THOUGHTS ON DIGITAL TRANSFORMATION

THE PATH TO THE NEXT GENERATION OF ROTORCRAFT

BASED ON

2019 NIKOLSKY LECTURE, VERTICAL FLIGHT SOCIETY

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This slide contains No Technical Data subject to the ITAR or EAR.
Thoughts on Digital Transformation

• The task is not digital translation, avoid codifying analog answers in digital code
• Think of our systems as Cyber-Physical entities, where data and digital monitoring is part of the system
• Use digitization to break down barriers, make system level analysis wherever possible
• To simplify, reduce cost, reduce development time seek commonality
• Imagine if Igor Sikorsky, Art Young, Frank Piasecki had the tools you now have
• If we don’t make development faster, better and simpler, we have not done our jobs
CYBER-PHYSICAL SYSTEMS DEFINED

BLENDED SYSTEMS

Cyber-Physical Systems (CPS) comprise interacting digital, analog, physical, and human components engineered for function through integrated physics and logic.

Cyber-physical systems (CPS) are smart systems that include engineered interacting networks of physical and computational components. These highly interconnected and integrated systems provide new functionalities......

Interacting Components

All Components of Equal Integrity

Digital, Analog, Physical, Human
ENABLING TECHNOLOGY: WORLD-WIDE ANALYTICS, MONITORING AND CONTROL

Fleet Data Management Processes

Integrated Data Analytics & Cluster-Based Computing

End-to-End UBM Process

Approved Credit/Debits

Spectrum/CRT Update

Analytical Tools
NEW DESIGN PARADIGM

- High authority and computational controls for air vehicle and systems
- Many HUMS technologies, advanced sensing and derived loads, and life cycle analytics have sufficiently matured to enable change in how safety and reliability are ensured
- Usage history for every tail number is known. History of key loads can be tracked for every tail number.
- Fleet safety and reliability can be maintained through combination of conservative design assumptions, real time monitoring and operational adjustment

Digital Flight Controls
- Full Authority, High BW
- Limit Peaks, Soften Response, Truncate loads
- Increase Component Life

Usage Monitoring
- Measurement, Recording, Archiving, Lifing

Continuous Analysis
- Compare to Design Requirements/Spectra
- Derive Inspections
VOYAGER SHOWED HOW FAR CAN MARGIN CUTS CAN GO

Empty Weight Fraction

Current Design Practice

Potential for Cyber-Physical Systems

The Voyager Solution
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IF WE DON’T CHANGE THE RULES, WE ARE STANDING STILL

“I am opposed to the laying down of rules or conditions to be observed in the construction of bridges lest the progress of improvement tomorrow might be embarrassed or shackled by recording or registering as law the prejudices or errors of today.”

Isambard Kingdom Brunel, 1848
Thank you!