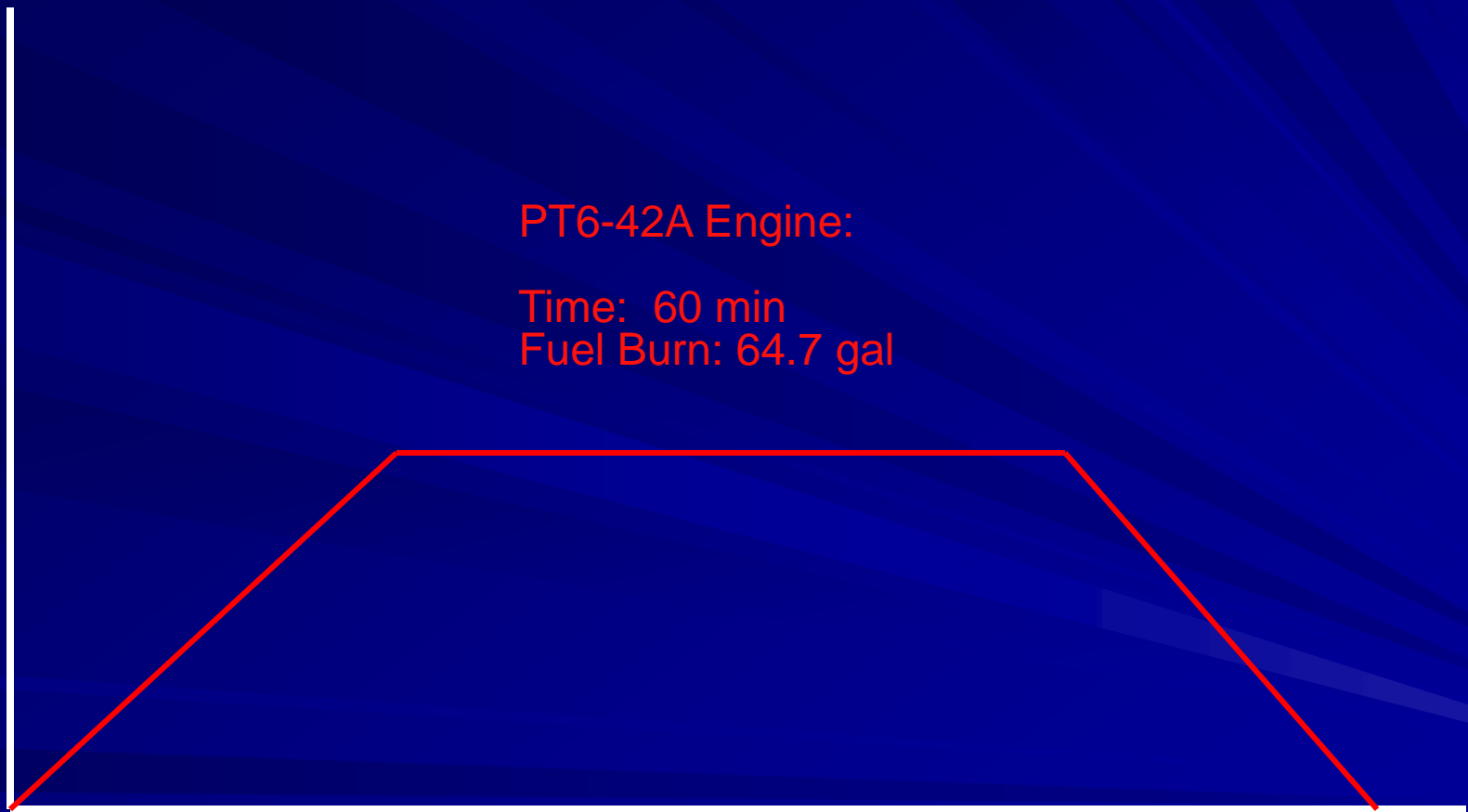
Time: 60 min
Fuel Burn: 69.5 gal



175 nm Leg

Flight Profile 10,000ft – Fuel Burn

(Same 190 KTAS Cruise Speed- Standard Day)



PT6-42A Engine:

Time: 60 min

Fuel Burn: 64.7 gal

175 nm Leg

Flight Profile 10,000ft – Fuel Burn

(Same 190 KTAS Cruise Speed- Standard Day)

7 gal or 11% fuel savings

PT6-42A Engine:

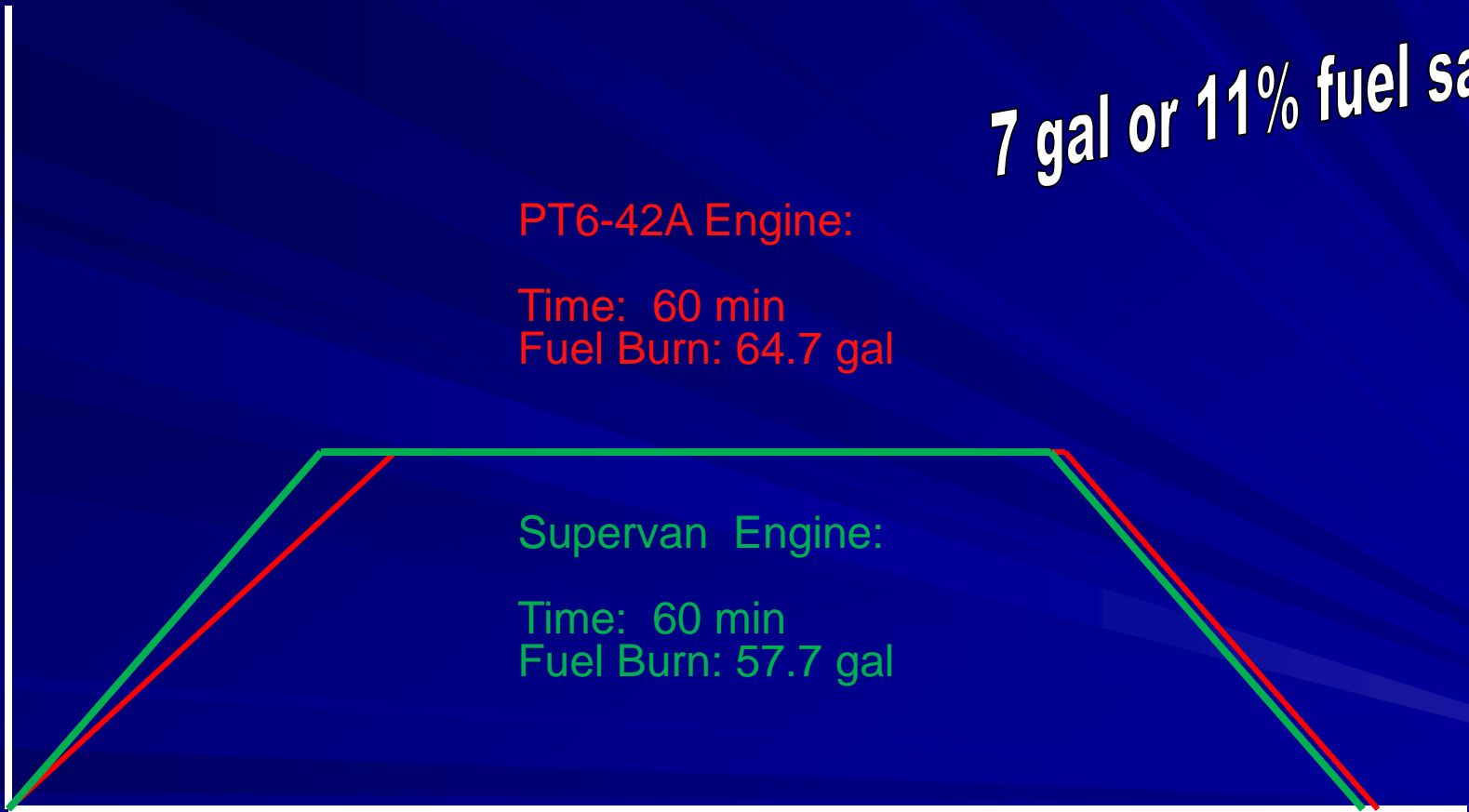
Time: 60 min

Fuel Burn: 64.7 gal

Supervan Engine:

Time: 60 min

Fuel Burn: 57.7 gal



175 nm Leg

Avg. Fuel Savings Over 7000 hrs

(TPE331-12JR Operation vs. PT6A-42A Operation)

$7.5 \text{ gal/hr} \times 7000 \text{ hrs} = 52,500 \text{ gallons}$

$52,500 \text{ gallons} \times \$4.50/\text{gallon} = \$236,250$

This saving in fuel alone would pay for the hot section and overhaul on the TPE331-12JR.

Life Limited Parts Cost Comparison

(2011 Pricing for Honeywell and Pratt & Whitney)

TPE331-12JR Life Limited Parts Cost Breakdown								
Individual Cycle Limited Components								Honeywell Overhaul Kit Replacement Cost (includes all life-limited items and blades)
Cycle Lived	Qty	P/N	Cycle Limit	List Cost	Avg Cost Honeywell Service Center	Cost/ Cycle	Replacement Cost (if bought individually)	
1st Impeller	1	3108259-1	30,000	\$70,436	\$38,973	\$1.30	\$38,973	\$157,797
2nd Impeller	1	3103254-4	30,000	\$67,234	\$26,310	\$0.88	\$26,310	
1st Air Seal	1	3103839-3	20,000	\$20,884	\$6,243	\$0.31	\$6,243	
2nd Seal Plate	1	3103921-1	30,000	\$13,990	\$5,980	\$0.20	\$5,980	
1st Turbine Disc	1	3103836-3	20,000	\$23,393	\$7,578	\$0.38	\$7,578	
1st Blades	32	3108126-1		\$1,653	\$768		\$24,576	
2nd Turbine Disc	1	3103923-2	15,000	\$23,891	\$17,234	\$1.15	\$17,234	
2nd Blades	33	3103925-2		\$1,193	\$569		\$18,777	
3rd Turbine Wheel	1	3103838-2	12,000	\$25,692	\$12,126	\$1.01	\$12,126	
Total Cost						\$5.23	\$157,797	
Avg. Discount (new parts)		N/A						

PT6A-42A Life Limited Parts Cost Breakdown								
Individual Cycle Limited Components								Pratt & Whitney Overhaul Kit Replacement Cost
Cycle Lived	Qty	P/N	Cycle Limit	List Cost	Avg Cost Pratt Service Center	Cost/ Cycle	Replacement Cost	
Hub/1st Disc Assy	1	3054141-01	20,000	\$50,629	\$37,972	\$1.90	\$37,972	Doesn't Exist
2nd Stage Disc	1	3023112	20,000	\$9,506	\$7,130	\$0.36	\$7,130	
3rd Stage Disc	1	3023113	20,000	\$9,518	\$7,139	\$0.36	\$7,139	
Impeller	1	3036793	24,000	\$77,056	\$57,792	\$2.41	\$57,792	
CT Turbine Disc	1	3049291-01	10,000	\$30,654	\$22,991	\$2.30	\$22,991	
CT Blades	58	3123131-02		\$1,358	\$1,019		\$59,073	
1st PT Turbine Disc	1	3029312	30,000	\$59,033	\$44,275	\$1.48	\$44,275	
1st PT Blades	47	3123422-01		\$1,426	\$1,070		\$50,267	
2nd PT Turbine Disc	1	3029313	30,000	\$55,490	\$41,618	\$1.39	\$41,618	
2nd PT Blades	43	3044263-01		\$1,416	\$1,062		\$45,666	
Total Cost						\$8.79	\$373,920	
Avg. Discount (new parts)		25%						

Operating Cost

An operator has the ability to :

- Reduce Maintenance Reserves
- Reduce Fuel Cost
- Reduce Flight time
- Increase the payload
- Where passenger loads were restricted due to runway lengths and altitude, your capability is increased

Summary

Texas Turbine Conversions, Inc.'s goal is to take great, well-proven airplanes and make them better by providing improved performance and lower overall operating costs without sacrificing reliability.