

Responding to industry challenges:

Elements of Environmental Positioning at GE and GE Aviation

DGAC-Programa Consulta
Politica Aeronautica

27 Oct'10

Mexico city

Pablo Sordo

Sales Director

GE Aviation



imagination at work



Climate change ... increasing focus

Why an aviation issue?

Pollutants: smog, smoke, ozone layer depletion, contrails, smell ...

Aviation engine emission **types**

- CO₂, NO_x, HC, Smoke and CO

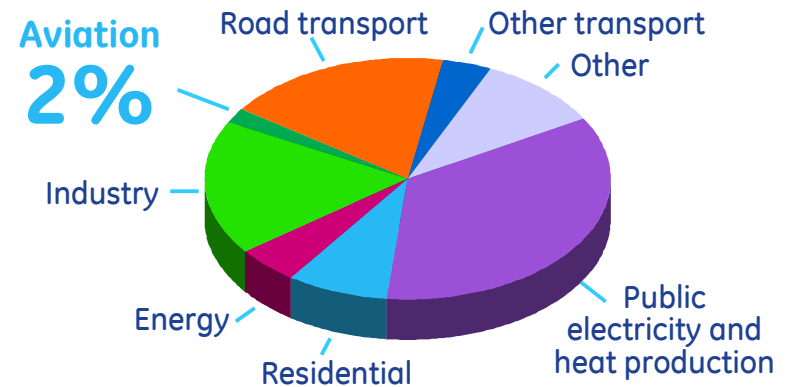
CO₂ contributes **67%** of GHG

Aviation GHG grew ~**100%** over last 15 yrs

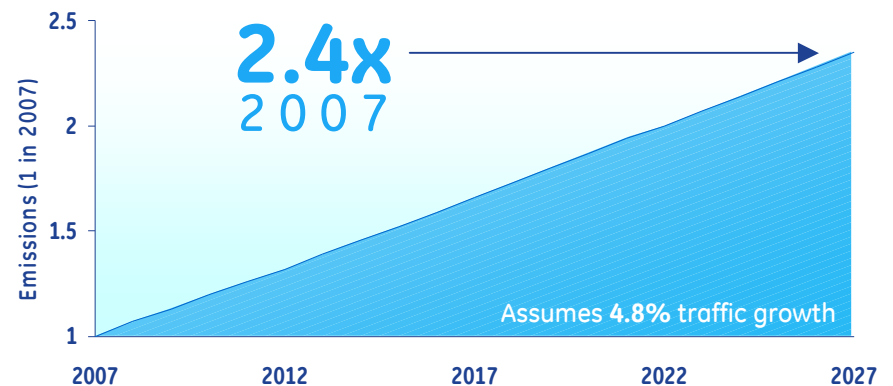
- All other industries declined



GHG Sector contribution*



Aviation emissions growth*



*Source: IPCC, GE Estimates

Aviation takes its environmental responsibility challenge seriously ...



enviro.aero **Aviation Industry Commitment to Action on Climate Change**

As leaders of the aviation industry, we recognise our environmental responsibilities and agree on the need to:

- build on the strong track record of technological progress and innovation that has made our industry the safest and most efficient transport mode; and
- accelerate action to mitigate our environmental impact, especially in respect to climate change while preserving our driving role in the sustainable development of our global society.

Therefore, we, the undersigned aviation industry companies and organisations declare that we are committed to a pathway to carbon-neutral growth and aspire to a carbon-free future.

To this end, in line with the four-pillar strategy unanimously endorsed at the 2007 ICAO Assembly, we will:

1. push forward the development and implementation of new technologies, including cleaner fuels;
2. further optimise the fuel efficiency of our fleet and the way we fly aircraft and manage ground operations;
3. improve air routes, air traffic management and airport infrastructure; and
4. implement positive economic instruments to achieve greenhouse gas reductions wherever they are cost-effective.

We urge all governments to participate in these efforts by:

1. supporting and co-financing appropriate research and development in the pursuit of greener technological breakthroughs;
2. taking urgent measures to improve airspace design including civil/military allocation, air traffic management infrastructure and procedures for approving needed airport development; and
3. developing and implementing a global, equitable and stable emissions management framework for aviation through ICAO, in line with the United Nations roadmap agreed in Bali in December 2007.

Our efforts and commitment to work in partnership with governments, other industries and representatives of civil society will provide meaningful benefits on tackling climate change and other environmental challenges.

We strongly encourage others to join us in this endeavour.

Signature Block:

- airports.council.international**: Robert J. Austinson, Director General
- canso**: Alexander de Kalle, Secretary General
- Ashley Smoot**, Chairman
- IATA**: Giulio Prigione, Director General & CEO
- Fernando Pinto**, Chairman
- BOEING**: Scott Carson, President & CEO
- BOMBARDIER**: Steve Rook, President, Regional Aircraft
- AIRBUS**: Thomas Enders, President & CEO
- EMBRAER**: Frederico Fleury Curcio, President & CEO
- GE Aviation**: Scott C. Donnelly, President & CEO
- cfm**: Eric Bachler, CEO
- Rolls-Royce**: Mark King, President, Civil Aircraft
- AT&T**: Philippe Rochat, Executive Director
- Pratt & Whitney**: Stephen Fingar, President

3rd Aviation & Environment Summit, 27th April 2008, Geneva, Switzerland

Consolidated Industry Position

Outline of where are we going ...

A global sectoral approach for aviation under ICAO

- An unprecedented action - industry “carve-out”
- Targets approved last week at the 37th Assembly
 - 2% / yr efficiency improvement
 - CNG from 2020
 - CO2 Standard for new aircraft from 2013

Suggests ICAO/UNFCCC equivalency

- Approach confirmed in Sep'10 by new UNFCCC head

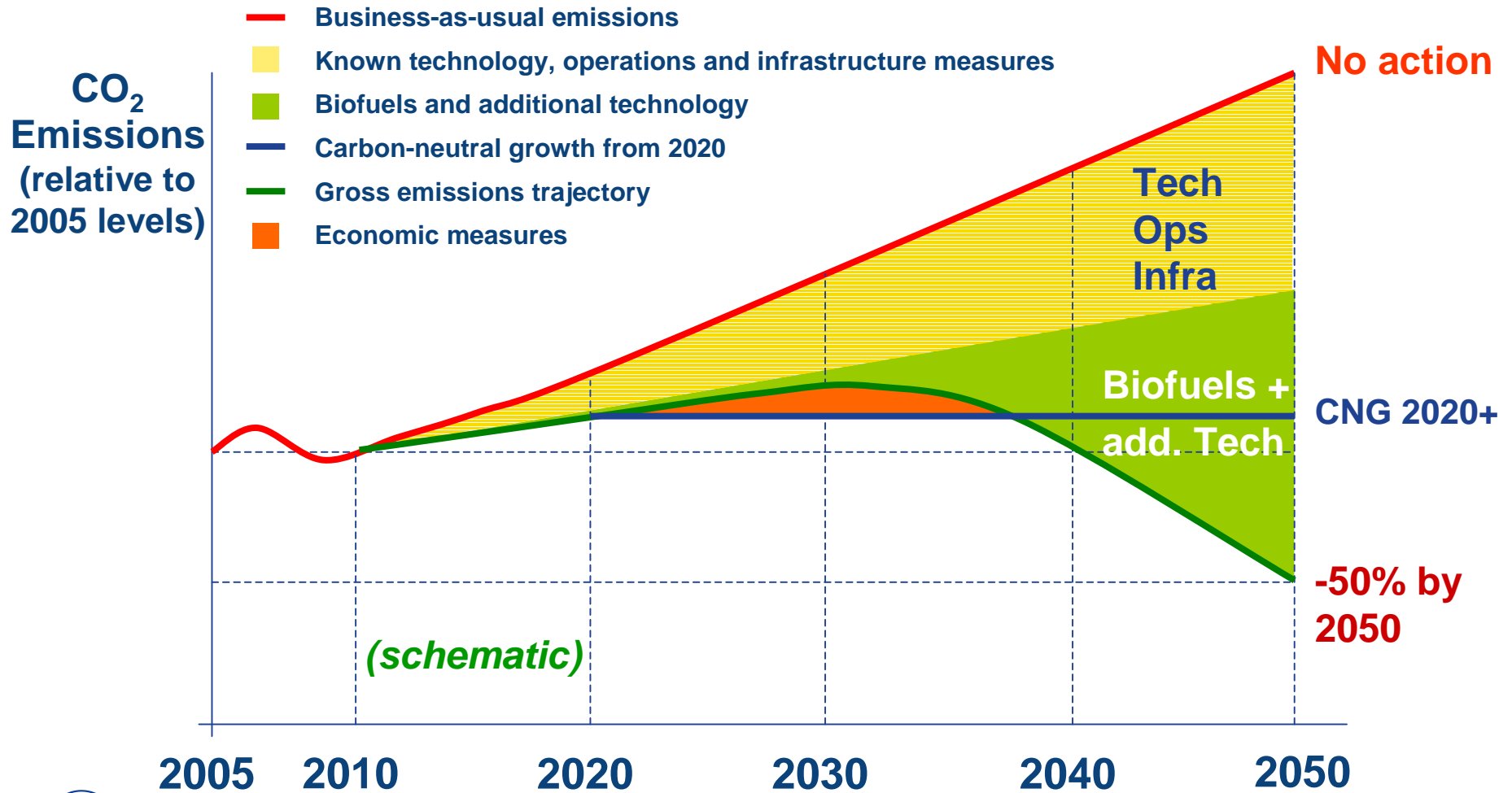
Obstacles to further progress

- Kyoto positioning, solutions to CBDR, non-distortion, Inter./Dom.

Can't sit still with ongoing anti-aviation activism



Emissions reduction roadmap



... Industry committed to action on four pillars:

- Technology
- Operations
- Infrastructure
- Measures

... a natural fit for GE Aviation

- efficient transport mode, and
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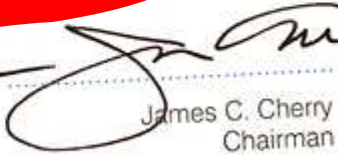
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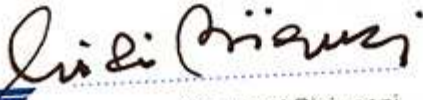
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Director General


James C. Cherry
Chairman




Giovanni Bisignani
Director General & CEO


Fernando Pinto
Chairman

GE Aviation is committed to improving:

1. Technology:

Engine upgrades

New Product Introduction

Advanced engine and component technology development

Alternative fuels development and proving

Innovative repair development

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Fernando Pinto

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Chairman

GE Aviation is committed to improving:

2. Operations:

Diagnostics-optimized engine wash

Performance-focused workscoping

Data-driven operational consulting

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GE Aviation is committed to improving:

3. Infrastructure:

Industry-changing flight management system, utilization, and proving

Air route and procedure development

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GE Aviation is committed to assisting with:

4. Policy:

Industry involvement and advocacy

UNFCCC / CoP : ATAG

ICAO : CAEP WGs

Legislative & Executive engagement – USCAP

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... As we are with our larger corporate commitment - **ecomagination**SM

GE's **commitment** to...

- helping customers meet their operational and environmental challenges

A **growth** strategy ...

- environmentally sound business is good business

A **marketing** program ...

- highlighting our broad range of environmentally advanced technologies

A public **pledge** ...

- to continually improve our operations and invest in R&D



ecomagination commitment

Next 5 years: 2010-2015

- 1. Double R&D to \$10B (cumulative)**
- 2. Grow revenues by 2X rate of GE growth**
- 3. Reduce our energy intensity by 50%**
- 4. Reduce water use by 25%**
- 5. Inspire a competitive energy future**

ecomaginationSM

GE Aviation ecomagination-certified products



Delivering operating *and* environmental performance



CFM56-3 Upgrade

- 1.6% lower CO₂
- +4K cycles on wing (vs base -3 engine)

CFM56 Tech Insertion

- 28% lower NO_x
- 4-12% lower mx cost (vs CFM56-5)

GE90-115B

- 9% lower CO₂
- 10% lower mx cost (vs competing 4 engine aircraft)

GEnx

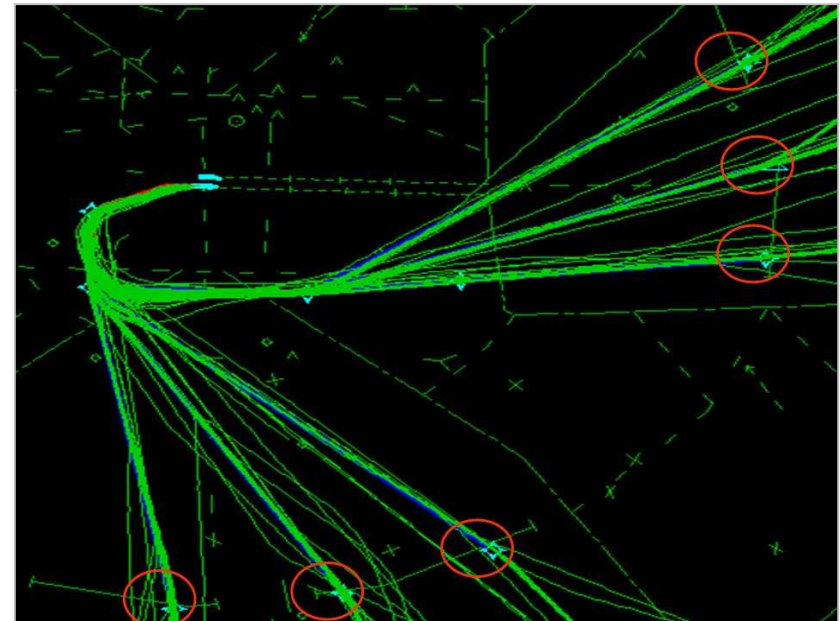
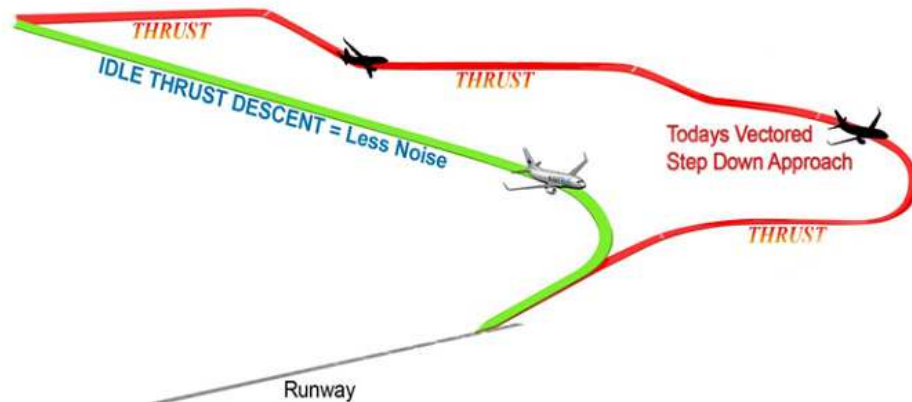
- 15% lower CO₂
- 30% lower mx cost (vs engine it replaces)

Optimized Descent

- 8-12% descent fuel savings, 1/2 tonne CO₂ per arrival
- 40% less noise

Performance based navigation ... enhancements to existing system

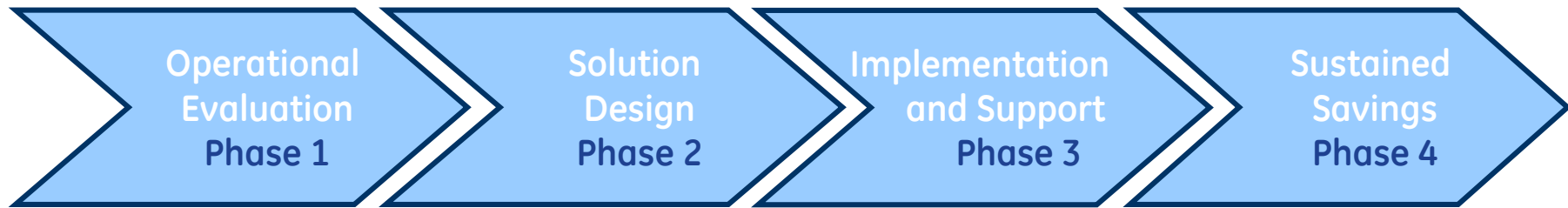
- Transitions from ground-based to aircraft-based navigation
- Allows aircraft to fly precise trajectories that save fuel, reduce CO₂ and reduce noise impact on the community



Atlanta Hartsfield

Fuel & Carbon Services

Helping the customer save fuel



- Data collection
- On site evaluation
- Analysis
- Solution identification
- Business case
- Prioritized solutions
- Implementation plan
- Support
- Future opportunities
- Track solutions
- Validate savings
- Launch next solution

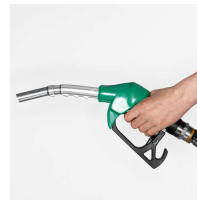
Baseline



Committed Projects



Savings



Verification



Cleaner, quieter, faster, affordable

Fuel consumption

Emissions

Noise

Cost of ownership

Reliability



GE imagination at work

a product of
ecomaginationsm

Conclusion

Aviation industry exemplary in pursuing improvement

Robust goals for next two generations defined

We're leaving no stone unturned

Research and technology development investments are key

Essential not to burden the Industry with mechanisms that
remove critical resources from the industry

Stable framework for understanding long-term carbon costs
would be helpful in pursuing appropriate tech/systems