

# **SAFRAN USA PRESS TOUR**

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March 30 – April 4, 2014

# SAFRAN IN THE UNITED STATES

by Jean-Paul Herteman, Chairman & CEO, Safran  
Peter Lengyel, President & CEO, Safran USA

# SAFRAN USA – STRATEGIC OUTLOOK



## → The United States of America:

- Leading world power
- Leader in R&D
- Leader in the aerospace, defense, and security markets through 2020

→ U.S.A. GDP on a growing trend

→ Traditional defense prime moving to commercial and international activities in compensation of military budget decrease

→ Economic growth of 4.1% in Q3 2013 and falling unemployment (6,7% in Q4 2013)

**The U.S. will remain the Group's primary customer for the foreseeable future**

# SAFRAN USA – CURRENT SITUATION

→ The U.S. is Safran's main market with about 25% of the Group's revenue

- Safran is leading with GE, the most successful aeronautical joint venture : CFM International



- Boeing programs\* are the first equal source of Safran's revenue



- Further to its american investments in security activities Safran is first ranking :

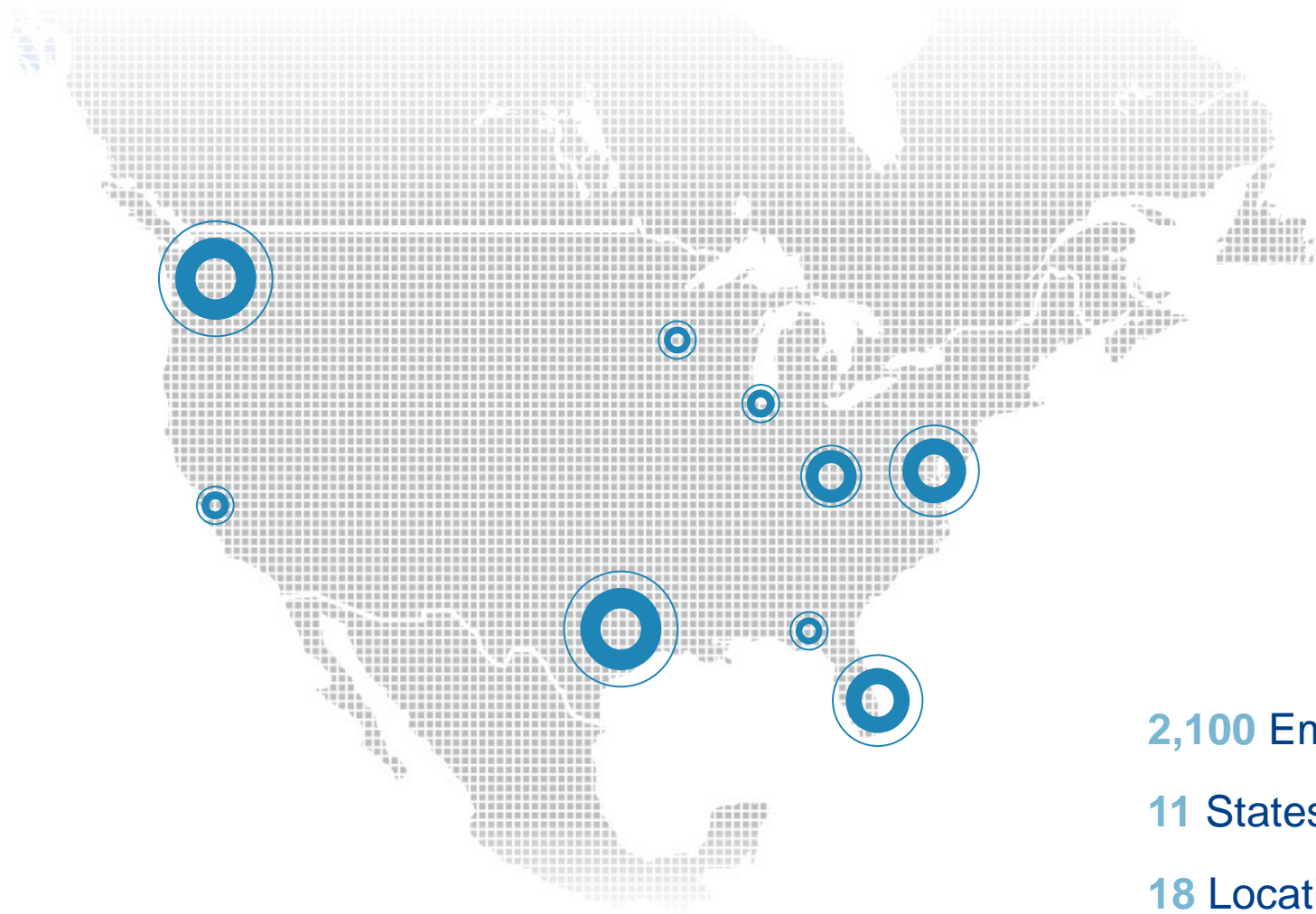


- Biometric ID documents
- Multibiometric technology
- AFIS, iris and face recognition solutions
- Explosive detection systems for hold baggage

*\* Revenue on Boeing programs includes sales to Boeing, to airlines, and to various other service providers.*



# SAFRAN FOOTPRINT: TEN YEARS AGO



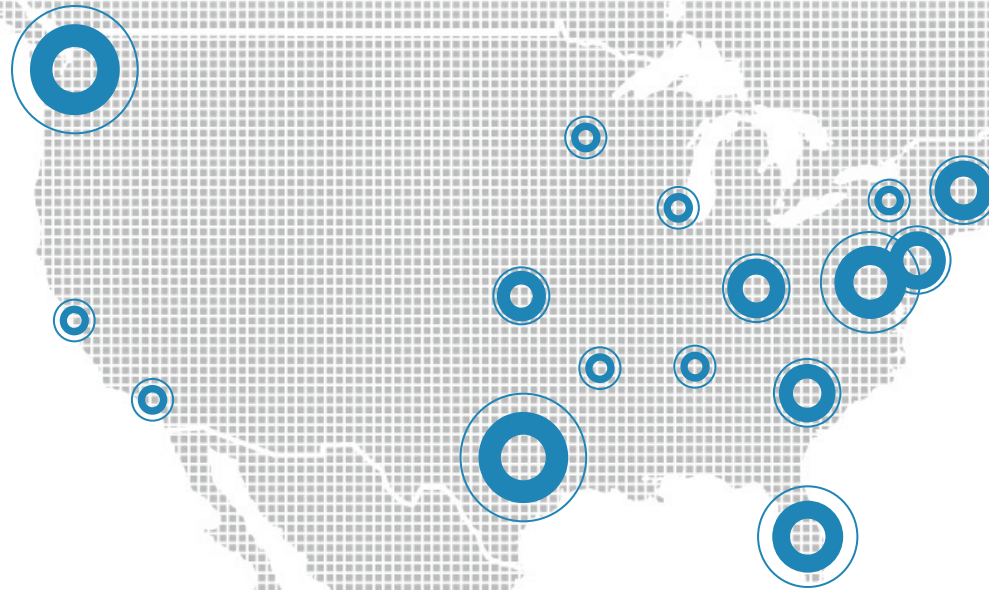
2,100 Employees

11 States

18 Locations

# SAFRAN FOOTPRINT: TODAY

The most extensive Group operations outside France



**7,000 Employees\***

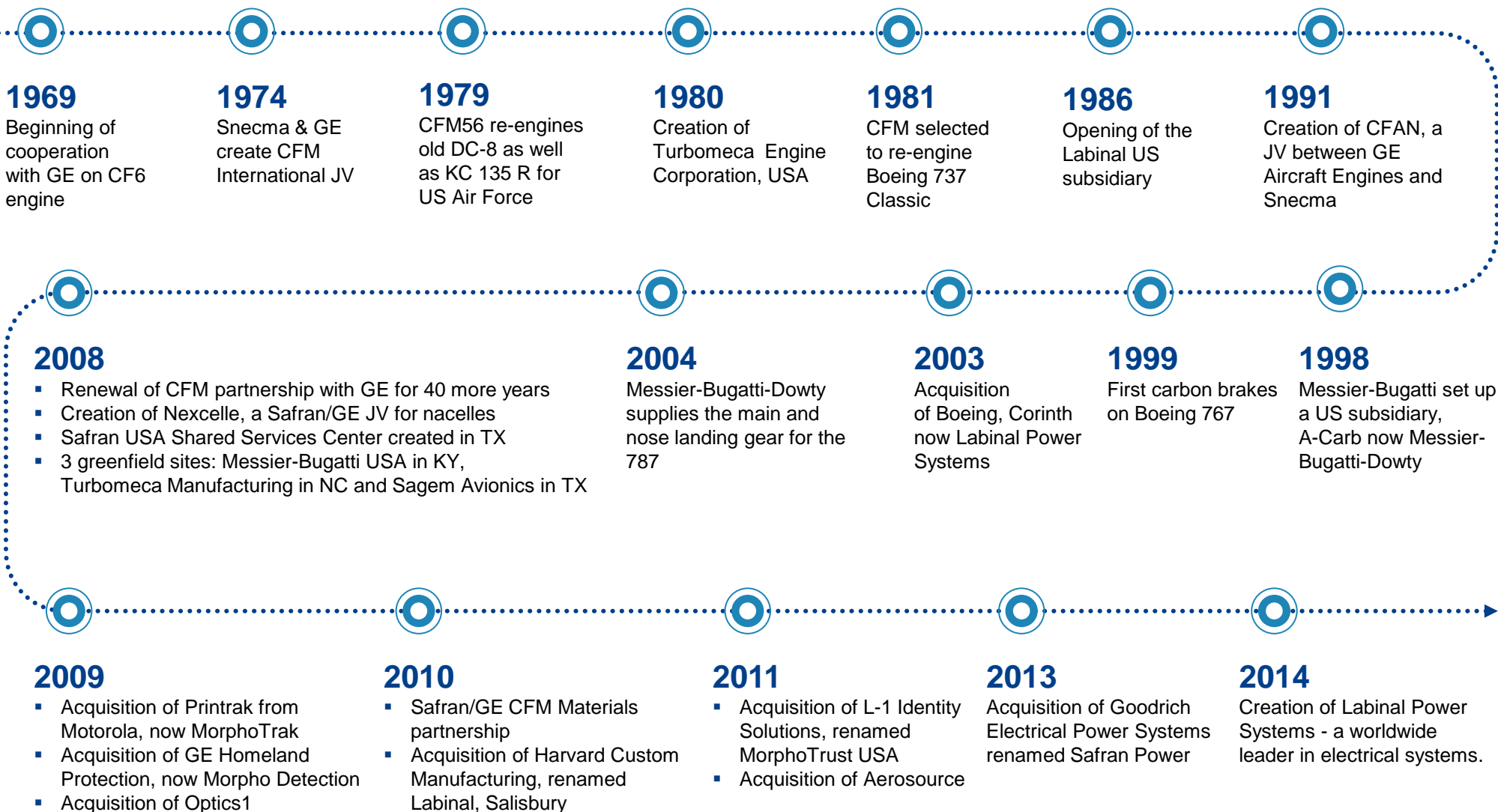
**22 States\***

**58 Locations\***

**32 Companies\***

*\* Including Joint Ventures*

# TIMELINE



# SAFRAN IN THE US AEROSPACE MARKET



Safran is a key supplier to the U.S. aerospace industry, providing both propulsion systems and aircraft equipment. Safran's expertise encompasses a broad range of aircraft systems and equipment, including turbine engines, landing systems, advanced electrical wiring solutions, flight controls, engine nacelles, thrust reversers and power transmissions, as well as jet engines for missiles and target drones. Safran also provides cost-effective maintenance, repair and overhaul (MRO) services.

## → Companies

- Safran Aerospace Composites
- Snecma (SMA)
- Techspace Aero  
(Advanced Components International, Cenco)
- Turbomeca USA (Microturbo), Turbomeca Manufacturing

## → Joint ventures

- C-FAN
- CFM International
- CFM Materials
- Propulsion Technologies International

## → Companies

- Aircelle
- Labinal Power Systems  
(Technofan, Aerosource, Safran Engineering Services)
- Messier-Bugatti-Dowty (MBT repair)

## → Joint ventures

- A-Pro
- Fadec International
- Nexcelle

# SAFRAN IN THE US DEFENSE MARKET

- Sagem Avionics
- Vectronix
- Optics 1



As a leading supplier to the global defense sector, Safran is helping America's armed forces and those of allied nations around the world meet their missions with a wide range of advanced technologies – many of which are produced and supported by Safran businesses in the United States.

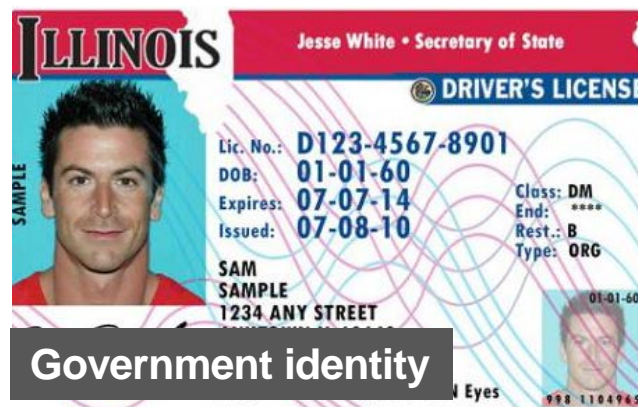


# SAFRAN IN THE US SECURITY MARKET

- MorphoTrak
- MorphoTrust
- Morpho Detection



Innovative, reliable, customer centric and qualitative security solutions to both public and private entities: criminal justice and public security, border control, transport, critical infrastructures, access control OEM, gaming.



Innovative, reliable and qualitative secure identification solutions to governments.



ID Solutions for businesses by selling products and services to Telecoms, Banks and other private market segments.

# US MAIN COMMERCIAL PLATFORMS



## → Boeing

- 787
- 737-CL-NG & Boeing Business Jet
- 747-400
- 777-200/300
- 767-200/300/400
- 737 MAX

## → Cessna

- Citation X
- Citation Longitude
- Citation Mustang
- Sovereign
- Caravan

## → Hawker Beechcraft

- (All series...)

## → Learjet

- 200
- 85

## → Gulfstream

- G450 BJ
- P-42
- G150
- G200
- G280
- G400/ 450
- G500/G550

## → American Eurocopter

- AS 350 A-Star
- AS 355
- AS 365
- EC 120
- EC 130
- EC 135
- EC 145
- EC 155
- EC 225
- Super Puma
- Bk117

## → Bell

- Bell 505



# US MILITARY AND GOVERNMENT PLATFORMS



Air Force



Navy



Army



Marine Corps



Coast Guard



NASA

- KC-135R Stratotanker
- E-3/KE-3 Sentry
- E-6 Mercury
- T-45 Goshawk
- C-17 Globemaster III
- F/A-18 C/D Hornet
- F/A-18 E/F Super Hornet
- F-16 Fighting Falcon
- F-22 Raptor
- C-40
- CH-47
- P-8A Poseidon
- V-22 Osprey
- C-130 Hercules
- HH-65 Dolphin
- UH72- A Lakota
- Subsonic Subscale Aerial Target
- Tactical targets
- Delta IV
- SM-3
- UH60M/MH-60R
- AV8B Harrier
- EC-120
- All US Army Armored Vehicles (CROWS)

**The DoD is Safran's single largest end-user**

# U.S. GOVERNMENT AGENCIES AND PRODUCTS



## → Federal Government

- FBI- Federal Bureau of Investigation
- DEA- U.S. Drug Enforcement Agency
- U.S. Army Crime Lab
- DHS- Department of Homeland Security
- TSA- Transportation Security Administration

## → State, County, and City

- Police and Sheriff Departments
- Justice Departments
- State Agencies

## → Products

- CTX 9x00, CTX x500, CTX 5800
- XRD 3500
- EntryScan 3e/4
- Vapor Tracer 2
- StreetLab Mobile
- Itemiser DX
- Automated Fingerprint Identification System
- Access Control Systems
- E-Document, drivers license, passport, and SIM card technology
- Identification Solutions
- Biometric self-service Kiosk
- Document authentication technology

# SAFRAN AEROSPACE COMPOSITES

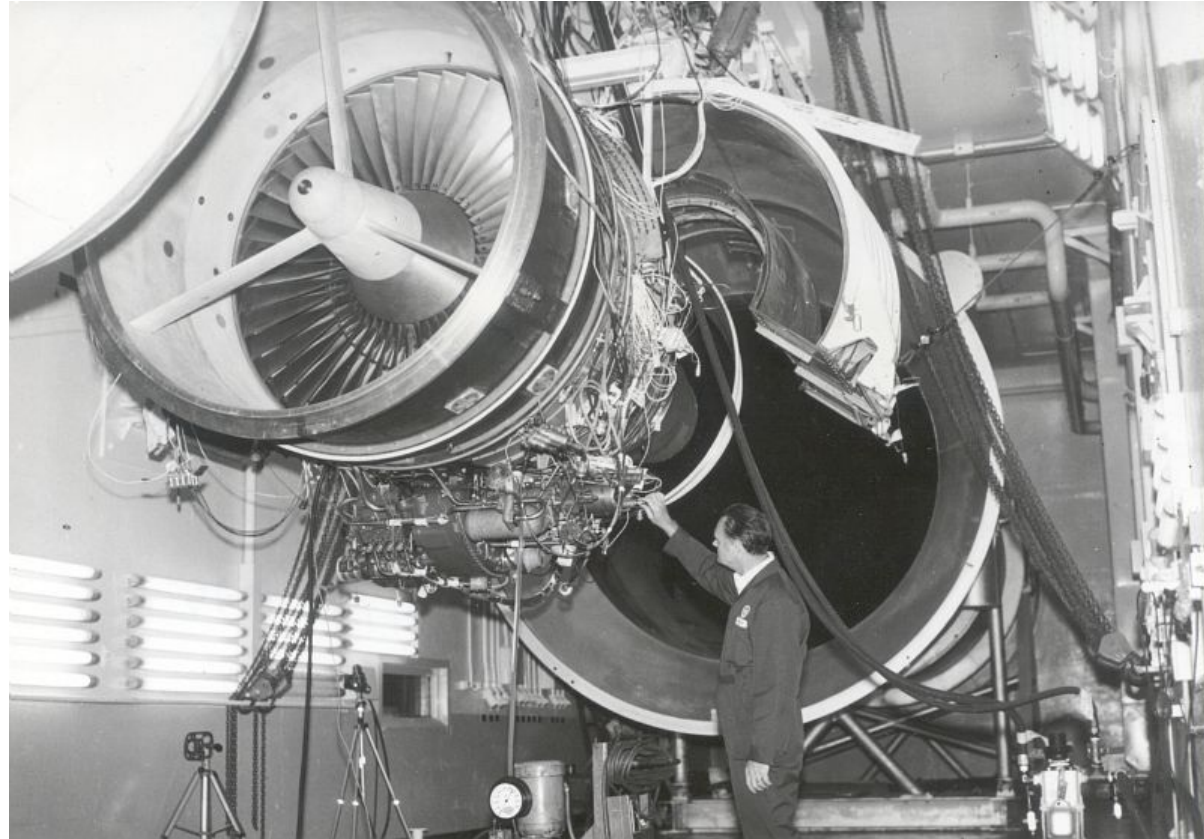
# **/1/** **CFM SUCCESS STORY**

by Marc Ventre, Deputy CEO, Operations, Safran

# CFM: SNECMA'S VISION



- In the early 1970s, Snecma was convinced that the market needed a new 10-ton-thrust class **jet engine** with a high bypass ratio, which would cut fuel costs by **20%** compared to the then industry standard JT8.
- Snecma launched **the M56 project**.
- Snecma sought a partner to tackle the American market, and in the end it was **GE** who **shared Snecma's vision**.

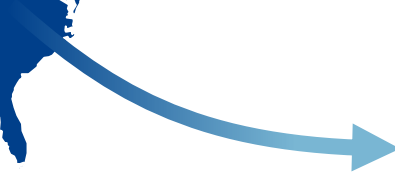


CFM joint venture agreement (50–50) signed in 1974



**Richard Nixon and Georges Pompidou**  
Reykjavík, Iceland, June 1973

# CFM ORGANIZATION

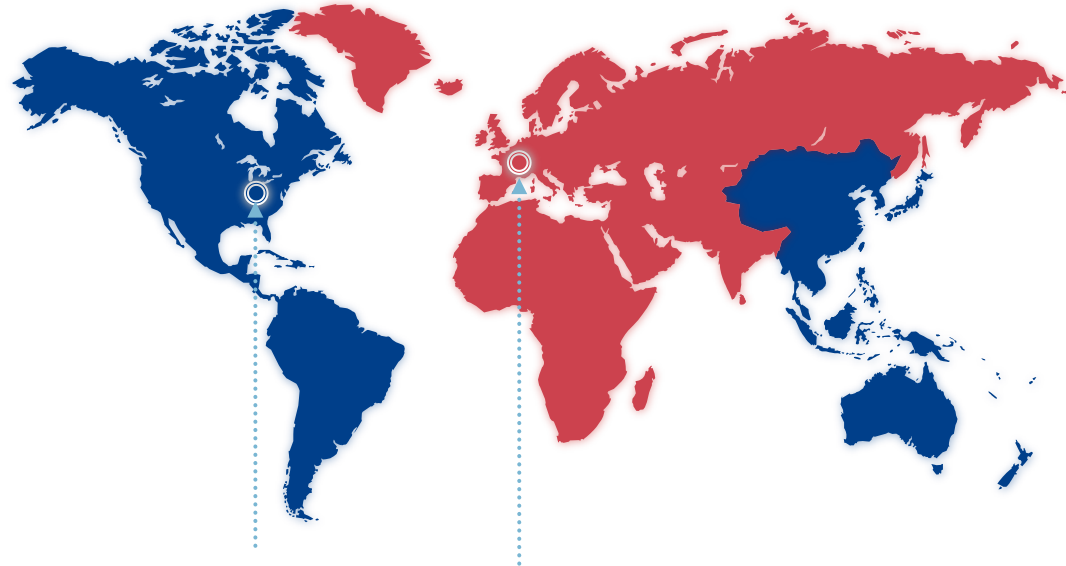
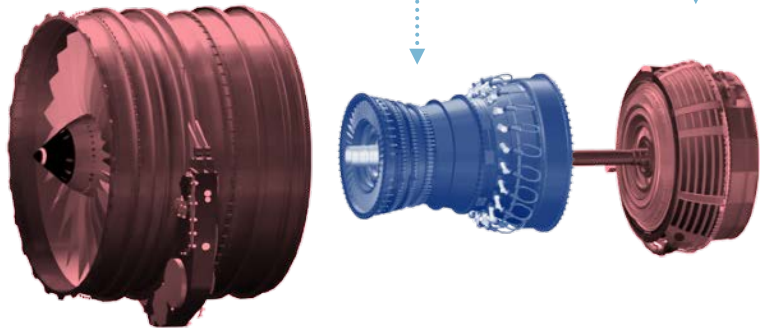


Founded  
in 1974





# A REAL 50/50 JOINT COMPANY



Design, development, production, sales, support

9 engine models

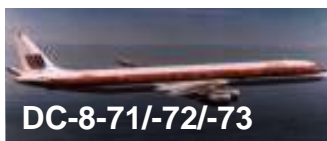
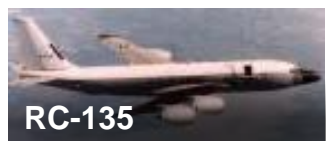
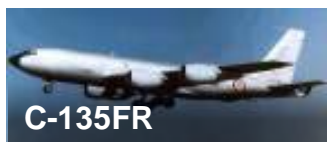
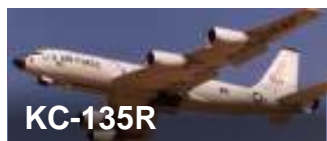
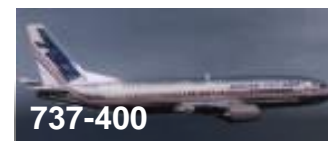
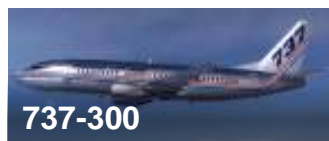
30 civil and military applications

More than 36,700\* cumulative orders and commitments

Close to 26,000\* engines delivered

More than 530 customers worldwide

A CFM56-powered aircraft takes off somewhere in the world every 2.5 seconds



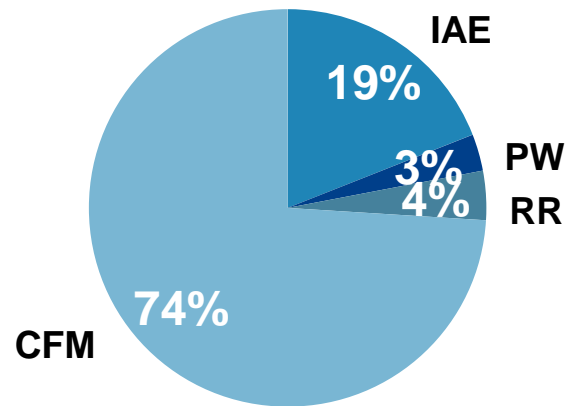
\* As of February 28, 2014

# CFM56, THE GLOBAL BEST SELLER



## SINGLE-AISLE JETS:

→ Total cumulative orders\*



o/w CFM56 equipped  
A320 family

✈ 4,066 aircraft



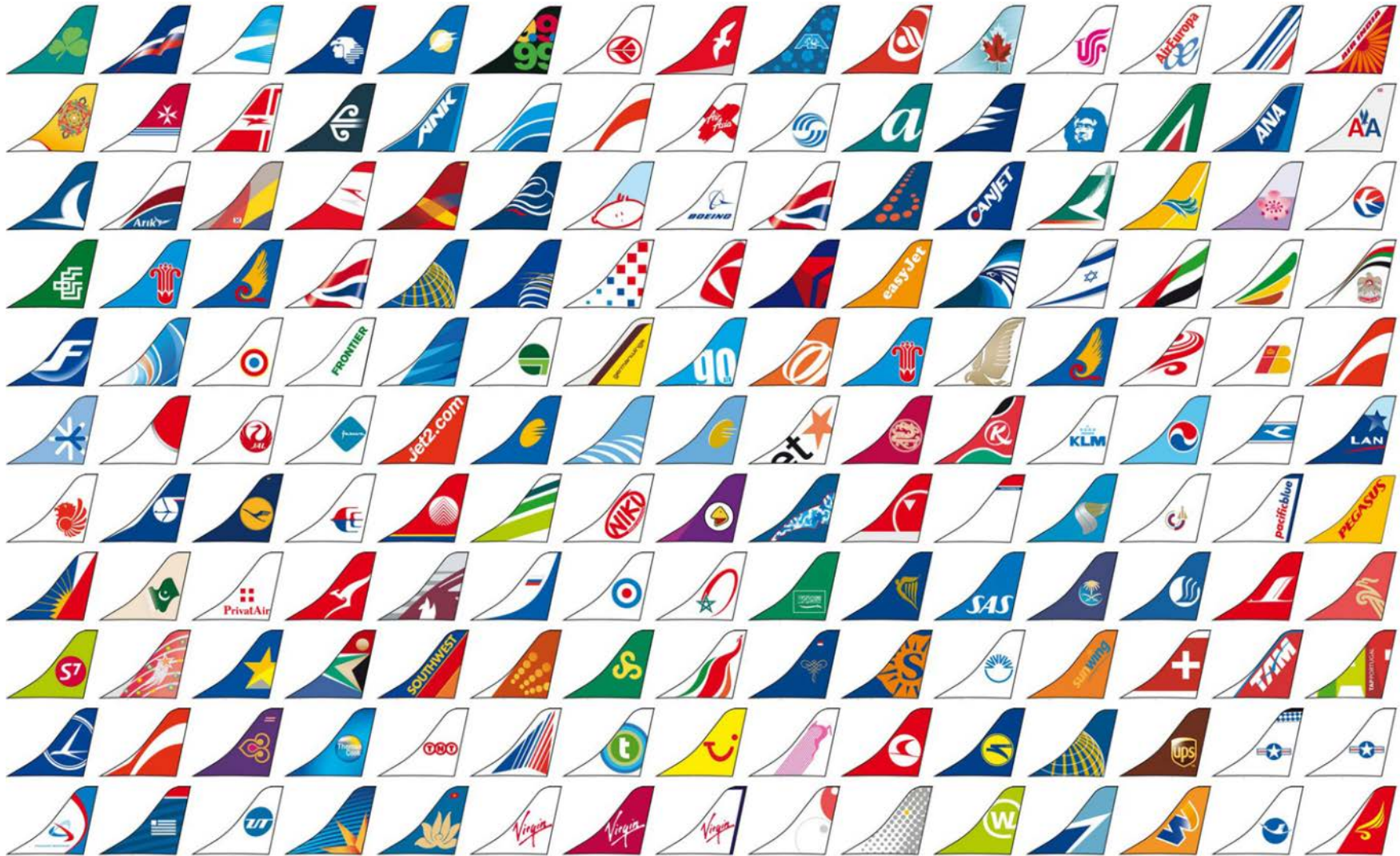
o/w CFM56 equipped  
Boeing 737 family

✈ 8,567 aircraft

\* As of February 28, 2014



# AN IMPRESSIVE CUSTOMER BASE (OVER 530)





# FROM CFM... ...TO LEAP

# FROM CFM56 TO LEAP



1974 ..... → CFM56

Gerhard Neumann/GE  
& René Ravaut/Snecma



- **11,066\*** aircraft delivered  
(o/w 6,790 Boeing 737 family aircraft and 3,408 A320 family aircraft)

2008 ..... → LEAP targets (number of aircraft)



Marc Ventre/Safran  
& David Joyce/GE



- Up to **2,000 C919**  
(single western source)
- **2,500 A320neo** (dual source)
- **4,000 Boeing 737 MAX**  
(single source)

Continuing 30 years of exceptional leadership

\* As of February 28, 2014

## LEAP-1A

Dual source



A320neo EIS 2016



## LEAP-1B

Single source



737 MAX EIS 2017



## LEAP-1C

Single western source



C919 EIS 2017



A backlog of more than 6,000\* LEAP engine orders and commitments

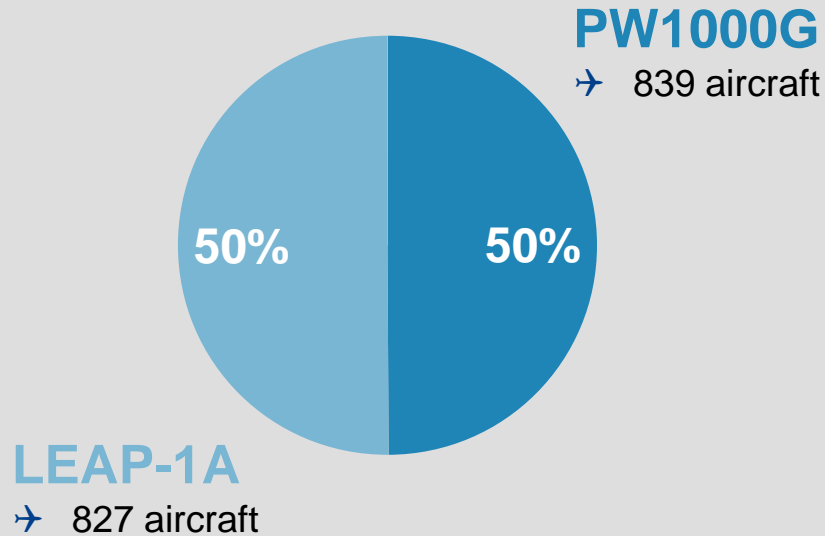
\* As of February 28, 2014



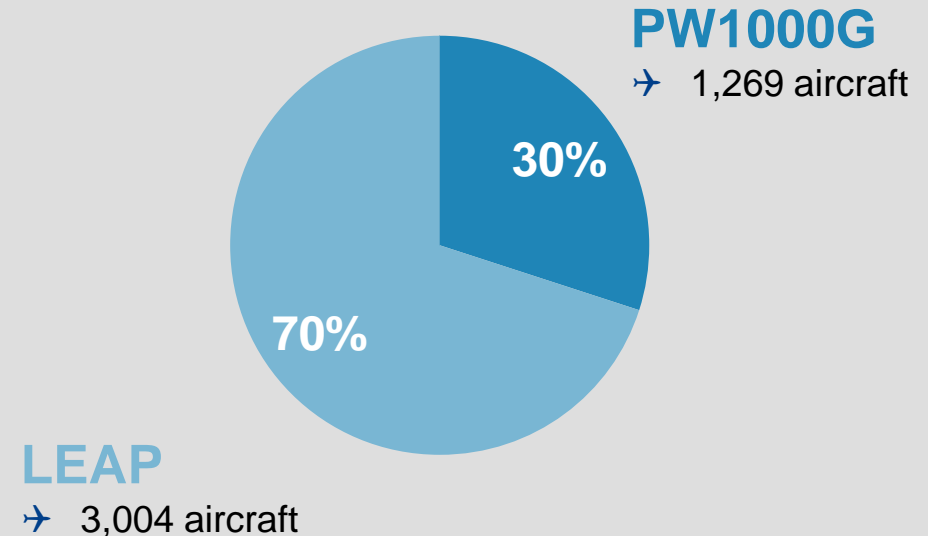
# LEAP WIN RATE (ORDERS & COMMITMENTS\*)



## → A320neo family



## → All applications



\* As of February 28, 2014

**/2/**

# 3D RTM COMPOSITE PARTS ON LEAP ENGINE

by Jean-Jacques Orsini, VP Composites Parts, Snecma

# CARBON COMPOSITE MATERIALS IN THE FAN



**CFM56-7**

28 klbs thrust  
61" (1,54 m) dia  
**24 Ti blades**  
118 kg

90's

Safran has 50% share  
in the manufacturing  
of the 123" (3,1 m) dia  
**GE90** and the 111" (2,8 m)  
**GENx 2D laminate carbon  
composite blades**



00's



**LEAP-1B**

27 klbs thrust  
69" (1,75 m) dia  
**18 3D woven composite blades**  
79 kg

10's

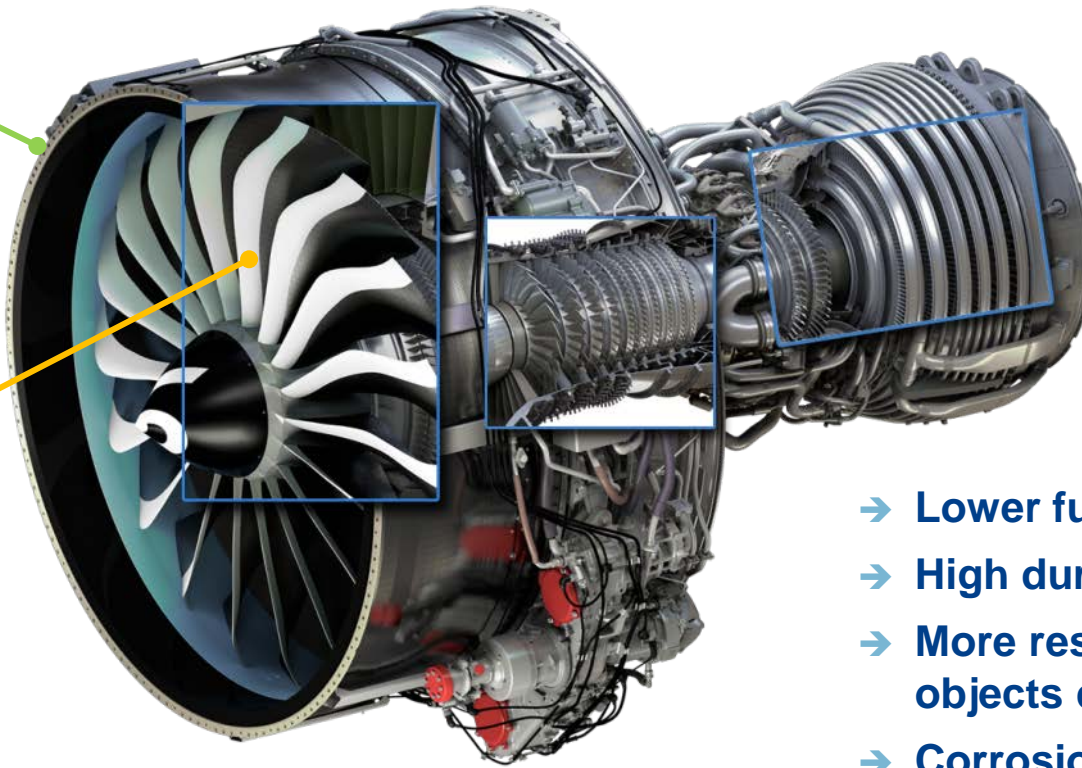
Lower weight and lower fuel burn

# LEAP: 3D WOVEN CARBON FIBER COMPOSITE FAN BLADES AND FAN CASE

Fan Case



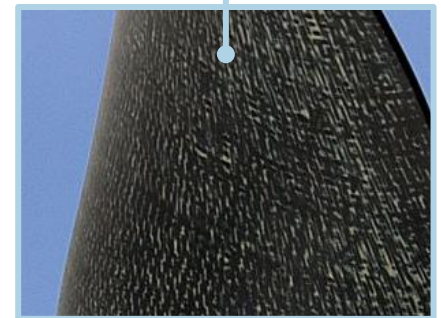
Fan Blade



- Lower fuel burn
- High durability
- More resistant to foreign objects damage
- Corrosion-resistant and lubricant-free
- Maintenance-free

# THE 3D WOVEN CARBON FIBER TECHNOLOGY

- A carbon fiber material structure (preform) **is woven in 3D using a Jacquard loom**
- A **high tenacity resin** is injected into the perform using the **RTM process**
- **The interlock 3D structure** brings higher damage tolerance than the conventional 2D plies because it does not delaminate
- The weaving process is **automated, thus repeatable and cost effective**; it reduces the need for NDT (Non-Destructive Testing)
- The 3D woven RTM process facilitates the realization of **3D loaded complex shapes**
- A **titanium leading edge** is bonded to the composite for foreign object damage protection and to prevent erosion



# SAFRAN'S STRONG PARTNERSHIP WITH ALBANY

- Albany is an unrivaled **expert in weaving of composite parts** for the aviation industry
- **Albany signed an exclusive agreement** with Safran to provide preform weaving for propulsion applications
- Industrial and commercial agreements signed for **the lifetime of the LEAP program**
- **In November 2013**, the two companies jointly established a **Joint-Venture (Albany Safran Composites)** for **LEAP composites parts manufacturing**



# TWO NEW MANUFACTURING PLANTS FOR THE LEAP COMPOSITE PARTS



## → In Rochester, New Hampshire, U.S.A

- Open in June 2013
- Close to Albany and its R&D center



## → In Commercy, Meuse, France

- Open in April 2014
- Close to the LEAP design team (Villaroche) and the new Safran Composites R&D Center (Itteville)

## → The two “Safran Aerospace Composite” plants are:

- Comparable size: approx. 300,000 square feet (28,000 m<sup>2</sup>)
- 400 to 500 employees at rate
- Set to manufacture all LEAP versions parts for risk mitigation

**A well-balanced industrial set-up supported by strong R&D centers**



**/3/**

# ALBANY INTERNATIONAL EXPERIENCE

by Joseph G. Morone, President & CEO, Albany International Corp.

■

# 14 YEARS OF JOINT EFFORT

**ALBANY**  
INTERNATIONAL



→ 20 years of R&D in woven structures

14 Years  
Of Joint Effort



→ 50 years of R&D and experience in  
advanced textiles & materials  
processing





**Albany Machine  
Clothing**

NYSE: AIN

**\$757M** 2013 revenue

**\$1.2B** enterprise value

**2** businesses

**11** countries

**20** plants

**4,100** employees



**Albany Engineered  
Composites**

# TWO BUSINESSES... ONE CORE

**ALBANY**  
INTERNATIONAL



# CONVENTIONAL LAMINATED COMPOSITES

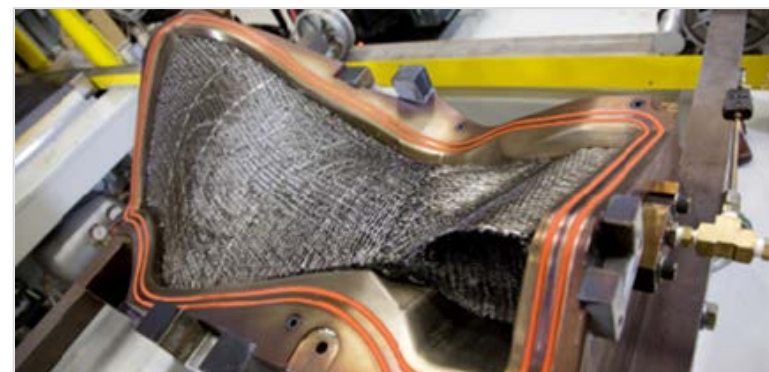
- Sheets of fiber pre-impregnated with resin (“prepreg”) cut on machine into “plies”
- Plies are individually layered onto a tool (“lay-up”)
- “Lay-up” is vacuum-bagged to tool and put into autoclave to cure





# 3D WOVEN RTM COMPOSITES

- Thousands of individually controlled fibers
- Woven in three dimensions into a near net shape “preform”
- Which is trimmed and formed
- And into which resin is injected and then cured in a net-shaped tool



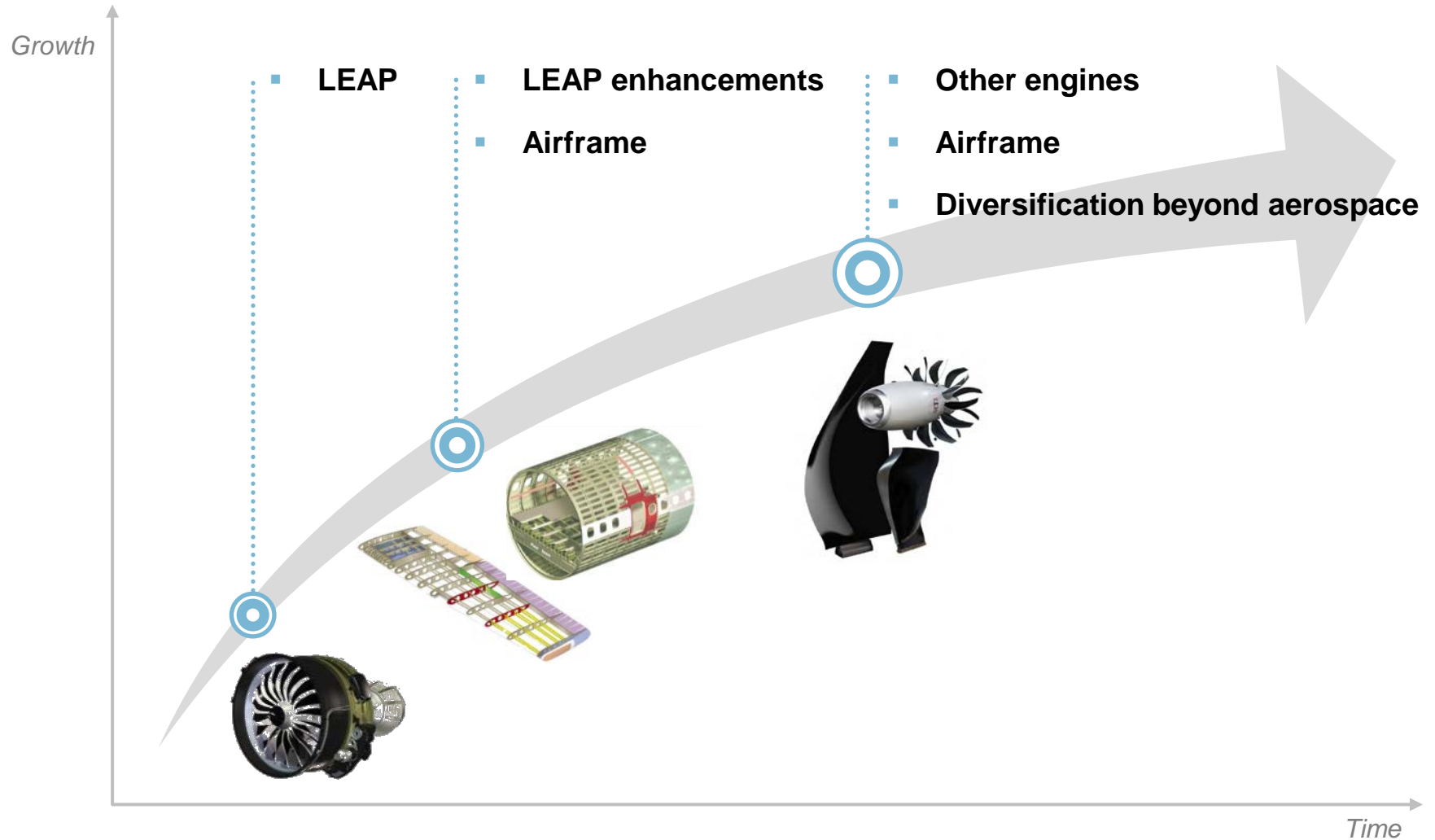


# 3D RTM: A UNIQUE MANUFACTURING CAPABILITY . . .



- . . . that draws on 50 years of experience in advanced textiles
- . . . and a decade of R&D and investment targeted at aerospace applications

# ... RESULTING IN PROPRIETARY TECHNOLOGY WITH BROAD APPLICABILITY



**/4/**

# SUPPORTING THE LEAP RAMP-UP

by Michael Rigalle and Olivier Balmat,  
VP and GM, SAC Rochester (USA) and SAC Commercy (France)



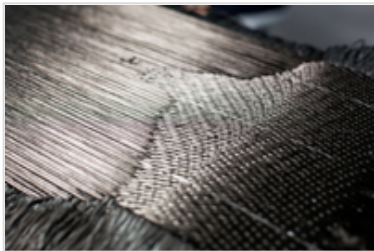
# SAC ROCHESTER AND COMMERCY PLANTS

- Size: about 300,000 sq. ft. each, 90% of manufacturing space
- Possibility to expand 90,000 sq. ft

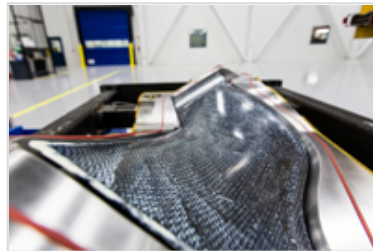
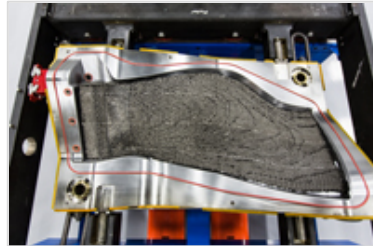


# ALBANY INDUSTRIAL PROCESSES

## Weaving



## Injection



## Inspection



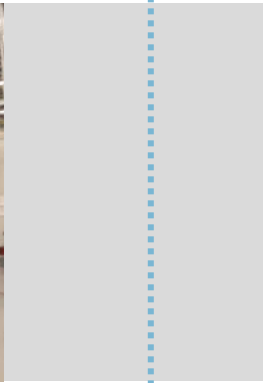


# SAFRAN INDUSTRIAL PROCESSES

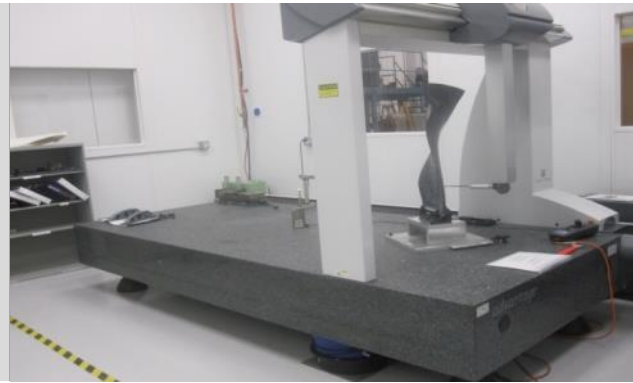
## Machining



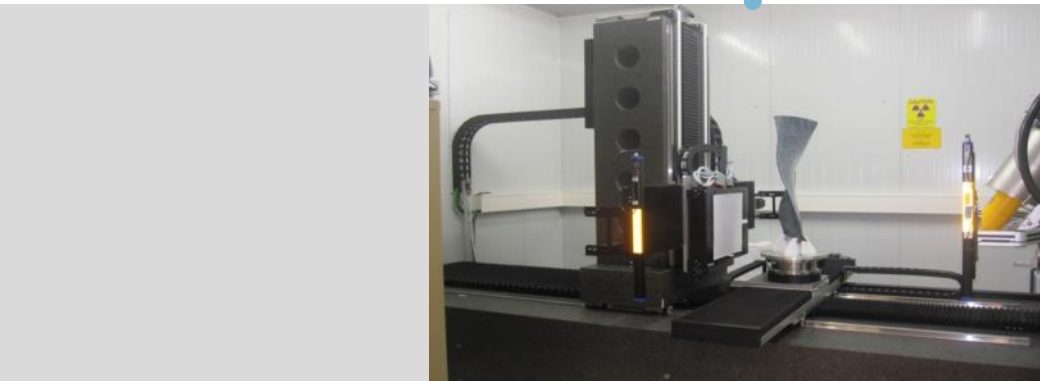
## Tomography



## CMM\*



## Bonding

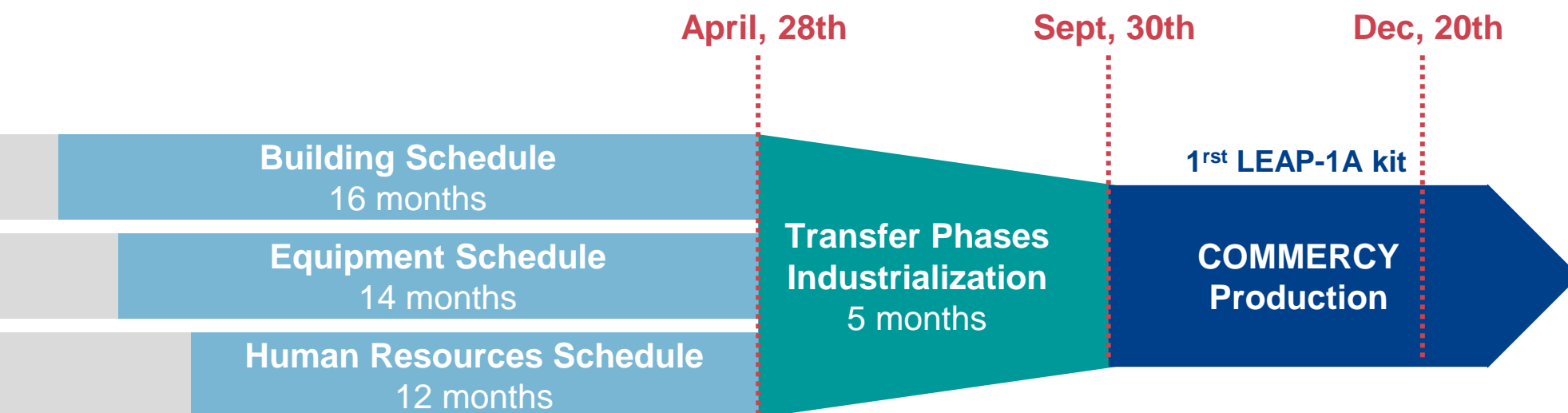


\* CMM: Coordinate Measuring Machine



# 2014 IN COMMERCE

→ Align and converge 3 ambitious schedules to produce the first LEAP-1A kit

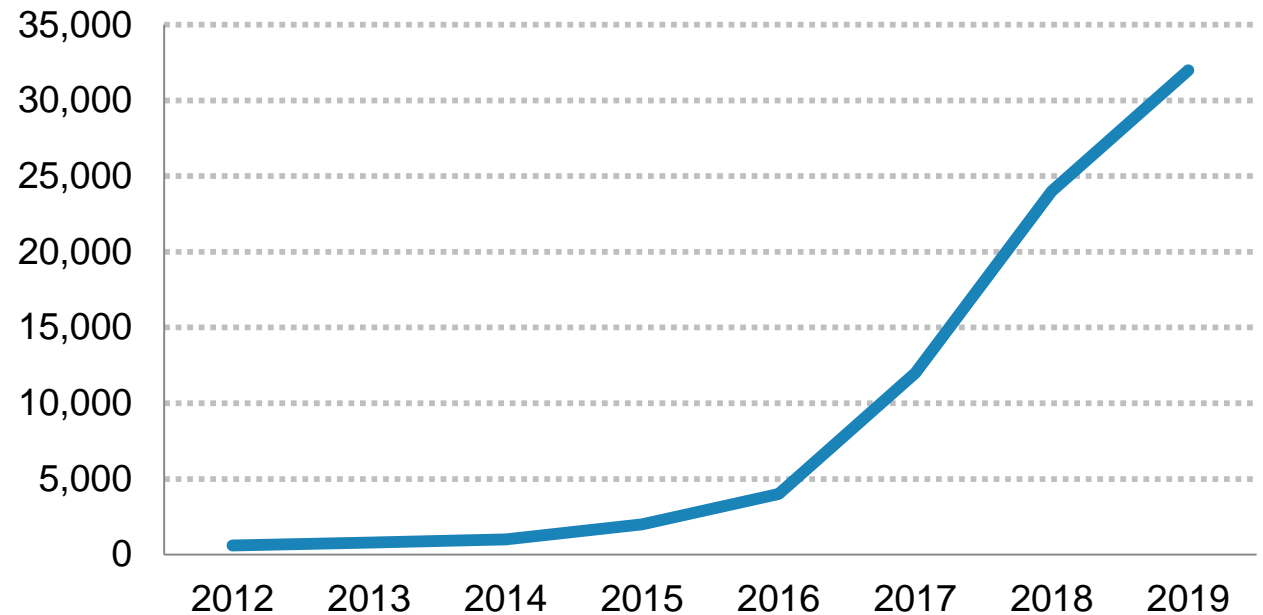


*(Rochester plant already in production)*

# PRODUCTION RAMP-UP

- **LEAP-1A FETT\* parts delivered on time**
- **634 blades produced in 2013**
- **1,400 blades and 97 cases in 2014 plan**
- **Includes maturation parts for process characterization and optimization**
- **Introduction of production runs to simulate increased rate**

Fan blade production per year



*\* First Engine To Test.*

# EQUIPMENT CAPACITY & WORKFORCE ANTICIPATED



- The equipments will be purchased and installed in both plants to support the ramp-up with some margin
- Maximum equipments commonality between the two plants for maximized flexibility & quality
- Hiring plan in line with production plan
- Starting 2014, majority of hired direct workforce will come from training centers in Rochester and Commery

# STRONG SUPPORT FROM NATIONAL AND LOCAL AUTHORITIES

## → Rochester infrastructures

- Bridge and road construction to access to the site
- Site preparation: clearing and grubbing, rock excavation, drainage and sewer structure

## → Recruitment & Training

- Rochester training center infrastructure, equipment, instructors, operational cost, paid by federal and state funds
- Reimbursement of all other training (leadership...) through various grants
- 200 students/year will graduate in the next 5 years



## → Commercy infrastructures

- Roundabout and road construction to access to the site
- Site preparation: clearing and grubbing, rock excavation, drainage and sewer structure



## → Recruitment & Training

- Dedicated “Pole Emploi” team to support the recruitment ramp-up
- Training center created, managed and supported by Regional Council and the Henri Vogt High School
- Most people recruited were unemployed (11% unemployment in Lorraine)



# SAC ROCHESTER PLANT INAUGURATION TODAY



# VECTRONIX / OPTICS 1

by Dane Hileman, President & CEO of Vectronix USA



# PORTABLE SOLUTIONS FOR DEFENSE AND SECURITY



# VISION



We set the standard as the worldwide, sustainable reference for observation and location.

# WHO WE ARE



Vectronix is a leader in the development of integrated handheld, module, and precision systems for observation, detection, geo-positioning, and targeting solutions.



# VECTRONIX TODAY



**Vectronix AG**  
**Switzerland**

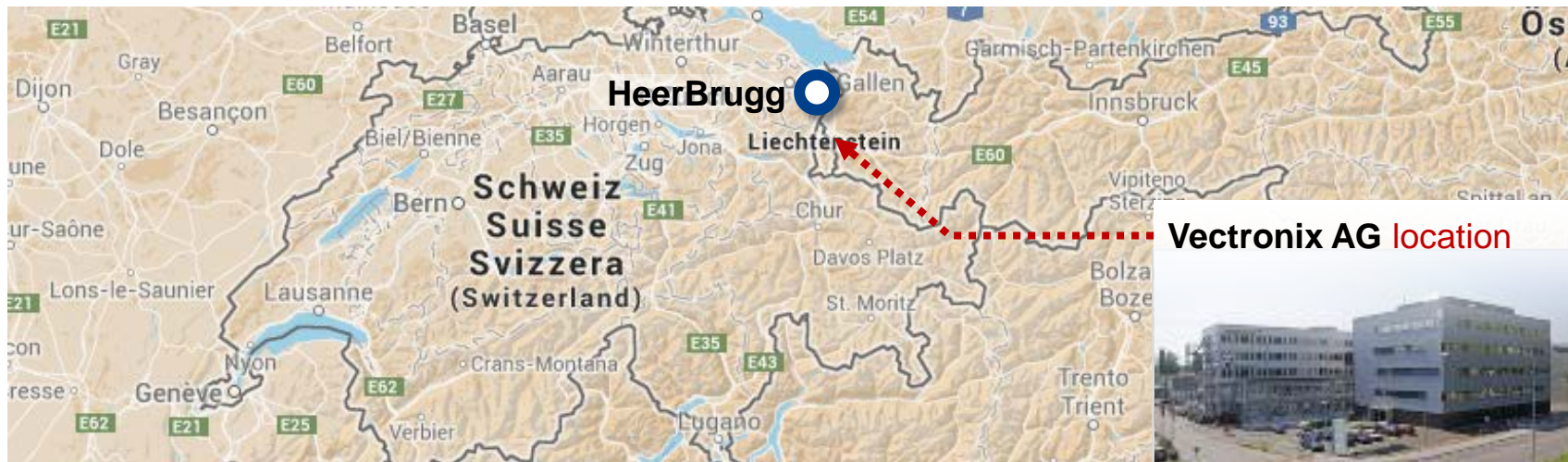
**Vectronix Inc.**  
**USA**

100 % Subsidiary

**Optics 1 Inc.**  
**USA**

100 % Subsidiary

# OUR ROOTS



**WILD  
HEERBRUGG**



 **WILD LEITZ**



*Leica*



**vectronix** 





# IN THE STATES



**Leesburg Virginia**  
Sales office opened 1984



**Westlake Village  
California**

**Optics 1** – Founded 1987 Vectronix acquired 2010



**Manchester,  
New Hampshire**



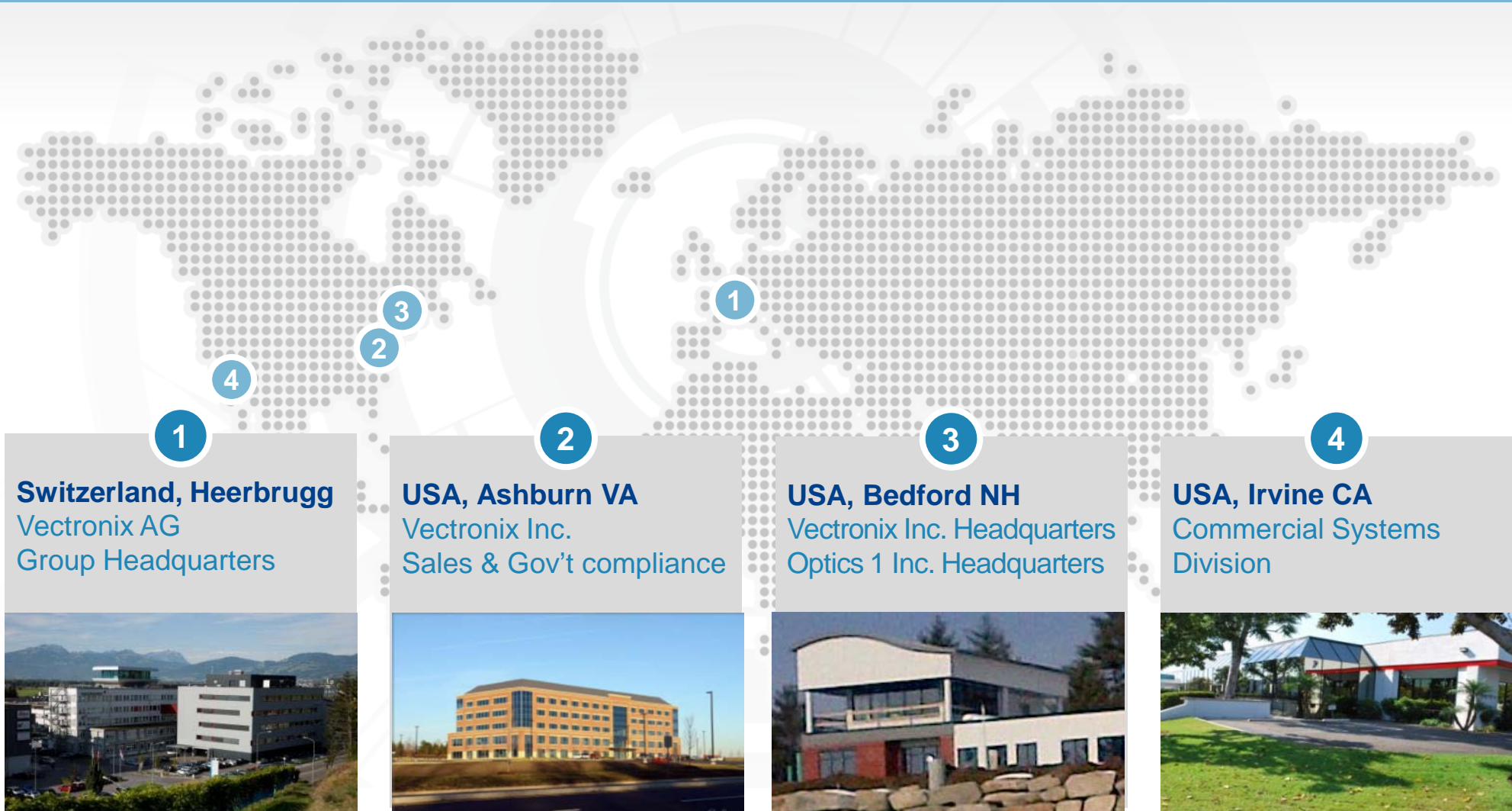
**Newington, NH**  
Mfg. facility opened 2009



**Vec. Inc. Thermal Irvine California** Purchased assets 2011



# WORLDWIDE PRESENCE VECTRONIX GROUP - TODAY



**1**

**Switzerland, Heerbrugg**  
Vectronix AG  
Group Headquarters



**2**

**USA, Ashburn VA**  
Vectronix Inc.  
Sales & Gov't compliance




**3**

**USA, Bedford NH**  
Vectronix Inc. Headquarters  
Optics 1 Inc. Headquarters



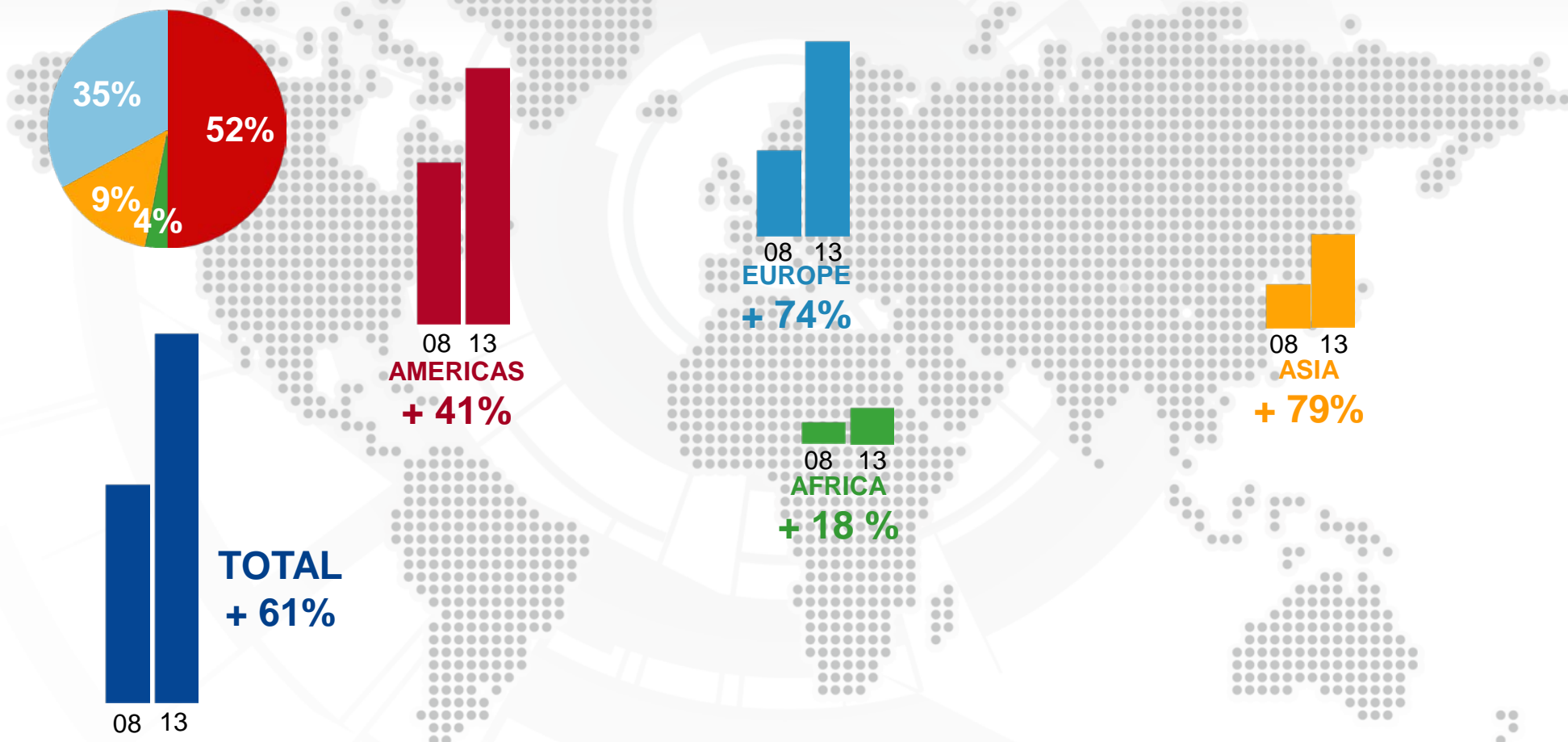
**4**

**USA, Irvine CA**  
Commercial Systems  
Division



# 6-YEAR SALES PERFORMANCE

Share of sales 2013  
by region



# VECTRONIX PROGRAM OVERVIEW

- **25 years of supplying multifunction, integrated handheld observation & targeting devices to the U.S. Government**
- **Delivered over 25,000 units**
- **Fielded product – March 31, 2014 demonstrations include:**
  - Vector
  - Long Range Thermal Video System (LRTV)
  - Hand Held Precision Targeting Device (HHPTD)
    - with STERNA true north finder
  - Clip-On Thermal Imager (COTI)

# VECTOR

- **Binocular optics**
- **Eye safe laser rangefinder**
- **Embedded Vectronix Digital Magnetic Compass (DMC)**
- **Deployed over 14,000 units to U.S. Government including**



- U.S. Army
- U.S. Marine Corps
- U.S. Navy
- U.S. Special Operations Command



# LRTV – LONG RANGE THERMAL VIDEO

## → Customer:

- JIEDDO / SPAWAR (The Space and Naval Warfare Systems Command), USA
- >1,500 total delivered

## → Application:

- Long Range Thermal detection
- Counter - Improvised Explosive Device (C-IED)
- Very favorable feedback from users
- Casualty reduction > 19%





# HAND HELD PRECISION TARGETING DEVICE (HHPTD)

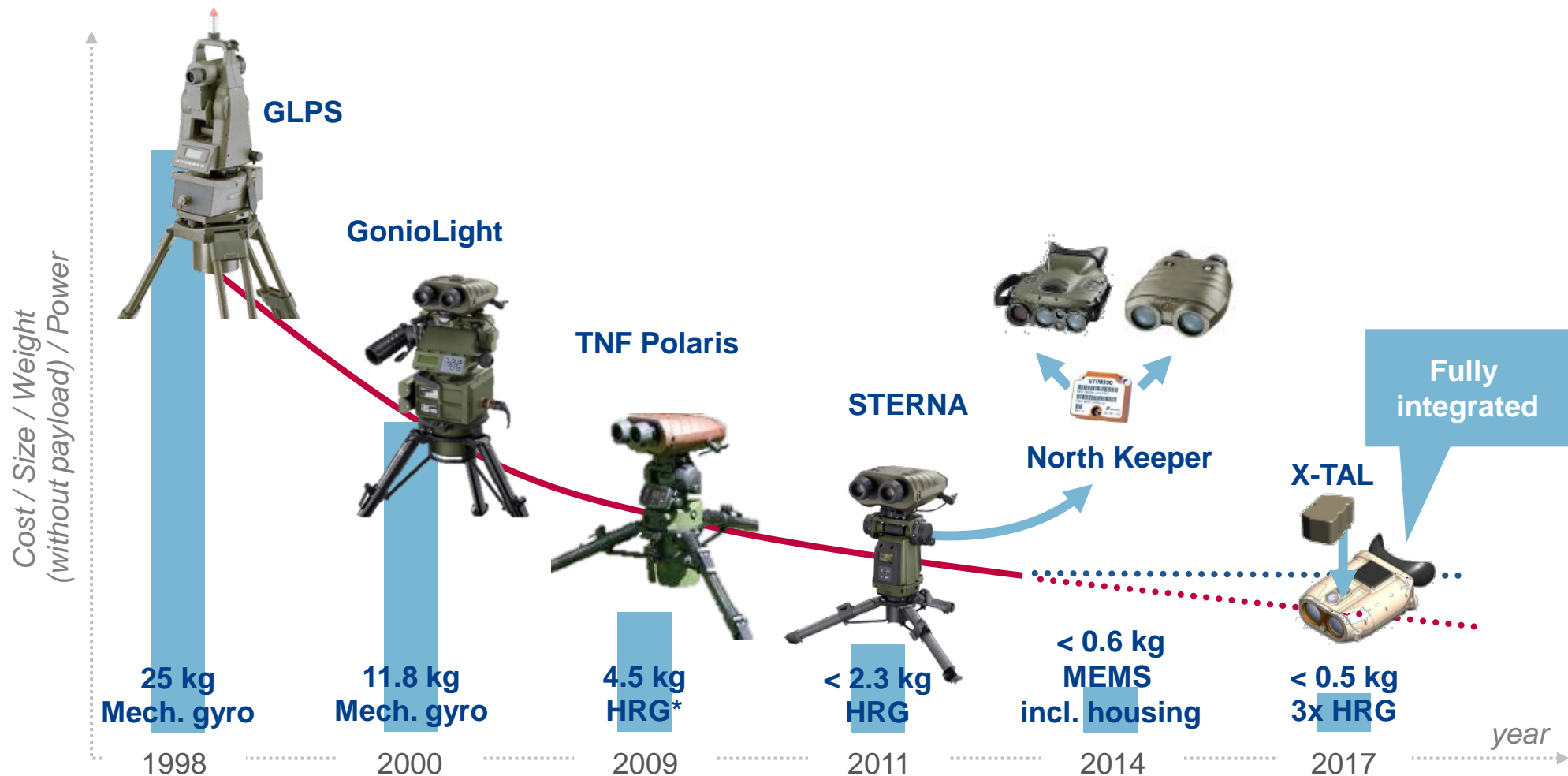
## → Program Overview:

- U.S. Army Rapid Equipping Force (REF) program
- Capable of precision targeting without mensuration
- New technologies added for better precision
  - Sagem new Gyro technology included
  - Celestial module

The Vectronix HHPTD is a Lightweight multi-spectral observation and targeting device capable of providing 24/7 precision target coordinates



# TRUE NORTH FINDERS/KEEPERS



\*Hemispheric Resonator Gyroscope HRG

# COTI (CLIP ON THERMAL IMAGER)

## → Customers:

- USASOC / Crane
- U.S. ARMY Rapid Equipping Force (REF)
- Department of Homeland Security (DHS)
- 70 countries approved for export

## → Application:

- Cost effective way to enhance existing I<sup>2</sup> devices with thermal capability



**I<sup>2</sup> Night Vision Only**



**I<sup>2</sup> Night Vision with COTI**



# FROM SCIENCE IDEAS TO NEW JET-ENGINE MATERIALS

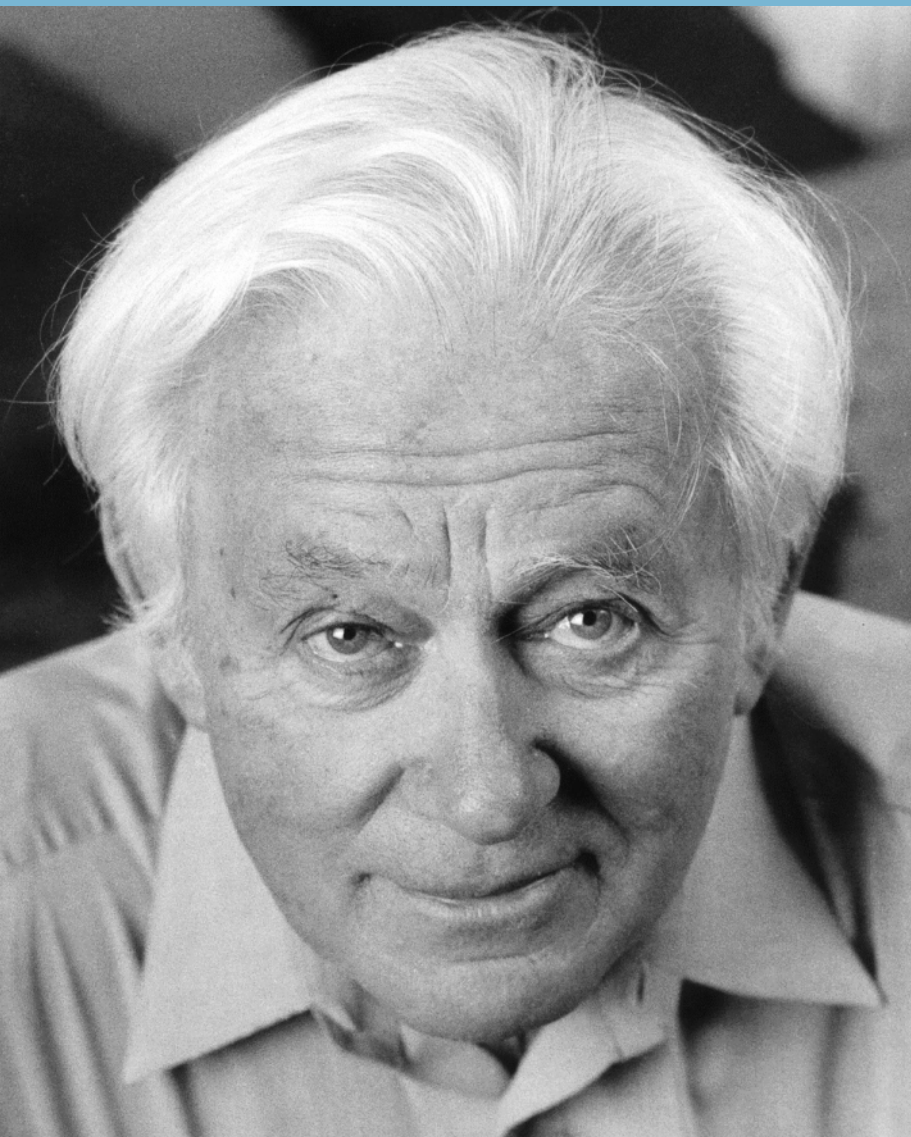
by Daniel Eylon,  
Director of Materials Engineering University of Dayton,  
Member of Safran Scientific Board

# JET-ENGINES: HIGHEST CHALLENGE

- Jet-engine history is **80 years of inventing** new materials
- Every **new generation** needs performance beyond earlier capabilities, and must have **new materials** ready in hand
- **Only in movies** new ideas are born on Monday, tested on Wednesday and fly on Friday
- In reality, some new materials may take **up to 30 year of development/maturation** for the needed reliability levels
- The **3-D composite blades**, which were introduced today, are just one story of many in the LEAP engine
- The biggest challenge is **predicting many years ahead of time** the future challenges, and acting upon them
- For that purpose Safran created the **Scientific Board**



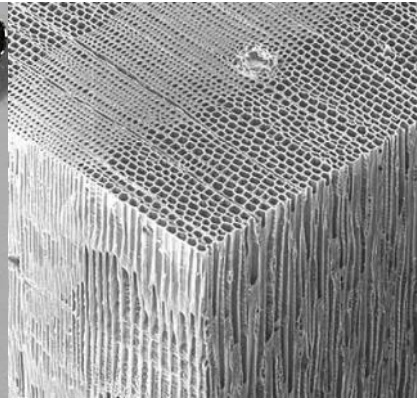
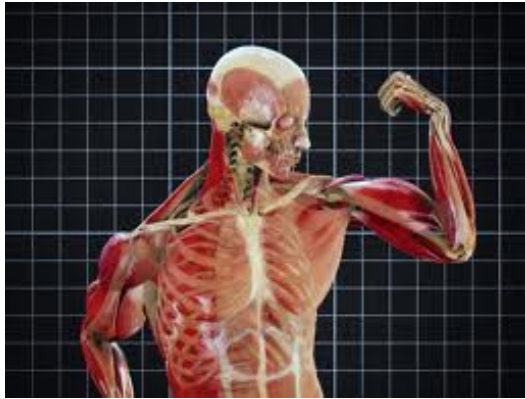
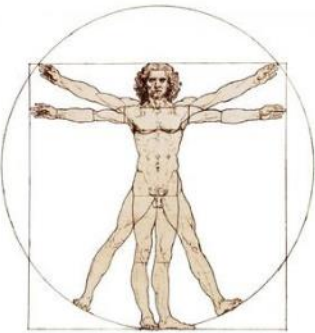
# SAFRAN SCIENTIFIC BOARD



- Formed in April 2009 under the leadership of **George Charpak** – the French 1992 Nobel laureate in physics
- Members are from very **diversified areas of science** with capabilities of predicting future Safran needs in areas such as electronics, controls, data processing, image recognition, acoustics, optics, materials and surfaces
- The board holds **review meetings** 3 times a year at different Safran divisions in addition to topic reviews done by only few board members, and issue reports
- In this capacity the Board acts as **a guard** to make sure that **critical technologies** are developed early enough to affect new generations of **future products**

# THE INSPIRATION FOR COMPOSITES

- Some say that science and engineering are just an attempt to study and copy nature
- No systems are as efficient as muscles or butterfly wings
- The inspiration for composites comes from wood

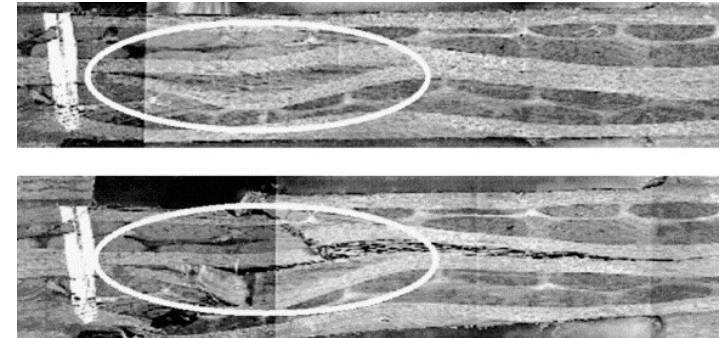
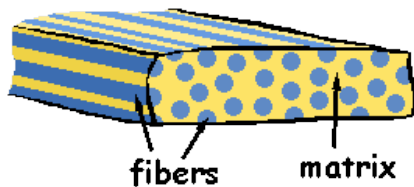


- Wood is one of nature's best structures
- When cross-plyed is strong in 2 directions
- Still it is very weak between the plies

# THE PROBLEM WITH WOOD

- Wood is also stiff **only** in the fibers direction
- It can easily vibrate and separate in the direction across the fibers and cannot be used in that orientation, therefore trees will split in a storm

a close-up of what  
a composite might  
look like

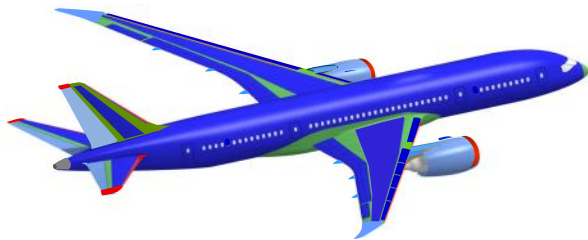


- **Layered composites** also split along the short direction which can be fatal in fan-blades
- Another solution is needed
- We need to improve upon nature



# THE PROBLEM WITH COMPOSITES

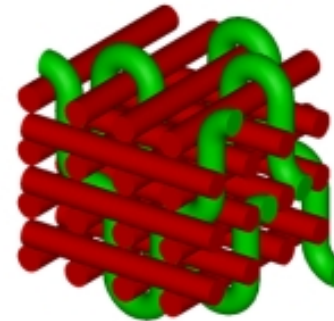
- We need to add strength to the composite layers for applications that need strength in the short direction
- The airframe of airplane does not need short-strength
- The body of a hybrid car does not need short-strength



- The fan-blades on jet engine **need** short-strength to survive **bird-strike impact**
- Impact ► flutter ► delamination ► fracture

# 1745 FRENCH SCIENCE HELPED HERE

- **Jacquard, textile inventor, developed first industrial loom allowing 3-D weaving of multiple layers by using a smart machine controlled by punch-cards: practically the very first analog computer-controlled industrial machine**

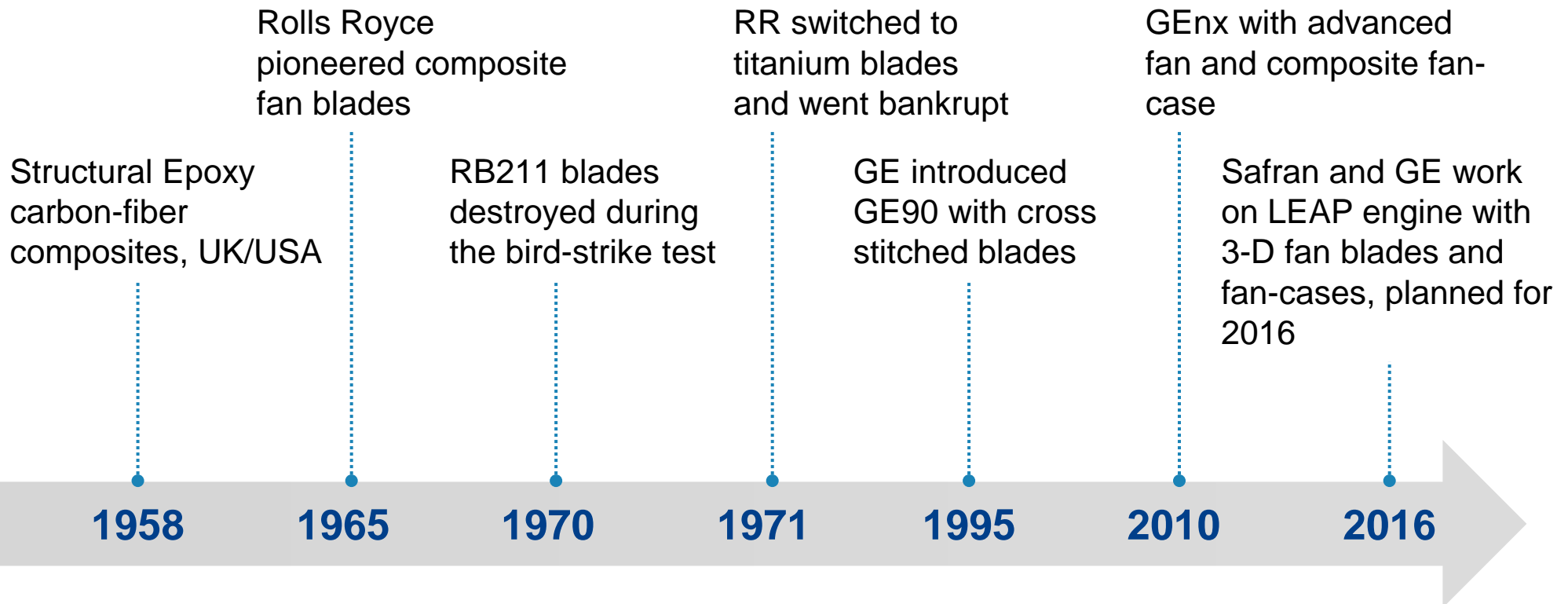


Dual-directional 3D-weaving enables direct production of countless profiled 3D fabrics in shell, tubular and solid types

- **3-D composite fiber-weaving created structure which for first time was strong and stiff also in the short direction**
- **This way, composites went one step ahead of nature**
- **Composite blades will not split like wood, upon impact**



# COMPOSITE-BLADE: A SHORT HISTORY



# BIGGEST METALS COMPETITOR - COMPOSITES

ELEMENT	Lithium Li	Beryllium Be	Magnesium Mg	Aluminum Al	Titanium Ti	Carbon fiber Composites (60% fiber)
Density, gr/cc	0.5	1.9	1.7	2.7	4.5	1.6
Modulus, GPa	12	295	45	70	120	170*
Specific Modulus	23	160	26	26	26	106
Elect. Resist. At 20C (μohm/cm)	8.5	4.0	4.5	2.7	42.0	621** 1.85***
Thermal Conduct. 20-100C (W m <sup>-1</sup> K <sup>-1</sup> )	82	194	156	238	26	1
C. of Thermal Expans. 0-100C (10 <sup>-6</sup> K <sup>-1</sup> )	(na)	12.0	26.0	23.5	8.9	0.5
Melting Temp. (C)	181	1287	650	650	1678	203****

\* 0° fiber orientation \*\* perpendicular to fiber direction  
\*\*\* parallel to fiber direction \*\*\*\* Tg

# LEAP ENGINE, A LEAP IN MATERIALS

## → LEAP in many ways, a revolution in jet engine materials:

- Fan blades
- Casings
- Titanium-aluminide turbine blades
- Ceramic-composites
- 3-D printed parts



## → However, this search for better materials never ends. We are now in search and development for next generation:

- Better composite fibers and polymers
- Ceramic composites for turbine blades
- 3-D printed complex alloys of compositions impossible to mix



# IN SUMMARY

- **3-D composite blades** are the result of 20 years effort
- The innovation progress is already in place for the engine beyond the **LEAP**, with the help of good science
- Advanced materials are more complex and less forgiving



- You have to start early so that you are ready when needed

# BOEING MARKET OUTLOOK

by Wendy Sowers, Marketing, Boeing Commercial Airplanes



# 2013 AVIATION MARKET – A VERY GOOD YEAR



**More than 3 billion  
people traveled**



**Airlines profitable  
led by U.S.  
carriers**



**More than 3,800 new  
airplanes sold (gross  
orders)**



**A record 1,600  
new airplanes  
delivered**



## → Geographic balance

- China, Emerging Asia, Middle East, Africa



## → Business model balance

- Geographic expansion of Low Cost model



## → Replacement requirements

- Replacement of older fleet driven by historically high fuel prices



# PRODUCTION RATES ARE RISING



78| Safran USA Press Tour - Safran / Boeing - April 1, 2014 – Everett WA



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# NEAR-TERM OUTLOOK



World economy continues to strengthen



Pax traffic growth above long-term average



Cargo traffic still weak but improving



Airlines profitable



# WHY THE CURRENT MARKET OUTLOOK ?



→ Product strategy



→ Long-range business plan



→ Suppliers and airline customers



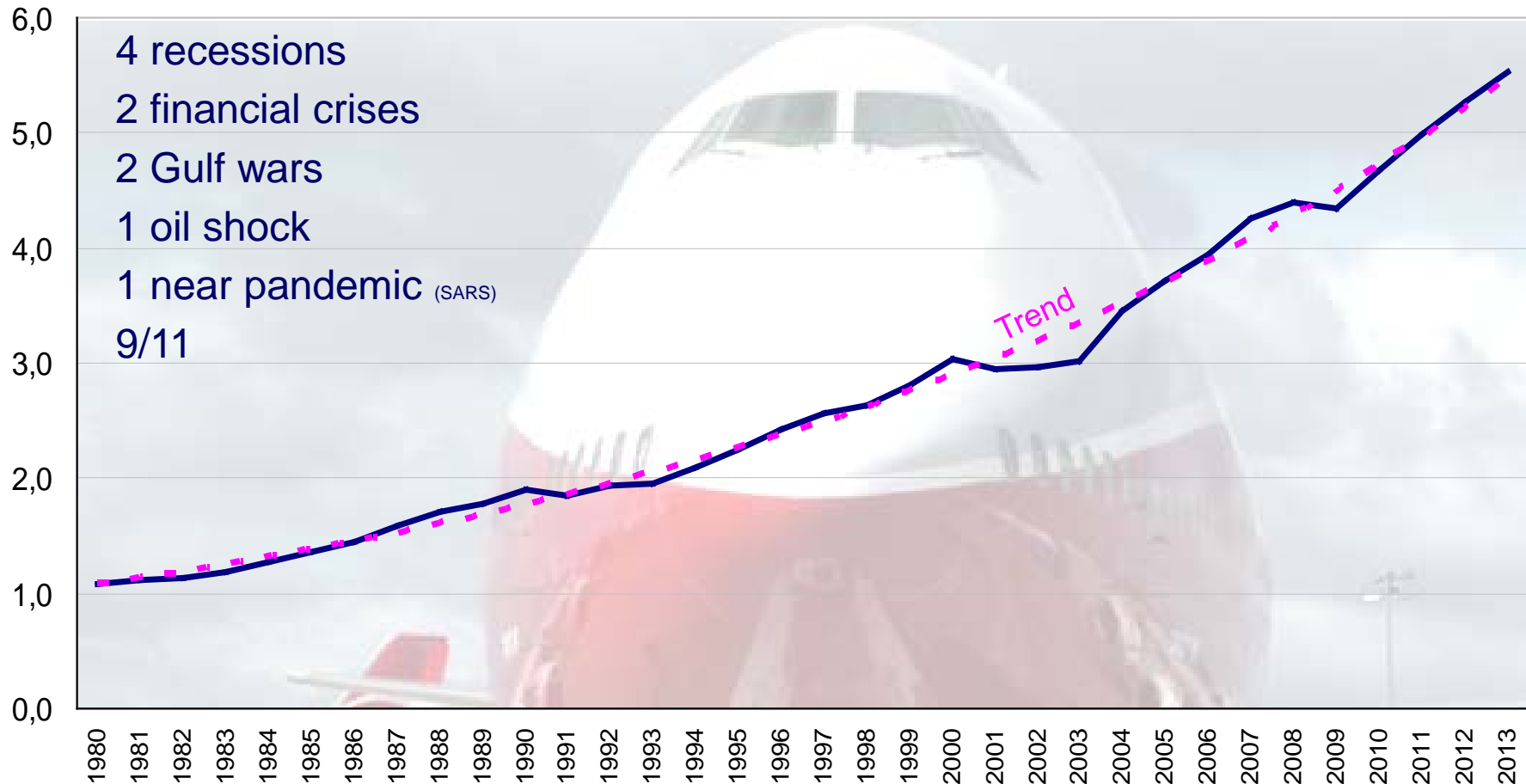
# MARKET FORECAST DRIVERS AND CONSIDERATIONS



# WORLD AIR TRAVEL HAS GROWN 5% PER YEAR SINCE 1980



→ RPKs = Revenue Passenger Kilometers (trillions)

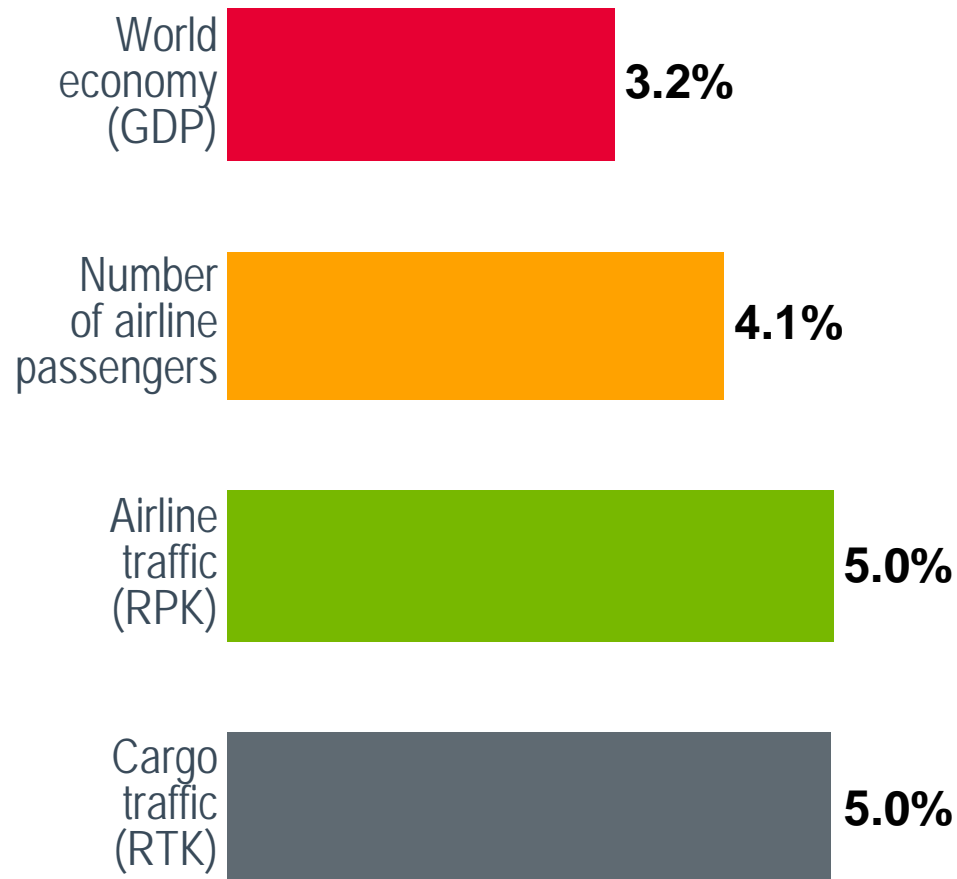


Source: ICAO scheduled traffic

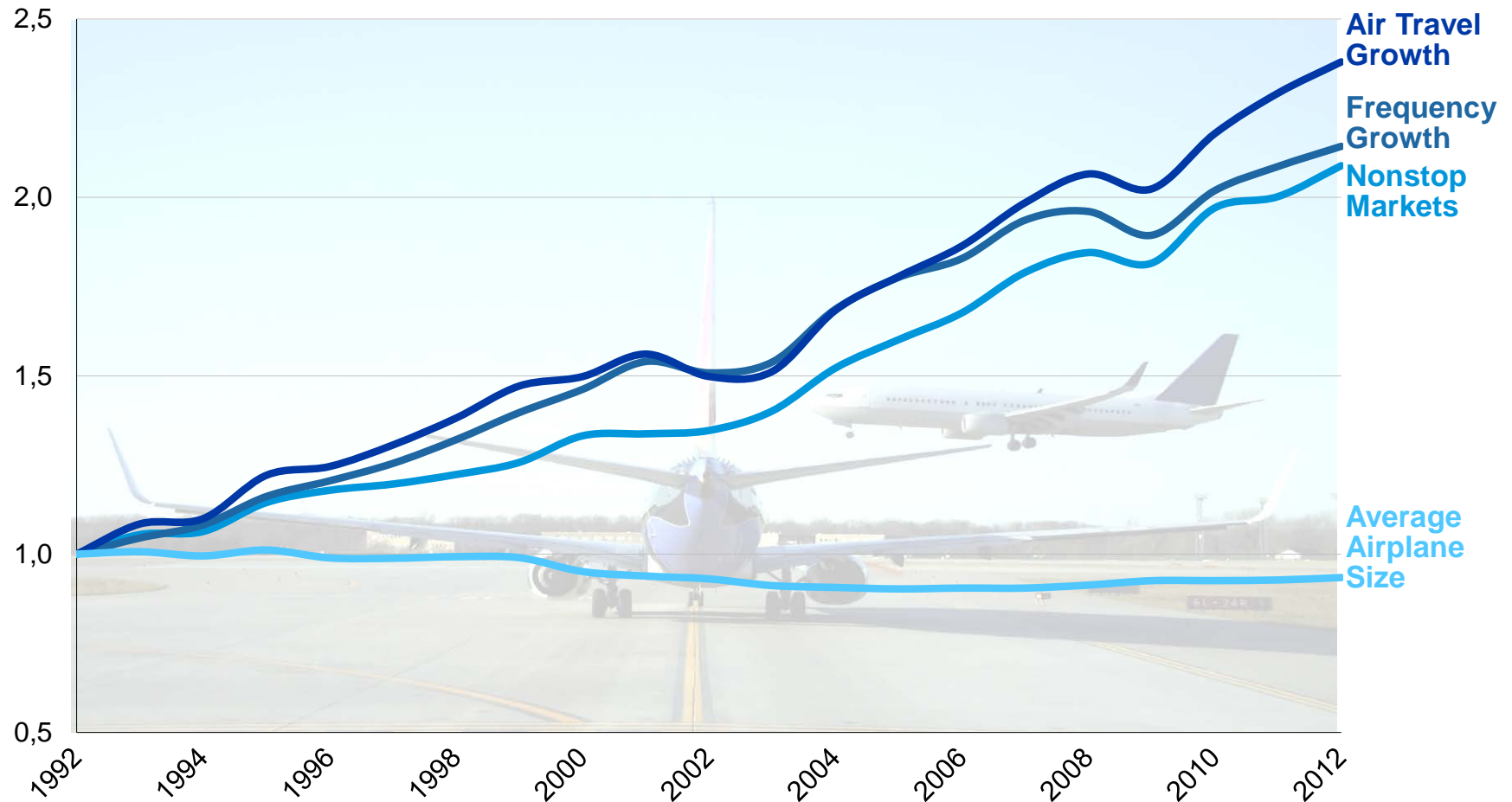
# 20-YEAR FORECAST: STRONG LONG-TERM GROWTH



→ 2012 to 2032



# AIR TRAVEL GROWTH HAS BEEN MET BY INCREASED FREQUENCIES AND NONSTOPS



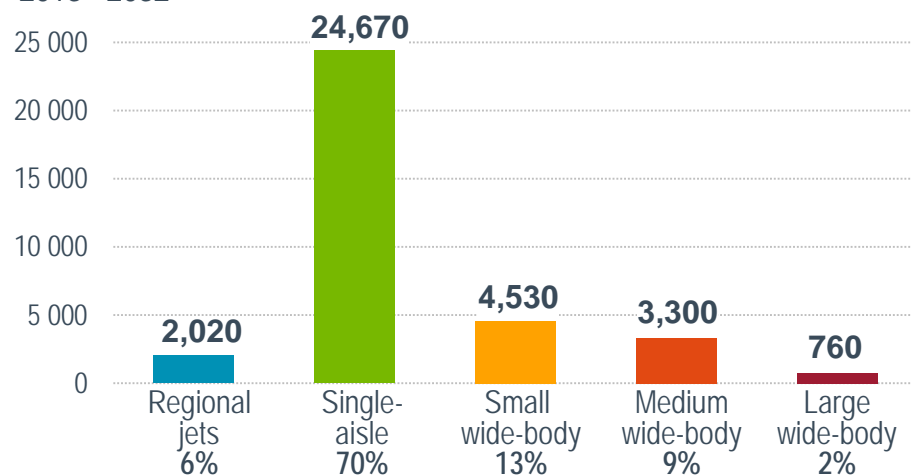
Source: August OAG  
Index 1992=1.00

# AIRLINES WILL NEED MORE THAN 35,000 NEW AIRPLANES VALUED AT \$4.8 TRILLION



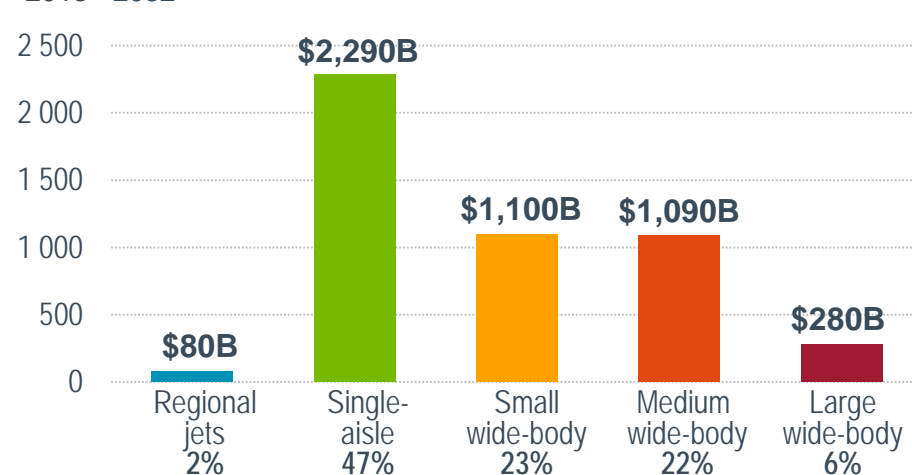
## Airplane deliveries: 35,280

2013 - 2032



## Market value: \$4.8T

2013 - 2032

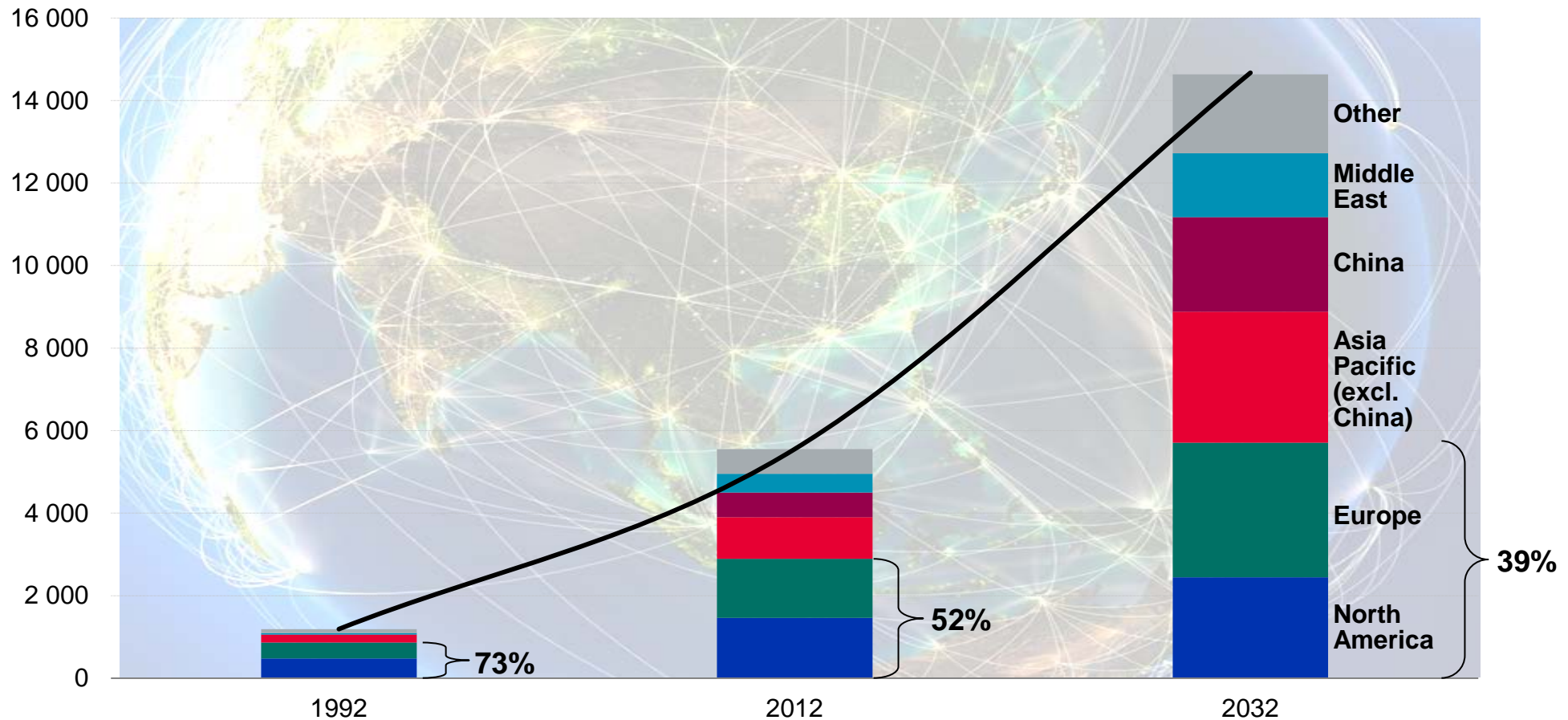




# AIR TRAVEL IS BECOMING MORE GEOGRAPHICALLY DIVERSE



## Air traffic, RPKs (billions)



Source: Boeing 2013 CMO

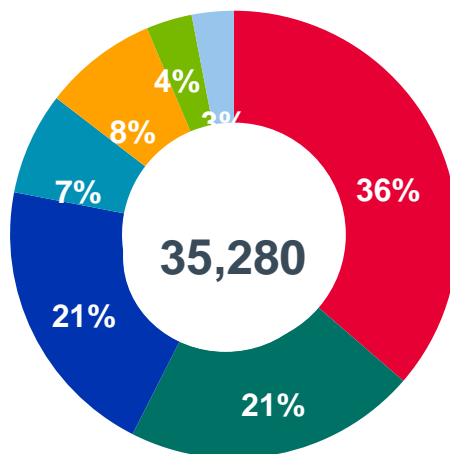
# MARKET FOR NEW AIRPLANES TO BECOME EVEN MORE GEOGRAPHICALLY BALANCED



## New airplane deliveries by region

2013–2032

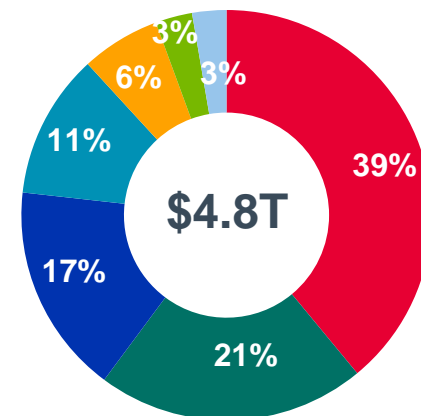
Region	Airplanes
Asia Pacific	12,820
Europe	7,460
North America	7,250
Middle East	2,610
Latin America	2,900
C.I.S.	1,170
Africa	1,070
World Total	35,280



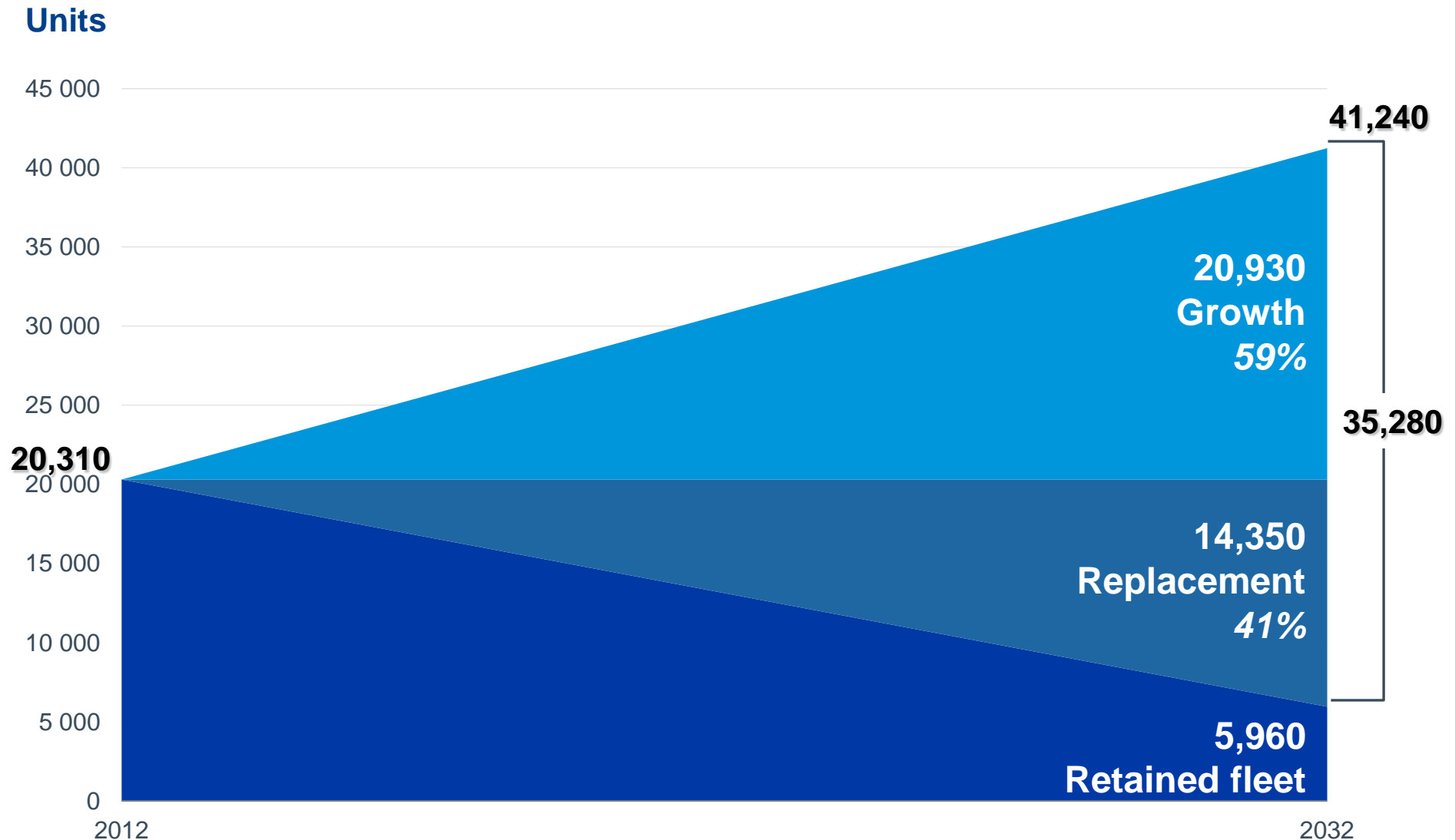
## Market value by region

2013–2032

Region	\$B
Asia Pacific	1,890
Europe	1,020
North America	810
Middle East	550
Latin America	300
C.I.S.	140
Africa	130
World Total	\$4,840B



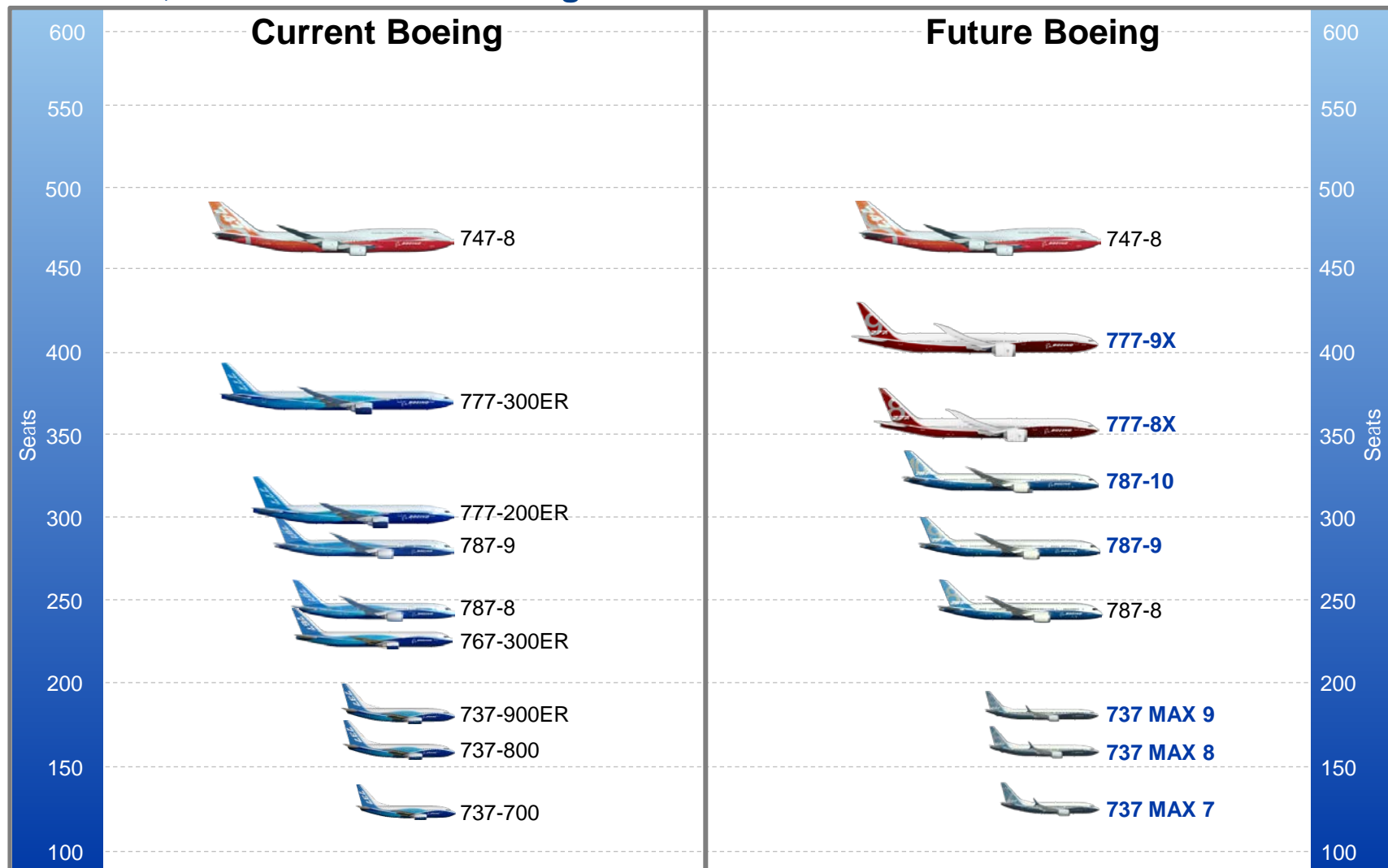
# LESS EFFICIENT AIRPLANES WILL BE REPLACED WITH NEWER GENERATION MODELS



# BOEING PRODUCT LINE-UP



→ Superior value, efficient market coverage



# SAFRAN / BOEING MORE THAN 35 YEARS OF PARTNERSHIP

by Jean-Michel Hillion, Safran Corporate Senior VP, Boeing Programs  
Kent Fisher, VP & GM for BCA Supplier Management, Boeing



## 1977

- First flight test of B707 powered by 4 CFM 56-2 (not launched after cancellation of 707-700 version)

## 1979

- Delta Air Lines, United Airlines & Flying Tigers to re-engine their old DC-8, with the CFM56, as well as US Air Force for its KC 135 R fleet

## 1981

- CFM selected to re engine Boeing 737-300, 400 et 500, so called Boeing 737 Classic (up to 20% fuel savings and 50% noise reduction)



« Team-7 » from Montereau

# HISTORY OF A PARTNERSHIP



## 1990

- GE associated with Snecma, IHI (Japan) and Avio (Italy) is selected to power the Boeing 777-200 & -300 with its GE90

## 1994

- CFM56-7B selected in exclusivity for the new generation of Boeing 737s, called Next-Generation Boeing 737

## 1995

- Labinal becomes sole supplier for the wiring electrical system for MD95 (Boeing 717).

## From 1997

- Messier Bugatti wins three competitions to supply carbon brakes: Boeing 767, versions –200 and –300, C-17 Globemaster III military transport aircraft and Boeing 777, version –300ER and –200LR.

## 2003

- Acquisition of Boeing electrical wiring manufacture activities, Corinth Inc. and opening of Labinal Corinth, Inc.



## 2004

- Messier-Bugatti-Dowty selected to supply the main and nose landing gear structure for the 787 / Labinal selected by Boeing for electrical wiring systems for the Boeing 787 program.

## 2011

- LEAP engine, successor of the CFM56 family, selected for the Boeing 737 MAX.



LEAP

## 2014

- Messier-Bugatti-Dowty selected to supply the Boeing 737 MAX in wheels and carbon brakes.



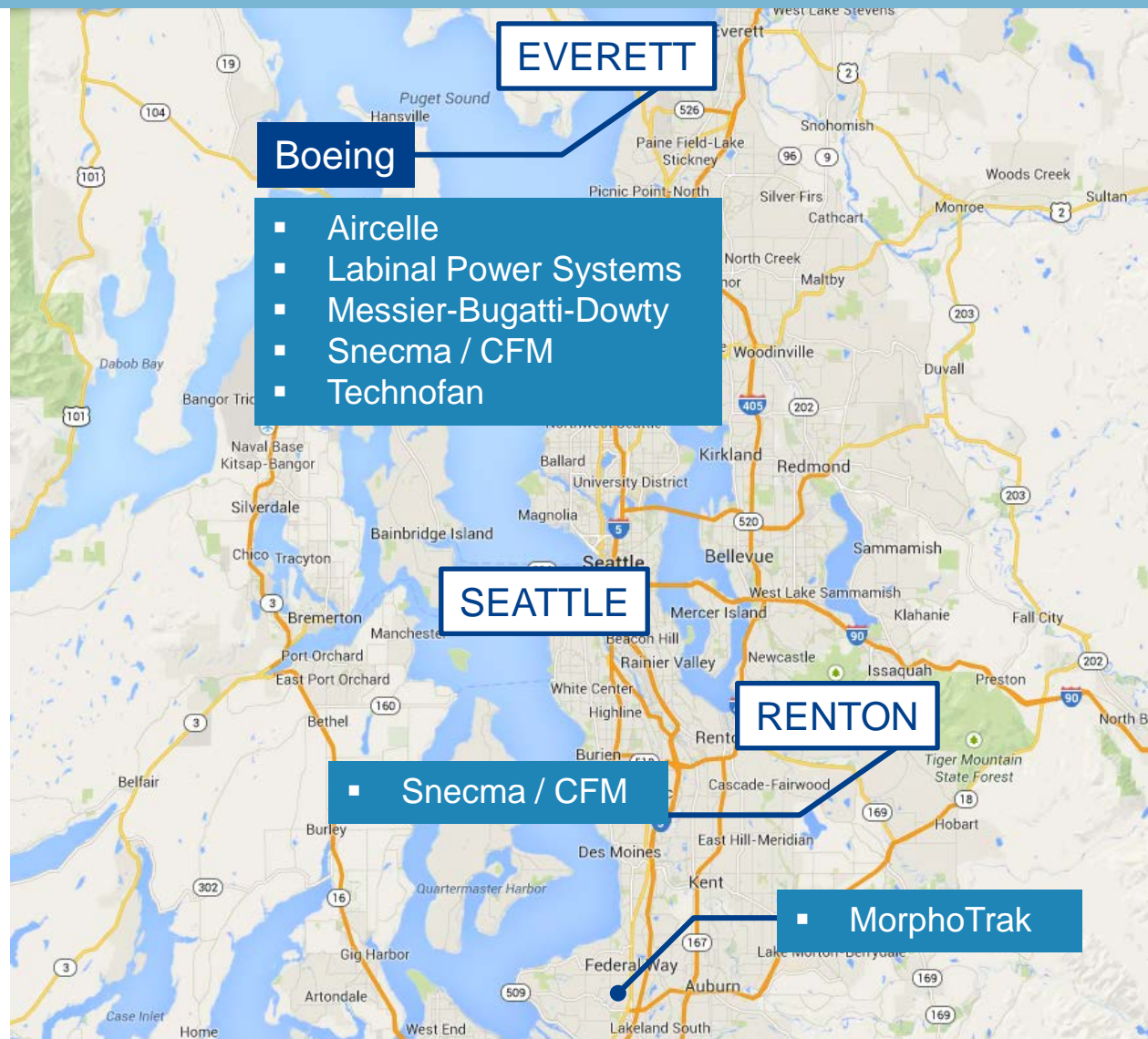
Brake for the Boeing 737 Next-Generation

# SAFRAN PRESENCE IN THE REGION

→ 320 employees

→ 6 companies :

- Aircelle – Everett
- Labinal Power Systems – Everett
- Messier-Bugatti-Dowty – Everett
- Snecma / CFM – Renton & Everett
- Technofan – Everett
- MorphoTrak – Federal Way





# SAFRAN AERONAUTICAL ACTIVITIES IN THE REGION

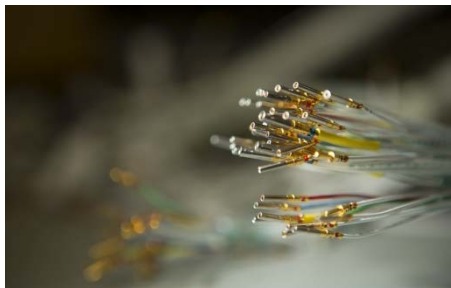


- LEAP engine development on 737 MAX: integration with aircraft, program management, flight test, sales...
- CFM 56-7 support activities for Boeing 737 assembly line, flight test and delivery center
- GE90, CF6 80, GEnx support activities for Everett assembly line, flight test and delivery center
- Boeing 737, 747, 767, 777, 787 assembly lines support
- Boeing 787-8/9 engineering activities wire bundles detailed design and installation design
- US sales support & customers interface
- Supply chain management
- Fan & ventilation systems : design, production and customer support

**Snecma - CFM**



**Labinal Power Systems**



**Aircelle**



**Technofan**

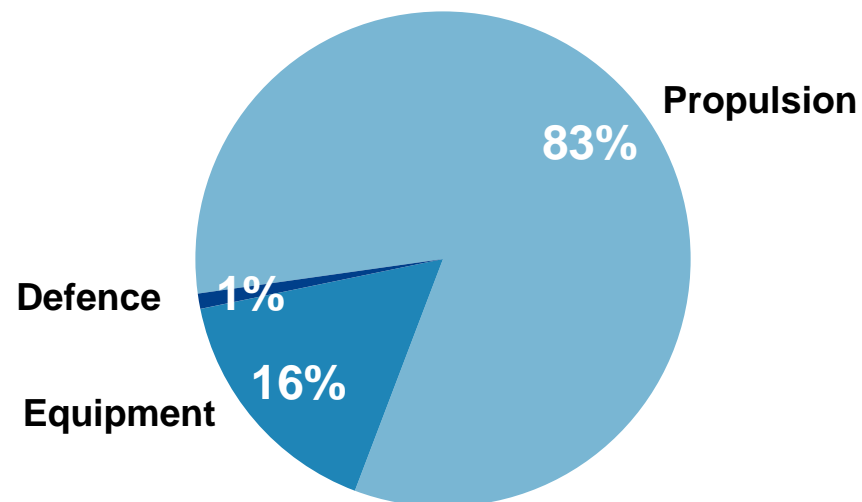




- 787 landing gear final assembly and integration of wheels & brakes (MBD or UTAS), control system computer, harnesses
- 787 -8/9 sustaining engineering
- Wheels & brakes support activities to assembly line, flight test & delivery center
- Local customer support
- LG systems support to assembly line
- US supply chain management



→ **Nearly 4 billion euros of revenue carried on Boeing programs\* in 2013 (OEM & services), up 20% compared to 2012 figures.**

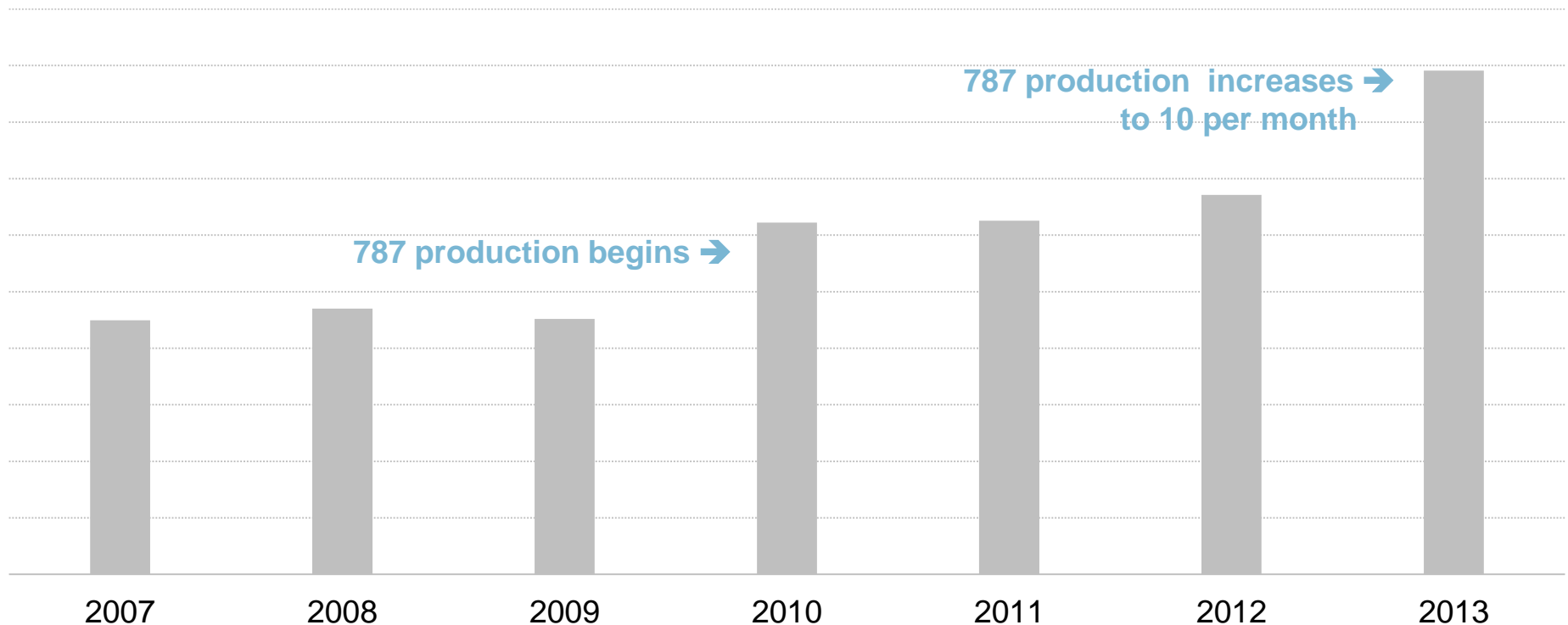


*\* Revenue on Boeing programs includes sales to Boeing, to airlines, and to various other service providers*

# STRONG GROWTH OF BOEING SAFRAN BUSINESS



→ Safran is on all Boeing commercial airplane programs



100% increase over six years

→ **Close relationships between individuals have enabled us to share challenges, innovate and resolve problems**

- Teamwork & integration
- Innovative technologies and processes
- A shared long-term vision
- Commitment
- Trust
- Performance



**Boeing - Safran partnership for more than 35 years**

# SAFRAN ON BOEING 737 NEXT GENERATION



- CFM56-7B engine (CFM International)
- FADEC engine control units
- Wiring
- Wheels and Carbon brakes

**7,936 deliveries & 1,896 orders**



# SAFRAN ON BOEING 737 MAX



- LEAP engine ( CFM International)
- FADEC engine control units,
- Wiring: 1400 W bundles / AC
- Wheels and carbon brakes

**1,807 orders**



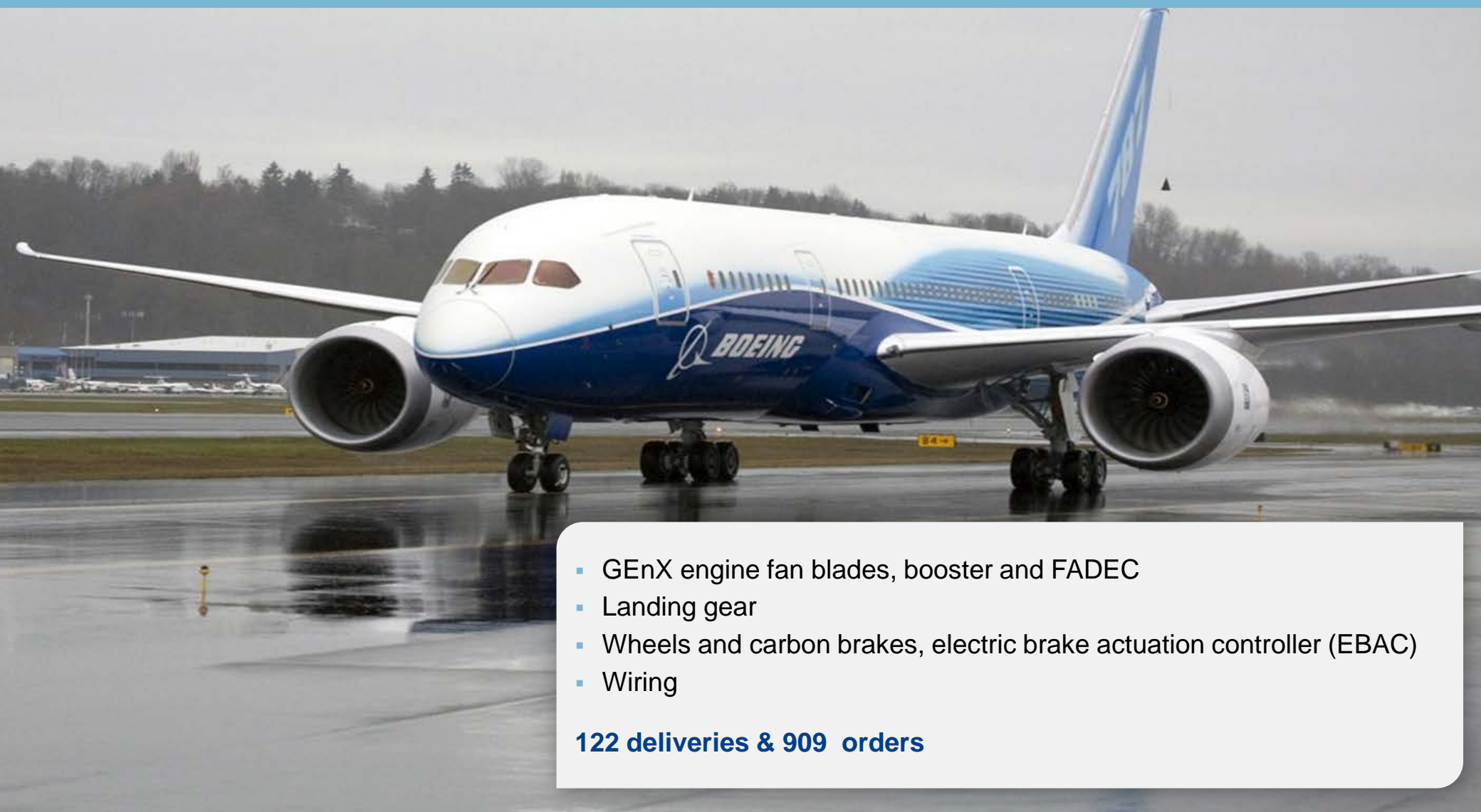
# SAFRAN ON BOEING 777



- GE90 engine fan blades, compressor, LPT and FADEC
- Wheels & carbon brakes
- Wiring

**1,178 deliveries & 370 orders**

# SAFRAN ON BOEING 787 DREAMLINER



- GEnX engine fan blades, booster and FADEC
- Landing gear
- Wheels and carbon brakes, electric brake actuation controller (EBAC)
- Wiring

**122 deliveries & 909 orders**



# SAFRAN ON BOEING 747-8



- GEnX engine fan blades, booster and FADEC
- Tire & Brakes monitoring system
- Wiring

**1,484 deliveries & 54 orders**

# SAFRAN ON BOEING 767



- CF6 80C engine LP Turbine booster and FADEC
- Wiring

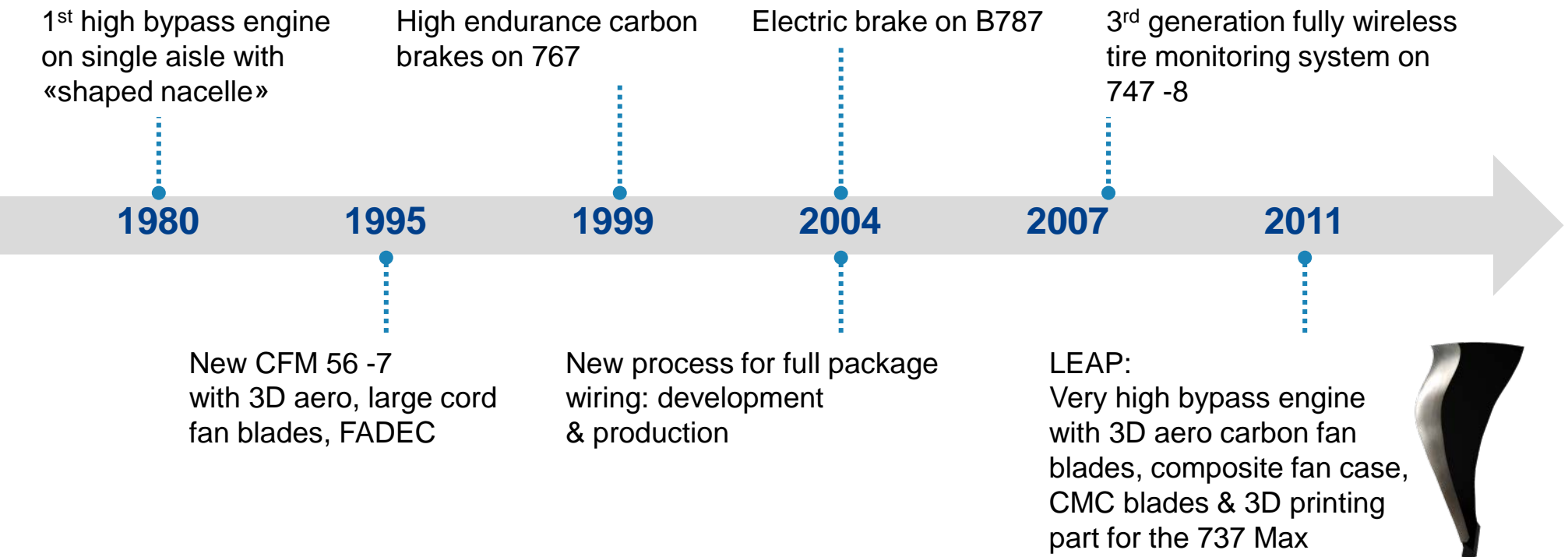
**1,061 deliveries & 49 orders**





	Wiring	Landing Gear	Wheels & Brakes	Engines
C17			✓	
KC135			✓	✓
V22		✓		
E6			✓	
F18		✓		
CHINOOK	✓			

# UNIQUE MILESTONES, INNOVATIONS



- **946 CFM56-7B engines (including spares) delivered in 2013**
  - 100 % on time – 5 engines less than 1 day behind PO date mitigated collaboratively
  - NO Notification Of Escape (quality issue at Boeing assembly)
  - Gold level performance throughout 2013
- **Wheels and brakes delivery performance to the assy line: 100% (rated gold)**
- **Quality > 99,8%: Silver level reached by Labinal and MBD (LG)**
- **150 000 Wire bundles delivered by Labinal**
- **Major plan and collaborative continuous plan on quality. QRQC implementation**
- **Strong support to Boeing assembly & delivery center by local team (CFM now in 3 shifts) – highly integrated teams**

## MAJOR PLAN ENGAGED BY SAFRAN TO SUPPORT PRODUCTION RATES INCREASE

### → CAPEX investments for capacity increase in most locations:

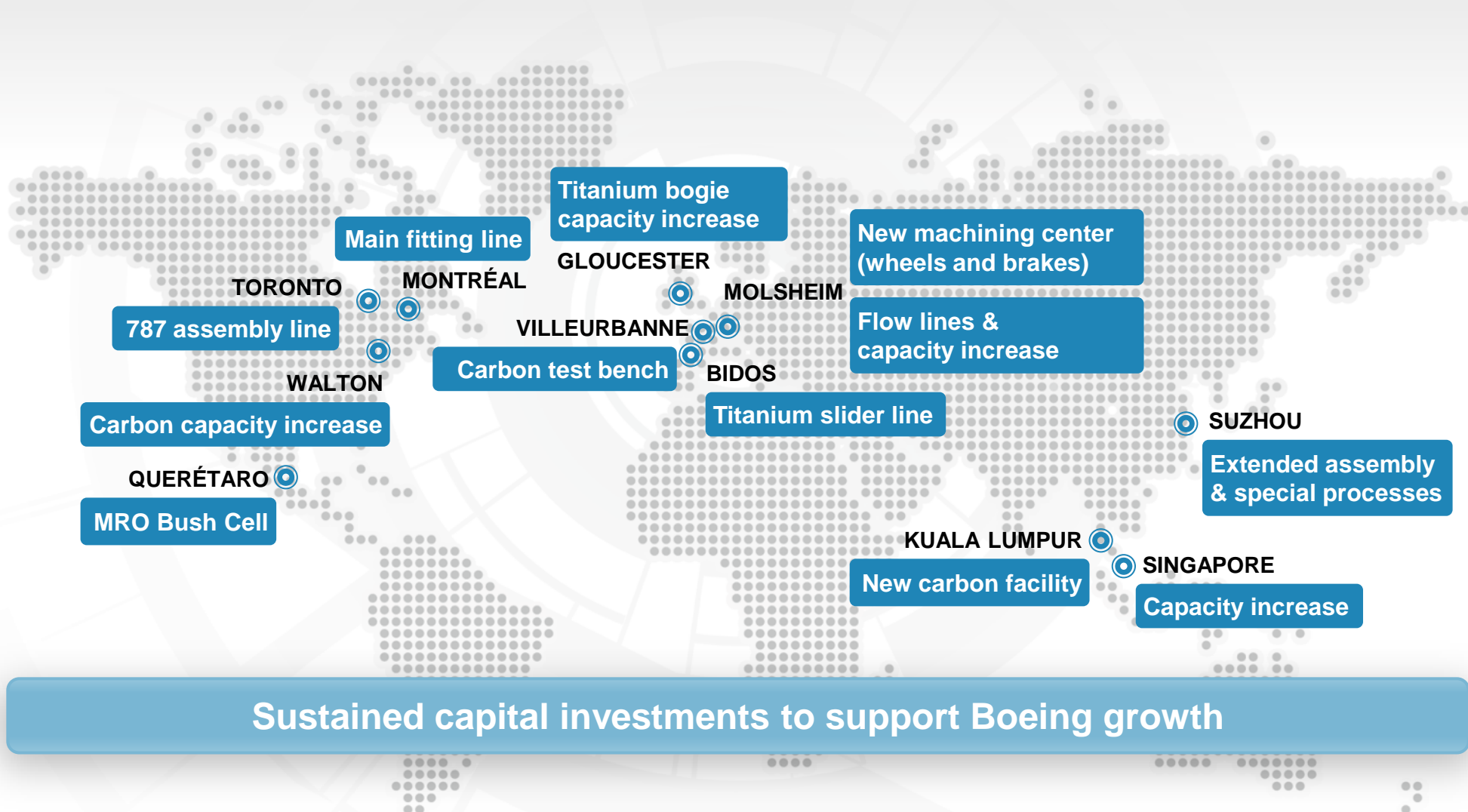
- 2 new plants to manufacture LEAP carbon fan blades and case (Fr & USA)
- New CFM sub-assembly lines ( Techspace & Snecma Queretaro)
- New titanium production line in Bidos
- New large scale machining center in Montreal
- Increased carbon brakes capacity in Walton (Ky) - New plant in Malaysia
- Increased wiring capacity in Mexico

### → Supply chain strengthening:

- Tier 2 & 3 supplier development (lean, QRQC,...)
- In house Lean projects for more capacity
- Enhanced industrialisation process
- Quality toward zero default for more capacity



# SAFRAN LANDING GEAR & BRAKES GLOBAL FOOTPRINT



# MORPHO

by Philippe Petitcolin, Chairman & CEO

# **/01/ MORPHO, A WORLDWIDE SECURITY LEADER**

# MORPHO AT A GLANCE

## → Morpho's solutions simplify and secure the lives of people around the world

- Morpho addresses emerging security requirements for:

**Individuals**

**Governments**

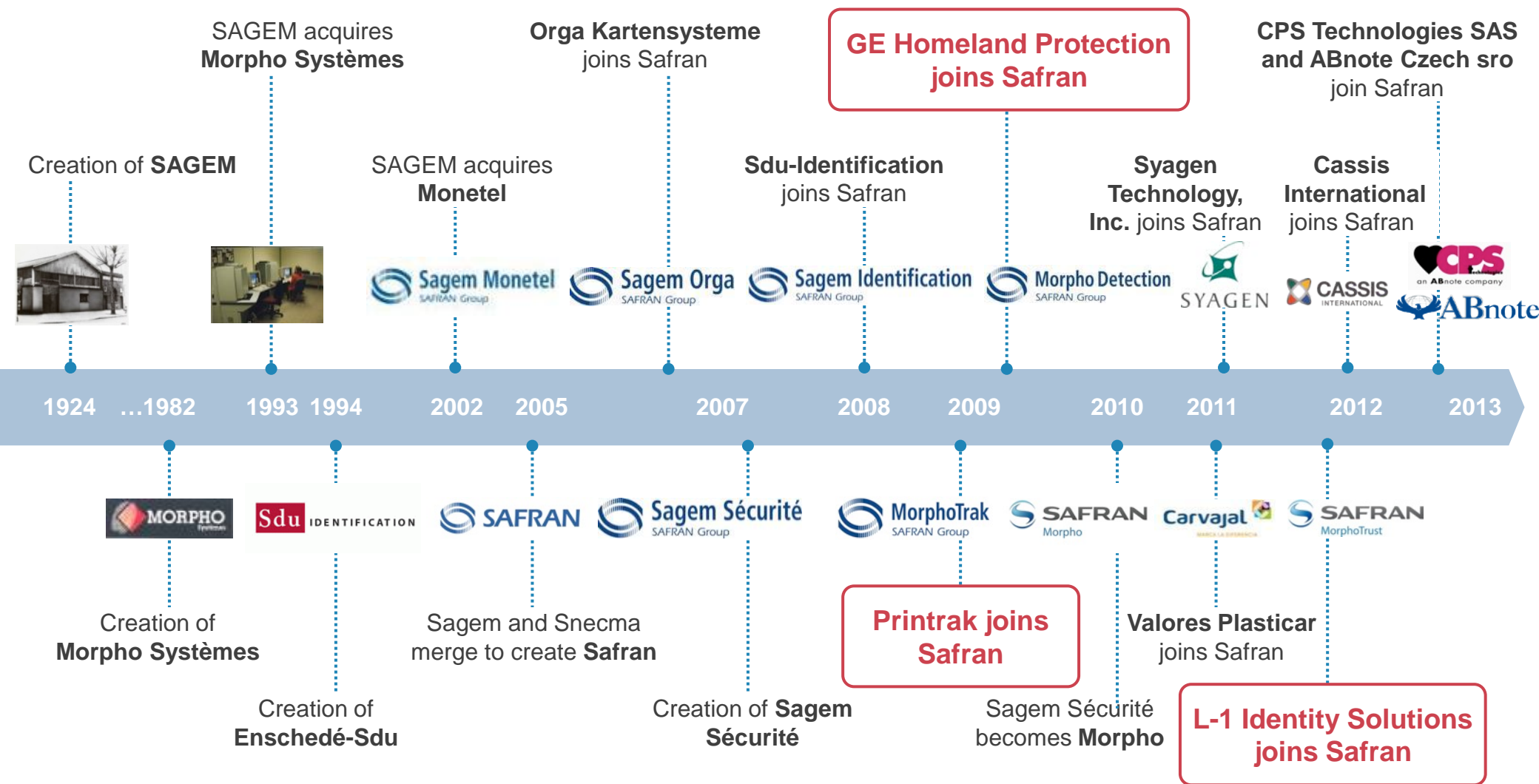
**Businesses**

**Administrations**

- Morpho manages large-scale projects and develops personalized local solutions



# MORPHO MILESTONES





# MORPHO WORLDWIDE LEADERSHIP



- Biometric ID documents
- Automated Biometric Identification Systems (ABIS) based on fingerprint, iris and facial recognition technology
- Computed Tomography based Explosives Detection Systems (EDS) for Hold Baggage
- Multibiometric technology



- Gaming Terminals



- Smart Cards



- Trace Detection equipment

# MORPHO FACTS & FIGURES 2013

## → Workforce

- More than **8,400** employees in 40 countries

## → Revenues

- **1.5 billion €**

## → R&D

- More than **30%** of Morpho's workforce

## → **9%** revenue invested in R&D

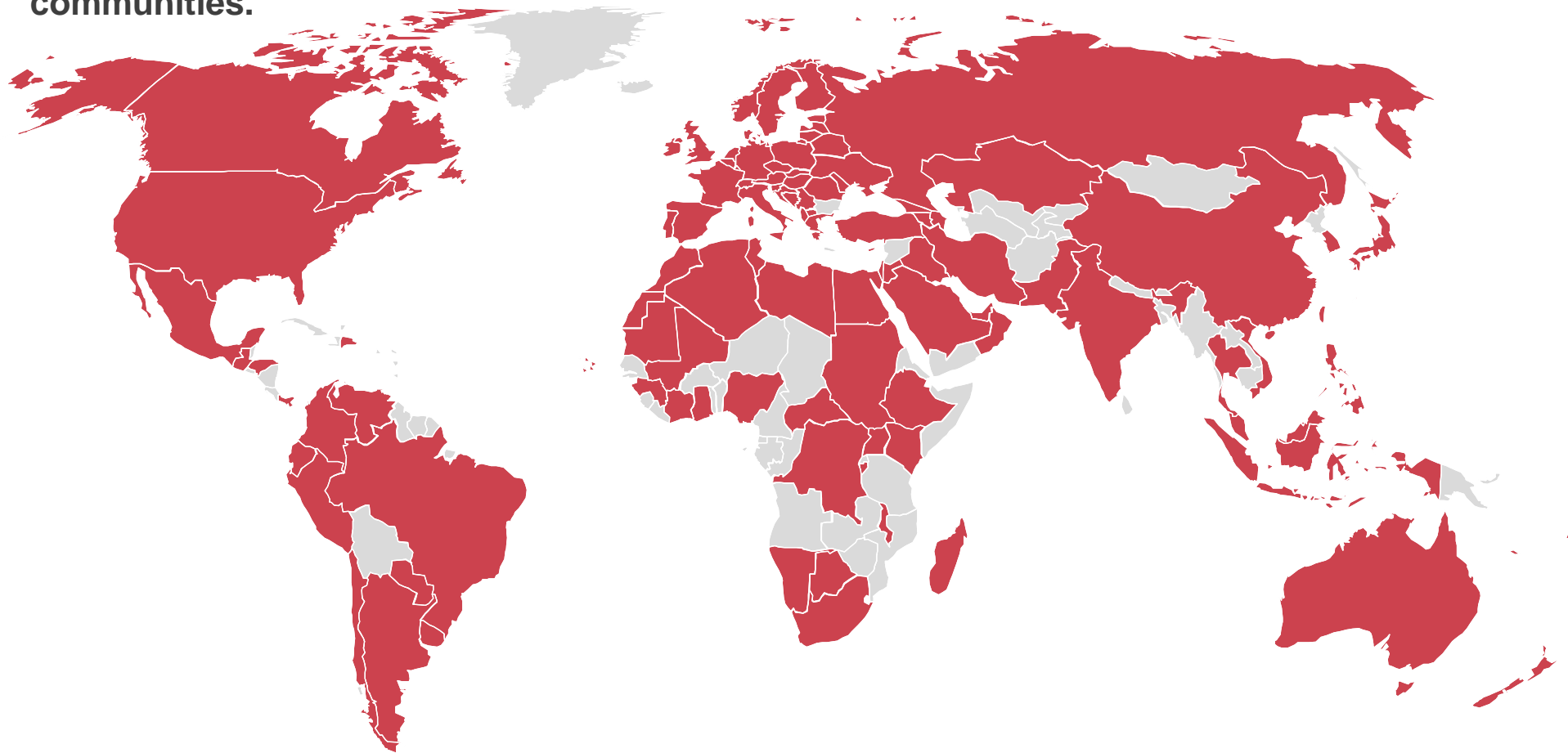
## → **18** R&D centers ; **10** countries

## → **76** subsidiaries & branches around the world



# PRODUCTS AND SOLUTIONS WORLDWIDE

- Governments and organizations all over the world trust Morpho to protect people, assets and communities.



 Morpho products and solutions deployed

# MORPHO US FACTS & FIGURES 2013

## → Workforce

- More than **2,500** employees In the US

## → Revenues

- **750 million \$**

## → R&D

- **4** R&D centers : Anaheim, Newark, Santa Ana, Wilmington

## → **3** main U.S. subsidiaries: Morpho Detection, MorphoTrak and MorphoTrust

## → **16** locations across the US



Transportation  
Security  
Administration



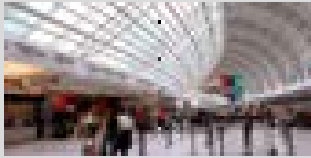
**/02/**

# MORPHO ACTIVITY OVERVIEW



# MASTERING EACH TECHNOLOGY IN THE SECURITY CHAIN

## Main markets



Transport & Border Control



Public Security



Critical Infrastructure



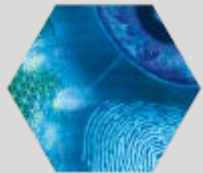
Civil Identification



Digital ID & Smart Transactions

## Main product ranges

### Multi-biometric Identification Systems



Fingerprint, Palm Face, Iris Vein

### ID Documents & Smart Cards



ID Documents



SIM cards



Authentication platform



Customized payment cards

### Security Equipment



e-Gates



Fixed & mobile biometric equipment



Chemical & Biological detection



Fixed and mobile enrollment stations



Speed cameras



Explosives & Narcotics detection

## Integrated solutions



Border control



Speed Enforcement



Law Enforcement



Access Control



Criminal Justice



CBRNe detection



Identity Management & Docs Issuance



Banking



Telecoms



Enterprises



Gaming & Betting

## Technologies



Pattern recognition  
Data & image processing  
Biometrics Vehicle recognition



Secure embedded software  
Cryptography



Secure printing



CT, ITMS "Trace", Mass & Raman Spectrometry, Quadrupole Resonance, X-ray, X-Ray Diffraction



Advanced system architecture



# CIVIL IDENTIFICATION



- Morpho provides governments and institutions with ID management solutions to protect the unique identity of their citizens.
- Morpho also develops authentication platforms enabling governments to offer secure online services to their citizens.

# TRANSPORT & BORDER CONTROL



- With automated border control solutions, threat detection solutions and identification systems, Morpho meets the needs of transportation sites such as airports.
- Morpho's solutions simplify and speed up control procedures in order to facilitate passenger flows and increase security.

# DIGITAL ID & SMART TRANSACTIONS



- **Morpho is a worldwide leader in digital identity solutions and smart transactions.**
- **Morpho enables trusted digital transactions through strong authentication software platforms, smart cards, tokens and secure documents.**
- **Morpho's solutions meet the needs of payment, telecoms and identity access management market segments.**



# PUBLIC SECURITY



- Thanks to its unique expertise in multibiometric identification technologies, explosives and narcotics detection systems and road safety solutions, Morpho helps police forces and organizations protect people and property.



# CRITICAL INFRASTRUCTURE



- **Morpho protects high-risk facilities with explosives and narcotics detection systems, biometric access control terminals and video screening solutions.**
- **These solutions are deployed at power-generation sites, banks, national monuments, government facilities, embassies and consulates.**

# SPECIFIC FOCUS ON MORPHOTRUST

## FACTS AND FIGURES

- MorphoTrust was created in 2011 following Safran's acquisition of L-1 Identity Solutions
- Headquartered in Billerica, Massachusetts
- Has approximately 1 600 U.S. employees
- Issues approximately 70 million driver licenses each year



# MORPHOTRUST ACTIVITIES

## → MorphoTrust's offerings include:

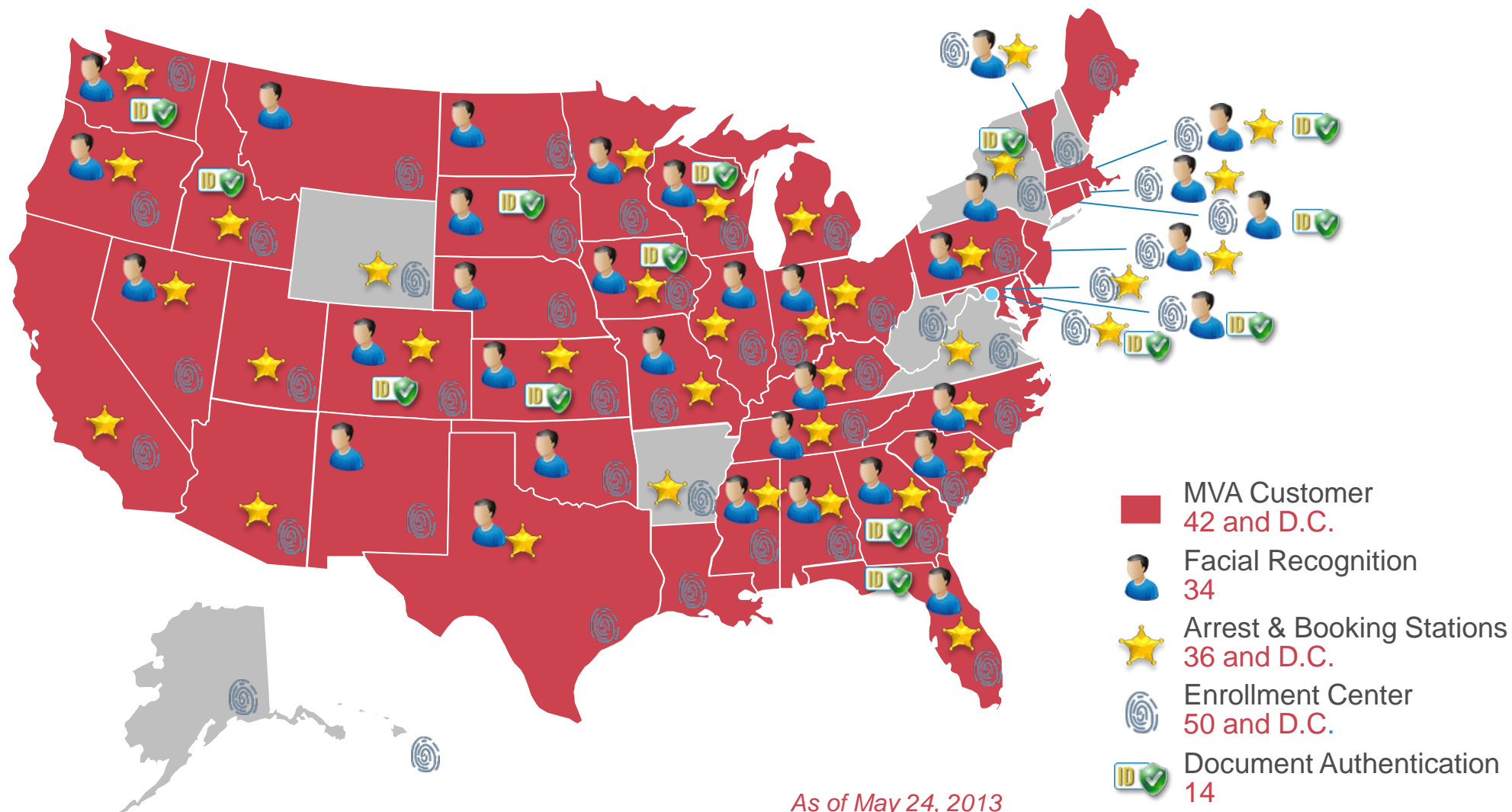
- Secure ID issuance solutions
- Biometric-based solutions for commercial/public safety
- Enrollment and identity-related services

## → MorphoTrust serves all 50 U.S. states and many federal agencies

- Multi-modal biometric software for the FBI, Department of Defense (DoD) and Department of State (DoS) based on the leading ABIS® platform
- Driver license and ID issuance solutions to 42 of 50 states and DC
- Nationwide network of over 1100 IdentoGO® Centers offering fingerprinting and other services



# MORPHOTRUST CUSTOMERS



# MORPHO DETECTION



# **/1/ COMPANY OVERVIEW**

by Karen Bomba, CEO Morpho Detection

# MORPHO DETECTION

## → Morpho Detection

- is a leading supplier of explosives, narcotics, chemical, radiological, and nuclear detection systems.

## → Our Customers

- include government, military, air and ground transportation, law enforcement, first responder, critical infrastructure and other high-risk organizations.

## → Our Technology

- is integrated into solutions that make security activities more accurate, productive and efficient.

## → Our Solutions

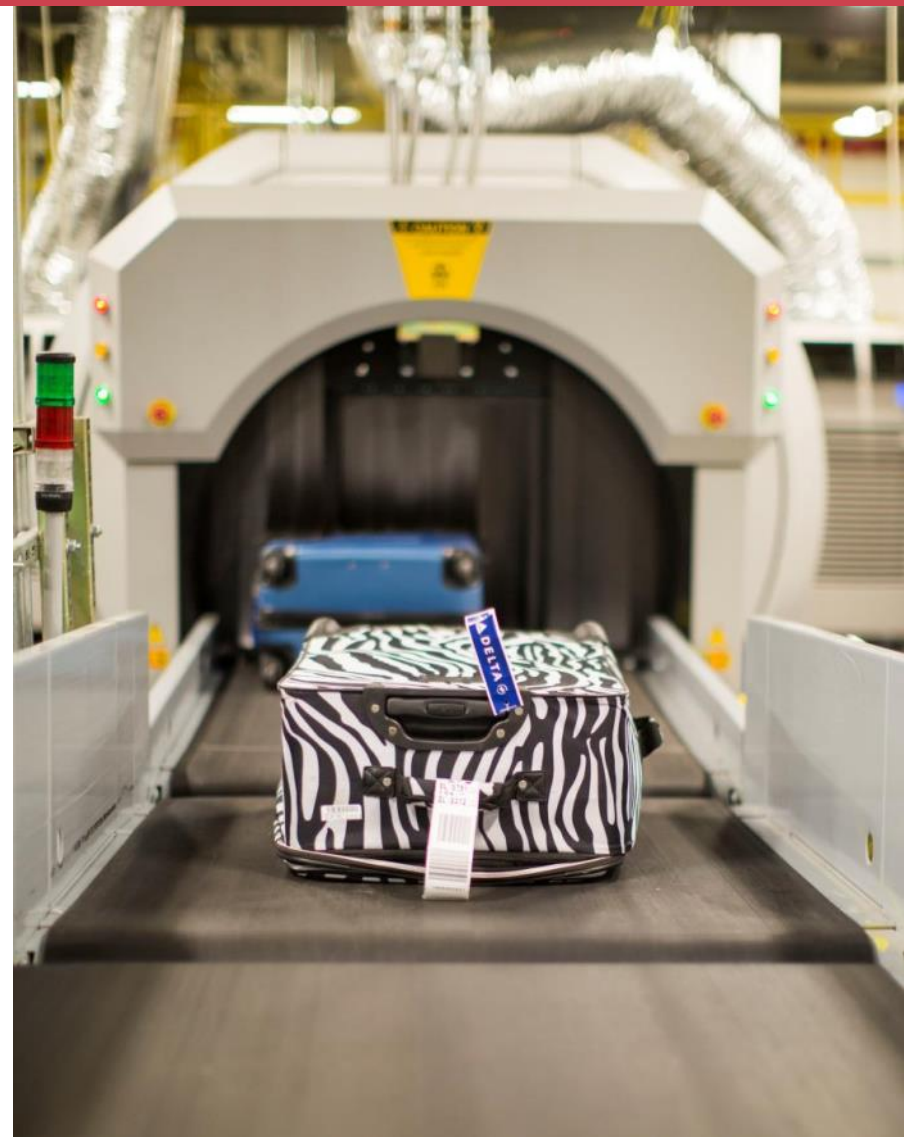
- are deployed to help protect people and property the world over.



# GLOBAL LEADER IN EXPLOSIVES DETECTION TECHNOLOGY

## BY THE NUMBERS

- ➔ **More than 40 countries and 250 global airports have** chosen Morpho Detection explosives detection systems (EDS) for hold baggage screening
- ➔ **More than 20 years experience** working on prestigious new airport projects
- ➔ **Approaching 2,000 CTX units deployed** worldwide
- ➔ **More than 23,000 Trace detection systems** shipped around the world



# HOW WE DEFINE INDUSTRY LEADERSHIP

## EXPLOSIVES DETECTION SYSTEMS

### → Most widely deployed

- Morpho Detection has more installed CT explosives detection systems than any other manufacturer – over 800 more systems than our closest competitor

### → Approved by regulators

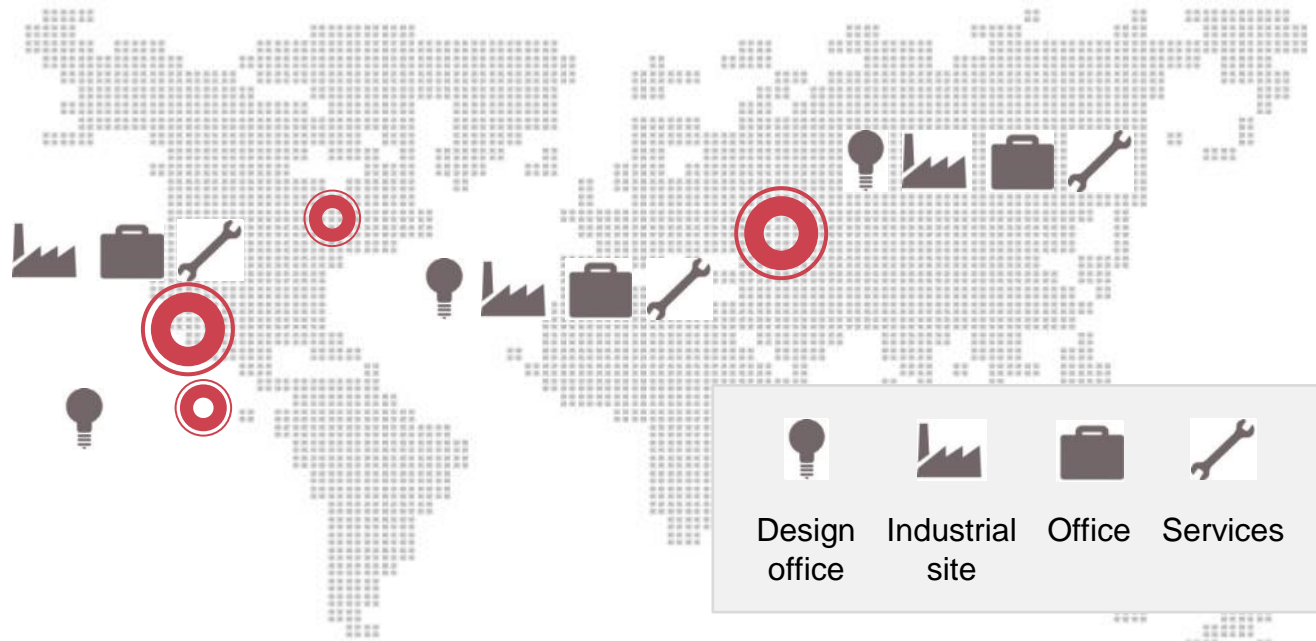
- Morpho Detection has had more CT explosives detection systems certified by more government aviation regulator authorities than any other EDS manufacturer

### → Pioneers in the industry

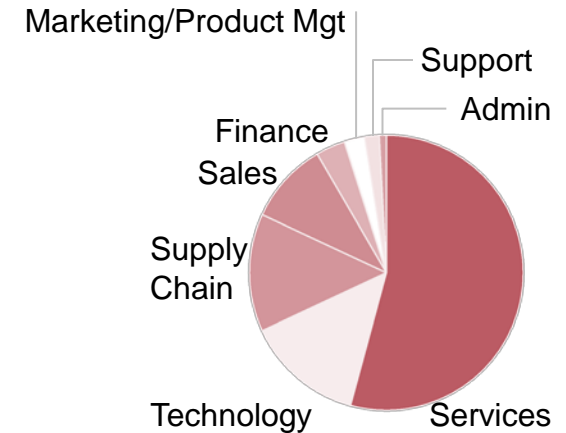
- In 1994, the CTX 5000™ became the first CT-based explosives detection system certified by the U.S. Federal Aviation Administration, forerunner to today's Transportation Security Administration (TSA)



# MORPHO DETECTION: PEOPLE AND PLACES



→ 800+ employees



CENTER OF EXCELLENCE	LOCATION	CRITICAL COMPETENCIES
Computed Tomography EDS	Newark, CA	Birthplace of modern CT checked baggage explosives detection systems -- including the compact CTX 5800 and high-speed CTX 9800
Trace, Chem., Rad/Nuc	Wilmington, MA	Deployed more than 23,000 explosives trace detectors (ETD) to airports, air cargo facilities, global events, power generation facilities, and critical infrastructure installations around the world
Mass Spectrometry, QR/Magnetics	Santa Ana, CA	Morpho Detection's newest R&D center, developing of next-generation solutions including MS based ETD and QR Wand
X-ray Diffraction	Hamburg, Germany	Development center of Morpho Detection's Type D checkpoint\baggage screening solution XD <sup>IT</sup>



# GLOBAL SERVICE & LOGISTICS SUPPORT

## KEY CAPABILITIES

- **Field Service Engineers** posted worldwide at or near major installations and customers
- **More than 40K product maintenance services** performed each year
- **Major service projects:**
  - 2014:** Four-year TSA Passenger Screening Program (PSP) service contract –maintaining checkpoint equipment, including non-Morpho products
  - 2011:** Integrated Logistics Service (ILS) contract for maintenance of TSA deployed EDS–Ongoing

### North America

1 Distribution Center  
& 55 Local Depots

### EMEA

1 Regional Hub  
& 26 Local Depots

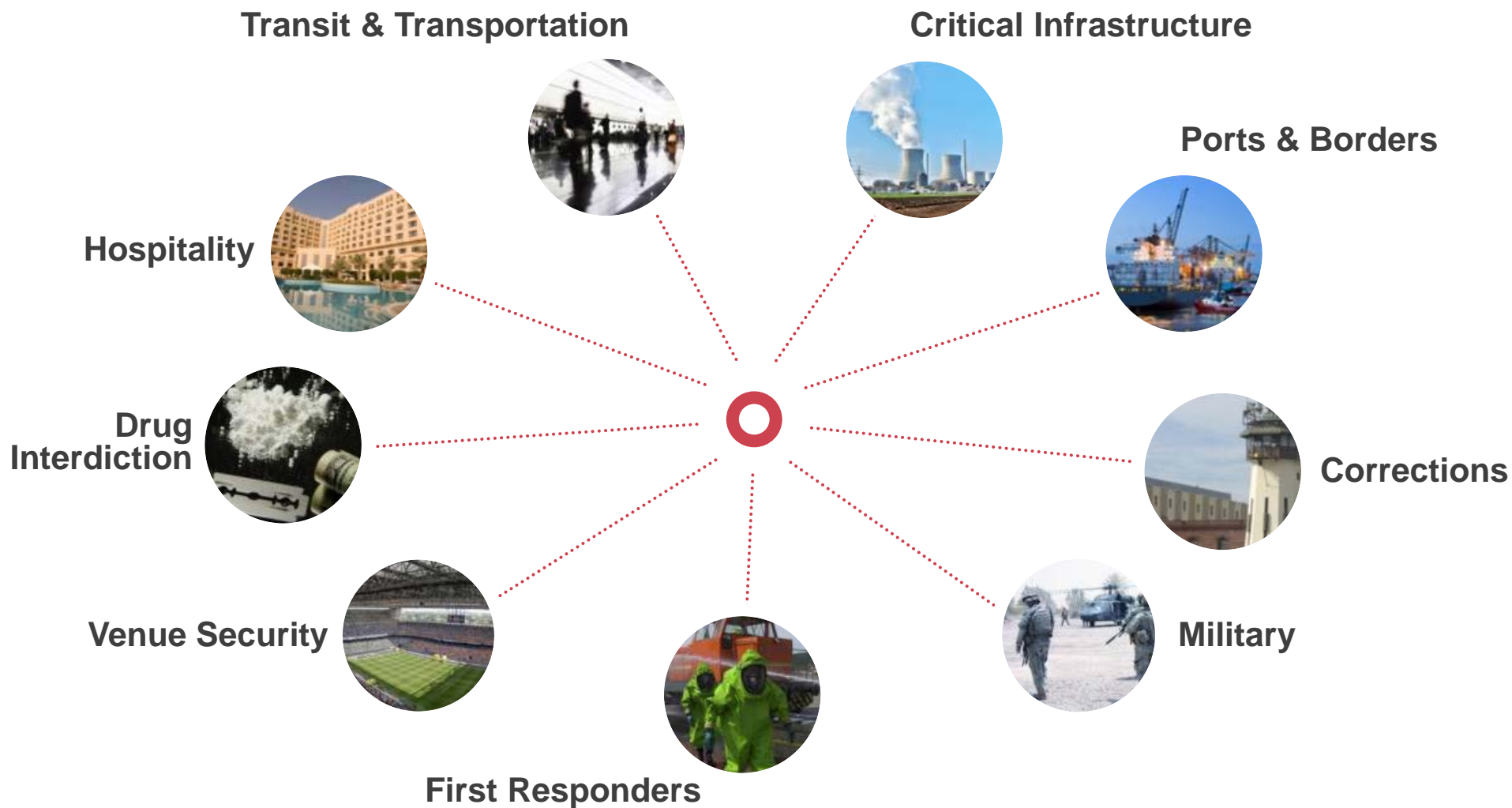
### Asia/Pac

1 Regional Hub  
& 9 Local Depots



**With more than 20 years of service experience, MD supports the daily operations of EDS, trace, x-ray, metal detection and AIT equipment at more than 500 airports**

# MARKETS



# CUSTOMER CHALLENGES



Threats continue to evolve

Customers operational  
costs/challenges continue  
to increase

Morpho's People, Technology  
& Service continue to  
advance to help solve these  
critical customer challenges

→ **Detection Products Include :**  
EDS-CT, Trace, X-Ray, X-ray Diffraction, Radiation/Nuclear and Chem

# **/02/ TECHNOLOGY OVERVIEW**

by Cameron Ritchie VP, Technology, and Chief Technology Officer

# COMPUTED TOMOGRAPHY – CTX EDS

## CTX™ Explosives Detection System (EDS) Platforms

CTX  
5800



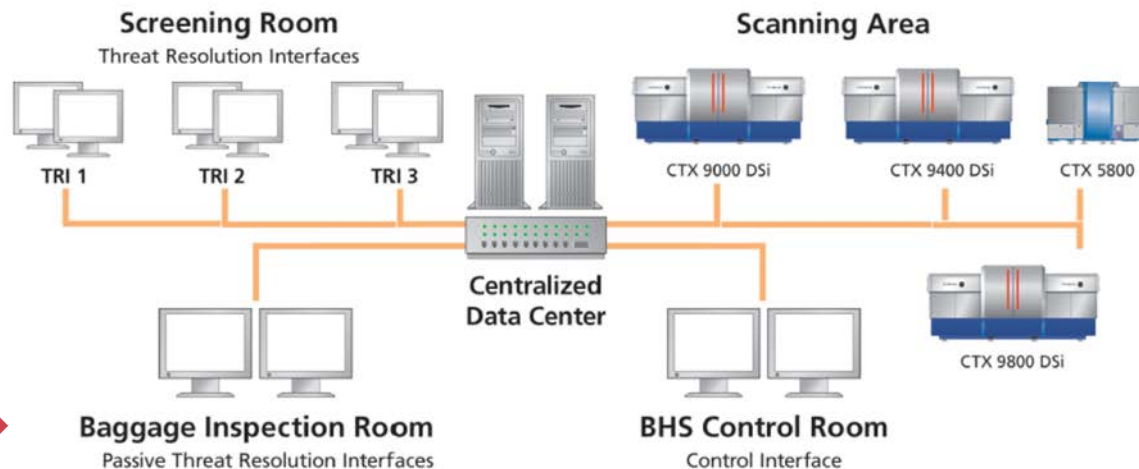
CTX  
9800



### → How do they work?

- Advanced Computed Tomography (CT) technology identifies explosives by measuring the density of baggage contents –similar to medical CT
- Standalone and inline configurations enable flexibility and scalability to meet ever changing security risks –**Enhancing ROI**
- Airport-wide networking capabilities and integration into new or existing baggage handling systems (BHS)
- Increased ability to **identify threats, reduce false alarm rates** and **lower operational costs** compared to Multi-View X-ray

### Multiplexing and Networking for CTX™ Series Systems →





# TRACE DETECTION – ITMS AND MS

## Ion Trap Mobility Spectrometry (ITMS®)



### → How does trace detection work?

- Trace detection is based on **contamination**
- When **narcotics** or **explosives** are handled, they leave invisible particles behind on the hands & clothes
- The next Generation of trace detection, MS is capable of identifying conventional and emerging threats at the molecular level –including homemade explosives (HME) and improvised explosive devices (IED)
- More **accurate, productive** and **efficient** security screenings

## Mass Spectrometry (MS)



# X-RAY DIFFRACTION – XDi & XRD 3500

## X-Ray Diffraction (XRD) Solutions

XDi



Checkpoint Screening

XRD  
3500



Hold Baggage Screening

System  
of  
Systems



Hold Baggage Screening

- **X-ray Diffraction** (XRD) enables molecular specific fingerprint (precise Material identification)
- **XDi™** will allow passengers to take liquids through checkpoints and have them scanned without divestiture – which is referred to as Type D capability
- **Morpho's XRD 3500™** can pinpoint the exact location of a potential threat inside a bag
- Airports with enhanced security needs combine one or more **CT EDS with XRD 3500™** for automated secondary screening and alarm resolution—creating Morpho's System of Systems

# NEXT GEN: RADIATION & EXPLOSIVES DETECTION

## → Cadmium Zinc Telluride (CZT) – SourceID™

- The next generation of handheld Radiation Isotope Identification Devices (RIID)
- Classifies and identifies isotopes as well as provides the direction from which the radiation originates
- Scheduled for release in 2014, will be the first commercially available RIID with real time directional data

SourceID™  
(CZT)



Handheld Explosives  
Detection

## → Quadrupole Resonance (QR) Wand

- Utilizes radio frequency magnetic fields, similar to a medial MRI machine, to detect specific atoms of explosive materials.
- Morpho's QR wand can accurately detect explosives implanted inside a person or hidden beneath clothing
- The result for passengers will be a reduction in invasive pat downs

Hand  
Wand  
(QR)



Handheld Radiation  
Detection

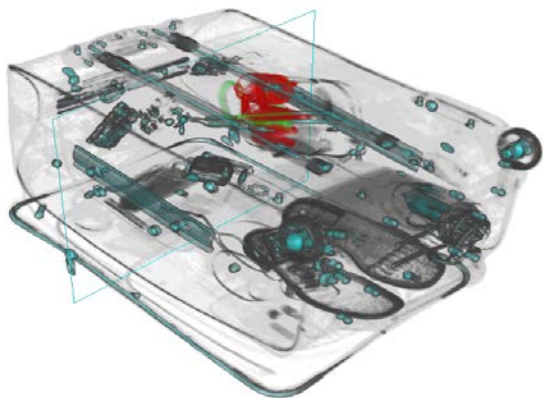
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# EXPLOSIVES DETECTION SYSTEMS

by Nik Karnik, Director of EDS Platforms  
Vandana Chellani, EDS Manufacturing Manager

# WHY COMPUTED TOMOGRAPHY?

- After 1988, CT was the main technology chosen to be evaluated for checked baggage EDS in the U.S.
- Other technologies, including dual-view X-ray, were unable to detect a broad range of explosives and deliver the low false alarm rates critical to checked baggage screening.
- Strong global growth leading up to ECAC 2020 deadline to screen all passenger checked baggage –referred to as Level I screening – with an EDS





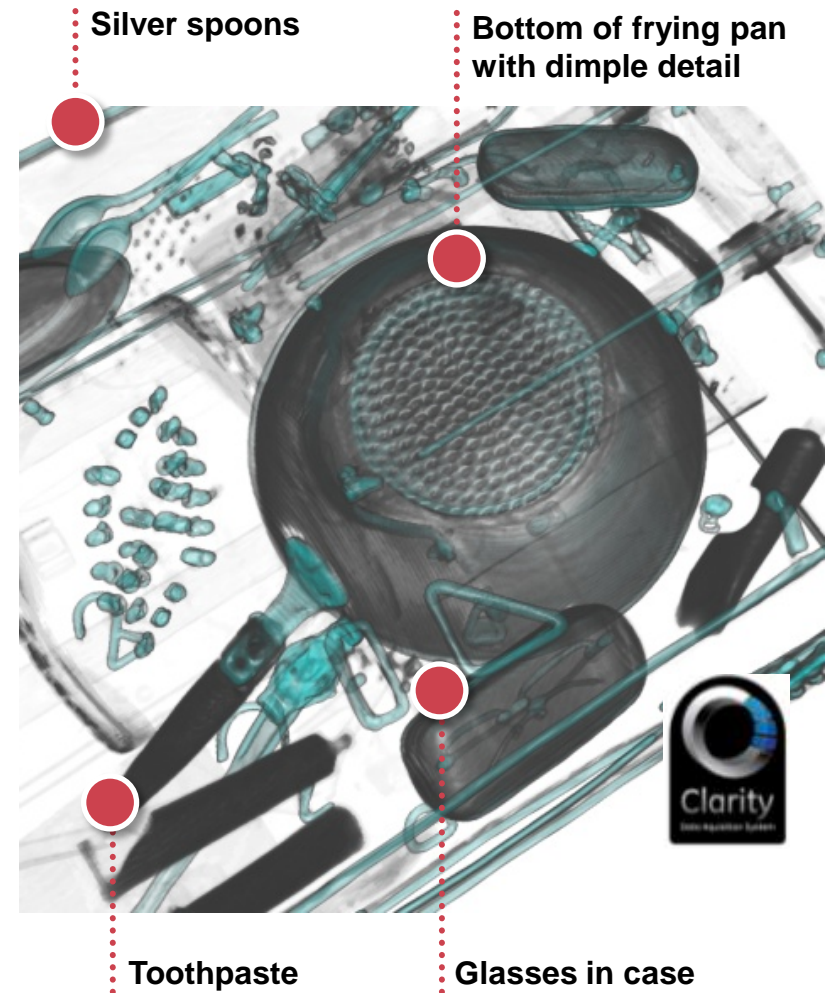
# UNPRECEDENTED HIGH-QUALITY 3D IMAGES

→ **Identify threats**

→ **Reduce False Alarm Rates**

→ **Lower operational costs**

- With the ability to visually “travel” throughout the bag and fully manipulate images, operators have more information and flexibility than ever before.
- Maximizing the information available to make efficient and effective security decisions.



# SECURING THE WORLD'S AIRPORTS

## → Regulator Approval

- Morpho Detection **CTX 5800 & 9800** systems have achieved approval from aviation security regulators world wide by meeting stringent requirements for both throughput and detection performance



Department for  
**Transport**



## Trusted by Airports Worldwide – A few of our EDS customers



# CTX: SECURING AIR TRAVEL

- **1994: CTX 5000™** first CT-based EDS certified by the Federal Aviation Administration (FAA), forerunner to TSA.
- **TSA:** five-year for CTX 5800 (up to \$133M).
- **Canadian Air Transport Security Authority (CATSA):** five-year contract for CTX 5800 and CTX 9800 (up to \$100M).
- **Nice Côte d'Azur International Airport:** 4 high-speed CTX 9800—first airport in the continental E.U. to use an EDS at Level I.
- **Narita International Airport (Japan):** 13 high-speed CTX 9800 EDS.
- **R&D Award from DHS S&T** to develop a next-generation EDS prototype –valued at \$10M.



# AVIATION HOLD BAGGAGE REGULATION & TIMELINE

## HOLD BAGGAGE

Players	Technology	Select Regulators				
		ECAC	TSA	DfT	DGAC	CAAC
Morpho	CT	Std. 3				
L-3	CT & MV X-ray	Std. 3 & 2				
Rapiscan	CT & MV X-ray	Std. 3 & 2				
Smiths	CT & MV X-ray	Std. 2				
SAIC	CT	Std. 3				
Nuctech	CT	Std. 3				

### Legend

- Meets Regulator Requirements
- Does Not Meet Regulator Requirements

### Acronyms

CT: Computed Tomography  
 Std. 3: CT  
 Std. 2: Multi View X-ray

## POSSIBLE REGULATION TIMELINE

Can't purchase X-ray  
after Sept. **2014**,  
 must purchase CT

Can't use X-ray  
 Purchased before **2012**  
 after Jan. **2020**

Can't use X-ray  
 Purchased after **2012**  
 after Jan. **2022**

**Hold Baggage**  
 (Latest EU Stds.)



**Regulatory mandates and evolving security environment drives R&D**



# MAKING A CTX SYSTEM WORK

- A **CTX 9800 EDS system** is comprised of approximately 270 parts containing around 10,000 components, purchased from approximately 100 individual suppliers.
- By working directly with airport developers and baggage handling system (BHS) manufacturers, **Morpho Detection** is **involved in the entire process** – from design concepts and installation, to post-deployment servicing and maintenance.
  - Parts depots located around the world.
  - Rapid-response field service engineers, located around the globe, strive to restore service to down systems within six hours – lowering the total cost of ownership.
  - We have FSE's located at strategic airports around the world to ensure maximum system uptime.
- From the **high-speed CTX 9800, to the compact 5800**, Morpho Detection has a CTX solution for airports of all sizes to deploy an automated checked baggage screening program while planning for future expansion and growth.





# **/04/ TRACE TECHNOLOGY**

by Rich Stoddard, Director Trace and CBRNe Platforms

# TRACE DETECTION WINS

## → Itemiser® DX

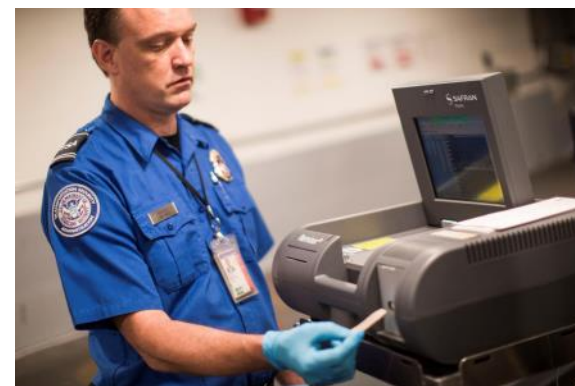
- Certified by six global regulatory agencies.
- More than 5,000 units purchased worldwide.
- In 2013, contract for 45 units with Brazil's national airport operator to support modernization for the upcoming World Cup and Olympics.
- More than 500 units deployed to leading global airlines, including United Airlines and Air Canada, to screen air cargo for explosives and maintain compliance with new TSA cargo screening mandates.

## → EntryScan®

- EntryScan portals are presently in use to help screen people visiting and/or working at more than 95 percent of U.S. Nuclear Power Plants.

## → MobileTrace®

- MobileTrace is deployed at border crossings, transportation facilities, global events and military installations worldwide to protect people and property.
- Available in a Hardened version to handle field deployments in the most hostile environments and the detection of TICs and CWAs.
- In 2013, contract with Border Force in the U.K. for Hardened MobileTrace to fight narcotics smuggling.



# NEXT GENERATION –MS AND NON-RADIATION

## → Mass Spectrometry

- Next Generation of trace detection – capable of identifying conventional and emerging threats at the molecular level.
- Resolution to provide detection of expanded threat lists without increase false alarms.
- Performs chemical analysis approximately 10x faster and with up to 10x more sensitivity and dynamic range than other technologies.

## → Non-Radiation Source

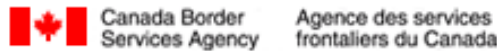
- Current Itemiser utilizes a detection source that omits a minute amount of radiation.
- Morpho Detection is developing a non-radiation source to meet the needs of our customers and ease the process of procurement and deployment.



# A FEW CUSTOMERS

## INTERRUPTING ILLEGAL DRUG SMUGGLING

- ➔ Morpho Detection's systems quickly, reliably and cost-effectively gather narcotics evidence needed in the field.



## SECURING SPORTING EVENTS



# AVIATION CHECKPOINT REGULATION & TIMELINE

## CHECKPOINT

Players	Technology	Select Regulators				
		ECAC	TSA	DfT	DGAC	CAAC
Morpho	IMS	Meets	Meets	Meets	Meets	Meets
L-3	IR	Does Not Meet	Does Not Meet	Meets	Does Not Meet	Does Not Meet
Rapiscan	IMS	Does Not Meet	Does Not Meet	Does Not Meet	Does Not Meet	Does Not Meet
Smiths	IMS	Meets	Meets	Meets	Meets	Does Not Meet
SAIC	IMS	Does Not Meet	Does Not Meet	Does Not Meet	Meets	Does Not Meet
Nuctech	IMS	Does Not Meet	Does Not Meet	Does Not Meet	Does Not Meet	Meets

## Legend

- Meets Regulator Requirements
- Does Not Meet Regulator Requirements

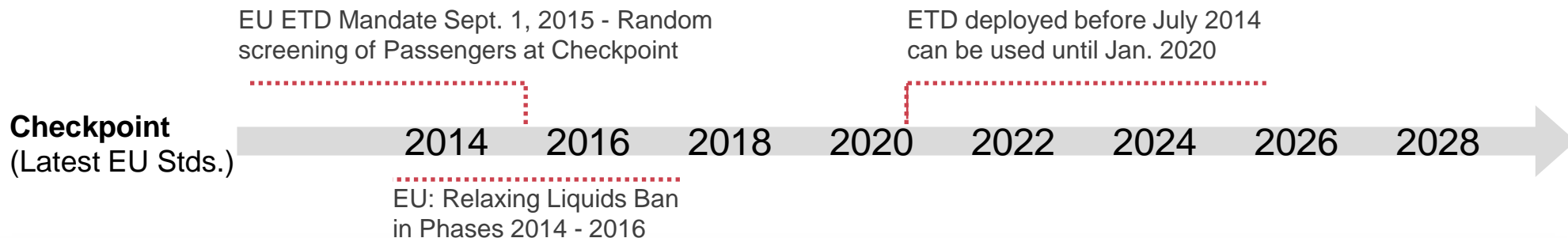
## Acronyms

IMS: Ion Mobility Spectrometry (trace)

IR: Infrared

ETD: Explosives Trace Detector

## POSSIBLE REGULATION TIMELINE



**Regulatory mandates and evolving security environment drives R&D**

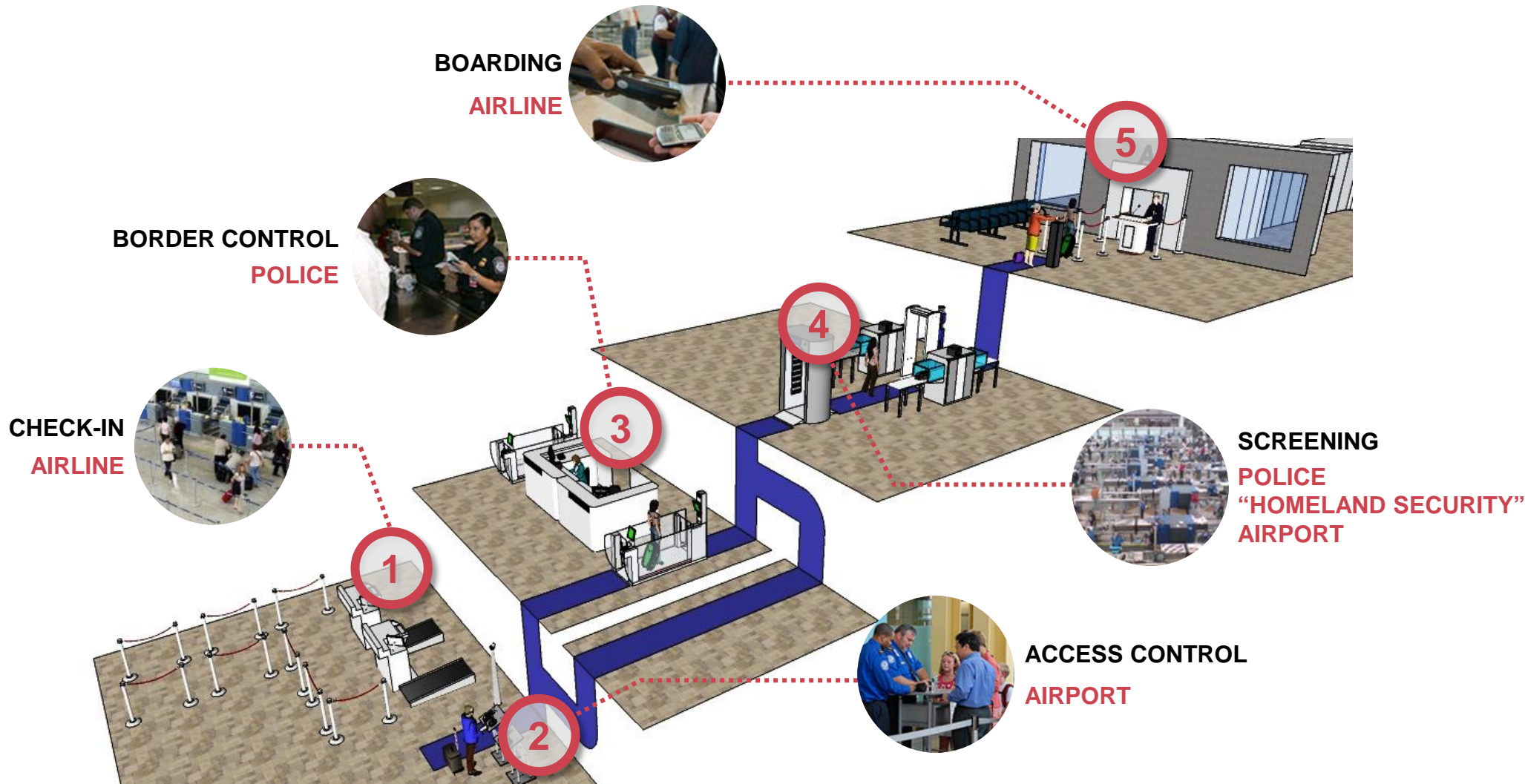


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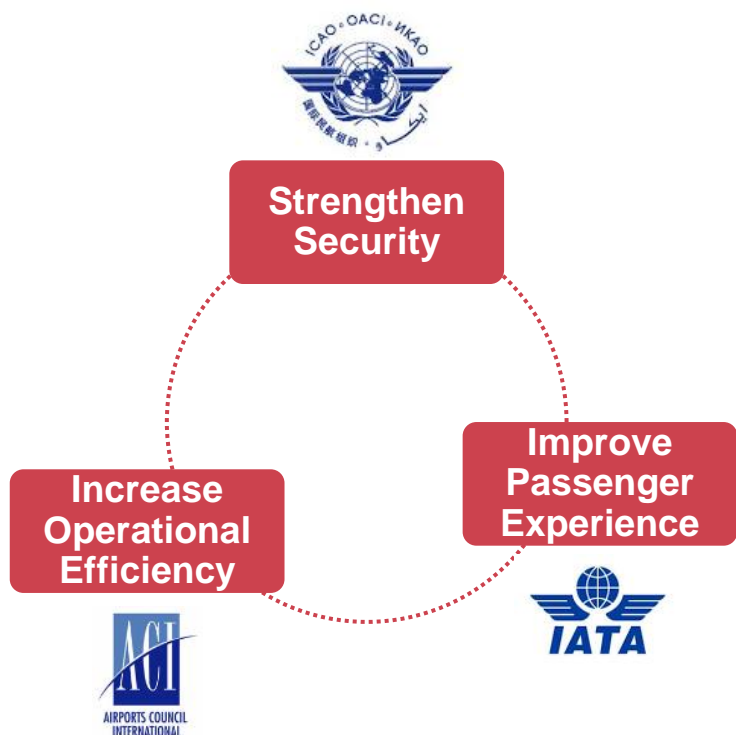
# **CHECKPOINT OF THE FUTURE**

by Daniel Malhum, Director, Checkpoint Platforms

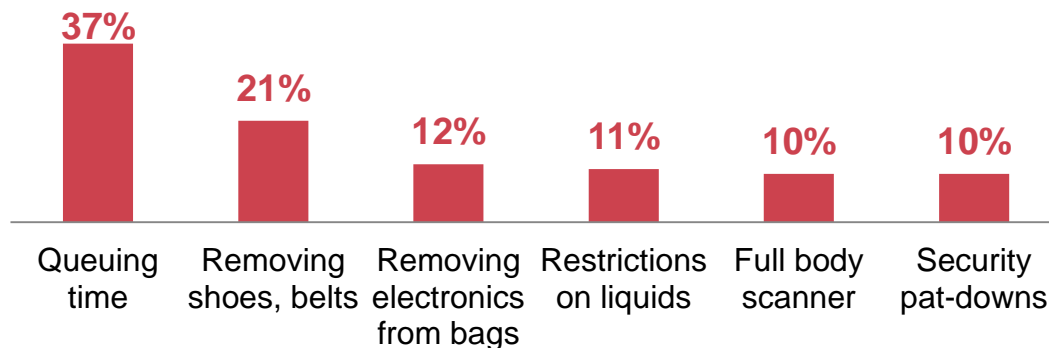
# FROM CHECKPOINT TO PASSENGER PROCESSING



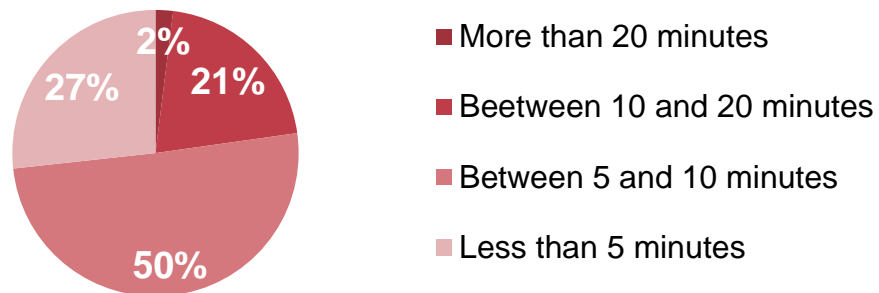
# COMMUNITY GOALS



→ **Passengers are telling us wait times are too long!**



→ **Nearly 75% of passengers would accept a 5-10 min. wait time**



# FACTS

## → Facts

- According to IATA, 37% of passengers are unhappy with the time they spend waiting at checkpoints
- According to ACI-Europe, checkpoints account for 27% of airports' operating costs
- The accumulation of control measures and regulatory changes contribute to significant organizational complexity

## → Why is there now a need for a new checkpoint?

- In the market for short and medium-haul flights, ensuring less than 20 min wait time at peak time is essential, otherwise passengers will switch to other means of transportation
- Cost of passenger processing is harder to finance
- Rule-based passenger processing should increase both facilitation and security





# OUR SOLUTION

## → Morpho's solution:

- Using passenger biometrics to enable logical differentiation amongst passengers avoiding dedicated assets
- Using passenger biometrics as a token to ensure processing quality control and efficiency
- Developing detection systems that will reduce false alarms and increase passenger satisfaction
- Proposing automation designed to reduce costs and enhance service quality
- Putting passengers back at the center of the process (passenger-centric approach)

## → Safran's leadership is based on the following:

- Operational vision of the entire process, rather than just a set of equipment; ability to draw on expertise developed in aerospace
- Ability to integrate the joint requirements of regulators and operators





# POSSIBLE SCENARIO OF THE SOLUTION

1

## Identification

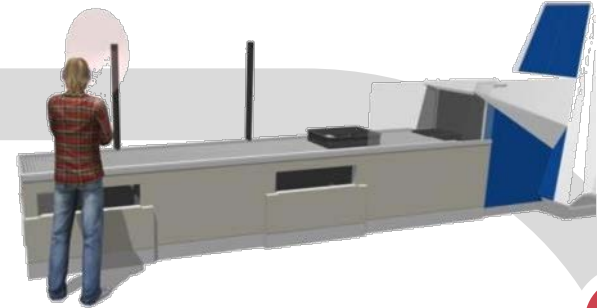
- Authentication
  - biometrics
  - BP scan
  - Person ID
- Rule associated with person



2

## Cabin Bag screening

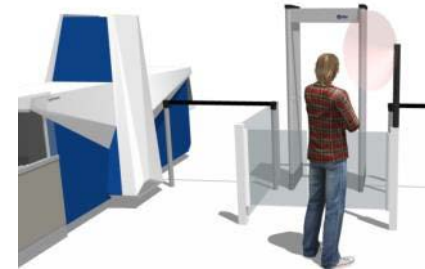
- Rule-based screening
- Minimize divestiture
- Adaptive Screening



3

## Person screening

- Rule-based screening
- Adaptive screening
- Minimize pat-down



5

## Boarding

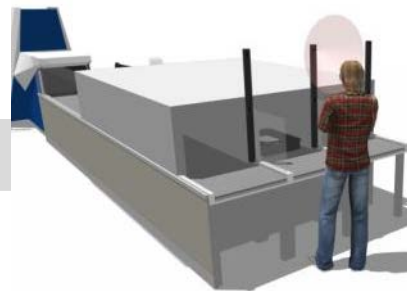
- Self boarding
- Process Control



4

## Reconciliation

- Process Control



# MORPHOTRAK

**/01/**

# **INTRODUCTION & BUSINESS OVERVIEW**

by Celeste Thomasson, CEO  
Clark Nelson, Senior VP Sales & Marketing

# MORPHOTRAK: TRUSTED U.S. SECURITY PARTNER

## → Mission:

- Help protect the American people against crime, fraud and intrusion, by bringing world-class biometric technology and systems to government and business.

## → Market Scope:

- Law Enforcement – local, state, national, international crime fighting
- Defense –“battlefield biometrics” and the fight against terrorism
- Immigration/Border Control –verifying identities for entry, visit and the rights of U.S. citizens
- Civil – fraud prevention, protection of benefits and privacy of individuals.
- Commercial – verifying identities for access control, time and attendance, membership and to prevent intrusion.

## → Vision:

- As the industry leader in biometric technology, MorphoTrak will continue to increase our accuracy, functionality, ease of use and value, and preserve our strong customer loyalty through flawless implementation and service.



# MORPHOTRAK: TRUSTED U.S. SECURITY PARTNER

## FACTS AND FIGURES

- **>400 U.S. employees**
- **Acquired Printrak in 2009** – MorphoTrak created
- **> 35 Years Experience** with Biometric Law Enforcement Solutions
- **Trusted Partner of System Integrators:** Lockheed, Accenture, HP/EDS, Booz Allen, Honeywell

## DOMINANT PROVIDER OF AFIS IN U.S.

- **64 AFIS and 3500 Livescans** serving populations of ...
  - FBI AFIS 309 Million
  - 28 State AFIS 137 Million
  - 36 City/County AFIS 51 Million
- **Thousands of Enterprise/Commercial Systems**



Headquarters Alexandria, VA



Engineering Center Anaheim, CA



Federal Business Federal Way, WA



Law Enforcement & Criminal justice



# MORPHOTRAK: TRUSTED U.S. SECURITY PARTNER

- ➔ Part of **Morpho**, bringing the best biometric technologies and experience to the US customer community
  - Global Technology and Experience
- ➔ Innovations based on our global R&D resources
  - Centers of Excellence in France, U.S. and 8 other countries.
  - U.S. National Institute of Standards and Testing (NIST) has validated that Morpho algorithms are #1 in the world
- ➔ U.S. law enforcement agencies are the global leaders in fingerprint biometrics
  - U.S. is just now trying to adopt biometrics for border control compared to other countries.



➔ **PARAFE France**  
automated border control  
using fingerprint  
recognition

**SmartGate Australia**  
automated border control  
using facial recognition ➔



# MORPHOTRAK'S MARKETS

## LAW ENFORCEMENT AND PUBLIC SAFETY

### Federal, State, Local

- Automated Fingerprint Identification Systems (AFIS) and associated products



## CIVIL ID AND FRAUD PREVENTION

- **Benefit Identity Verification**
- **Healthcare Solutions**
- **Employment Verification**
- **Medicare Biometrics**
- **Banking Identification**



## ACCESS CONTROL SOLUTIONS

### Biometric Solutions for:

- Sensitive Site Access
- Physical Access Control
- Logical access/sign-on
- Time & Attendance
- "Convenience" systems



### Readers Suitable for:

- High security facilities
- Harsh Industries
- Corporate Facilities
- Luxury Environments
- Health clubs

## IMMIGRATION BORDER CONTROL

### Entry – Exit Systems

- US Visit

### Airports & Borders

- Ports, Airports, Federal Govt
- Passenger Security



### Automated Border Control

- eGates
- Mobile Passport Checking

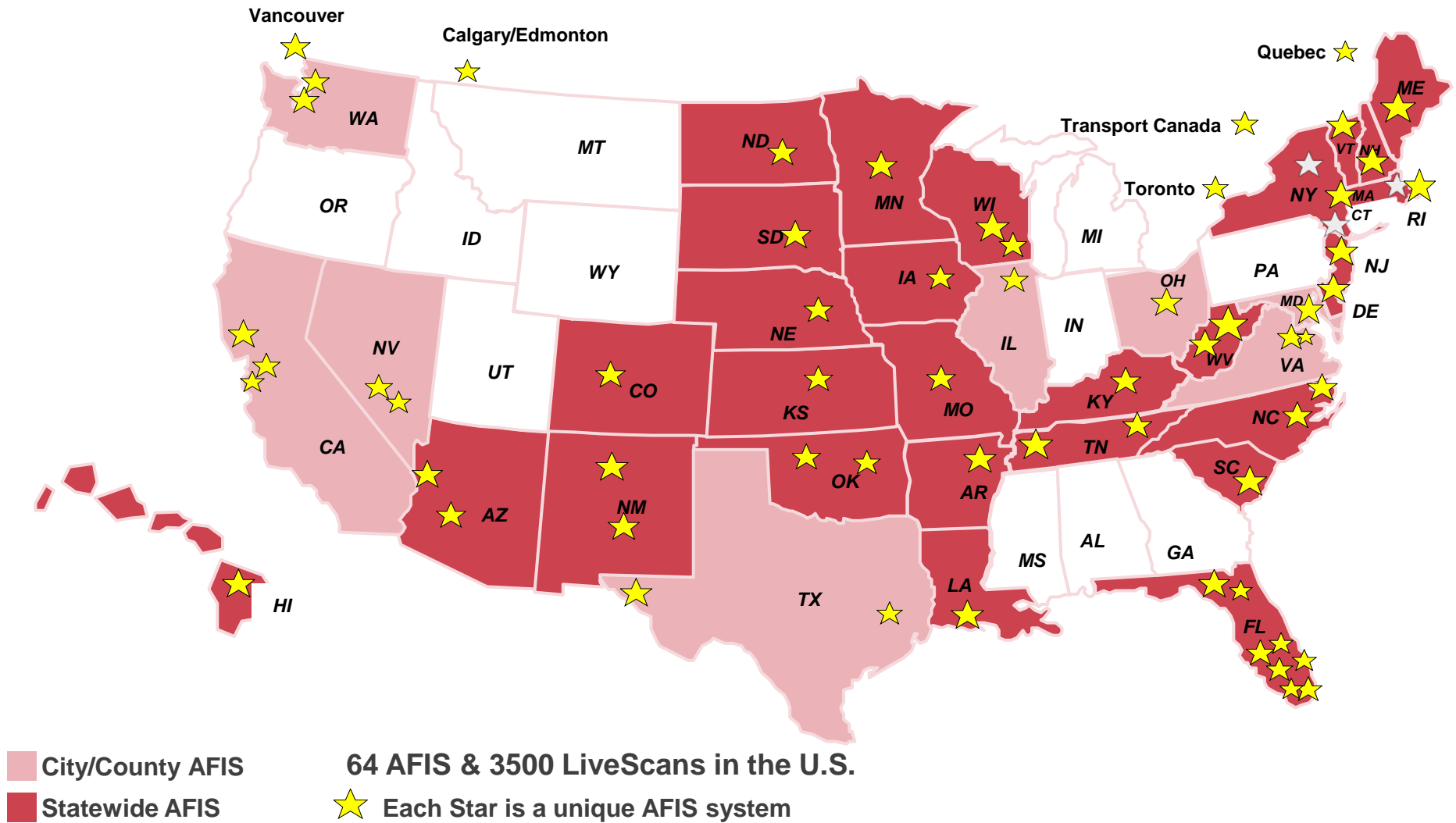


# LAW ENFORCEMENT AND PUBLIC SAFETY

**AFIS, the core of all law enforcement identification**



# LAW ENFORCEMENT AFIS CUSTOMERS (U.S. AND CANADA)

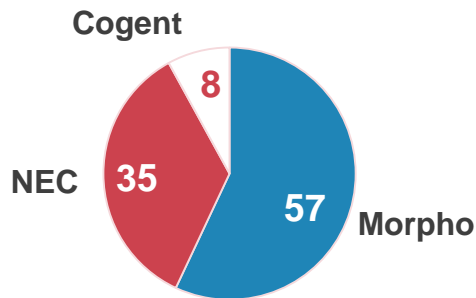


# U.S. LAW ENFORCEMENT MARKET

Intensely competitive in a challenging budget environment

1. Preserve and grow existing customers: new products and business models to keep long-term contracts
2. Win accounts from # of AFIS systems in U.S. -no new major opportunities created competitors

## Competitive share – Statewide\* AFIS systems



## MorphoTrak Recent Competitive AFIS Wins

- King County, WA Sheriff AFIS 
- Calgary Edmonton Police Service/Canada AFIS 
- Orange County, CA AFIS 
- Massachusetts State Police AFIS 

- ➔ 11 major system upgrades or replacements in 2013
- ➔ 6 recent contracts currently under implementation

- ➔ High win rate in competitive market space – when agencies change AFIS vendors, they change to MorphoTrak!

50 states plus Washington DC



# CUSTOMERS - U.S. FEDERAL AGENCIES



## → U.S. FBI – Next Generation Identification (NGI)

- 10 Print Identification System
- Repository for Individuals of Special Concern (RISC)
- Latent Fingerprint Identification (operational Q2 2013)
- Human Machine Interface (HMI – Latent Workstation)



## → U.S. Department of Defense (DoD)

- Fingerprint, palm, and latent matching
- DoD Regional Systems for Middle East
- Battlefield Biometrics -- “MorphoLift” Development

# CIVIL ID AND FRAUD PREVENTION

## → Growth areas – Fraud and Intrusion Prevention systems in civil and commercial programs

- Immigration Reform Border Control & E-Verify Work verification programs
- Govt benefits – Medicare
- Banking – convenience and security
- Healthcare – protection of information and convenience of access

## PROJECT EXAMPLES



### → Arizona Department of Economic Security

- Civil ID AFIS/Card for Benefits



### → California Health & Human Services

- Welfare Benefits



### → State of New Jersey: Applicant Background Check

- Recently transferred to MorphoTrust

# ACCESS CONTROL SOLUTIONS

- ➔ **#1 U.S. provider of fingerprint access terminals**
- ➔ **#1 in fingerprint matching accuracy – U.S. NIST testing of algorithms**
- ➔ **Fingerprint readers can replace or supplement access cards, PINs, passwords, tokens, etc**
- ➔ **Significant increases in:**
  - Security
  - Protection of privacy
  - Convenience

- **PACS**  
(Physical Access Control Systems) ➔
- **LACS**  
(Logical Access Control Systems)
- **Time & Attendance**



## GROWTH AREAS:

- PIV & TWIC (Govt Workers ID Credentials) - security
- Time and Attendance – accuracy and convenience
- Commercial – banking, healthcare records

## End Users

- ➔ Facility access control throughout the new World Trade Center and Port Authority of New York New Jersey
- ➔ Airport personnel security screening: SEATAC, Minneapolis, Salt Lake City, Las Vegas Airports...
- ➔ Education Facility Access Control, Cafeteria payments. Childcare systems
- ➔ Membership checks – 24 Hour Fitness Health Clubs, and now their competitors
- ➔ Access & Time in harsh industrial environments – TWIC/Ports, factories, mines, railroad companies

# IMMIGRATION/BORDER CONTROL

## → Immigration Reform: Future Biometric Opportunities

- VISA Entry/Exit: air, land, sea
- Facial “surveillance”
- Immigrants’ right to work
- Mobile devices/border enforcement
- Airport security and convenience

## → Current Activities

- Gateway-on-the-Move (GOTM)
- Biometric identification systems in 40 airports
- Product evaluations/pilots (DHS)
- Modernization of border control biometric matching systems

## BIOMETRIC PRODUCTS/SOLUTIONS



Finger  
on the Fly



Iris and Face  
At a distance



Access Control  
Terminals



MorphoPASS

# **/02/ CUSTOMER SERVICE**

by Walt Scott, Senior Director Customer Support



# EXCEPTIONAL CUSTOMER SERVICE



**24/7 365 days/year.  
Customer support operations in Anaheim**

## ...OUR CUSTOMER

- **Support Department**
- **We are #1 in terms of customer satisfaction and loyalty**
- **140 people (27% of our workforce) – dedicated to providing service and maintenance throughout the U.S.**
- **34,000 calls/year. 86% addressed within 24 hours**
- **Absolutely critical in the field of public safety**

**/03/**

# **RESEARCH & DEVELOPMENT**

By Guy Mahoney, VP Engineering Products & Innovation, MorphoTrak  
Jean-Christophe Fondeur, VP Research & Technology, Morpho

# INNOVATION

## → Innovation at the heart of our strategy

- **Worldwide coordination** of product and technology roadmap
- World-class **R&D centers** in **10 countries**:  
USA, France, Brazil, Germany, Morocco, Ireland, India, Russia, Singapore, The Netherlands
- **9% annual turnover** invested in R&D
- **30% workforce** in Europe and North America dedicated to R&D
- Morpho operates one **of the world's largest R&D centers** dedicated to identification technologies



# BIOMETRIC TECHNOLOGIES

## → Multi Biometrics

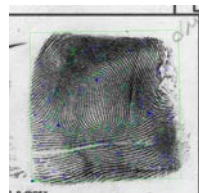
- Fingerprint / Face / Iris / Palm
- Latent Impression
- Vein
- Tattoo
- DNA
- Voice

## → A variety of functions

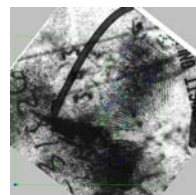
- Pre processing, compression
- Quality estimate
- Detection, Segmentation, Tracking
- Coding/Matching

## → Main Performance Indicators

- Accuracy



Fingerprint



Latent



Palm



MugShot



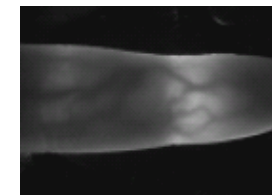
Video



3D Shape



Iris



Vein



Tattoo



DNA Profile



Voice

**Our technology Ranks #1 in many industry tests**

# USA DEVELOPED AND MAINTAINED PRODUCTS

## → MorphoBIS

- Combination of best of the best from acquisitions and new leading edge software.
- Deployed: USA (FBI, NYPD, Massachusetts, Orange County, Tennessee, Colorado, Florida), Canada, Europe, Middle East, Asia Pacific and Africa.
- **MorphoBIS Workstations**
  - Latent Expert Workstation (LEW)
  - Tenprint Expert Workstation (TEW)
  - Morpho Lite Face Explorer (LFE)
  - Record Archive Service (RAS)
- **MorphoBIS Components:**
  - Advance Data Services (ADS)
  - Data Exchange Services (DES)
  - Work-Flow Services (WFS)
  - Maestro (Gateway, Fleet Mgmt)

## → Enrollment Stations: LiveScan, IDM, HIIDE

- Capture of demographics, fingerprints, palmprints, face,
- iris, signature to build database for identification and verification





# INNOVATIVE PRODUCTS DEVELOPED IN FRANCE



## → MorphoDent

- Handheld finger print capture device wirelessly integrated into MorphoBIS system
- Deployed: West Virginia, Virginia Fairfax County, Missouri, Arizona and Harris County.

## → MorphoTablet

- Multifunction mobile biometric terminal suited for identity checks and criminal investigation (capture and transmission of clue/evidence photos, remote latent searches).



## → Biometrics On-the-Fly

- High quality imaging
- Fast, Ease of Use
- Simplicity
  - Intuitive ergonomics
  - Lower Failure to Acquire
  - Easy for First time users

# BIOGRAPHIES

# JEAN-PAUL HERTEMAN



## Chairman and Chief Executive Officer of Safran

Jean-Paul Herteman holds degrees from the prestigious Ecole Polytechnique (1970) and the Ecole Nationale Supérieure de L'Aéronautique et de l'Espace (1975). He started his career with French defense procurement agency DGA in 1975 as test engineer for materials.

He joined Snecma in 1984 as head of materials and processes research programs. He was named Vice President for Quality in 1989.

Named Snecma Design department manager in 1993, Jean-Paul Herteman was subsequently director of CFM56 programs, then Vice President of CFM International (the GE/Safran joint venture that is the world leader in commercial aircraft engines). In 1996 he was named Vice President for Engineering at Snecma, before taking responsibility for the Rocket Engine division (previously Société Européenne de Propulsion) in 1999. He was named Chairman and CEO of Snecma Moteurs (now Snecma) in 2002.

In 2004, Jean-Paul Herteman was named Executive Vice President of Snecma, in charge of the Aerospace Propulsion branch. He took over responsibility for the Defence Security branch at Safran in December 2006. In July 2007, he was named Chief Executive Officer of Safran.

On April 21, 2011, Safran changed its governance structure and the Board of Directors named Jean-Paul Herteman Chairman and Chief Executive Officer of the Group. Jean-Paul Herteman has also been the French aerospace industry association, since July 2009, a member of the Board of Directors of French scientific research agency CNRS since November 2009 and president of ASD (AeroSpace and Defence Industries Association of Europe) since October 2012.

# MARC VENTRE



## Deputy Chief Executive Officer, Operations

Marc Ventre graduated from the Ecole Centrale de Paris engineering school, and holds a Master of Sciences degree from the Massachusetts Institute of Technology. He joined Snecma in 1976, holding a series of positions concerning materials sciences in the Quality department at the Corbeil plant.

From 1979 to 1980 he was assigned to General Electric Aircraft Engines headquarters in Cincinnati, Ohio, representing Snecma as part of the development program for the CFM56, jointly produced by the two companies. Following an assignment in Villaroche, from 1981 to 1988, Marc Ventre was in charge of Quality at Snecma's Gennevilliers plant.

From 1988 to 1991, he was Deputy Director of Production at Snecma. He then became General Manager of the Gennevilliers plant, before being named Snecma Vice President, Production and Purchasing in 1994. In 1998, he was named Chairman and CEO of Hispano-Suiza, then held the same position at Snecma Services from 2000 to 2004, before being named Chairman and CEO of Snecma.

He moved back to Safran headquarters in 2006 as Executive Vice President, in charge of the Aerospace Propulsion branch. On July 29, 2009, he was appointed to the Executive Board. On April 21, 2011, the Safran Board of Directors named Marc Ventre Deputy Chief Executive Officer, Operations. Marc Ventre was also named Chairman of the French Civil Aviation Research Council (Corac). He is on the Gifas board, a director of the Ecole Centrale de Paris, and a member of the Supervisory Board of Radiall.

# STEPHANE ABRIAL



## Deputy Chief Executive Officer, Corporate Office

Stéphane Abrial graduated from the French Air Force Academy (1975), from the U.S. Air Force's Air War College (1992), from the National Institute for Higher Defense Studies (IHEDN, 2000) and received a Doctor of Science (HC) degree from Old Dominion University.

Stéphane Abrial started his military career in 1972.

Earning his wings as a fighter pilot in 1976, flight commander within the German Air Force (1981-84), he also served in a Greek Air Force squadron (1988), then in operations in Chad, and took part in the war to free Kuwait, during Operation Desert Shield – Desert Storm (1990-91) as commander of the 5th Fighter Wing. From 1996 to 1999, he was assigned to NATO international headquarters in Brussels.

He also acquired political experience during assignments with the French President's cabinet from 2000 to 2002, and as head of the Prime Minister's military office (2002-2005). He was named Commander of Air Defense and Air Operations in 2005, then the following year General and Chief of Staff of the French Air Force.

In September 2009, Stéphane Abrial was named commander of one of NATO's two supreme commands, ACT (Allied Command Transformation), working for three years with the Alliance's 28 countries on strategic analysis, capability development, education and training.

After leaving active military service in October 2012 he joined Safran on January 1, 2013 as Advisor to the Chairman and CEO. On July 1 he is named Deputy Chief Executive Officer, Corporate Office.



# PETER LENGYEL



## President and CEO of Safran USA

Peter Lengyel is responsible for execution of the strategic vision of Safran among the 32 companies and joint ventures operating in the United States.

He was previously the Vice President for Business Development for Safran USA, and in this role coordinated Group approaches across Safran's aerospace, defense and security markets in the US.

Prior to joining Safran, Peter Lengyel was a career naval officer, and last served as the naval attaché for defense security cooperation at the American Embassy in Paris, France. As the Director of Naval Affairs, he served as a liaison between government, defense, and private sector leaders to increase interoperability of US and French defense systems.

# JEAN-JACQUES ORSINI



## General Manager, Industrial Division Snecma

Jean-Jacques is graduated from 2 French Engineering Schools “ENSAM” and “ESTA” (1988 and 1989). Jean-Jacques begins his career in 1990 at Snecma in the Engineering Office in charge of the structural parts. After a brief passage in the Production Support Division in 1997, he takes in charge the function of “Module Manager” for the high pressures compressor of the GE90 engine at General Electric from 1998 to 2000.

Back from the United States, he takes the responsibility of the development and the certification of parts made by Snecma on the project GE90-115B, before becoming in 2003 the Project General Manager of the High Powered Engines.

From 2005 to 2008, Jean-Jacques was back in design as the manager of the Fan and Compressor modules. In 2008 he was appointed as R&T VP and, from 2009 Quality VP for Snecma. In 2012, Jean-Jacques volunteered to play a key role in the Snecma’s composites effort for the Leap as the Woven Composites Parts Center Of Excellence VP inside Snecma’s industrial division.

# JOSEPH MORONE



## President & CEO, Albany International Corp.

Joseph G. Morone is President and Chief Executive Officer of Albany International Corp., a global advanced textiles and materials processing company that trades on the New York Stock Exchange.

Dr. Morone was named President of Albany International on August 1, 2005, and appointed Chief Executive Officer on January 1, 2006.

He is a member of the Board of Directors of Albany International Corp., Presiding Director of Transworld Entertainment Corporation, and serves on the University System of New Hampshire Board of Trustees. Until July 2005, he served as chairman of the Board of Trustees at Tufts-New England Medical Center and its Floating Hospital for Children.

Before joining Albany International, Morone served as president of Bentley University for eight years, and before Bentley, as dean of the Lally School of Management and Technology at Rensselaer Polytechnic Institute.

Prior to joining Rensselaer, Morone worked for the Keyworth Company, a consulting firm that specialized in technology management and science policy; GE's Corporate Research and Development; and the White House Office of Science and Technology Policy.

Dr. Morone holds a Ph.D. from Yale University in political science.

# MICHAEL RIGALLE



## Vice-President and General Manager, Safran Aerospace Composite - Rochester

Michael Rigalle received his Engineering degree from the Institut Catholique des Arts et Metiers of Lille, France.

Michael joined Safran in 1995 as Manufacturing Manager within Labinal. In 2002, Michael became Operations Manager and launched the MATIS Aerospace, Casablanca, Morocco facility for Labinal.

In 2007, Michael was promoted to General Manager for Labinal in Pryor, Oklahoma plant. In 2009, he relocated to Bordes, France where he held the position of Rotating parts Plant Manager for Turbomeca.

His most recent assignment is the launch the LEAP Project facility in Rochester, NH where he is now VP and General Manager of Safran Aerospace Composites.

# OLIVIER BALMAT



## General Manager, Safran Aerospace Composite - Commercy

Olivier Balmat is graduated from a French Engineering Schools “Ecole Centrale de Lyon” (1997) and has a Master’s degree in Acoustics (1998). Olivier began his career in engineering and in 2000 he turned to production in the forging mill unit of Gennevilliers. During five years, Olivier will occupy several positions in the shop floor (Production manager, Continuous improvement and Lean manager) and in the office (Supply chain manager).

In 2005, he coordinates emerging sources (industrial internal deployment) for Safran.

Olivier comes back in Gennevilliers plant to take the responsibility of the Materials and Processes Department for forging and casting parts until 2009.

In 2009 he was appointed as Lean General Manager for the industrial Division in Snecma, and managed the Lean deployment in the 4 major Snecma plants in France. In 2012, Olivier volunteered to manage the construction of Commercy plant and become in 2013 the General Manager of Safran Aerospace Composite.



# DANE HILEMAN



## CEO & President, Vectronix Inc.

He is responsible for the day to day operations of facilities in California, Virginia and New Hampshire as well as its wholly owned subsidiary Optics 1, Inc.

He has extensive experience in the field of optical technology including various business management and technical roles in the design, development and manufacture of electro-mechanical-optical systems.

In his career he held positions with Hughes Aircraft, Bausch & Lomb, Compaq Computers, Corning Inc. and prior to Vectronix he was the Chairman, CEO, President and co-owner of Optics 1, Inc.

Dane Hileman earned undergraduate technical degrees in physics and optical engineering prior to obtaining a Master's degree in Business from the University of Rochester's William E. Simon Graduate School of Business.

He is a member of the Optical Society of America and the International Society for Optical Engineering.

# DANIEL EYLON



## Director of Materials Engineering University of Dayton, Member of Safran Scientific board

Dr. Daniel Eylon received his B.Sc. in mechanical engineering and his M.Sc. and D.Sc. in materials engineering, all from the Technion-Israel Institute of Technology. He has lived in Dayton, Ohio (USA) since 1972 and worked in association with the US Air Force Materials Directorate at WPAFB till 1985 on the development of titanium alloys.

Since 1986 he has been a professor in the Graduate Materials Engineering Program at the University of Dayton and is now also the program director. In the past ten years most of his research work was devoted to powder, casting and high temperature titanium alloy technologies. He has over 300 papers and 50 patents in the area of structural metals. He is a Fellow of the ASM (FASM), a member of the European Academy of Sciences (EAS) and enjoys studying, researching, lecturing and writing on the evolution, history and archaeology of metals (archaeometallurgy).

# JEAN-MICHEL HILLION



## Safran Corporate Senior Vice President, Boeing Programs

Jean-Michel Hillion graduated from the Ecole Supérieure d'Electronique de l'Ouest electronics engineering school (1986) and holds an MBA from IAE in Paris (1991).

Jean-Michel Hillion joined the Group in 1988, as head of production testing for Elecma, the electronics division of Snecma at the time. He then created the commercial aircraft FADEC repair workshop when the A320 entered service, prior to taking charge of FADEC 2 development for the A340 CFM engine.

In 1993 he was named head of commercial aircraft programs at Elecma. He took part in the creation of Snecma Control Systems in 1998, being named head of business development.

In 2001 he joined Messier-Bugatti as director of programs for the Hydraulics and Braking Control divisions. Jean-Michel Hillion was subsequently named director of these Messier-Bugatti divisions.

He moved to Sagem in September 2008 to direct the creation of Safran Electronics, then was named head of this division in February 2009.

# KENT FISHER



## VP & GM for BCA Supplier Management, Boeing

Kent Fisher is the vice president and general manager of Boeing Commercial Airplanes' Supplier Management organization. Named to this position in September 2011, Fisher has responsibility for the overall strategy, contracting, daily management and development of the Boeing Commercial Airplanes supply chain, which supports the manufacture and after market support of all Boeing commercial airplanes.

Fisher has held a variety of posts in his more than 18 years with Boeing, through which he has progressively deepened his understanding of commercial aviation. Prior to joining BCA Supplier Management, Fisher held positions in Supply Chain Strategy, New Airplane Business Development, Market Analysis, Air Traffic Management, and Sales.

Before joining Boeing, Fisher held various positions at Price Waterhouse in its litigation and bankruptcy consulting group in Los Angeles and Seattle. Fisher holds a bachelor's degree in Economics from Pomona College and a master's degree in Business Administration from the University of California – Los Angeles.

# PHILIPPE PETITCOLIN



## Chairmain and CEO of Morpho

Philippe Petitcolin holds a master's degree in mathematics, as well as a degree from the CPA business school.

He started his career in 1978 as export manager for the company Europrim, and was subsequently named head of the export zone for Filotex, an Alcatel-Alstom subsidiary.

In 1982 he was named aviation sales and marketing director for Chester Cable in the United States. He returned to Filotex in 1984 as export director.

In 1988, he joined Labinal as deputy sales & marketing director, subsequently being named director of sales & marketing for the aeronautical systems division. In 1995, he was named managing director of this division.

From 1999 to 2001, Philippe Petitcolin was managing director of Labinal's Filtrauto division, while also acting as general manager of the friction materials business following the purchase of Filtrauto by Valeo. In 2001, he was named CEO of Labinal, and became Chairman and CEO of the company in November 2004. He joined Snecma in 2006 as Chairman and CEO.

From 2011 to 2013, he was named President, in charge of Safran's Defense and Security businesses, as well as Chairman and CEO of Sagem.

Philippe Petitcolin is appointed as Morpho Chairmain and CEO on July 1, 2013. He retains his position as Chairman of the Sagem's Board of Directors.



# KAREN BOMBA



## President and CEO of Morpho Detection

Karen Bomba was appointed president and CEO of Morpho Detection in July 2013. Karen Bomba's leadership track record of delivering growth and performance while driving customer focus most recently includes serving as chairman and CEO of Labinal (Safran). She began her career at Northrop Corporation's Advanced Systems Division facilities in California as manufacturing engineering manager, working on the structures and systems for the B-2 bomber program.

She then spent seven years as business line manager for Aircraft Structures, Insulation Products and Carbon-Carbon products at Hitco Carbon Composites in Gardena, CA. In 2000, Karen Bomba joined Messier-Bugatti USA (Safran) as executive vice president and general manager, and was named chairman and CEO in 2004.

After her appointment to chief operating officer of Zoltek Companies, Inc. in 2008, she returned to Safran as chairman and chief executive officer of Labinal in 2010.

# CAMERON RITCHIE



## Vice President, Technology & Chief Technology Officer (CTO)

Cameron Ritchie leads several technology R&D teams developing products to address the homeland security and aviation security markets. His teams focus on developing orthogonal technologies such as x-ray computed tomography, X-ray diffraction, quadrupole resonance, and chemical trace detection to more quickly and accurately detect explosives and other threats and to meet emerging detection requirements.

Ritchie started his career in 1994 as a research scientist with Imatron, a manufacturer of Ultrafast Cardiac Computed Tomography (CT) scanners. He joined GE Medical Systems in 2001 and took the role of engineering program manager. In this capacity, he led the development of GE's eSpeed Ultrafast CT System.

In 2003, Ritchie was promoted to manager, CT Systems and Applications Lab at GE's Global Research Center in upstate New York. Ritchie holds a Bachelor of Science degree in Mechanical Engineering and a Ph.D. in Bioengineering, both from the University of Washington.



## Director of Explosives Detection System (EDS) Platforms

Nik Karnik manages the direction and strategy of the EDS portfolio. His main responsibilities include ensuring MDI is developing the right solutions to meet market needs and drive continuous improvements for the sales, operations, and servicing of the EDS portfolio.

Prior to this role, Karnik was the product manager for Compact Computed Tomography (CT) Solutions and lead the development of the CTX 5800™.

He moved to California and joined Morpho Detection in 2005 within the commercial finance organization, before moving to product management in 2008.

Karnik began his career in sales and deal management with GE Global Exchange Services in 2000. He later took a position as a Commercial Blackbelt with Tyco Plastics and Adhesives in Princeton, New Jersey. Karnik graduated from Pennsylvania State University with a Bachelor of Science degree in Marketing.

# RICH STODDARD



## Director, Trace and CBRNe Platforms

As Director of Trace and CBRNe platforms, Stoddard leads Morpho Detection's product development and works across the business to maintain current product lines and drive creation of next generation products and markets.

Since 2002, Stoddard has worked in training, product support and product management roles within Morpho Detection.

In his most recent role as product manager of Trace desktops, Stoddard launched the Itemiser DX and improved the Itemiser 3 product line.

Prior to joining Morpho Detection, Stoddard worked in a variety of roles including manufacturing and engineering for Lockheed Martin, global field service for Asyst Technologies, and as a Service/Technical Support Manager for Integrated Labeling.

# DAN MAHLUM



## Director, Checkpoint Platforms

Dan Mahlum is director of checkpoint platforms at Morpho Detection.

Dan Mahlum leads Morpho Detection's Global Checkpoint strategy and works extensively with the strategy and technology teams and external partners to develop and expand Morpho Detection's checkpoint portfolio.

Mahlum has more than 10 years of experience with the business, having acted in roles in engineering and product management.

He has experience with a wide variety of checkpoint related technologies, most recently as product manager for X-ray and Metal Detection where he launched several new products and worked to diversify Morpho Detection's product offering.

Dan Mahlum earned a Bachelor of Science degree in Information Systems, Business Administration from San Diego State University.



# CELESTE THOMASSON



## President and CEO of MorphoTrak

As a U.S. citizen, Celeste Thomasson's path has allowed her to acquire extensive experience with Safran, serving most recently as Safran General Counsel, a position she began in July 2010. Previous to that, she served as Senior Vice President & General Counsel of Safran USA. Celeste Thomasson first joined Safran in 2002 as Legal Counsel of Messier Services and in 2003 she was appointed General Counsel of Messier-Dowty.

# CLARK NELSON



## Senior Vice President of Sales & Marketing for MorphoTrak

Clark Nelson joined the company as the Vice President of Federal Sales in 2006.

He led the sales effort to win the 2 largest biometric contracts in the U.S. – FBI Next Generation Identification (NGI) 10P and Latent Fingerprint AFIS. He was part of the integration team of Printrak, GE Homeland Protection, and L-1 Identity Solutions, merging sales/marketing efforts, and looking for synergies in a variety of markets and applications.

# WALTER SCOTT



## Senior Director of the MorphoTrak Customer Support and Test Business Unit

His scope of responsibility in the service industry includes Field Service Organization Management, Product and Technical Support as well as Test and Certification.

He has spent the last 18 years managing AFIS support. Walt earned an MBA from the Florida Institute of Technology.

# GUY MAHONEY



## Vice President of the MorphoTrak Center of Excellence (Research and Development)

Guy Mahoney's team has successfully released several versions of the AFIS product line, including the next generation MorphoBIS. His team has also released product versions of MorphoIDent Mobile ID, LiveScan and Identity Management Solutions.

He is currently working on fusing the technology from Morpho, L-1, and Printrak to produce the industry leading next generation algorithms.

During his 17-year tenure with MorphoTrak, Guy Mahoney has also previously led the Systems Integration Team, Solutions Engineering team, the Next Generation Workstation team, performed software engineering and integration roles. Before joining the MorphoTrak, Guy Mahoney was a researcher and software engineer with Hughes Aircraft and Singer Librascope.

# JEAN-CHRISTOPHE FONDEUR



## Jean-Christophe Fondeur is VP, Research & Technology for Morpho

He has been leading Morpho biometric research activity for more than 13 years and has been involved in all of the company's breakthroughs in biometrics of the past 20 years. His achievements include the development of biometric algorithms and innovative biometric sensors. He is also responsible for the design of scalable architecture for large-scale biometric systems for customers such as the FBI and Unique Identification Authority of India (UIDAI).

He holds more than 13 patents in the field of biometrics and is a senior member of the Institute of Electrical and Electronics Engineers (IEEE).



# KEY MISSIONS, KEY TECHNOLOGIES, KEY TALENTS