



PILOT & TECHNICIAN OUTLOOK

2019 - 2038

The 2019 Boeing Pilot & Technician Outlook, a respected industry forecast of personnel demand, projects that 804,000 new civil aviation pilots, 769,000 new maintenance technicians, and 914,000 new cabin crew will be needed to fly and maintain the world fleet over the next 20 years. The forecast is inclusive of the commercial aviation, business aviation, and civil helicopter industries.

The demand will stem from a mix of fleet growth, retirements, and attrition. Meeting this strong demand will require a collective effort from across the global aviation industry. As several hundred thousand pilots, technicians, and cabin crew reach retirement age over the next decade, educational outreach and career pathway programs will be essential to inspiring and recruiting the next generation of personnel.

The aviation industry will need to adopt innovative training solutions to enable optimum learning and knowledge retention. Immersive technologies, adaptive learning, schedule flexibility, and new teaching methods will be needed to effectively meet a wide range of learning styles. The growing diversity and mobility of aviation personnel will

also require instructors to have cross-cultural, cross-generational, and multilingual skills to engage with tomorrow's workforce. Effective training and an adequate supply of personnel will remain critical to maintaining the health and safety of the entire aviation ecosystem.

Forecast Methodology

New personnel demand is calculated based on a 20-year fleet forecast for commercial aviation aircraft with more than thirty seats, business jets, and civil helicopters. Based on fleet growth, aircraft utilization, attrition rates, and regional differences in crewing specific to aircraft type, Boeing's Pilot and Technician Outlook estimates the number of new pilots, technicians, and cabin crew needed worldwide.

Slight variations to the forecast can occur on a year over year basis as a result of many factors, some of which include changes in regulations, crew productivity, and aircraft mix. The forecast does not currently include assumptions for single-pilot commercial operations or autonomous airplanes. We continue to track the market for indications of regulatory movement, and will update our forecast accordingly.



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Pilots

As pilot labor supply remains constrained, airlines are increasingly seeking to recruit, develop, and train locally sourced pilots. Cadet programs that train aspiring pilots to be a qualified, competent, and operationally-ready first officer have increased in popularity as airlines look to fill future pilot pipelines. Airlines are also recognizing the significant cost burden for students, and bond programs have gained traction as another avenue for interested candidates.

An advantage of today's data-rich environment is the ability to assess knowledge gaps as they occur, enabling training solutions that produce more competent and qualified pilots. With the wealth of historical data available, evidence and competency-based training programs are increasingly being adopted to change how pilots are trained and assessed. Instruction is evolving to train pilots to proficiencies and competencies, rather than a standard syllabus. The goal is to ensure pilots are effectively trained on procedures to address today's most common operational risks and assessed based on key skills and competencies that all pilots should possess.

Technicians

As new generation airplanes become more prominent in the global fleet, advances in airplane technology will drive demand for a new set of skills, such as digital troubleshooting and composites repair. Concurrently, operators and MROs will be challenged to ensure technicians continue to maintain the skills and capability necessary to service the large fleet of

older generation aircraft. These two skill sets often differ, creating opportunities for the industry to enhance its standard training curriculum.

Mobile and distance learning solutions are supplementing traditional classroom instruction and allow students to continue their studies outside of traditional instructor-led classes. New technologies, such as augmented and mixed reality solutions, are also being tested as a way to improve student engagement, quality of instruction, and knowledge retention. Competency-based maintenance training continues to evolve as the industry focuses on addressing individual students' progress, needs and knowledge gaps.

Cabin Crew

Cabin crew are essential to ensuring the safety and comfort of passengers and can provide a level of service that enables brand differentiation. As airlines continue to refine business models and personalize offerings to specific market segments, additional demand for cabin crew will result from aircraft up-gauging, denser seat configurations, and multiple cabin configurations. Regulatory requirements and customer preferences will continue to drive demand across the industry.

Training continues to focus on providing superior customer service and ensuring cabin crew have the skills to recognize and mitigate safety risks. Advances in scenario-based training and mobile learning technologies support continuous learning and prepare cabin crew for situations that may occur in the cabin.



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GLOBAL FORECAST



804,000
PILOTS



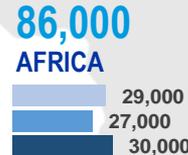
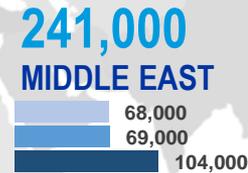
769,000
TECHNICIANS



914,000
CABIN CREW

NEW PERSONNEL DEMAND:

- PILOTS
- TECHNICIANS
- CABIN CREW



COMMERCIAL AVIATION
2,158,000
NEW PERSONNEL

BUSINESS AVIATION
224,000
NEW PERSONNEL

CIVIL HELICOPTERS
105,000
NEW PERSONNEL



PILOT & TECHNICIAN OUTLOOK ON A PAGE

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(2019-2038 values, rounded)

Region	Asia-Pacific	North America	Europe	Middle East	Latin America	Africa	Russia & C. Asia	World
Growth Measures								
Economic growth (GDP) %	3.9%	1.9%	1.6%	3.2%	2.9%	3.4%	2.0%	2.7%
Commercial Personnel Demand								
Pilots	244,000	131,000	118,000	64,000	41,000	24,000	23,000	645,000
Technicians	249,000	123,000	111,000	65,000	39,000	22,000	23,000	632,000
Cabin Crew	323,000	161,000	186,000	102,000	51,000	29,000	29,000	881,000
Total	816,000	415,000	415,000	231,000	131,000	75,000	75,000	2,158,000
Business Aviation Personnel Demand								
Pilots	8,000	60,000	17,000	2,000	7,000	3,000	1,000	98,000
Technicians	7,000	56,000	16,000	3,000	7,000	3,000	1,000	93,000
Cabin Crew	4,000	15,000	8,000	2,000	2,000	1,000	1,000	33,000
Total	19,000	131,000	41,000	7,000	16,000	7,000	3,000	224,000
Civil Helicopter Personnel Demand								
Pilots	14,000	21,000	13,000	2,000	6,000	2,000	3,000	61,000
Technicians	10,000	14,000	10,000	1,000	6,000	2,000	1,000	44,000
Total	24,000	35,000	23,000	3,000	12,000	4,000	4,000	105,000
Total Personnel Demand								
Pilots	266,000	212,000	148,000	68,000	54,000	29,000	27,000	804,000
Technicians	266,000	193,000	137,000	69,000	52,000	27,000	25,000	769,000
Cabin Crew	327,000	176,000	194,000	104,000	53,000	30,000	30,000	914,000
Total	859,000	581,000	479,000	241,000	159,000	86,000	82,000	2,487,000