Enabling the Factory of the Future

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#MyStory
History 100
Vision / Strategy
Enabling Factory Today
Enabling Future Factory
Ecosystem
Cybersecurity
Q&A
#Me

[Images of various scenes and people]
#OurStory, #MyStory
We are embarked as pioneers upon a new science and industry in which our problems are so new and unusual that it behooves no one to dismiss any novel idea with the statement “It can’t be done”

— William E. Boeing
PURPOSE AND MISSION
Connect, Protect, Explore and Inspire the World through Aerospace Innovation

ASPIRATION
Best in Aerospace and Enduring Global Industrial Champion

ENTERPRISE STRATEGY
Operate as One Boeing
Build Strength on Strength
Sharpen and Accelerate to Win

2025 GOALS
Market Leadership
Top-quartile Performance and Returns
Growth Fueled by Productivity
Design, Manufacturing, Services Excellence
Accelerated Innovation
Global Scale and Depth
Best Team, Talent and Leaders

ENDURING VALUES
Integrity
Quality
Safety
Diversity and Inclusion
Trust and Respect
Corporate Citizenship
Stakeholder Success

BUSINESS IMPERATIVE
Deliver Superior Value to Customers, Employees, Shareholders, Communities and Partners
Competitors and Partners

Boeing’s new CEO sees Amazon and Facebook as competitors (and potential partners)

by Alan Boyle on September 22, 2015 at 10:53 am

One of Muilenburg’s presentation slides shows Apple, Google, Amazon and Facebook alongside Airbus, Bombardier and Lockheed Martin as part of a web of competitors and partners in the aerospace industry. (Credit: Alan Boyle for GeekWire)
737: 291 million parts and 20,370 miles of wiring are installed per year

747: It takes 6 million parts to build each airplane

767: 800 suppliers contribute to each airplane.

777: The wiring on each plane stretches 134 miles.

787: The airplane has flown the equivalent of 1000 round trips to the moon

787: Each airplane contains enough carbon fiber to stretch approximately 2,200 miles – the distance from Seattle to New York City
The Industrial Internet of Things (IIoT)

Machine learning
• Drives improvements to our productivity

Advanced manufacturing and Robotics
• Safety, Quality, and Competiveness
• Smart Parts (Passive & Active RFID, UWB, GPS, UID, Barcode Solutions)

Large-scale data capture and visualization
• A single flight of our 787 Dreamliner can create half a terabyte of information
• Enable real-time decision support & prognostics (in core and at the edge)

Mobile Solution and device integration
The Opportunity of Advanced Manufacturing

Safety
• Reduce injuries and make jobs safer

Quality
• Precise tools for reliable and repeatable quality
• Essential to Boeing and our customers

Competitiveness
• Improve productivity
• More efficient production rates
• Enhanced skills of employees
Boeing’s IoT Domains
Digital Twins, Digital Thread
The Boeing factory of today is fueled by productivity

Boeing to Increase 737 Production Rate to 52 per Month in 2018. “This is the most productive airline factory in the world”
- Jack Stewart - WIRED
The Boeing factory of today is accelerated through innovation. "Our purpose is to make a better product with less strain and stress on our painters. We want to avoid injuries while producing perfect quality and meeting every requirement the first time."

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- Growth Fueled by Productivity
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ENDURING VALUES
- Integrity
- Quality
- Safety
- Diversity and Inclusion
- Trust and Respect
- Corporate Citizenship
- Stakeholder Success
The Boeing factory of today is safer with higher quality

Boeing’s Panel Assembly Line (PAL) is the 60 ton, 20 feet tall, friendly robot. At the rate today we install 44,000 fasteners per day.

- Greg Beltz 737 PAL Senior Manager
The Boeing factory of the future …

Boeing Unveils T-X Advanced Trainer Aircraft

By: Valerie Insinna, September 13, 2016 (Photo Credit: Boeing Defense, Space & Security)
“Boeing has 11 different design centers, hundreds of offices around the world, and almost 20,000 suppliers.”

Smart Manufacturing : Additive Manufacturing

One for the Record Books
August 28, 2016 in Technology, Commercial

From 30 hours to 30 seconds
How the world’s “Largest solid 3-D printed item” was made

https://www.youtube.com/watch?v=J2Or9r1Z_3ls

“Developing the drill-and-trim tool was a collaborative effort between ORNL, Boeing and other local companies”

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www.boeing.com/features/2016/08/record-books-08-16.page
Smart Manufacturing : AR/VR/Mixed
University Partnerships

Remote Assistance with HoloLens

http://hciresearch4.hcii.cs.cmu.edu/M-HCI/2014/Boeing/
## Trends that impact Cybersecurity

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Rapid transition to ‘smart’ technology</strong></td>
<td>- Information &amp; Communications Technology (ICT) increasingly relies on small, cheap, poorly protected Internet of Things (IoT) based services.</td>
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<td>- ICT based ecosystems are becoming less tolerant of service disruptions.</td>
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<td>- Many “smart” devices operate without direct human intervention or control.</td>
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<td><strong>Data proliferation</strong></td>
<td>- Data is accumulating faster than it can be organized, categorized, or protected.</td>
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<td>- Data is often more valuable than physical assets, but data protection typically lags physical asset protection.</td>
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<td>- Current data protection technologies are losing their effectiveness.</td>
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<td><strong>Over reliance on the Internet</strong></td>
<td>- Intellectual property and critical services are transitioning to the Internet with no viable return path.</td>
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<td>- Over reliance on a decades-old Internet infrastructure puts both national security and the global economy at risk.</td>
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<td><strong>Complex cyber ecosystem</strong></td>
<td>- The growing knowledge gap that exists between end users and ICT specialists provides an opportunity for cyber attackers.</td>
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<td>- Regulatory policies and controls often hamper, instead of help, protection of cyber resources, potentially fragmenting the Internet and causing disruption.</td>
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<td><strong>Expanding cyber attacks</strong></td>
<td>- Every device, every bit of data, and every service of value is under attack.</td>
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<td>- Cyber attackers continue to steal intellectual property, PII, and other valuable data.</td>
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<td>- Targets have expanded to include Industrial Control systems (ICS) and IoT devices.</td>
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<td>- The velocity and sophistication of cyber attacks are evolving, rapidly, faster than defenses.</td>
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Imagining the future