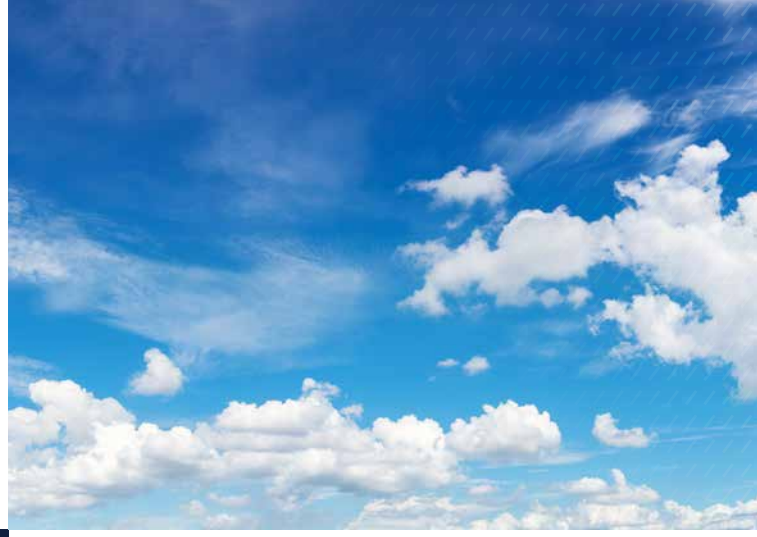
Pilot and Technician Outlook

2025-2044



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Introduction

The 2025 Boeing Pilot and Technician Outlook (PTO) projects that 660,000 new pilots, 710,000 new maintenance technicians, and 1,000,000 new cabin crew members will be needed to fly and maintain the global commercial aviation fleet over the next 20 years.

Global air travel demand is outpacing economic growth as markets have remained resilient. Effective training and an adequate supply of personnel remain critical to maintain the health, safety, and prosperity of the global aviation ecosystem.

To enable continued growth, the aviation industry will need a long-term strategy that addresses current and upcoming labor challenges. Investment in early career-development programs and in tactics that spark excitement among future aviators will be essential to a healthy aviation market for years to come.

The aviation industry has proven resilient time and again despite major external and macroeconomic shocks. This historic persistence is driven by global commerce, business travel, people's desire to visit family and friends, and to explore the world. While periodic market downturns are challenging, operators, in time, tend to resume their growth trajectories through collaboration, adaptation, and innovation.

Despite ongoing challenges and regional differences, the industry leveraged available resources during a temporary downtime to enhance training capacity. This effort aims to support long-term demand and reduce the lag time associated with onboarding personnel, all while prioritizing safety

This outlook assumes continued investment in an uninterrupted pipeline of qualified personnel to replace those who either reached retirement age or moved out of the aviation industry to other professions. Competition to recruit and retain top-tier talent will be strong as more flights and routes are added. The industry is currently facing a juniority across the workforce, but as experience grows, this trend is expected to stabilize. This situation underscores the importance of providing relevant, affordable, and accessible training.

Fortunately, innovation is widespread. Personnel trained are encountering new solutions adopted by schools, training providers, and regulators. Digital technologies, virtual formats, and other developments have helped bridge gaps in subject matter while improving the delivery and implementation of training. Methodologies continue to advance toward a holistic approach focused on competencies and outcomes rather than a prescriptive, task-based syllabus. As commercial operators and training providers plan for the future, we will see new investments in artificial intelligence, machine learning, and mixed reality that will help tomorrow's students learn more quickly, efficiently, and effectively and will lead to a safer, more efficient aviation industry.

Executive summary

Global outlook

2,370K
2025-2044

660K
Pilots

710K
Technicians

1,000K
Cabin Crew

Regional highlights

North America
New Personnel: **435K**
Pilots: **119K**
Technicians: **123K**
Cabin Crew: **193K**

Africa
New Personnel: **74K**
Pilots: **23K**
Technicians: **24K**
Cabin Crew: **27K**

Eurasia
New Personnel: **550K**
Pilots: **149K**
Technicians: **165K**
Cabin Crew: **236K**

China
New Personnel: **426K**
Pilots: **124K**
Technicians: **131K**
Cabin Crew: **171K**

Northeast Asia
New Personnel: **92K**
Pilots: **23K**
Technicians: **27K**
Cabin Crew: **42K**

Latin America
New Personnel: **134K**
Pilots: **37K**
Technicians: **42K**
Cabin Crew: **55K**

Middle East
New Personnel: **234K**
Pilots: **67K**
Technicians: **63K**
Cabin Crew: **104K**

South Asia
New Personnel: **141K**
Pilots: **45K**
Technicians: **45K**
Cabin Crew: **51K**

Southeast Asia
New Personnel: **243K**
Pilots: **62K**
Technicians: **78K**
Cabin Crew: **103K**

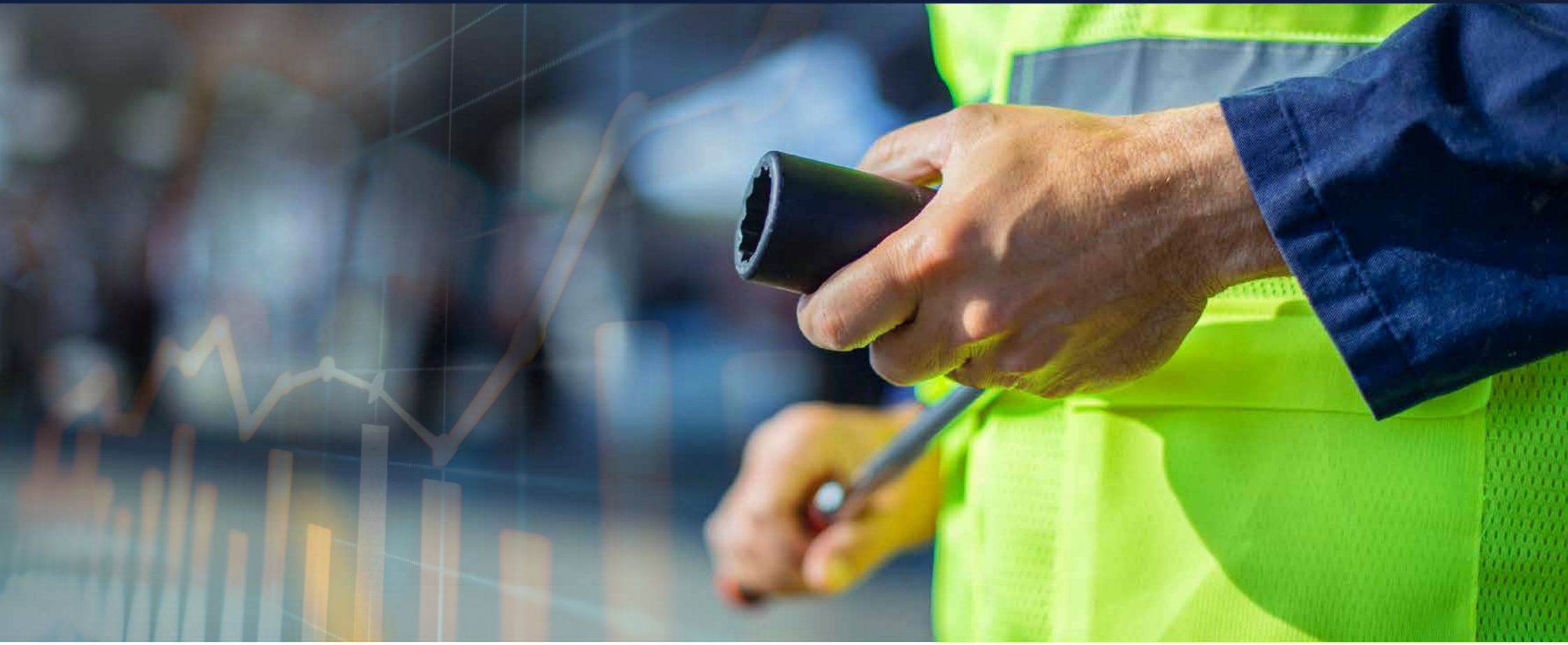
Oceania
New Personnel: **41K**
Pilots: **11K**
Technicians: **12K**
Cabin Crew: **18K**

Forecast methodology

This forecast is limited to the commercial aviation sector, which includes commercial passenger and commercial freight. Consistent with prior forecasts, this year's outlook does not include business aviation and civil helicopter demand.

New-personnel demand is calculated on the basis of a 20-year fleet forecast for commercial aviation aircraft with more than 30 seats. By analyzing fleet growth and replacement, aircraft utilization, attrition rates, and regional differences in crewing specific to aircraft type, the Boeing PTO estimates the number of new pilots, maintenance personnel, and cabin crew members needed worldwide to meet global traffic demand.

Year-over-year forecasts may vary due to many factors, including changes in regulations, crew productivity, and aircraft mix. The forecast does not include assumptions for single-pilot commercial airplane operations, but it does consider impacts from alternative modes of transportation such as advanced air mobility and high-speed rail. Boeing continues to track the market for indications of regulatory movement and will update our forecast accordingly.



Pilots

Air traffic demand continues to grow globally. While the industry focuses on stability and growth, operators must plan to ensure adequate staffing of qualified pilots for their routes.

Although some regions are currently facing challenges in attracting and retaining pilots, the industry is generally balanced on a global scale. However, it is essential to continue investing and planning for future growth, driven by stabilizing supply chains, production rates, attrition, and new technologies.

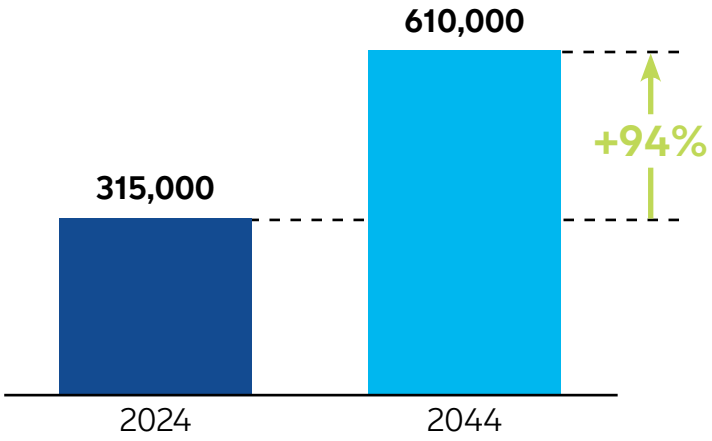
Competition for qualified pilots will remain strong. New pilots can benefit significantly by building hours through instruction and opportunities in government, business aviation, and general aviation. Aspiring pilots who begin their training today will be well-positioned to seize emerging opportunities by the time they graduate.

Flight training scheduling will remain a challenge as growth stimulates pilot hiring. As airlines adjust their fleet mixes to meet demand, an increasing number of pilots will be required to complete qualification or differences training.

While many aspects of training have transitioned to digital formats, full-flight simulator training time is expected to remain constant in commercial flight training. Training methodologies are evolving to focus on proficiencies and competencies rather than prescribed tasks, and these priorities are expected to gradually dominate the flight training curriculum.

In conclusion, demand for pilots is likely to soar. Projections indicate that over the next 20 years, 660,000 new pilots will be needed to meet demand from commercial operators.

Active personnel



660,000
2025-2044 demand

4.1%
Annual growth
in new personnel

Technicians

The aviation maintenance market has continued to endure challenges that impact the labor market. As air traffic increases, aviation technicians will continue to play a vital role in inspecting, repairing, and restoring airplanes to airworthiness.

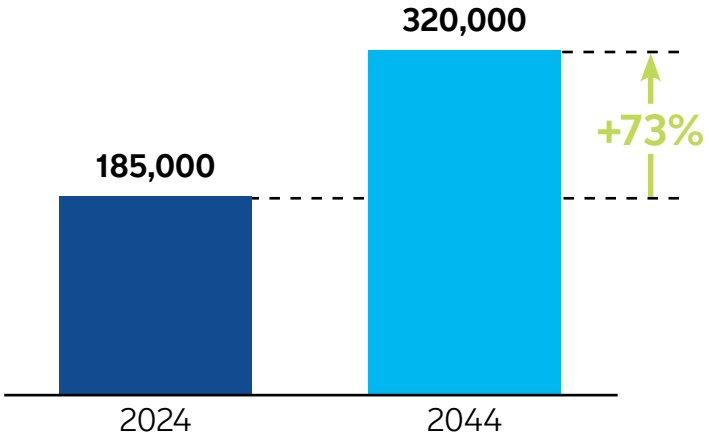
Technicians are critical to operational safety and play a key role in supporting the industry. However, many are leaving the workforce through retirement and natural attrition. Educational outreach efforts will be necessary to attract new talent, and knowledge transfer to junior workers will remain essential to conserve critical expertise and specialized skills.

The role of the technician continues to evolve as next generation aircraft join the global commercial fleet. Vast amounts of data, enabling innovative predictive solutions. Technicians must accurately analyze, interpret, and act on this data, while still maintaining and repairing older aircraft that remain in service. The coming years will demand flexible training that addresses not only traditional maintenance but also emerging skillsets.

Investments in modern, digital and non-traditional learning platforms have enabled current and prospective technicians to enhance their skills and knowledge. The long-term outlook for learning modernization is positive, as schools and industry providers adapt to attract a new generation of students.

Over the next 20 years, 710,000 new technicians will be needed to meet demand from fleet operators and maintenance providers. The combination of fleet growth, attrition, and replacement will continue to drive high demand for the foreseeable future.

Active personnel



710,000
2025-2044 demand

3.9%
Annual growth
in new personnel

Cabin Crew

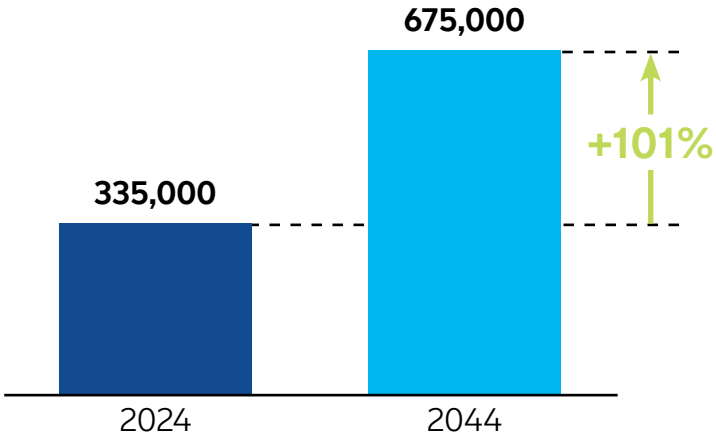
The cabin crew profession remains an attractive career for those interested in aviation, travel, and customer service. Cabin crew members are essential to ensuring passenger safety and comfort, as well as to provide services that enable airline brand differentiation.

Cabin crew members maintain a high level of professionalism as they work to ensure the safety of their passengers and the airplane. While they are typically known for their customer service, their primary mission is to ensure safety in the cabin, where they are called upon to resolve, manage and defuse disruptive situations. Similar to other aviation professions, cabin crew are increasingly using their digital skills, including familiarity with in-flight entertainment systems, self-service kiosks, and handheld devices that monitor cabin systems and provide personalized passenger information.

Cabin crew members are trained to respond to the most likely disorderly scenarios. This training is increasingly supplemented with augmented and virtual reality for more immersive learning experiences. Refresher courses and skills training will be in demand for cabin crew members who have been away from service for extended periods.

Finally, regulatory requirements, attrition, replacement, and business-model differentiators will drive strong cabin crew demand across the industry. Over the next 20 years, airlines likely will seek 1,000,000 new cabin crew personnel.

Active personnel



1,000,000
2025-2044 demand

3.2%
Annual growth
in new personnel

Forecast on a page

Boeing Pilot and Technician Outlook 2025-2044

	Africa	China	Eurasia	Latin America	Middle East	North America	Northeast Asia	Oceania	South Asia	Southeast Asia	World
New Personnel Demand (2025-2044)											
Pilots	23,000	124,000	149,000	37,000	67,000	119,000	23,000	11,000	45,000	62,000	660,000
Technicians	24,000	131,000	165,000	42,000	63,000	123,000	27,000	12,000	45,000	78,000	710,000
Cabin Crew	27,000	171,000	236,000	55,000	104,000	193,000	42,000	18,000	51,000	103,000	1,000,000
Total New Personnel	**74,000**	**426,000**	**550,000**	**134,000**	**234,000**	**435,000**	**92,000**	**41,000**	**141,000**	**243,000**	**2,370,000**
Services (2025-2044 $B)											
Maintenance, Repair, Overhaul and Modifications	$85	$545	$810	$165	$350	$635	$135	$55	$130	$270	$3,180
Digital Services	$40	$245	$295	$75	$90	$295	$50	$25	$60	$115	$1,290
Training and Pilot Services	$5	$35	$45	$10	$15	$40	$10	$5	$15	$10	$190
Total	**$130**	**$825**	**$1,150**	**$250**	**$455**	**$970**	**$195**	**$85**	**$205**	**$395**	**$4,660**
Services Growth (USD 2024-2044)	**5.2%**	**5.1%**	**3.4%**	**4.1%**	**4.2%**	**2.7%**	**2.7%**	**3.3%**	**7.2%**	**6.5%**	**3.8%**
Aircraft Deliveries (2025-2044)											
Regional Jet	90	365	120	25	30	820	20	45	< 10	30	1,545
Single Aisle	865	6,910	7,195	2,110	1,430	6,640	770	565	2,875	3,925	33,285
Widebody	240	1,540	1,415	215	1,370	905	640	185	395	910	7,815
Freighter	10	185	180	15	120	315	80	5	20	20	955
Total	**1,205**	**9,000**	**8,910**	**2,365**	**2,950**	**8,680**	**1,515**	**800**	**3,290**	**4,885**	**43,600**
Airline Traffic Growth (RPK) (2024-2044)	6.0%	5.3%	3.1%	4.3%	4.4%	2.8%	2.4%	3.0%	7.0%	7.0%	4.2%
Airline Fleet Growth (2024-2044)	4.4%	4.0%	2.4%	3.0%	3.9%	1.3%	1.6%	2.2%	6.7%	6.6%	3.1%

For more information, including our interactive Tableau, visit our website:

boeing.com/commercial/market/pilot-technician-outlook

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