# **Contents**

# **AVIATION**WEEK

& SPACE TECHNOLOGY



**Digital Extras** Tap this icon in articles in the digital edition of AW&ST for exclusive features.

- 10 Feedback
- 12-14 Second Take
  - **16** Up Front
  - 18 In Orbit
- 20-21 Letter from the Editor
  - 151 Classified
  - 152 Contact Us
  - **153** Aerospace Calendar

#### TECHNOLOGY

**22 European advances** in precise airflow control promise big reductions in fuel burn, noise

#### SPACE

**26** SpaceX's Falcon 9 first-stage recovery signals paradigm shift in easing human access to space

#### DEFENSE

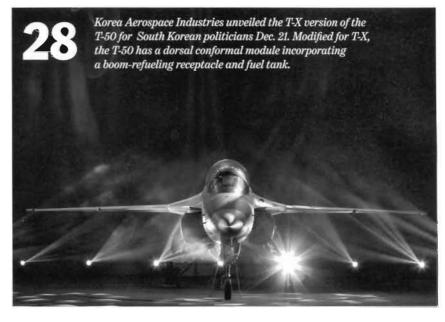
- **28** Even if South Korea's KAI loses in USAF T-X trainer bid, it will gain from T-50 development
- **32** Northrop Grumman tests tailsitting vertical-takeoff-andlanding concept for Darpa

#### COMMERCIAL AVIATION

- **33 Certification of** C Series and money to ramp up production pave way for airline operation
- **34** North America and Europe are driving the airline industry's profit improvement
- **36 Virgin Atlantic** uses Heathrow Airport slots as bond collateral for purchase of new aircraft
- **38 Qantas treads** carefully in ordering new aircraft after dramatic return to profitability

#### **AEROSPACE & DEFENSE 2016**

**42 Global aerospace** industry's moving parts are more out of sync than ever in recent times



#### WATCHPOINTS FOR 2016

**44** Narrowbody reequipment, defense procurement pressures, UAVs make for challenge, opportunity

# **DEFENSE & SECURITY**

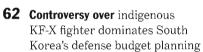
**46** Threats around the world to rules-based international order have seldom been so diverse



#### **DEFENSE PROFILES**

- **49** Budget agreement with Congress is enabling the Pentagon to plan for a world at war
- **50 Canada's new** government is juggling defense priorities of cost, risk and technology transfer
- **52 Political and economic** instability amid budget cuts force Brazil to reassess defense projects
- **53 Despite spending** on some programs, European defense expeditures continue to decline

- **54 Britain strengthens** its defense plan in light of terrorism threat and Russian aggression
- **55 Paris seeks to** increase its defense budget in response to terrorist attacks
- **56** Economic woes weigh on Russian defense budget, but Syrian ops display military modernization
- **57 Germany boosts** its defense budget, including a large increase in procurement funding
- **58** European nations deciding on fighters and missiles in face of a more militant Russia
- **59 To counter** evolving threats, Israel focuses on ability of military to operate far from borders
- **60 Continuing conflicts** from Iraq to Yemen spur Persian Gulf countries to build up defenses
- **61 China is overhauling** its defense structure, increasing ability to project power abroad
- **62 Japan prioritizes** maritime systems in its 2016 defense budget request



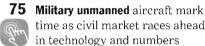
- **63** National and defense priorities collide in India as long-pending payroll revision nears
- **63 Submarines,** maritime patrol aircraft and fighters top shopping lists in the Asia-Pacific region

# **DEFENSE SYSTEMS**

- **64 F-35 dominates** global fighter forecast as new development programs focus on stealth
- **68 Airbus and Boeing** hope for recovery from 2015 setbacks in A400M and KC-46 programs
- **72 Fighter sales** and missile developments keep Europe's industry in the competition
- **74 Lockheed Martin,** Raytheon stand to benefit as worldwide missile defense demand grows



# AEROSPACE SYSTEMS



- **79** Rotorcraft industry invests in new models despite oil slump, softening commercial market
  - 81 Civil engine production will set new records, but military propulsion outlook is less certain
- **83 Space-launch sector** is being shaped by new vehicles, smaller satellites and commercialization
- **85** Expanding market for small satellites is driving development of low-cost launch vehicles
- **86 Commercial,** military customers eye smaller, more powerful satellites to build bandwidth

# **TOP TECHNOLOGIES**

- **90 Defense and space** tech advances to watch include robotic copilots and lasers for communication
- **110 Civil aviation** is experiencing effects of disruptive changes, from UAVs to electric propulsion

### **CIVIL AVIATION**

**100 A320neo and C Series** debuts lead wave of new airliner



lead wave of new airliner developments in 2016

**104** Several new narrowbody types enter the field, although Airbus and Boeing remain dominant

# AIR TRAFFIC MANAGEMENT

**106 FAA division** is likely to occur eventually but not in next reauthorization by Congress

# **BUSINESS AVIATION**

**108** New aircraft development focuses on large-cabin business jets as light-jet demand fades