

# FACING THE DISRUPTION IN AEROSPACE AND DEFENSE

To remain competitive in a fast-changing economic and political climate, A&D companies must digitally transform to deliver new, advanced technologies as quickly as possible.

## Exponential Change

**90%** OF A&D COMPANIES SEE A NEW ERA OF TECH ADVANCEMENT MARKED BY EXPONENTIAL CHANGE

### KEY DRIVERS OF CHANGE



#### ECONOMIC

- Rising defense spending
- Cost of maintenance, repair & operations (MRO)
- Low margins



#### COMPETITION

- Supplier consolidation
- The new space race
- Emerging markets
- Disruptors & startups



#### POLITICAL

- Geopolitics
- Space: the final frontier
- Tariffs & trade



#### ENVIRONMENT

- Emissions reduction



#### LEGAL

- Noise & emissions
- Safety
- Certification



#### SOCIAL

- Aging workforce
- 24/7 connectivity



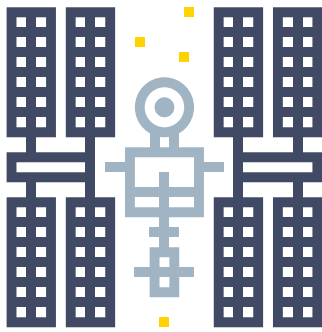
#### TECHNICAL

- Autonomous systems
- Digital enterprise
- Advanced materials & additive manufacturing
- Electrification
- Enhanced communications & 5G

## Industry KPIs

### COMMERCIAL AVIATION

- Quieter, more fuel-efficient & environmentally friendly aircraft
- MRO revenue growth
- Improved safety & lower design, testing and certification costs



### SPACE

- Launch cost reduction and commercialization of space
- Satellite miniaturization, constellations & high-altitude pseudo-satellites
- Advanced telecommunication, observation & exploration capabilities

## Digital Transformation



68 PERCENT OF AEROSPACE COMPANIES INVESTING IN DIGITAL TECHNOLOGIES AS PART OF OVERALL BUSINESS STRATEGY



97 PERCENT OF AEROSPACE EXECUTIVES WILLING TO DIGITALLY REINVENT THEIR BUSINESSES

(Yet aerospace trails auto and industrial manufacturers in digital implementation)

### DRIVING THE DIGITAL STRATEGY



#### NEW LEVELS OF EFFICIENCY

SpaceX's Falcon 9 rocket operates at an average of **\$60 million** per flight vs. NASA's Space Launch System at **\$1 billion+**



#### NEW SOURCES OF GROWTH

By 2028, **37,978** aircraft will be in service and commercial MRO industry will grow to **\$114.7 billion**



#### CUSTOMER SATISFACTION

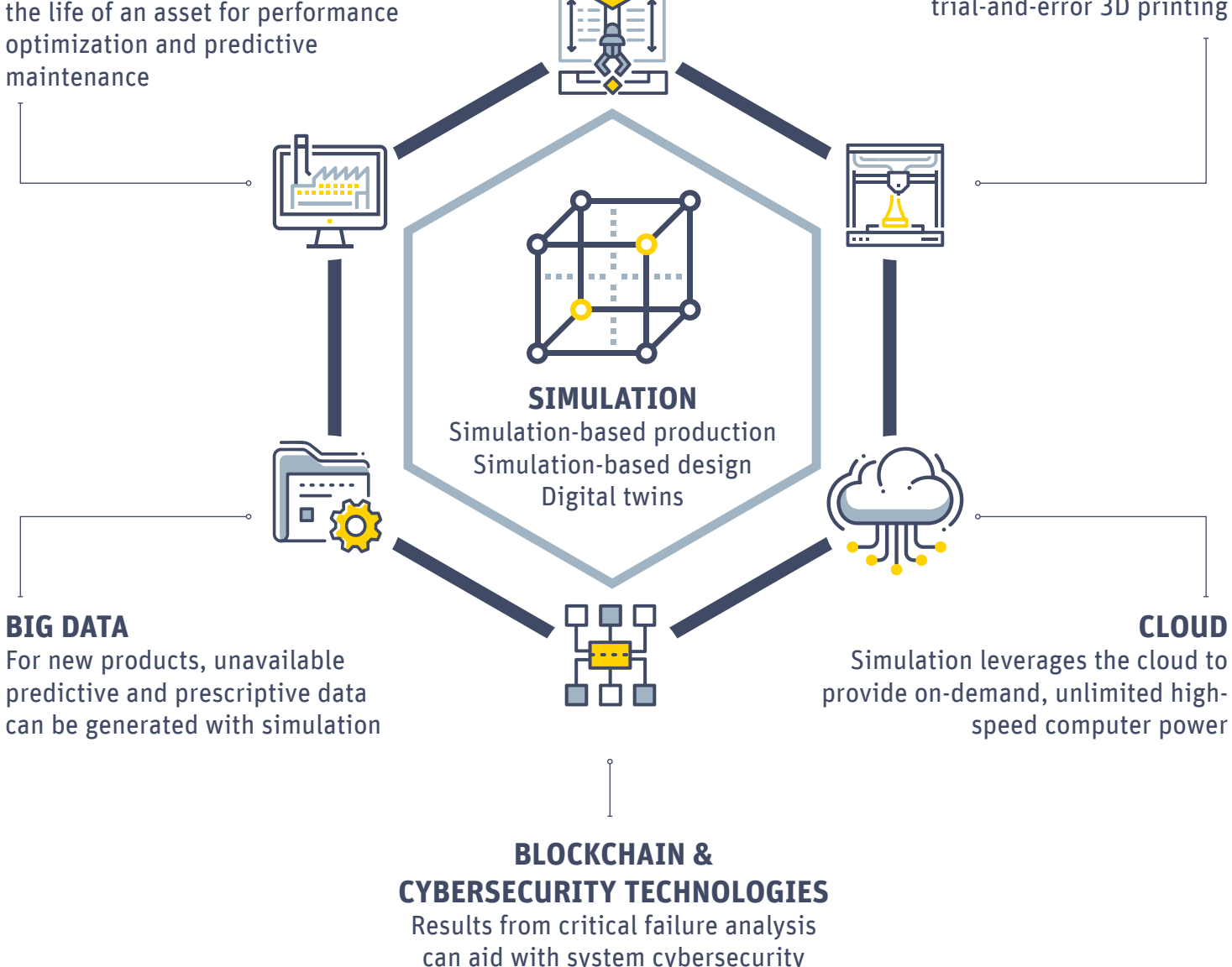
**67%** of airline passengers more likely to rebook if Wi-Fi available; **54%** prefer no Wi-Fi to poor-quality Wi-Fi

## Disruption & Growth

**ADVANCED ROBOTS**  
The complex optimization of weight, sensors & electronics integration, control software and power management is enabled by multiphysics simulation

**INDUSTRIAL INTERNET OF THINGS (IIoT)**  
Simulation-based digital twin mirrors the life of an asset for performance optimization and predictive maintenance

**ADDITIVE MANUFACTURING**  
Only simulation predicts distortions and thermal stresses; helps avoid trial-and-error 3D printing



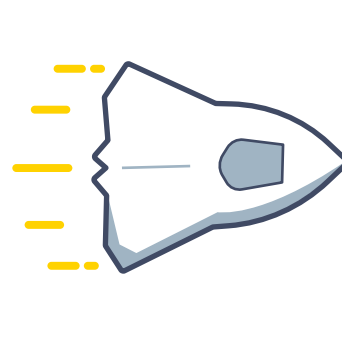
**BIG DATA**  
For new products, unavailable predictive and prescriptive data can be generated with simulation

**CLOUD**  
Simulation leverages the cloud to provide on-demand, unlimited high-speed computer power

**BLOCKCHAIN & CYBERSECURITY TECHNOLOGIES**  
Results from critical failure analysis can aid with system cybersecurity

## Innovation Through ANSYS Simulation

DELIVERING FUEL-EFFICIENT & ENVIRONMENTALLY FRIENDLY AIRCRAFT



WINNING THE SPACE RACE

### AERODYNAMICS

**4.5%** Drag Reduction

**\$27 billion** Saved from 15% reduction in fuel burn

### ADDITIVE MANUFACTURING

**10 - 100X** Reduction in Volume

**\$500 billion** Available to space race winners in 2030

### AEROSTRUCTURES

**18%** Weight Reduction

**\$10 billion** Saved in fuel consumption due to winglets

### ACCELERATED INNOVATION

**50%** Reduction in Development Time

**400%** 10-year cost reduction to reach low Earth orbit

### PROPULSION

**15%** Fuel Burn Reduction

**\$1.3 billion** Saved for each 1% reduction in mass

### PROPULSION

**10X** Reduction in Temperature

**\$1 billion** Invested in space startups in Q1 2018