GE Aviation

Highways in the Sky

Gauging the Impact of New Flight Paths on the U.S. Economy, Environment and the Everyday Traveler

The Federal Aviation Administration (FAA) is conducting a comprehensive overhaul of the National Airspace System to make air travel more dependable and efficient, while reducing the impact of aviation on the environment and on communities around airports. The FAA's air traffic modernization program, called **NextGen, will improve air traffic management** to save fuel and reduce noise, pollution, congestion and delay.

Performance-based Navigation (PBN), a cornerstone technology of NextGen, allows aircraft to fly more accurate paths by shifting reliance in navigation to a satellite-based system. RNP, or Required Navigation Performance, is the most advanced form of PBN and uses GPS and onboard technology to guide airplanes with precision and safety. **Our national airspace is being remapped with RNP routes, which serve as "Highways in the Sky" that help travelers get to their destinations quicker and safer.**

Today, the FAA is studying RNP implementation and other NextGen technologies in the nation's busiest *metroplex* airspace, or the heavily trafficked, complex airspace around major metropolitan areas. GE completed a study of the economic and environmental benefits we can expect if we implement RNP at 46 non-*metroplex* airports over the next three years. **And the benefits, shown inside, are significant.**

imagination at work

WHY BUILD HIGHWAYS IN THE SKY?

A LOOK AT THE IMMEDIATE BENEFIT OF RAPIDLY DEPLOYING RNP APPROACHES AT 46 REGIONAL AIRPORTS ACROSS THE UNITED STATES.

THE PROBLEM

Our current air traffic management system relies on an aging system of **radio-based navigation aids.** This Eisenhower-era system, which restricts airplanes to flying indirect paths over ground-based radio-beacons, has shaped the way we currently manage air traffic. Inefficiencies stemming from this **create unnecessary fuel consumption, excess carbon emissions, longer flight time and increased noise impact,** which negatively affect our travel plans, drag down the economy and perpetuate our dependence on foreign oil. The total cost of all U.S. air transportation delays in 2007 was $32.9 billion according to a study by the National Center of Excellence for Aviation Operations Research.[1]

THE SOLUTION

The FAA is currently engaged in a modernization effort, called NextGen, which will upgrade our antiquated air traffic management system to reduce delays, improve efficiency and reduce the environmental impact of flying. The FAA and other aviation authorities around the world recognize RNP as a proven and available NextGen solution.

RNP technology allows aircraft to fly precisely-defined trajectories without relying on ground-based radio-navigation signals. **The streamlined flight paths achieved with RNP allow pilots and controllers to shorten the distance an aircraft has to fly, reducing flight time and using airspace more efficiently.** Nearly half of U.S. commercial aircraft—and virtually all new airliners—are capable of flying these paths today.

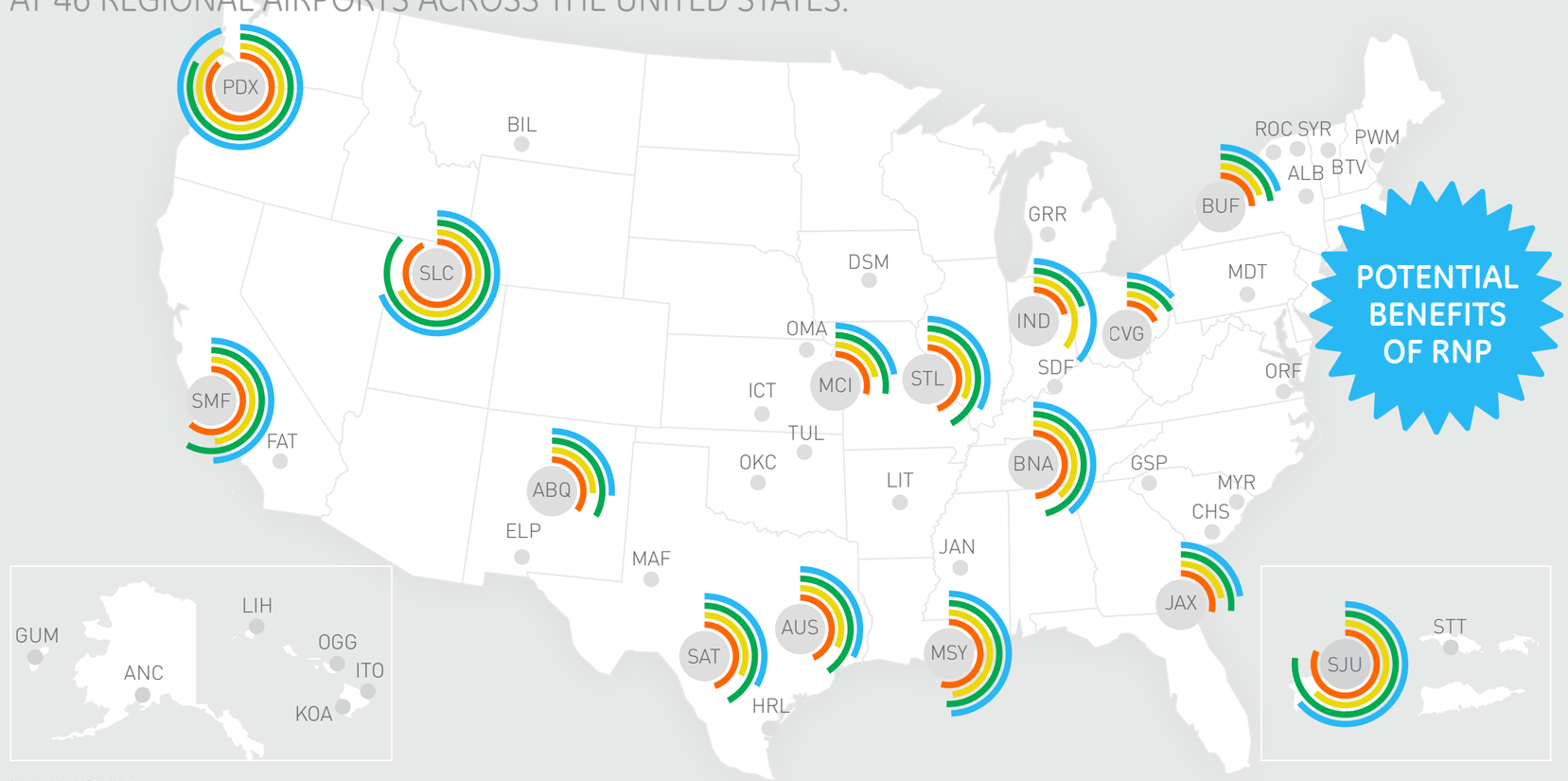
It's important that we begin to leverage this technology, because the FAA's annual aviation forecast has predicted that domestic air travel will double in the next 20 years, reaching the one billion passenger mark in the U.S. alone by 2021. In addition, ICAO, the International Civil Aviation Organization, has predicted that efficiencies made possible by RNP alone can cut global CO_2 emissions by 13 million metric tons per year.

GE'S ANALYSIS

GE Aviation analyzed existing navigation procedures, current air traffic statistics and today's fleet compositions to project the benefits of RNP implementation at airports across the country. While the FAA prepares to study RNP implementation and other NextGen technologies in the nation's busiest *metroplex* airspace, GE focused its study on 46 mid-size U.S. airports where aircraft flying RNP arrivals would achieve measurable benefits. The data and analysis in the study provide convincing evidence that accelerated deployment of RNP can benefit nearly any airport.

[1] NEXTOR Total Delay Impact Study, Revised Final Report — November, 2010

OUT OF 46 NON-METROPLEX AIRPORTS IN THE STUDY, THE BAR GRAPHS SHOW THE TOP 15 THAT CAN REALIZE THE MOST BENEFIT



MAP LEGEND:

CUMULATIVE BENEFITS ACROSS ALL 46 AIRPORTS

= EXPECTED SAVINGS OF 125,000 GALLONS OF FUEL

12.9 MILLION GALLONS

OF FUEL CONSUMPTION REDUCED

Equal to saving 307,142 barrels of oil, which fuels **527 round trip flights from NY to LA**

1 ICON = 10,000 BARRELS

= EXPECTED SAVINGS OF 750,000 USD

$65.6 MILLION

IN ECONOMIC SAVINGS FOR 12 AIRLINES

Equal to the full-time salary of **1,573 middle class jobs**

1 ICON = 100 JOBS

= EXPECTED SAVINGS OF 2,500,000 LBS OF CO_2

274.6 MILLION POUNDS

OF CO_2 EMISSIONS REDUCED

Equal to planting **1,384,095 trees**

1 ICON = 100,000 TREES

= EXPECTED SAVINGS OF 37,500 MINUTES

747 DAYS

IN TIME SAVINGS

Equal to **2 years and 17 days**

1 ICON = 1 QUARTER

CHANGING THE WAY WE FLY

Lorraine A. Bolsinger
President and CEO
GE Aviation Systems

We are facing a serious global challenge as air traffic increases and our skies become more and more congested. The time is now to address aviation's contribution to greenhouse gas emissions and to tackle air traffic management system inefficiencies that cost airlines and passengers time and money. Underscoring the urgency of this issue, the Federal Aviation Administration (FAA)'s annual aviation forecast has predicted that domestic air travel will double in the next 20 years, reaching the one billion passenger mark in the U.S. alone by 2021.

GE is investing in the research and capabilities required to meet aviation growth in the U.S. and abroad. GE Aviation's PBN Services group is a world leader in the development and deployment of RNP navigation procedures and is one of only two companies authorized by the FAA to design and deploy public-use RNP instrument flight procedures in U.S. airspace. GE's TrueCourse® flight management systems deliver advanced navigational and optimization capabilities to the cockpit. These and other GE capabilities in air traffic management, advanced jet engine technology and digital aviation services are creating new avenues to make commercial flight more efficient and sustainable.

ABOUT GE AVIATION

GE Aviation, an operating unit of GE (NYSE: GE), is a world-leading provider of jet engines, components and integrated systems for commercial and military aircraft. GE Aviation has a global service network to support these offerings. GE Aviation Systems LLC, GE Aviation Systems Ltd, and Naverus, Inc. are subsidiaries of GE. For more information, visit us at www.ge.com/aviation.

GE Aviation develops and implements technologies that provide significant economic and environmental benefits to airlines, airports and the communities they serve. GE's PBN Services is a world leader in the design and deployment of Performance-based Navigation and is working with aircraft operators and air traffic management providers in China, South and Central America, the United States, Australia, New Zealand, Canada and Europe to implement PBN solutions. GE's RNP Services is an ecomagination qualified product. Learn more about GE's PBN Services at: www.naverus.com.

METHODOLOGY — GE Aviation's PBN Services' analyses projected the benefits of RNP deployment at 46 U.S. airports that do not currently have optimized, published RNP procedures for arrivals of RNP-capable aircraft. A total of six models of aircraft for 12 national airlines were included in the study.

An average time savings of three minutes per flight were used to derive the average operating benefit of an aircraft flying on an RNP approach. Fuel savings were calculated using the following rates of fuel consumption in pounds per minute for airplane landings: 737NG: 88.5lbs; A320: 81.1lbs; A330: 197.5lbs; Turboprop: 25lbs; E-170/190: 61.1lbs. CO_2 savings were calculated using a conversion of 3.14 pounds per one pound of fuel and the figure for trees was calculated using Climate Change Resource Center of the U.S. Department of Agriculture's estimate of 4.5 million tons of CO_2 being annually sequestered by 50 million trees. Monetary savings are in USD and are calculated at $60.99 per minute, which is sourced from the Air Transport Association's 2009 study on delay costs to U.S. airlines. Jobs were calculated using earnings numbers from the 2010 U.S. Census.

Only direct aircraft operational savings were taken into account, which includes savings due to reductions in fuel (accounting for 41% of savings), maintenance and crew costs. Calculations were made using 2009 fuel prices, which have since risen significantly and can be extrapolated into further savings today. Indirect operator costs, such as on-time performance and diversions, are highly dependent on airlines and were not included in the analysis, making these figures highly conservative.

Key to airport codes: **ABQ**: Albuquerque, NM; **ALB**: Albany, NY; **ANC**: Anchorage, AK; **AUS**: Austin, TX; **BIL**: Billings, MT; **BNA**: Nashville, TN; **BTV**: Burlington, VT; **BUF**: Buffalo, NY; **CHS**: Charleston, SC; **CVG**: Cincinnati, OH; **DSM**: Des Moines, IA; **ELP**: El Paso, TX; **FAT**: Fresno, CA; **GRR**: Grand Rapids, MI; **GSP**: Greenville/Spartanburg, SC; **GUM**: Guam, GU; **HRL**: Harlingen, TX; **ICT**: Wichita, KS; **IND**: Indianapolis, IN; **ITO**: Hilo/Hawaii, HI; **JAN**: Jackson, MS; **JAX**: Jacksonville, FL; **KOA**: Kona/Hawaii, HI; **LIH**: Lihue/Kauai, HI; **LIT**: Little Rock, AR; **MAF**: Midland/Odessa, KS; **MCI**: Kansas City, MO; **MDT**: Harrisburg, PA; **MSY**: New Orleans, LA; **MYR**: Myrtle Beach, SC; **OGG**: Kahului/Maui, HI; **OKC**: Oklahoma City, OK; **OMA**: Omaha, NE; **ORF**: Norfolk, VA; **PDX**: Portland, OR; **PWM**: Portland, ME; **ROC**: Rochester, NY; **SAT**: San Antonio, TX; **SDF**: Louisville, KY; **SJU**: San Juan, PR; **SLC**: Salt Lake City, UT; **SMF**: Sacramento, CA; **STL**: Saint Louis, MO; **STT**: St. Thomas, VI; **SYR**: Syracuse, NY; **TUL**: Tulsa, OK