



Honeywell CLEEN Program

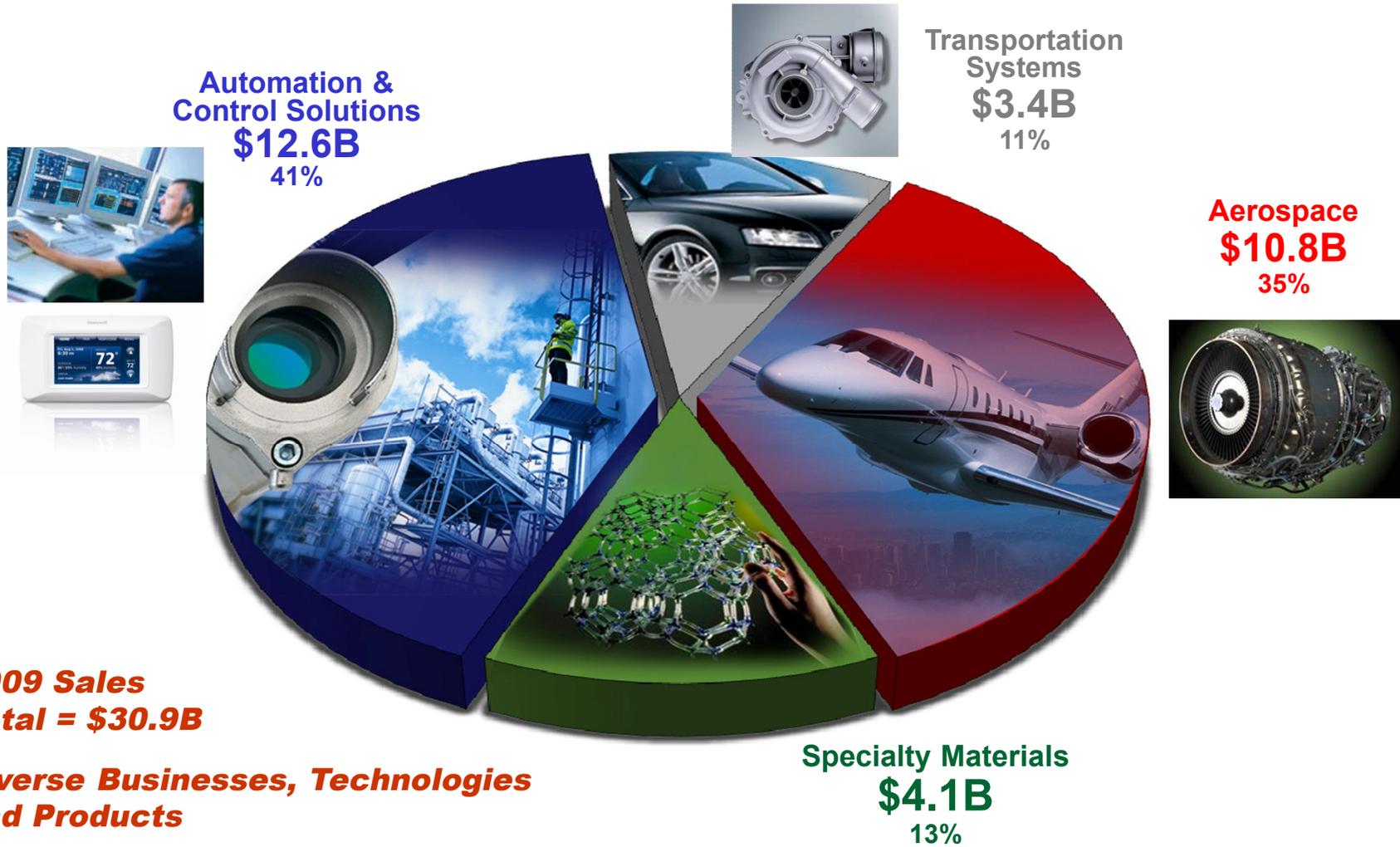
Eric Blatt

FAA CLEEN Consortium

October 26-27, 2010

Honeywell

Honeywell International Inc. Businesses



**2009 Sales
Total = \$30.9B**

**Diverse Businesses, Technologies
and Products**

Honeywell Aerospace



A Global Leader in the Aerospace Industry

Turbine Engine Product Lines

APU	Turbofan	Turboprop	Turboshaft
 <p>660 85 Series 131 Series 36 Series 331 Series RE220 700 Series RE100</p>	 <p>HTF7000 731 Series CFE738 LF507 F124 ATF3</p>	 <p>TPE331-14 TPE331-12 TPE331-10/11 TPE331-5</p>	 <p>T55 T53 AGT1500 CTS800 LTS101</p>
<p>APUs 100 to 1400 hp for commercial and military aircraft</p>	<p>Turbofan Engines 3,000 to 10,000 lb thrust for commercial and military aircraft</p>	<p>Turboprop Engines 575 to 1,600 shp for commercial and military aircraft</p>	<p>Turboshaft Engines 500 to 5,000 shp for tanks, commercial and military rotorcraft</p>

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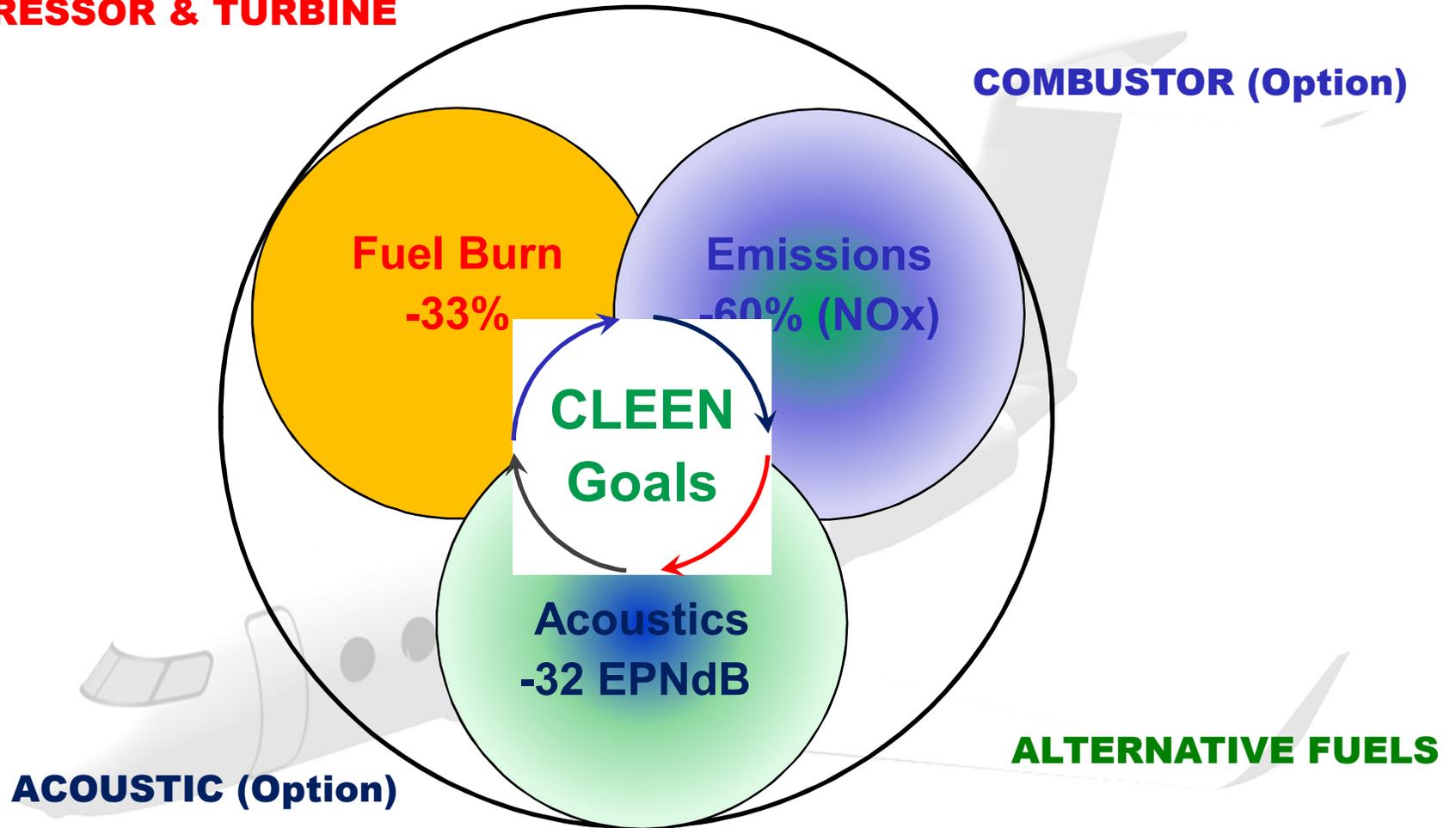
Over 150,000 Turbine Engines Delivered – Large Installed Base

Honeywell CLEAN Program



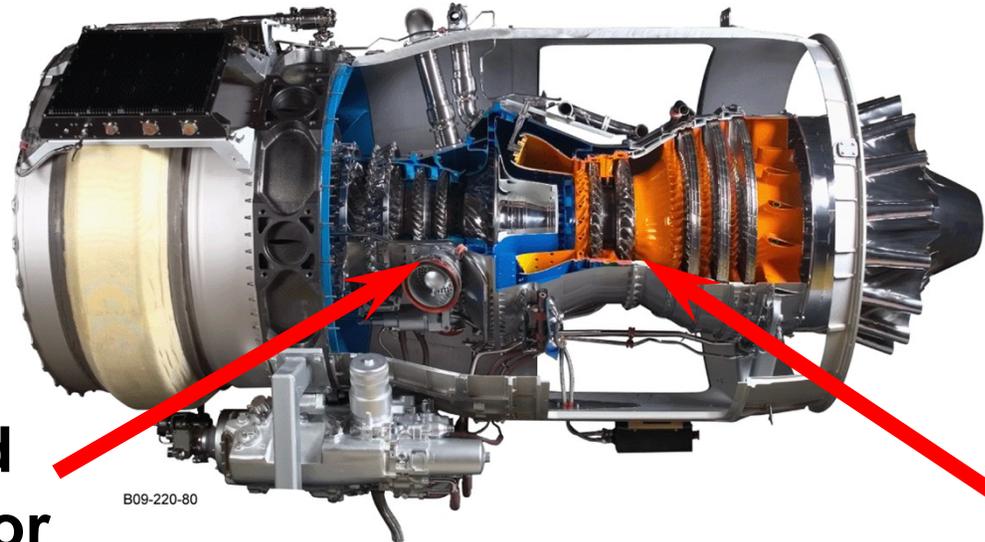
Honeywell CLEEN Program Addresses Aggressive CLEEN Goals

COMPRESSOR & TURBINE



Honeywell Technologies Align with CLEEN Goals

Technology	Goal
Engine/Aircraft weight reduction & engine cycle improvement: Advanced Compressor & Turbine	Fuel-burn
100% HRJ & bio-aromatic	Alternative Fuels

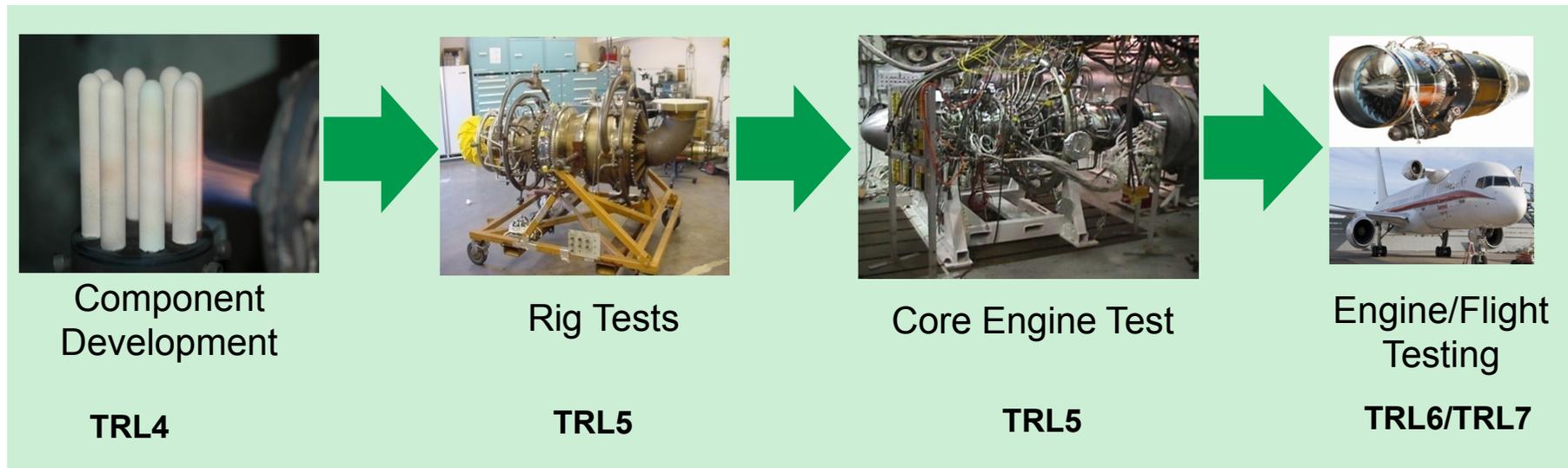


100% Bio Based Fuel

Advanced Compressor

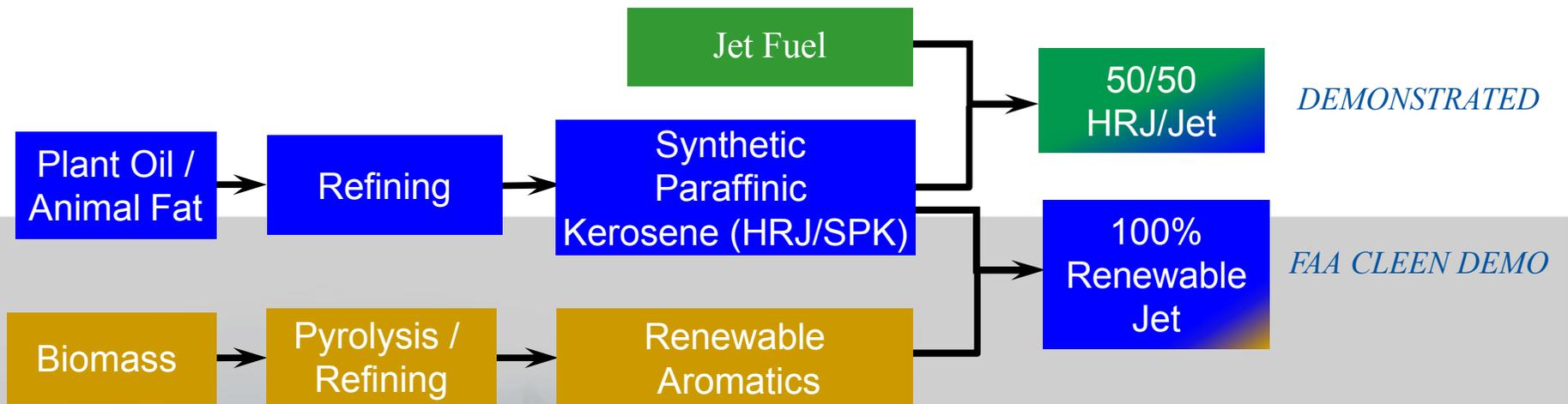
Advanced Turbine

Honeywell Fuel Burn Technology Maturation Approach



Honeywell Fuel Burn Technologies Mature to TRL6/7

High-Level Alternative Fuel Technology Description



Honeywell 100% bio based fungible jet fuel

Selection of Renewable Aromatics

- Elastomer seal swell
- Particulate emissions
- Density – meet spec limits
- Composition – match Jet A/JP-8
- Lubricity – bearing life



HRJ - Hydroprocessed Renewable Jet

Alternative Fuel Technology Maturation Approach

FAA CLEEN



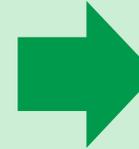
Specification Properties
FRL 4.2



Fit-For-Purpose Properties
FRL 6.1



Component/Rig Testing
FRL 6.2 & 6.3

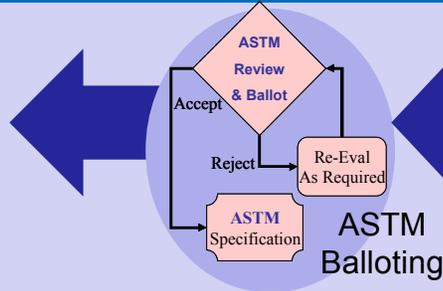


Engine/Flight Testing
FRL 6.4/TRL7

Transition Plan



ASTM Spec D1655



ASTM Balloting



OEM Review & Approval

ASTM RESEARCH REPORT

TRANSITION STRATEGY, LCA & EMISSIONS



Commercial Use



Commercial Production

Honeywell CLEAN Schedule

	2010	2011	2012	2013	2014
Mature Technologies	TRL3/4				
Core Test				TRL5	
Ground Engine Test				TRL6	
Flight Test					TRL7
Bio Based Fuel Tests		FRL4.2			FRL6.4

CLEEN Technologies Benefit Military Applications

Small Turboprop / Small Turbofan Supporting Air Force & Navy Missions

MQ-9 Reaper TPE331-10.5 → Growth

TPE 331-10X Fewer A/C per Orbit



USN UCLASS 2x HTF7000 Demonstrator

UCLASS VAATE STF for Range/ Loiter



USAF MQ-X HTF7000 Demonstrator

MQ-X VAATE STF for Range/ Loiter



Turboshaft Engines Supporting Army GWOT and Future Missions

CH-47 Chinook T55 → T55-715



T55-715 High-Hot Perform
Restore Payload
Cold Day Perf. OEI



AATE High-Hot Perform
Payload
Range (SFC)

OH-58DC250 → HTS900 / SHFE



ARH Replacement OH58 AVX ?
Weapons – Payload (Power)
Range (SFC)



Air Transport and Business & General Aviation

World Air Traffic over 24 hours

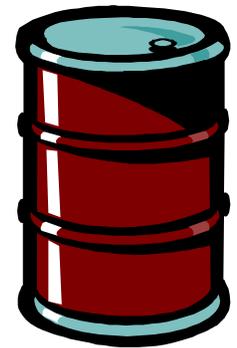


USA has highest concentration

Air Transport and Business & General Aviation

Jet Fuel Domestic Consumption (2009)	Gallons
U.S. Carriers (big engines)	11,478,000,000
Business & General Aviation (small engines)	1,364,000,000

(Ref : Air carrier jet fuel, form 41, U.S. DOT)



Honeywell CLEEN program addresses:

- The critical need to improve fuel burn for small engines
- Overall carbon footprint with 100% bio based fuel

Air Transport Vs Business & General Aviation

DOT Air Traffic Hubs 128

(Ref :DOT Air Traffic Hubs (2009))

Business & General Aviation 5226 (40x)

(Ref :Stratos Jet Charter Service)



Business & General Aviation Jets impact noise & emissions in a vast number of local communities throughout the United States.

Summary

- Honeywell CLEEN Program
 - Is aligned with FAA Goals
 - Provides benefit to over 5000 local communities throughout the United States
 - Can significantly reduce carbon footprint of US aviation

