



Boeing Metrology: CIPM MRA

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Boeing Test & Evaluation

Metrology And Test Equipment Services



Bureau
♦ **I**nternational des
♦ **P**oids et
♦ **M**esures



Outline

- ◆ Boeing Company Overview
- ◆ Boeing's Commitment to Metrology
- ◆ Compliance in Aerospace
- ◆ CIPM-MRA and Boeing





Boeing Company Overview

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The Boeing Company



Founded in
1916
in the Puget Sound region
of Washington state



Became a
**LEADING
PRODUCER**
of military and
commercial aircraft



Completed a
series of
strategic
mergers and
acquisitions to
become the
**WORLD'S
LEADING
AEROSPACE
COMPANY**



Boeing Airplane Co. 1916



Douglas Aircraft Co. 1921



Stearman Aircraft Co. 1927



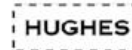
North American Aviation,
Inc. 1935



Pittsboro Helicopter 1940



McDonnell Aircraft
Corp. 1945



Hughes Space and
Communications 1946



McDonnell Douglas
Corp. 1967



Rockwell International 1968



The Boeing Company today

The Boeing Company



Products and services support
to customers in more than
150 COUNTRIES



Manufacturing, service and
technology partnerships
with companies around
the world

Contracts with more than
20,000
suppliers and
partners globally

Approximately
145,000
BOEING
EMPLOYEES

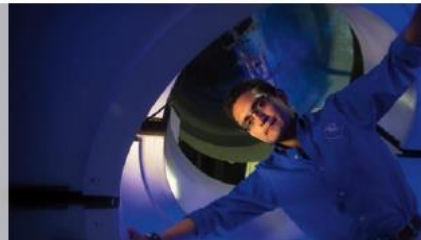


across the
United States and
in more than
65 COUNTRIES

Research, design
and technology-
development
centers and
programs in
multiple countries



of commercial
airplane revenue
historically
from
customers
outside the
United States



The Boeing Company



Commercial Airplanes



**\$65
BILLION**
in 2016 revenues

Offers a family of airplanes and a broad portfolio of aviation services for passenger and cargo carriers worldwide

Headquartered in the
**PUGET
SOUND**
region of Washington state
with operations in
several U.S. states



Approximately
**60,000
BOEING
EMPLOYEES**



Boeing airplanes represent
about half of the world's fleet,
with more than **10,000
jetliners** in service



of sales (by
value) are
to customers
outside the
United States



Defense, Space and Security



**\$29.5
BILLION**
in 2016 revenues

Has a balanced backlog across all markets, including a strong mix of development, production and support contracts

Headquartered in the
**WASHINGTON,
D.C.**
area with operations in
three countries and 26 states



Approximately
**35,000
BOEING
EMPLOYEES**



**FORMED IN
2000**

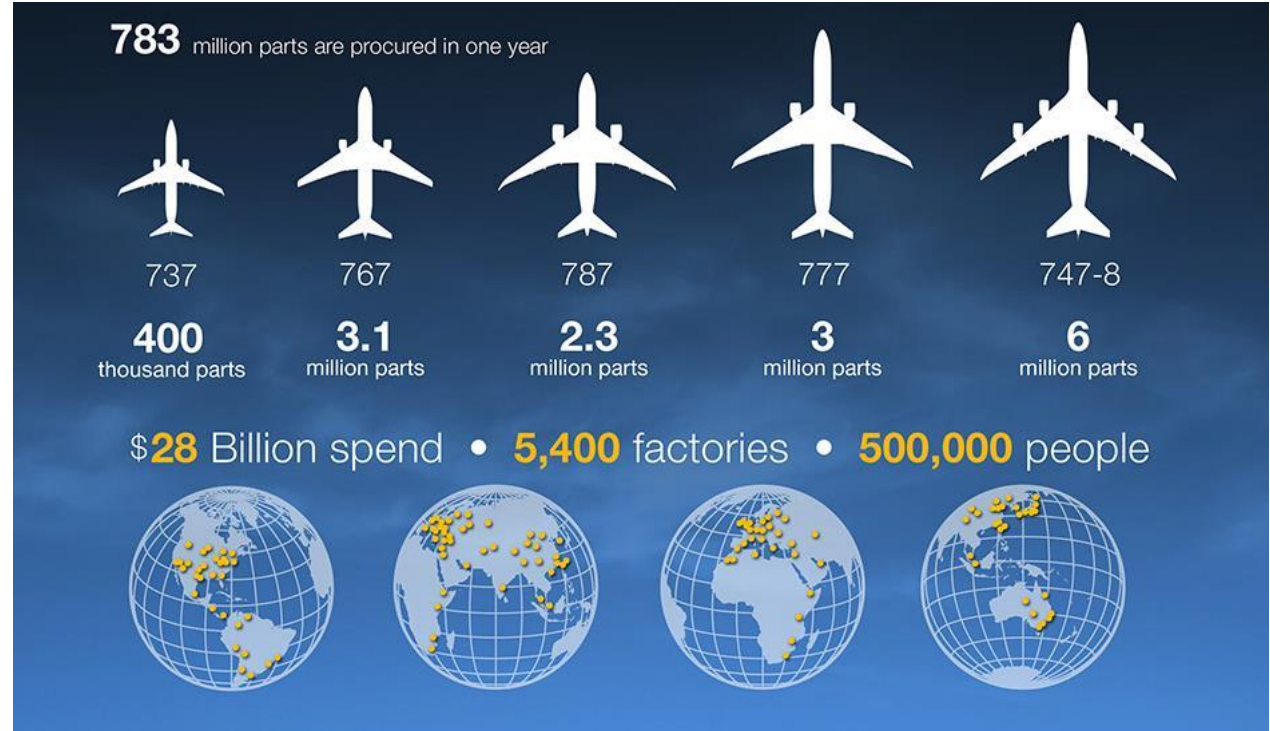
to integrate Boeing's
defense, space, intelligence
and communications capabilities

Designs, builds
and supports
net-enabled platforms
and systems for
government and
commercial customers



Accurate and repeatable measurements are a critical part of aerospace manufacturing.

A global supply chain demands confidence in measurement results and consistency in technical approach.





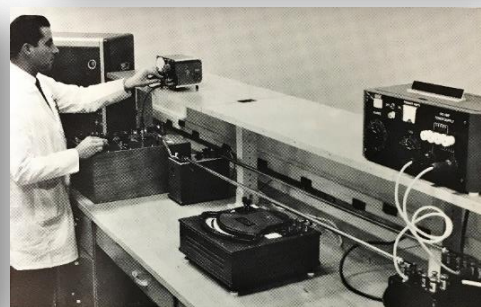
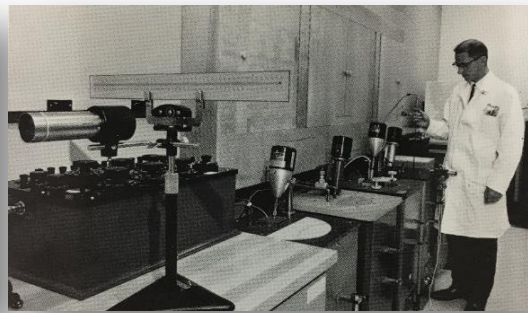
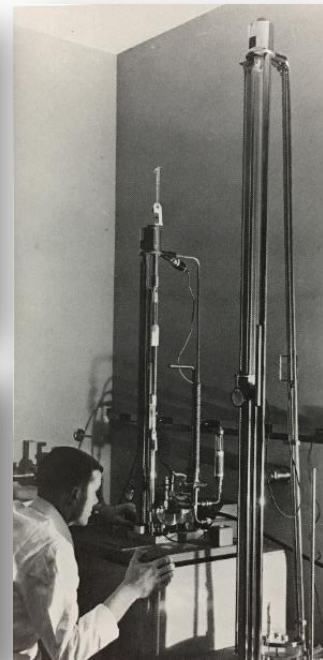
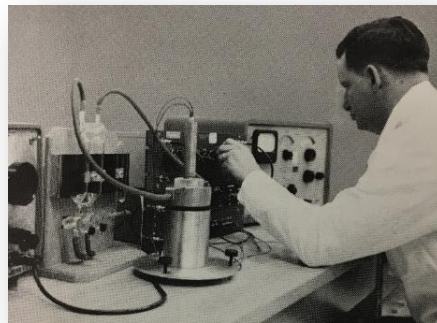
Boeing's Commitment to Metrology



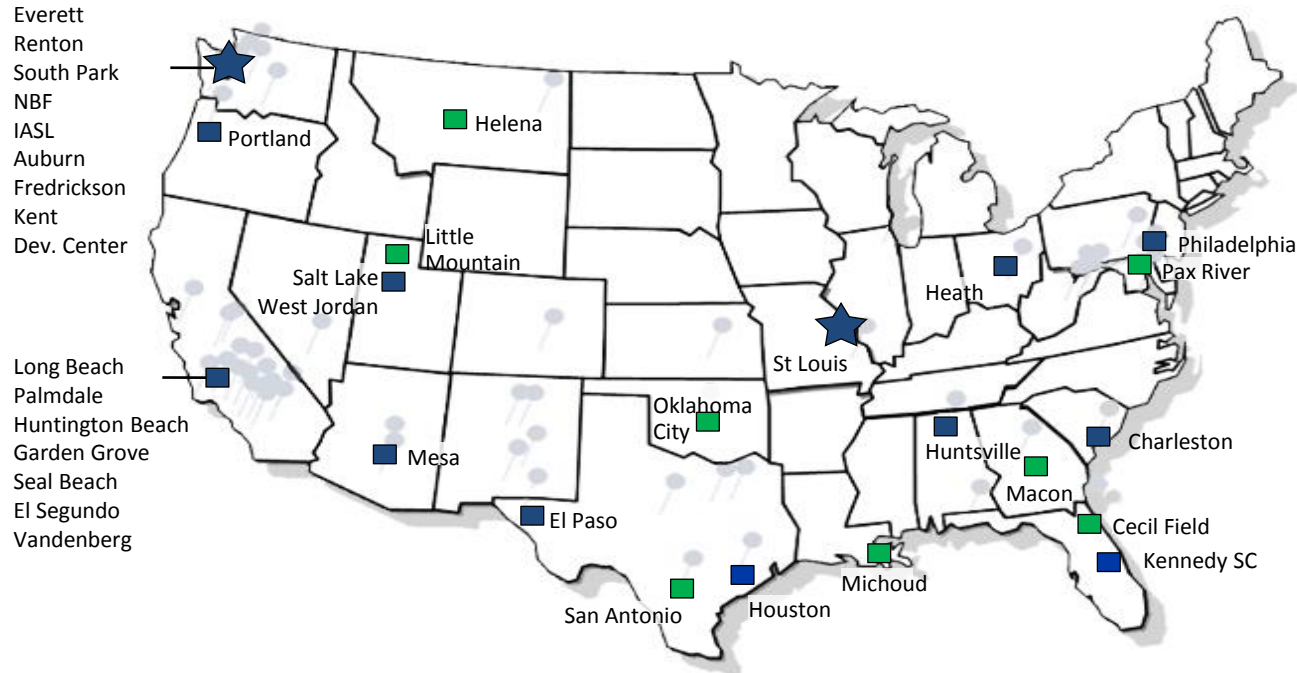
Boeing's Commitment to Measurement Science

Boeing's commitment to the quality, accuracy, and consistency of measurement results runs deep.

Established in 1963 and chartered to “establish and maintain traceability between the national measurement standards...and measurement standards used by Boeing calibration labs”, Boeing's commitment to metrology spans more than half of its 100 year history.



Boeing Metrology in 2017



~300 employees

Nationwide presence:
15 States; 25 Sites

Support all value streams
and full product life cycle

Dedicated Metrology
Engineering Function

Boeing Test & Evaluation Metrology Labs Test Asset Management Regional Hub

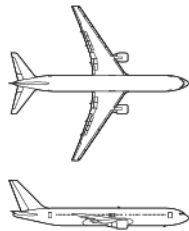


Compliance in Aerospace

FAA Production Certificate 700



- ◆ Originally issued to The Boeing Company in 1949
- ◆ Single certificate listing approved sites for production
 - Evidence that the FAA has evaluated and approved the applicant's organization, production facility, and **quality system** for compliance with applicable requirements.



Regulatory requirements that are specific to aerospace manufacturing



7.1.5 Provide monitoring, measuring, and traceability resources

7.1.5.1 Provide suitable monitoring and measuring resources

Determine the monitoring and measuring resource requirements.

Identify the monitoring and measuring resources that are necessary to meet requirements.

Provide appropriate monitoring and measuring resources.

7.1.5.2 Provide suitable measurement traceability resources

Determine measurement traceability requirements.

Maintain a register of monitoring and measuring equipment.

Establish a recall process for monitoring and measuring requirements.

Maintaining Traceability at Boeing



- ◆ Traceability to the international system of measurements (SI) traditionally comes from within the USA
- ◆ NIST capabilities cover the majority of calibration requests, but not all
- ◆ Boeing Metrology utilizes other NMI sources for mitigating calibration delivery, cost and capability challenges
- ◆ International product developmental testing requires updated calibrations under the local countries NMI





CIPM-MRA and Boeing

CIPM-MRA and Boeing



- ◆ CIPM-MRA Equivalence data
- ◆ Peer reviewed NMI capabilities
- ◆ Access to BIPM data
- ◆ Resources for traceability outside of NIST
- ◆ Calibration supplier approval
- ◆ NMI capability visibility



Questions?





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