

AVIATIONWEEK[↑]

& 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 tail-sitting vertical-takeoff-and-landing 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



Korea Aerospace Industries unveiled the T-X version of the T-50 for South Korean politicians Dec. 21. Modified for T-X, the T-50 has a dorsal conformal module incorporating a boom-refueling receptacle and fuel tank.

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 expenditures 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




85


62 Controversy over indigenous KF-X fighter dominates South Korea's defense budget planning

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


 **75 Military unmanned** aircraft mark time as civil market races ahead in technology and numbers

 **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 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