Carbon Free Liquid Fuel for Tomorrow's piston and turbine Generators

Cryogenic NH3; for Hybrid Electric Aircraft

electric & hybrid aerospace

TECHNOLOGY SYMPOSIUM 2016

9-10 NOVEMBER 2016

COLOGNE, GERMANY

DELEGATE PASS

Companies that have participated previously include:

ZODIAC AEROSPACE · E|S|AERO · AIRBUS · Bauhaus Luftfahrt Neue Wege. · BOEING · Clean Sky 2 · DLR · Fokker · GAMA

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AKASOL High Performance Battery Systems

Aurora FLIGHT SCIENCES

Aurora SWISS AEROSPACE

Electronic Concepts

CLICK HERE TO BOOK NOW!

The Electric & Hybrid Aerospace Technology Symposium will bring together aerospace industry R&D engineers and heads of design and engineering to discuss, debate and analyse future possibilities for the hybridisation of aircraft and even the possibility of pure electric-only commercial flight.

The two-day event will cover all aspects of aerospace activity, from commercial aviation to military applications, its purpose being to highlight the ever-growing amount of research into the increased electrification of aircraft and the possibilities and challenges that brings.

BOOK YOUR CONFERENCE SEAT NOW!

Book before 23rd September for a Priority Pass

Click here

Click here to enter these dates in your e-diary or Google Calendar

9 - 10 NOVEMBER 2016

Moderator
Prof Josef Kallo, head of energy systems integration, Deutsches Zentrum für Luft- und Raumfahrt (DLR), GERMANY

09:00 - Electric flight in Airbus Group
Andrew Anderson, chief operating officer, Airbus Group, GERMANY
Airbus Group is committed to environmentally friendly aircraft: greatly reduced carbon emissions in flight and on the ground, significant in-flight noise level reduction, hybrid engine is quieter than conventional aircraft engines, additional noise reduction benefit thanks to an electric taxiing system. We view electric aircraft as the future, to provide a possible alternative to fossil fuels over the next 30-40 years. The E-Fan technology demonstrator 1.2 is a hybrid-electric/gas version of the original, all-electric technology demonstrator originally developed in 2011. The hybrid version of the technology demonstrator incorporates the following key changes and technologies: extended flight time, and gas/electric engine.

09:25 - Bridging the technology gap for hybrid-electric propulsion
Mark Husband, lead engineer - electrical systems and technologies, Rolls-Royce plc, UK
This presentation discusses the potential aerospace journey towards hybrid-electric aircraft and the associated power and propulsion systems. The industry and business challenges will be presented as well as the technical key enablers required to deliver a more integrated solution. The key power and propulsion enablers include an integrated boundary layer ingestion (BLI) propulsion system and hybrid-electric gas turbines. The electrical system is the enabling interconnecting technology that delivers the integrated solution. The presentation will discuss the current state of the art, future trends in electric technology and routes to close the gap for aerospace applications.

09:50 - NASA investments in hybrid-electric technologies for large commercial aircraft


Dr Nateri Madavan, associate project manager, NASA, USA
The presentation will offer details of NASA's research and technology portfolio in the area of hybrid-electric and distributed propulsion as it relates to large commercial transport aircraft.

Aircraft GHG Emissions

The U.S. transportation sector is a significant contributor to total U.S. and global anthropogenic GHG emissions.

Aircraft remain the single largest GHG-emitting transportation source not yet subject to GHG standards in the U.S.

U.S. aircraft (this includes all domestic flights and international flights originating in the U.S.) emit:

12 % of GHG emissions from the U.S. transportation sector

3 % of total U.S. GHG emissions.

29 % of all global aircraft GHG emissions.

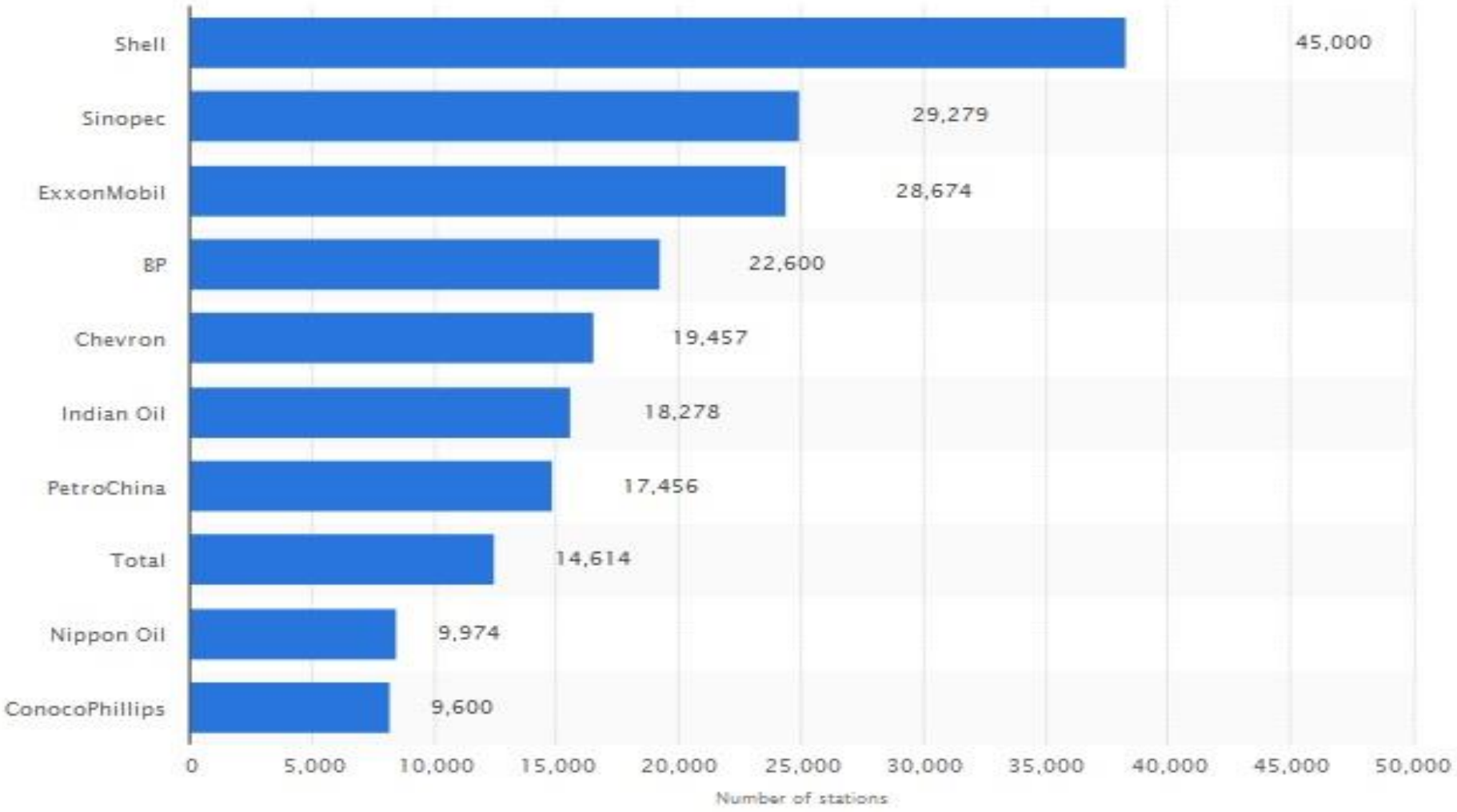
0.5 % of total global GHG emissions

http://www.epa.gov/otaq/aviation.htm

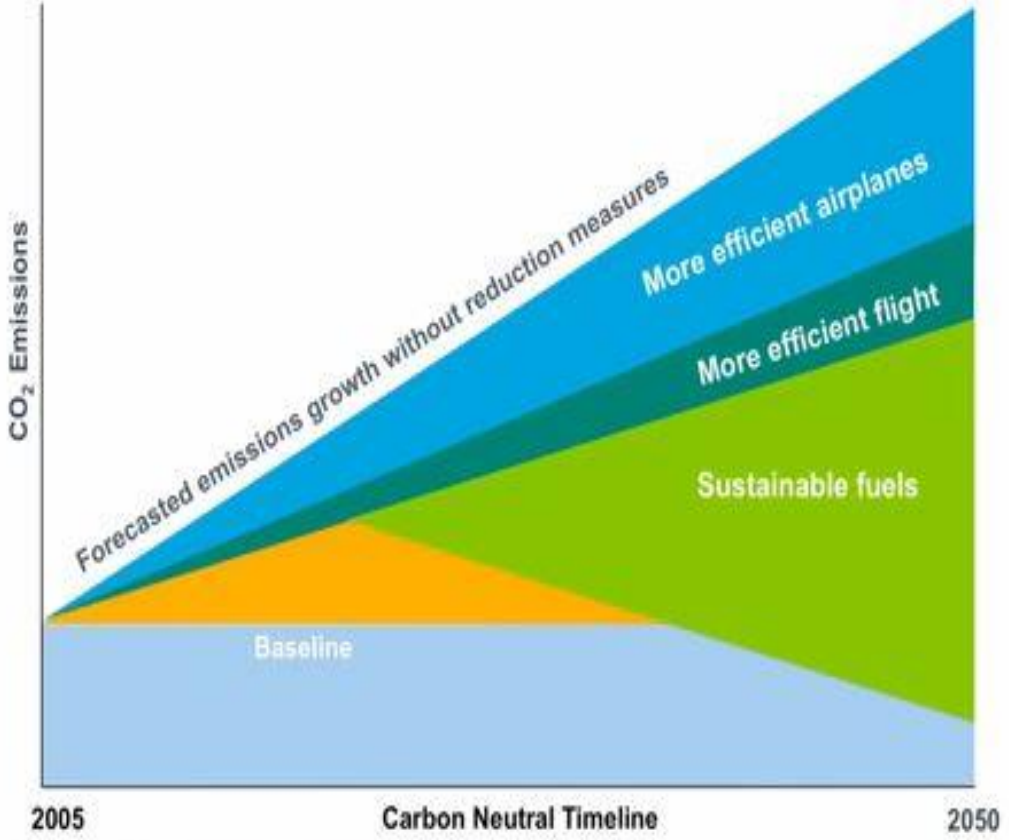
The Titanic; 600 tons a day

Top 10 largest gas and petrol station operators worldwide in 2009, based on number of stations

The statistics shows largest service station operators worldwide based on the number of stations in operation in 2009. At this time, Shell operated 45,000 stations worldwide.



Boeing Strategy for Reducing Emissions



EU is in a panic

Clean Sky : Innovation takes off

Europe's largest Aeronautics Research Programme ever

- Environmental objectives: 20 to 30% CO2 and noise reduction w.r.t. Year 2000 reference
- €1.6B ($ 2.1B) value, split 50/50 between the Commission (cash) and Clean Sky members and partners (in kind)
- Integrated breakthrough technologies, up to full scale demonstrators
- 80 % of the work achieved by end 2014
- 600 participants

Clean Sky
JOINT UNDERTAKING

A REVIEW OF NASA'S ATMOSPHERIC EFFECTS OF STRATOSPHERIC AIRCRAFT PROJECT

Panel on Atmospheric Effects of Aviation

Board on Atmospheric Sciences and Climate

Commission on Geosciences, Environment, and Resources

National Research Council

The word **"Earth"** was added to NASA by the Authorization Act of 1985

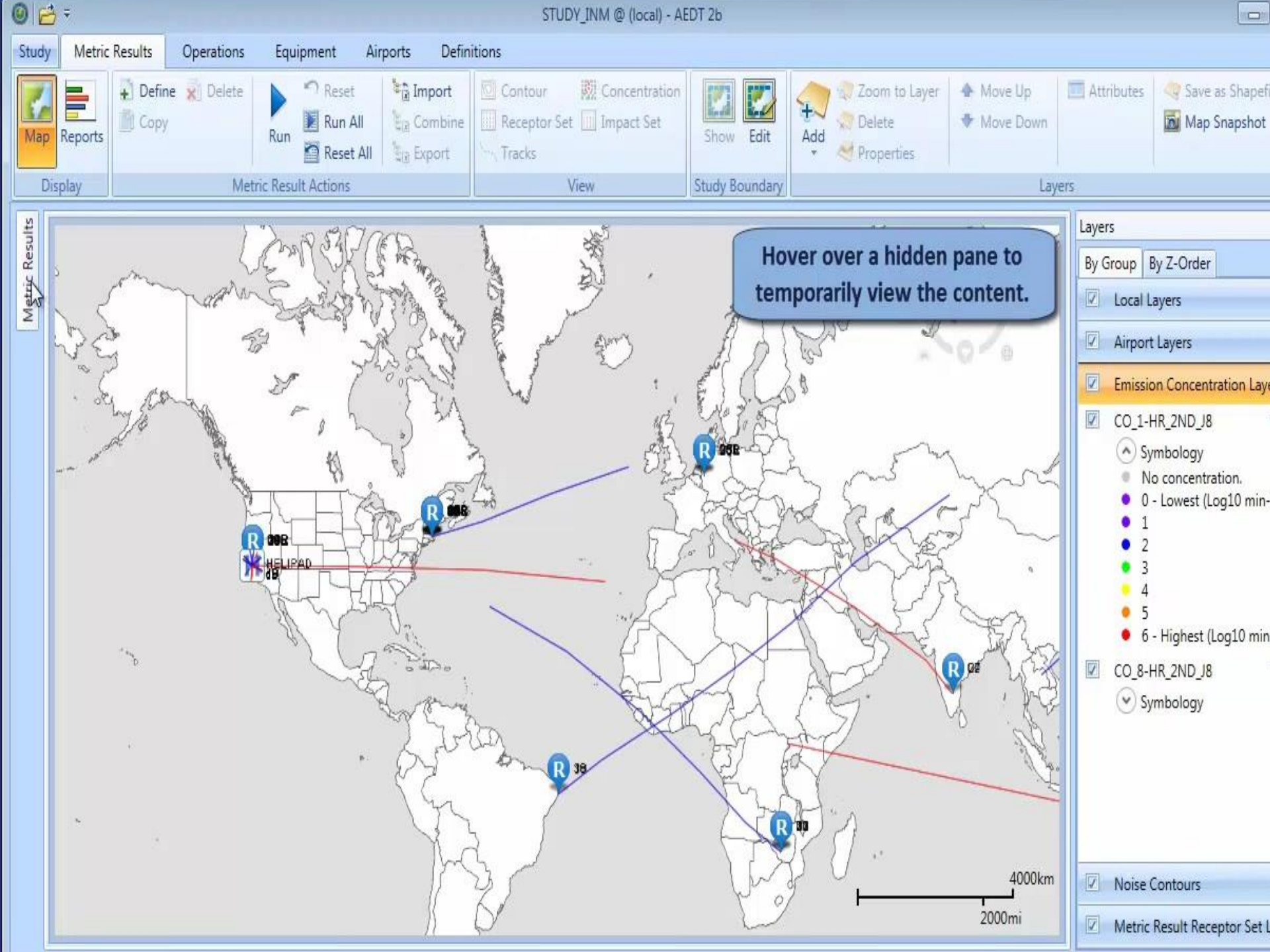
Public Law 98-361, July 16, 1984, section 110(b) (98 Stat. 426)

"(d) The aeronautical and space activities of the United States shall be conducted so as to contribute materially to one or more of the following objectives:

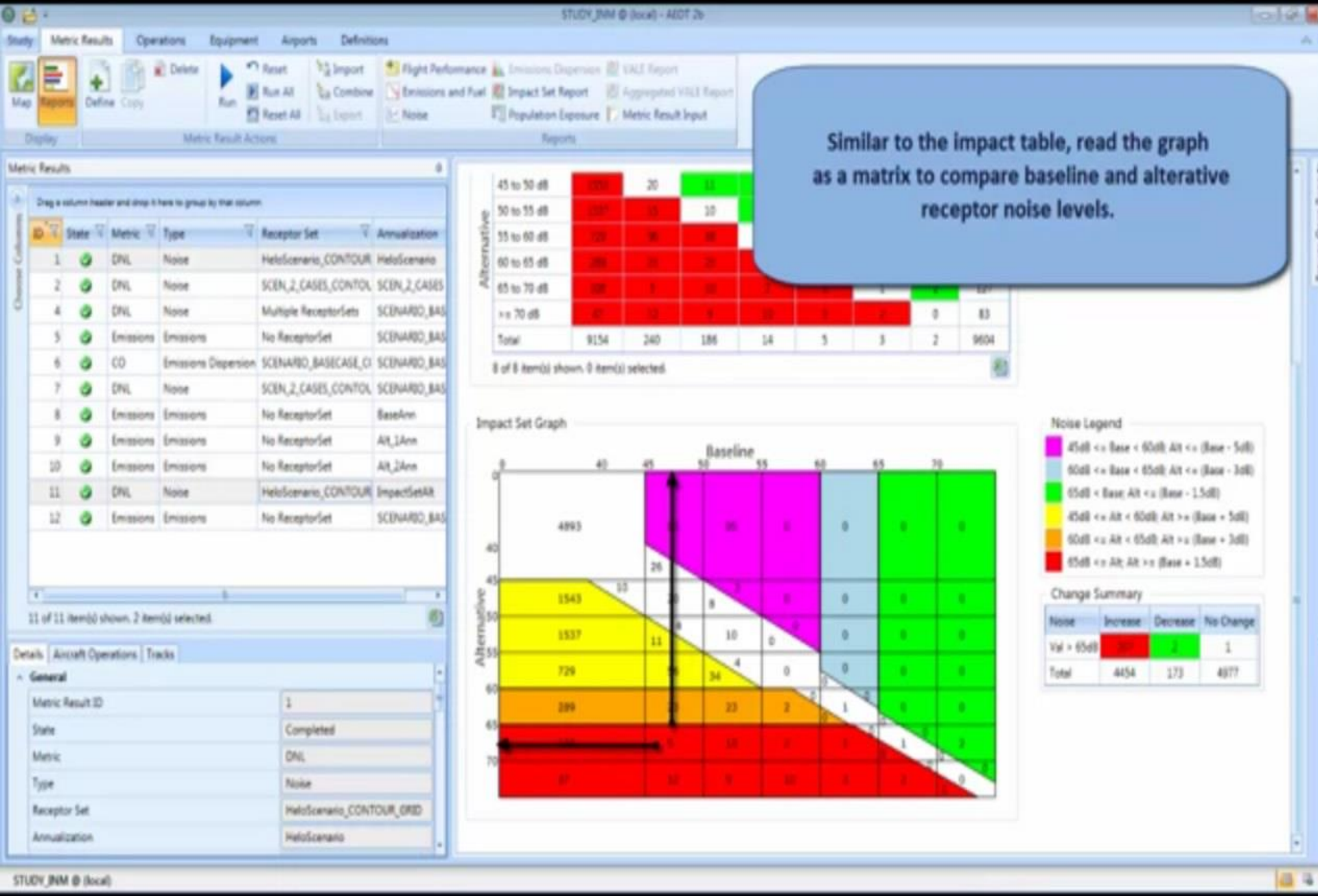
*(1) The expansion of human knowledge **of the Earth and** of phenomena in the atmosphere and space;"*

(Ronald Reagan was President and had a Republican-controlled Senate)

http://www.au.af.mil/au/awc/awcgate/amendact.htm


STUDY_INM @ (local) - AEDT 2b
Study
Metric Results
Operations
Equipment
Airports
Definitions
Map
Reports
Display
Define
Delete
Copy
Run
Reset
Run All
Reset All
Import
Combine
Export
Metric Result Actions
Contour
Concentration
Receptor Set
Impact Set
Tracks
View
Show
Edit
Study Boundary
Add
Zoom to Layer
Delete
Properties
Move Up
Move Down
Attributes
Save as Shapefi
Map Snapshot
Layers
Metric Results
Hover over a hidden pane to temporarily view the content.
HELIPAD
4000km
2000mi
Layers
By Group
By Z-Order
Local Layers
Airport Layers
Emission Concentration Laye
CO_1-HR_2ND_J8
Symbology
No concentration.
0 - Lowest (Log10 min-
1
2
3
4
5
6 - Highest (Log10 min
CO_8-HR_2ND_J8
Symbology
Noise Contours
Metric Result Receptor Set L

Similar to the impact table, read the graph as a matrix to compare baseline and alterative receptor noise levels.



CO2 a problem 2016

Federal Register / Vol. 81, No. 157

Monday, August 15, 2016

ENVIRONMENTAL PROTECTION

AGENCY

40 CFR Parts 87 and 1068

[EPA–HQ–OAR–2014–0828; FRL–9950–15–OAR]

RIN 2060–AS31

Finding That Greenhouse Gas Emissions From Aircraft Cause or Contribute to Air Pollution That May Reasonably Be Anticipated To Endanger Public Health and Welfare

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: In this action, the Administrator finds that elevated concentrations of greenhouse gases in the atmosphere endanger the public health and welfare of current and future generations within the meaning of section 231(a)(2)(A) of the Clean Air Act (CAA or Act). She makes this finding specifically with respect to the same six well-mixed greenhouse gases—carbon dioxide (CO_2), methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride—that together were defined as the air pollution in the

WSJ: Airlines this year are expected to burn 80 billion gallons of fuel.

Transportation.gov
U.S. Department of Transportation

About DOT

Home › Policy Initiatives › Future of Aviation Advisory Committee

Future of Aviation Advisory Committee

Overview

Musk’ 40 minutes at COPA21; Tax Carbon!

Starting from one meal a day back when

Elon Musk Clarifies That Tesla's Patents Really Are Free; Investor Absolutely Freaks Out

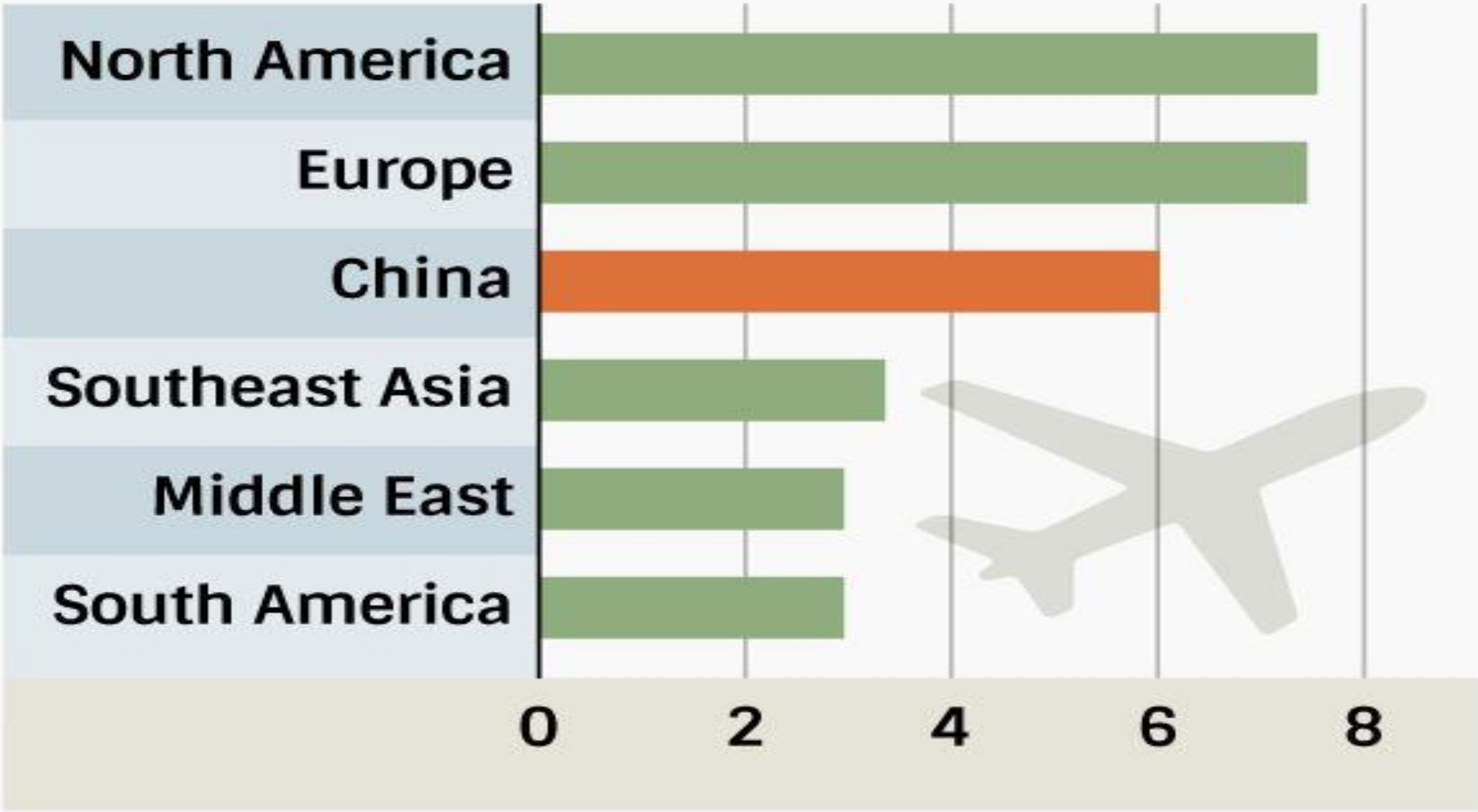
from the *silly-investors* dept

We've written a few times about Elon Musk and Tesla's decision to open up all of Tesla's patents, with a promise not to sue anyone for using them. We also found it funny when some reacted to it by complaining that it wasn't done for "altruistic" reasons, but to help Tesla, because of course: that's the whole point. Musk recognized that patents frequently *hold back* and *limit* innovation, especially around core infrastructure. Since then, Musk has said that, in fact, rivals are making use of his patents, even as GM insists it's not.

All transportation is paid for with taxes

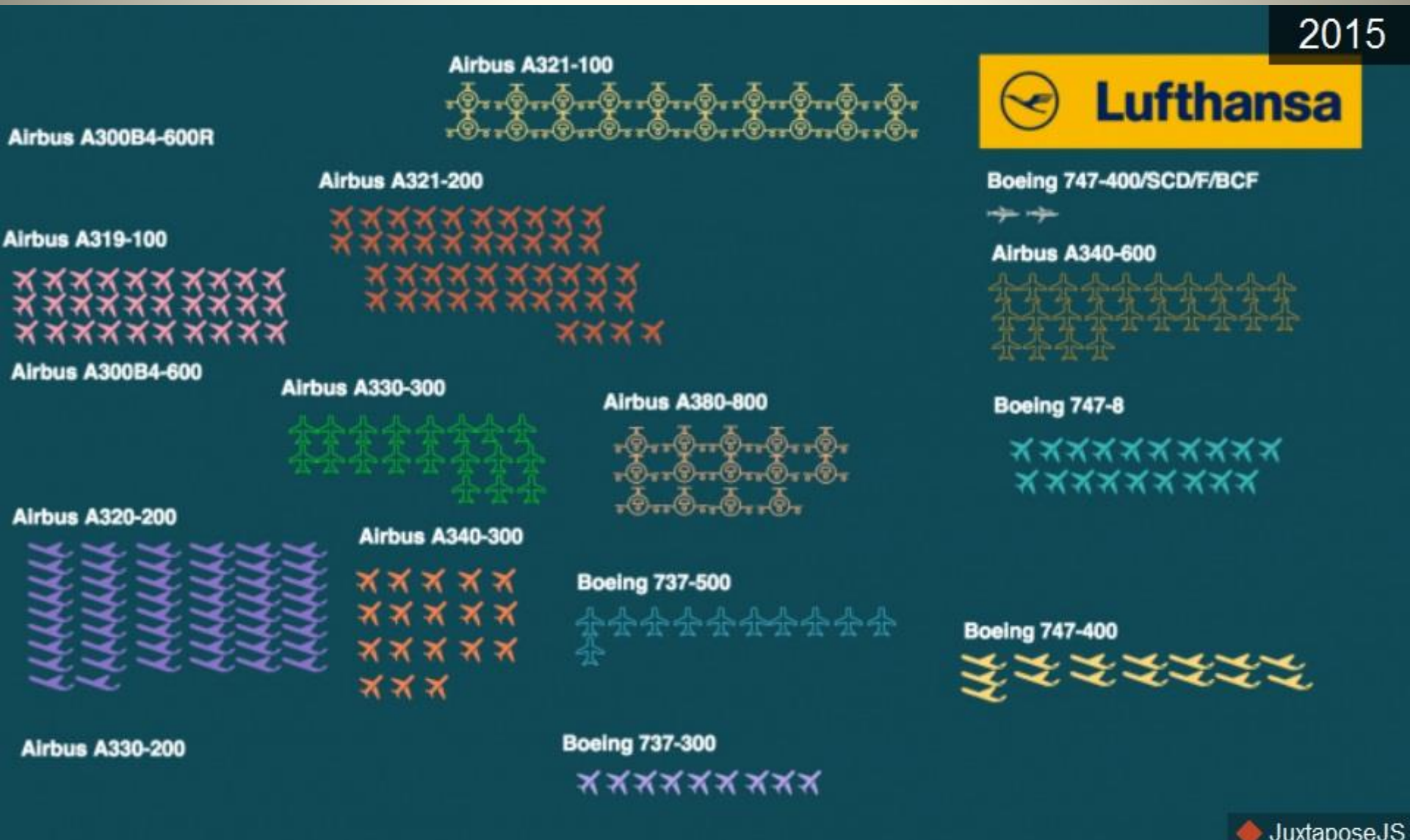
- One of America's largest private bus systems is the local 'Foothill Transit', mainly funded by local sales tax revenue, with 75% coming from Los Angeles County Propositions A and C, California State Transportation Development Act, and the State Transit Assistance Fund. The remaining 25% comes from farebox revenue.[1] WiKi
- ~~
- My own copy of Foothill Transit's Yearly Budget would say 80%+, and of course, the private bus system's road infrastructure is 'off their books'.
- 40% Airline subsidy is in the form of tax-free 'business travel expenses', unavailable for 9-5 jobs.
- But, where I live almost 50% of the land is Un-Taxable automobile right-of-ways, mostly
- asphalt roadways:
- a waste product from Gasoline production that evaporates and is repaved every 5 years.

Forecast for passenger plane demand, 2014–2033; in thousands

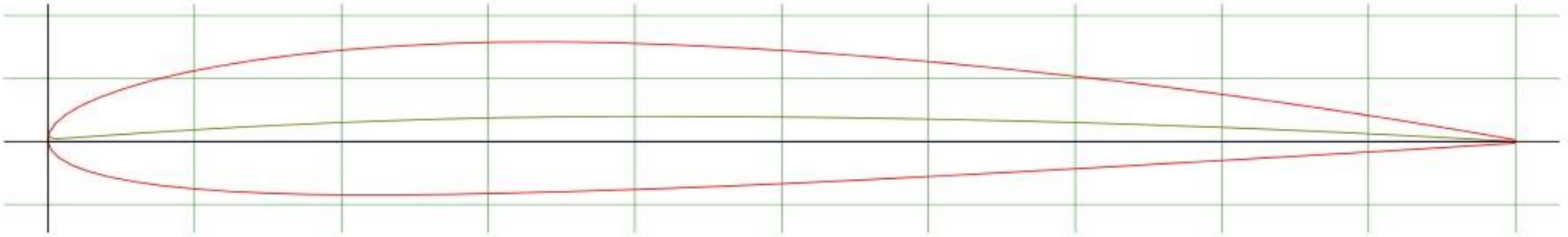


Source: Boeing

Airlines fly many types
(but not South West airlines)



NACA 4 digit airfoil generator (NACA 2412 AIRFOIL)



Max Camber (%)	2	First digit. 0 to 9.5%
Max camber position (%)	40	Second digit. 0 to 90%
Thickness (%)	12	Third & fourth digit. 1 to 40%
Number of points	81	20 to 200
Cosine spacing	☑	Cosine or linear spacing
Close Trailing edge	☐	Open or closed TE

Plot

Send to airfoil plotter Add to comparison Add to My airfoils

Dat file

```
NACA 2412 Airfoil M=2.0% P=40.0% T=12.
  1.000084   0.001257
  0.998557   0.001575
  0.993984   0.002524
  0.986392   0.004086
  0.975825   0.006231
  0.962343   0.008922
  0.946027   0.012110
  0.926971   0.015740
```

NACA 4 digit airfoils in the database

NACA 0006	NACA 0008
NACA 0009	NACA 0010
NACA 0012	NACA 0015
NACA 0018	NACA 0021
NACA 0024	NACA 1408
NACA 1410	NACA 1412
NACA 2408	NACA 2410
NACA 2411	NACA 2412
NACA 2414	NACA 2415
NACA 2418	NACA 2421
NACA 2424	NACA 4412
NACA 4415	NACA 4418
NACA 4421	NACA 4424
NACA 6409	NACA 6412

USAAVLABS TECHNICAL REPORT 66-52

UTILIZATION OF AMMONIA AS AN ALTERNATE FUEL IN ARMY AIRCRAFT ENGINES

By

Nicholas C. Kaños

June 1966

U. S. ARMY AVIATION MATERIEL LABORATORIES
FORT EUSTIS, VIRGINIA

rity 2002-01-28 • Filing 2003-01-28 • Publication 2004-04-15

ro emissions (non-polluting) **electric** powered air vehicle having dual lifting surfaces comprised of a blended g-body and a semi-annular upper wing, the blended body comprising a fuselage volumetrically sized to house a supply ...

icient low carbon emission **airplane** integrating jet **fuel** and **cryogenic fuel** ...

Application US20140339367A1 • Mithra M.K.V. Sankrithi • The Boeing Company

Priority 2013-05-20 • Filing 2013-05-20 • Publication 2014-11-20

A **hybrid fuel airplane** and methods are presented. A **cryogenic fuel** is transferred to an **airplane** propulsor from an **airplane fuel** system comprising a **cryogenic fuel** tank and a jet **fuel** tank. The **cryogenic fuel** tank conforms to an outer mold ...

yogenic electrical convertiplane

nt RU2529568C1 • Дмитрий Сергеевич Дуров • Дмитрий Сергеевич Дуров

rity 2013-08-15 • Filing 2013-08-15 • Grant 2014-09-27 • Publication 2014-09-27

LD: **aircraft** engineering. SUBSTANCE: convertiplane of biplane aerodynamic configuration with different-size gs has larger second wing mounted above the first all-moving smaller wing. Convertiplane allows conversion of its otor ...

yogenic turbo-**electric** stol **aircraft**

nt RU2534676C1 • Дмитрий Сергеевич Дуров • Дмитрий Сергеевич Дуров

rity 2013-05-27 • Filing 2013-05-27 • Grant 2014-12-10 • Publication 2014-12-10

LD: **aviation**. SUBSTANCE: **cryogenic** turbo-**electric** STOL **aircraft** has longitudinal design of triplane with a plane, twin-finned H-shape tail unit. The **aircraft** includes fuselage, wings, wheel landing gear, power plant and able ...

New insulation should ramp up Cryogenic aircraft fuels

National Aeronautics and Space Administration

NASA

Materials and Coatings

Durable Aerogel Technologies

For thermal insulation and lightweight structures

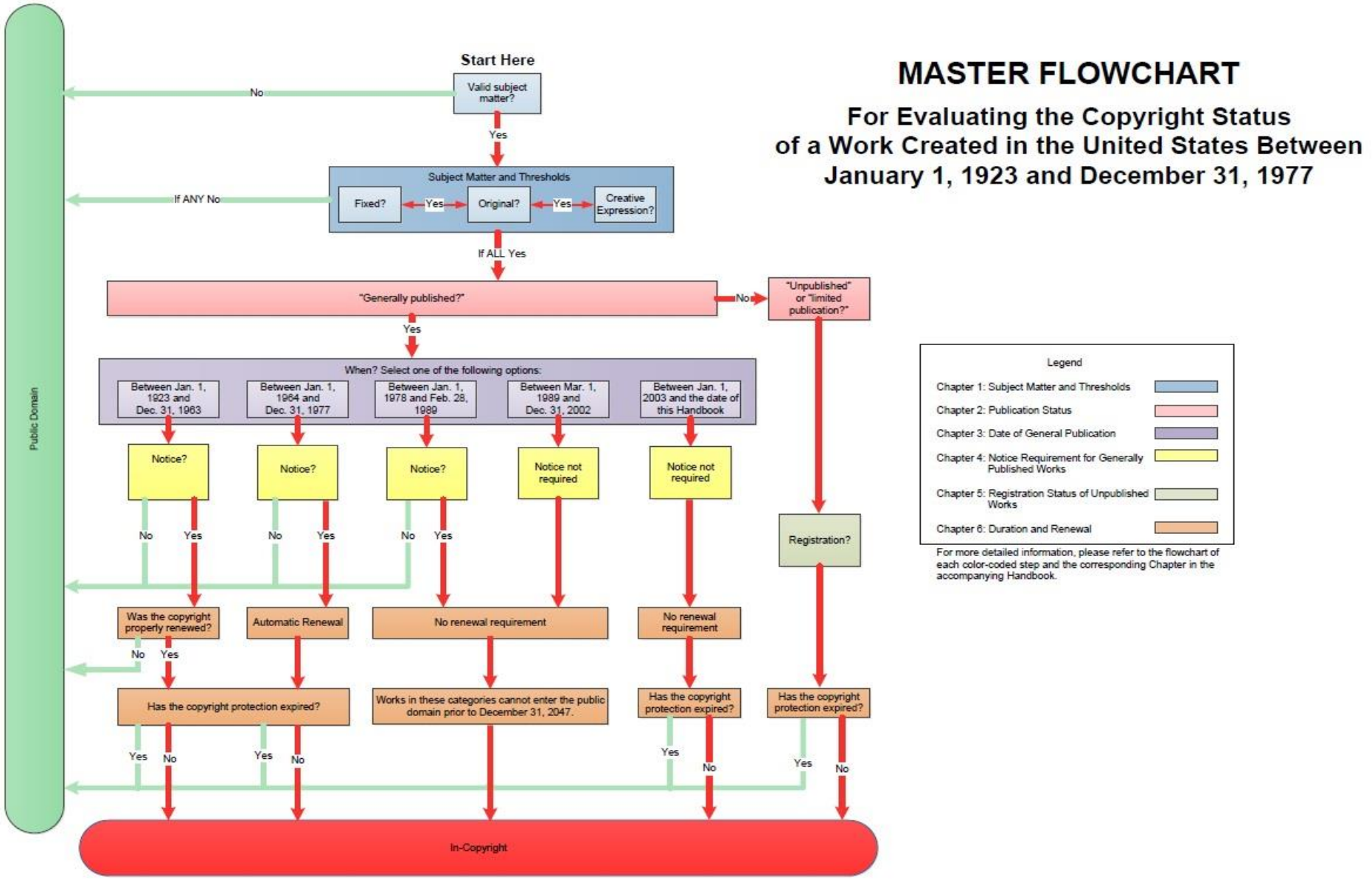
NASA-developed polyimide aerogels are 500 times stronger than

BENEFITS

- Thin and flexible - can be manufactured in a flexible form yet maintain excellent tensile properties
- Strong - 500 times stronger than traditional silica

solution

Courtesy of UC Berkley,



Doug@Bar-nett.com
MarlaIsMom@gmail.com

http://terraplane.info

Thankyou

And without prejudice,

Treasurer@CAGreens.org