Planning for the impact of Electronic Component Obsolescence on future avionics design

A Commercial Airplane Manufacturers View

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The Aerospace Corporation

Electronic Component Obsolescence in the Commercial Aerospace Industry

ECCB Users Advisory Group

Arlington, VA

March 18, 1998

Lloyd Condra

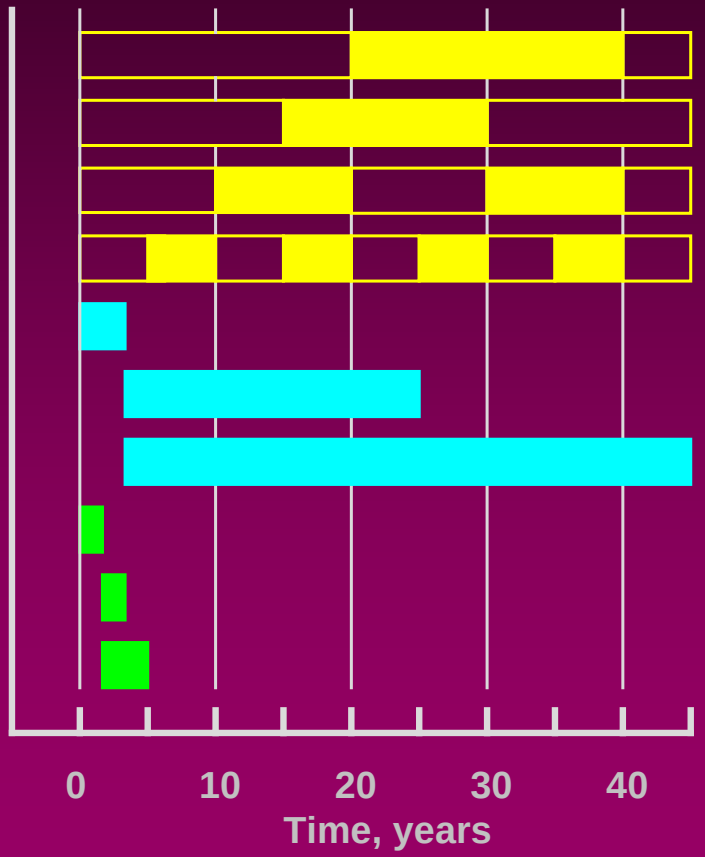
Boeing Commercial Airplane Group

The Situation

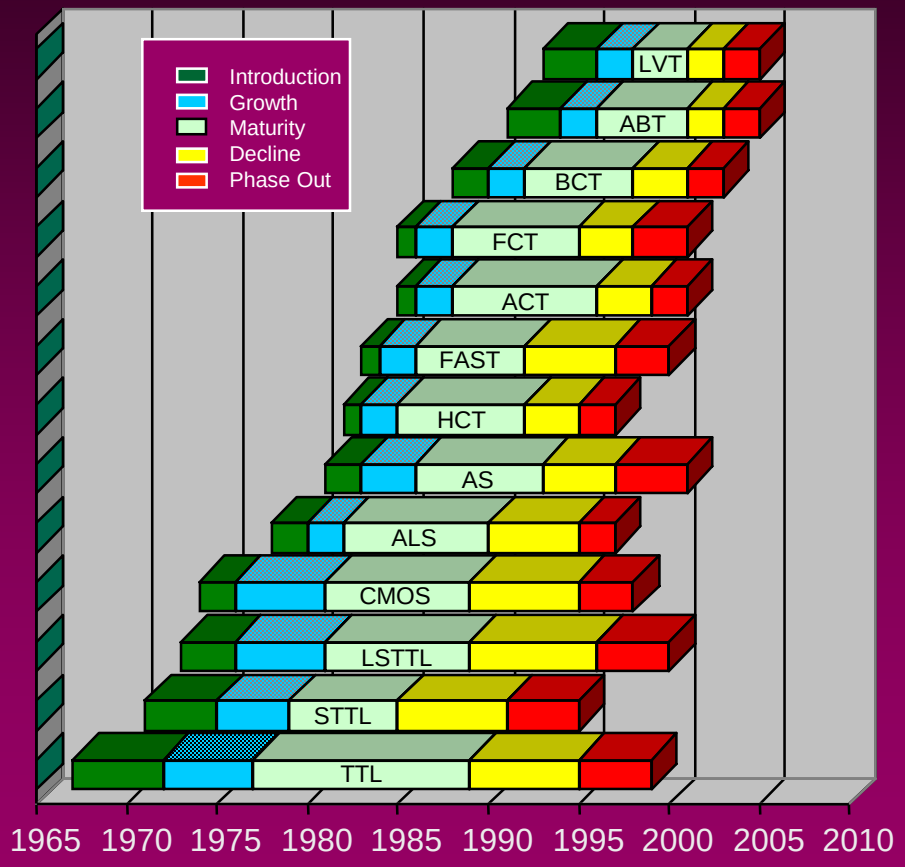
- Military components are disappearing, and many current system designs depend on them
- Available components are produced for computers and consumer electronics; they have 3-6 year production lives and narrow operating temperature ranges
- Designing, certifying, operating, and maintaining our airplanes will change dramatically
- There is no single, permanent solution
- We have three years to solve the problem

Technology, Airplane, and Computer Lifetimes

Technology element:	System archictecture
	Software
	Mfg. processes
	Piece parts
Airplanes:	Design
	Production
	Service
Computers:	Design
	Production
	Service



Technology Trends: Most Components are Near the End of Production



Parts Technology Life Cycle Is Shrinking

We Are Almost Imperceptible to Component Manufacturers (<0.5%)

*Annual Commercial Aerospace Consumption Estimated from Boeing Data**

Part Type	Part Numbers	Annual Volume, Pcs.	Annual Volume, $M	Annual Volume, $/PN
Microprocessors	60	300,000	22	367,000
Other integrated circuits	780	8,033,000	86	110,000
Discretes	300	13,500,000	20	66,000
Passives	650	77,000,000	26	160,000
Misc. (Hard Drives, Displays, etc.)	30	57,000	19	633,000
Aerospace Total	1,820	95,000,000	173	95,000
Intel Alone			25,000	

*The volumes represent commercial aerospace. They can be doubled to obtain a rough estimate for all of aerospace. Basis is EP procures ~30% components used on BCAG airplanes. Factored by 3 for BCAG and 1.5 for total marget

Integrated Circuit Trends

	1997	2001	2006	2012
DRAM capacity	256M	1G	16G	256G
Transistors/chip	11M	40m	200M	1.4B
Frequency, MHz	750	1400	2000	3000
Min. Supply voltage	1.8 - 2.5	1.2 - 1.5	0.9 - 1.2	0.5 - 0.6
Wafer diameter, mm	200	300	300	450

Boeing Initiatives to Respond to the Problem

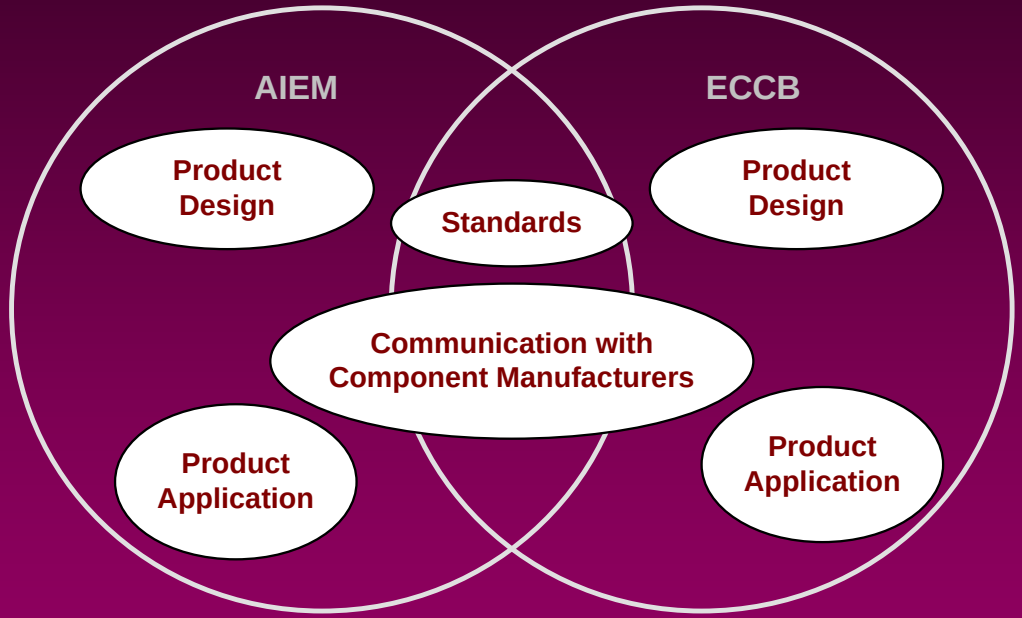
- Component Obsolescence Strategy Team formed in 1997
- Airlines International Electronics Meeting (AIEM)
- Electronic Components Certification Board (ECCB)
- Electronic Component Management Program (ECMP)

Boeing Strategy Board

1. What should be BCAG's role in the industry?
2. How should we change procurement strategies with equipment suppliers?
3. Can we change equipment environmental requirements?
4. Can we change the way airplanes are operated, maintained, and supported?
5. How should we change airplane systems designs?
6. How can we change the certification process?

AIEM-ECCB

Aerospatiale
Airbus
Boeing
Collins
Honeywell
Lucas
Sextant
Smiths



AVX
Boeing
EIA
Lockheed Martin
Lucent Technologies
Nortel
Northrop Grumman
Sony
Textron
UL

Northwest
Lufthansa
TWA
TAP
FEDEX
Delta

British Airways
Air France
Singapore Airlines
American Airlines
Finnair

AIEM-ECCB Agenda

- Impact on equipment operation, maintenance, and support
- Impact on equipment design
- Communicating with component manufacturers
- Component Management Standards
- Impact on certification

Impact on Equipment Operation, Maintenance, and Support

- Boeing, Airbus, and Lufthansa to prepare outline of communication to airlines
- Consider elimination of level three maintenance by repair shop
- Throw-away modules
- May have to change startup procedures

Impact on Equipment Designs

- Verify environmental requirements
- Develop life cycle plan for each LRU, and review at design stage
- “Given that only components specifed at -40 to +85C are available, and that they will change every five years; and that service cannot be degraded, and that costs must decrease, how will we design, build, operate, maintain, and support airplanes?”

Communicating with Component Manufacturers

- What do we need from component manufacturers (that we can reasonably expect to get)?
- How can we use available components?
- Can we speak with a common voice (other industries, STACK)?

Component Management Standards

- Electronic Component Management Program (ECMP) Plan Template
- Performance Derating of Electronic Components
- Uprating of Electronic Components
- Reliability Assessment of Electronic Equipment
- Product Discontinuance

ECMP Template Objectives

- Component Application
- Component Qualification
- Component Continuous Quality Assurance
- Component Compatibility with Equipment Manufacturing Process
- Component Data
- Component Configuration Control
- Components Used Outside Mfrs. Specified Ranges
- Component Obsolescence Management

ECMP Template and Reliability Assessment Schedule

- ECMP Template
  - Present to SAE E-36, March 12, 1998
  - Present to ECCB, March 18, 1998
  - ECCB release date ??
  - SAE, RTCA ??
- Reliability Assessment
  - Outline approach, February - April, 1998
  - Initial draft, August, 1998
  - Submit to (IECQ, SAE, IEEE ???)

Reliability Assessment

- Aerospace industry effort led by Boeing
- Top-down approach (does not resemble Mil-Hdbk-217)
- Will develop standard for presentation to industry: Is SAE interested?
- Next meeting is April 23 in Toulouse

Impact on Certification

- ARAC definition of Standard Part
- Why do we change part numbers and re-certify so often?