

China GA Report

2019

SPECIAL FEATURE **COMMERCIAL DRONES**

by Ipsos Business Consulting

CONTENT PARTNER
PRATT & WHITNEY

CHINA GENERAL AVIATION REPORT





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ASG provides its clients with the following business aviation services:

Aircraft Sales & Acquisition | Aviation Consulting | Market Research | Charter Service

The acclaimed Asian Sky Fleet Reports are produced by ASG's market research and consulting team, in collaboration with Asian Sky Media — a branch of ASG focusing on media and publications.

Asian Sky Media has a growing portfolio of business aviation reports designed to provide valuable information to readers for a better understanding of the market. Included in the portfolio is the Asia Pacific Fleet Reports for both civil helicopters and business jets.

Asian Sky Quarterly provides a reader-friendly look at market dynamics within the pre-owned markets of civil helicopters and business jets. ASG's other reports include the Asia Pacific Business Jet Charter Report, the Asia Pacific Training Report and the Asia Pacific Infrastructure Report and China GA Report focusing on specific industry segments showcasing the current status and challenges of the industry.

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CONTRIBUTION

ASG would like to acknowledge the gracious contributions made by numerous organization, including aircraft operators, Avion Pacific, OEMs, CAAC and China Aviation Transportation Association General Aviation Division in providing data for this report.

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PW200 ENGINE FAMILY

PUBLISHER'S NOTE



With 70% of the world's commercial drones being manufactured by approximately 1,200 companies in China, it is only natural that these "aircraft" would start to appear in ASG's China GA Report. According to the Civil Aviation Administration of China, there were 285,000 drone aircraft registered at the end of 2018, with these numbers growing 19% alone through the first six months of 2019. As our "Special Feature" in this issue proclaims, talk about a global powerhouse!

At the moment most of the commercial drone aircraft in China are being used in the agricultural sector followed by requirements for energy inspection. But the top manufacturers like Yuneec International, Ehang, Beihang UAS and EFY are quietly pushing into logistics and urban air mobility (UAM), with the determination to establish themselves in these other growing segments with autonomous air mobility solutions. This will lead to dramatic changes for general aviation (GA) in China, the effect of which we are just starting to see. So, alongside other international applications, like Uber Copter, BLADE, Voom and Ascent Urban Air Mobility, we see the likes of China-based EHang with its autonomous aerial vehicle (AAV) building an operational network of air taxis and transports in Guangzhou.

*Source: Nexa Advisors – "Urban Air Mobility – Economics and Global Markets 2020-2040"

As with traditional China GA segments, there are a multitude of challenges ahead for UAM. To name a few of the familiar big ones, and they are all significant: technical, regulatory, certification, airspace and, of course, infrastructure, which we all know is typically overlooked – new infrastructure will be the key to UAM viability, as well as necessitating new heliports, vertiports and traffic management systems.

The prize at the end of day, if Chinese manufacturers can make the transition to commercial civil applications and the challenges are overcome, is an estimated 20-year revenue opportunity globally of just US\$244 Billion*.

In addition to this Special Feature on commercial drones, the China GA Report will outline the GA market as has been typically done before: an overview of the GA fleet, infrastructure, and training schools & pilots. You'll also find the latest regulatory developments from the Central Government and aviation regulatory bodies over the course of the past few years – of which there have been quite a few. In this report, you'll also gain insight from Pratt & Whitney Canada, speaking on their latest service offerings, innovative technology and the PW200 Engine family.

A handwritten signature in black ink that reads "Jeffrey C. Lowe". The signature is fluid and cursive.

Sincerely,
Jeffrey C. Lowe
Managing Director, Asian Sky Group



EXECUTIVE SUMMARY

- Mainland China is home to over 1.4 billion people¹, making it one of the most populous countries in the world. As China's economic growth slows, the country is turning to new industries to act as economic drivers. Among those industries is general aviation (GA), which is being positioned as an industry that can provide connectivity to some of the more remote areas of the vast countryside, as well as utilized in areas such as emergency services and forestry.
- China's GA industry is made-up of 3,317 aircraft, as of June 2019. This includes business jets (330), helicopter (1,200), turboprop / piston (1,667) and others² (120).
- The fixed-wing fleet stands at 2,007. Of this, 68% are piston aircraft, 16% are business jets, 15% are turboprop and 1% are electric aircraft. The southwestern province of Sichuan is home to the most fixed-wing aircraft, many of which are used for training purposes. Sichuan is the base for the Civil Aviation Flight University of China. The northernmost province of Heilongjiang, which is China's largest agriculture base, has the second highest number of fixed-wing aircraft, followed by the Shandong Province which borders the Bohai Sea.
- The rotary-wing fleet stands at 1,237. Of this, 57% are turbine helicopters, 40% are piston helicopters and 3% are gyroplanes. The Guangdong Province has the highest amount of rotary-wing aircraft, many of which are used in the offshore oil and gas segment. Guangdong is home to CITIC Offshore Helicopter. Beijing, the home of China's largest powerline inspection company – State Grid GA, has the second highest amount, followed by Shanghai, the home of China's largest helicopter emergency medical services (HEMS) operator Kingwing.
- As of June 30, 2019, there were 228 CAAC approved GA airports, with 84 located in the agricultural province of Heilongjiang. The number tripled that of certified airports from 2017, which was 75. The rapid increase is attributed to the certification of several GA airports over the past two years.
- There were 234 heliports and helipads, as of June 30, 2019, with the most located in the highest earning economy of all China's provinces – Guangdong.
- In terms of supporting GA infrastructure, there were 9 FBOs in China providing ground support services, along with 47 major MROs.
- The capacity of Airline Transport Pilot License (ATPL) courses increased by 69% between 2014 to 2018. CCAR-141 schools doubled from 14 in 2014 to 32 in 2019. Additionally, of the 104 GA companies that are authorized to provide training courses under CCAR-61, many of those do not actually offer courses.
- The number of employed GA pilots has increased by 26% from 2016, reaching 49,224 in 2018, while the number of pilots in training has declined by 36% from 2016 to 3,071 in 2018. The number of GA unemployed pilots has also increased by 76% from 2016.
- It is estimated China supplies up to 70% of the world's civilian drone market³. Drone use has become increasingly important to support construction, energy, agriculture, forestry, security, emergency operations and logistics, in addition to being used for photography and aerial imaging.
- In 2013, there were approximately 130 drone manufacturers in China, which has increased to 1,200 drone manufacturers by the beginning of 2019. According to the Civil Aviation Administration of China, there were 285,000 drone aircraft registered at the end of 2018. By June 2019, the number of registrations increased to 339,000 drone aircraft⁴.

1. Source: United Nations 'World Population Prospects' Report

2. Others include balloon, gyroplane, airship and electric fixed-wing aircraft.

3. Information on commercial drones in China courtesy of Ipsos Business Consulting.

4. These figures do not reflect all civilian drones sold and used in the market, nor reflect China's total production capability.

ABOUT IPSOS BUSINESS CONSULTING

We are a purpose-driven consultancy that believes knowledge empowers your organisation and enables you to create opportunities and generate growth in your chosen markets. We provide you with this knowledge through a structured set of sales and marketing strategy solutions that draw upon on our network of market specialists and consultants who have unparalleled on-the-ground knowledge and extensive experience in key established, emerging and frontier markets around the world.

Here at Ipsos Business Consulting we are united and driven by our mantra **"BUILD • COMPETE • GROW"** – three words that encapsulate who we are and what we do.

- **BUILD** Establish firm foundations for new lines of business that match client resources to the strongest opportunity within their chosen market.
- **COMPETE** Devise winning business models that will outperform the competition.
- **GROW** Improve top-line growth for developed and emerging markets.

Established in 1994, Ipsos Business Consulting is part of Ipsos, founded in France in 1975, and still managed and controlled by research and consulting professionals. They have built a solid Group around a multi-specialist positioning. Ipsos is listed on Eurolist – NYSE Euronext. The company is part of the SBF 120 and the Mid-60 index and is eligible for the Deferred Settlement

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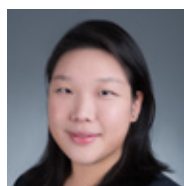
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GA MARKET OVERVIEW

NUMBER OF CERT. GA AIRPORTS:



NUMBER OF GA OPERATORS¹:



NUMBER OF GA AIRCRAFT²:

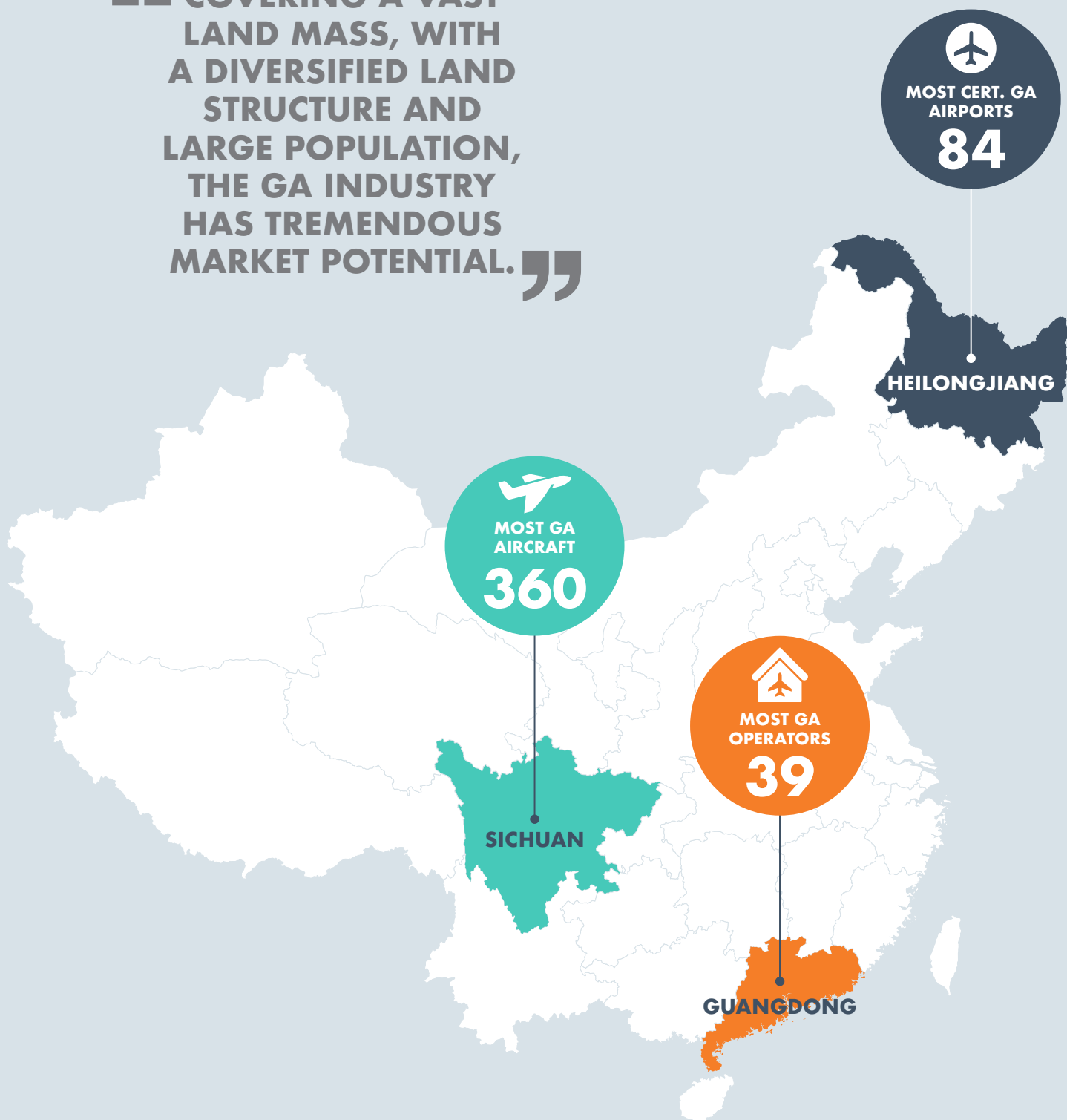


Note: This report includes data as of June 30, 2019, and includes Mainland China only.

1. This number is based on all enterprises and organizations operating GA aircraft in Mainland China.

2. Includes all China and non-China registered GA aircraft operating in Mainland China.

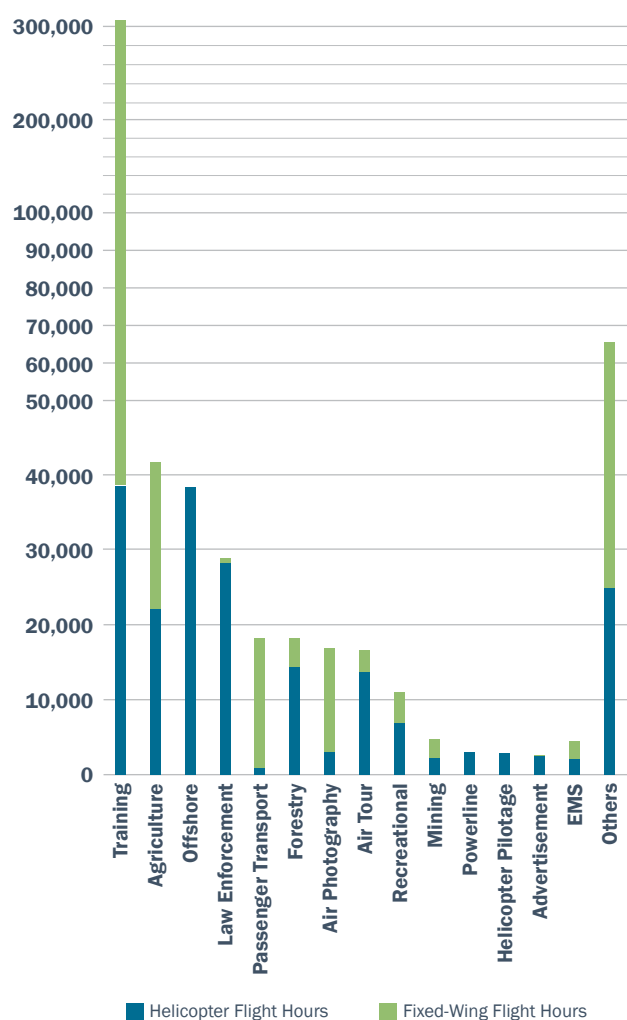
“COVERING A VAST
LAND MASS, WITH
A DIVERSIFIED LAND
STRUCTURE AND
LARGE POPULATION,
THE GA INDUSTRY
HAS TREMENDOUS
MARKET POTENTIAL.”



Note: The base location of the operator and aircraft is defined by the operator's main operating base airport.

Developing China's general aviation (GA) market has been a focal point of the Central Government for several years. Policies have been implemented aimed at attracting investors, building infrastructure, moving toward homegrown aerospace engineering and relaxing the bureaucratic process of operating a GA business and aircraft.

2018 GA FLIGHT HOURS BY MISSION

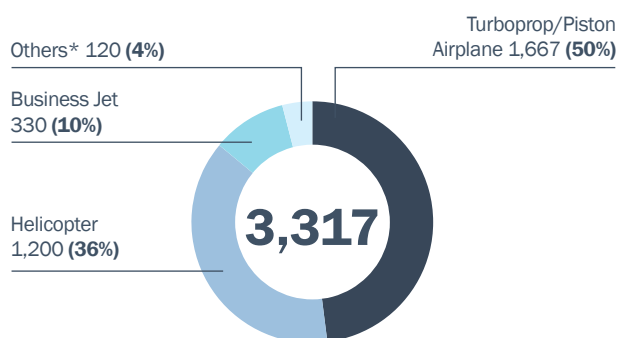


Data Source: China Aviation Transportation Association General Aviation Division, China Civil Helicopter Operation Development Report 2018.

Covering a vast land mass, with a diversified land structure and large population, the GA industry has tremendous market potential. GA provides connectivity to some of the more remote regions in China, transporting goods and people. It also presents an opportunity in the agriculture sector, and likewise can be used for search and rescue, emergency medical services, law enforcement and for pilot training.

As of June 30, 2019, there were 3,317 GA aircraft in Mainland China. Half (50%) of those were turboprop and piston aircraft, while 36% were helicopters and 10% were business jets. The number of GA flight hours is on the rise. At yearend 2018, GA aircraft flight hours reached a high, although the growth rate was much less than it has been in previous years. Reflective of the GA fleet, most fixed-wing aircraft and helicopter flight hours can be attributed to training, however, the total number of fixed-wing flight hours doubled that of helicopter flight hours. In the fixed-

NUMBER OF GA AIRCRAFT



*Note: Others include Balloon, Gyroplane, Airship and Electric Fixed-Wing aircraft.

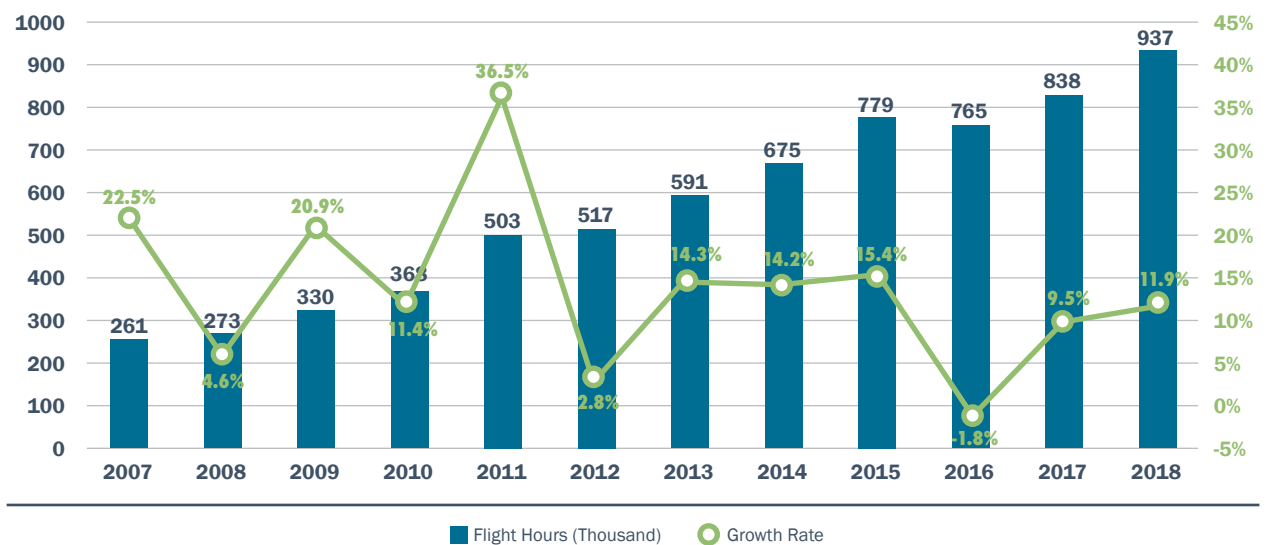


wing segment hours were also logged in passenger transport and air photography applications. Meanwhile, flight hours in the helicopter segment were dominantly logged in the offshore, law enforcement and air tourism segments.

While the hopes for GA in China are high there are still a number of issues the industry faces. Past legislation on lower altitude airspace hasn't been enough, as operators are still faced with several conditions, which prioritize other segments of aviation. Additionally, the lack of infrastructure, particularly in highly congested cities, means operators must seek further approval. Finally, to fully develop the GA industry in China, a priority must be placed on cultivating talent to enter into the growing industry.

“ GA PROVIDES CONNECTIVITY TO SOME OF THE MORE REMOTE REGIONS IN CHINA, TRANSPORTING GOODS AND PEOPLE. ”

TOTAL GENERAL AVIATION OPERATION HOURS



Data Source: CAAC, 2018 Statistical Bulletin of Civil Aviation Industry Development



INNOVATION IN ENGINES



INTERVIEW WITH **FREDERIC LEFEBVRE**; VICE PRESIDENT, MARKETING; **PRATT & WHITNEY**

Interview by Litalia Yoakum

Pratt & Whitney, a division of United Technologies Corp., is a leading aviation company with operations around the world, known for its engines powering aircraft from Airbus, Boeing and more. Today, the company is focusing on developing its extensive engine portfolio and reliable aftermarket support. With the leadership of Frederic Lefebvre, Vice President, Marketing, Pratt & Whitney will continue to advance new market opportunities while bringing forth the best in engineering and innovation.

WHAT'S INCLUDED IN THE PRATT & WHITNEY ENGINE PORTFOLIO?

In addition to powering aircraft from the major OEMs, our PW100 and PW150 engine family powers several regional turboprop aircraft in operation and development. These include Chinese manufacturer Xi'an with the MA60, MA600 and soon the MA700, as well as ATR, De Havilland Aircraft of Canada and more. Our portfolio of auxiliary power units (APUs) flies aboard a variety of commercial aircraft, including the Comac ARJ21 in China.

One of our latest products is the Pratt & Whitney GTF™ (geared turbofan) engine, a game-changing powerplant powering five next-generation aircraft families including the Airbus A320neo, Airbus A220, Embraer E-Jets E2, Mitsubishi SpaceJet and Irkut MC-21. Eight airlines in China are currently operating the GTF-powered Airbus A320neo.

Our Canadian division offers a range of turbofan, turboshaft and turboprop engines, for both fixed-wing and rotary-wing aircraft, for business and general aviation. These include the iconic PT6A turboprop engine, which is the proven choice for demanding missions in both single- and twin-engine aircraft.

Our turbofan engines power a range of aircraft from Gulfstream, Dassault, Cessna, Embraer and more. The latest member of our turbofan family is the award-winning PW800 engine, which has been chosen to power the next generation of business jets, including the Gulfstream G500 and G600 now in service, as well as the Dassault Falcon 6X.

Rounding out the portfolio, we offer helicopter engines with a strong presence in the light twin-engine, intermediate, medium and super-medium helicopter segments, powering aircraft from Airbus, Bell, Leonardo, Russian Helicopters and others

WHAT OTHER SERVICES ARE OFFERED THROUGH PRATT & WHITNEY?

We are an industry leader in service innovation. We're always listening to our customers, reading the market and developing personalized solutions for our customers along the entire product lifecycle.

We helped pioneer pay-per-hour engine maintenance programs with our simple Eagle Service™ Plan (ESP™) for single-aircraft owners. Our Fleet Management™ Program (FMP™) gives operators of large

We've been in China for 90 years, since we first powered the Loening Air Yacht with the Hornet engine in 1929. Today, we have more than 3,600 engines in service in China.

Through the years we have established partnerships with state-owned enterprises, suppliers and service providers to evolve our relationship into a long-term friendship. We have two manufacturing centers in the country – P&W Chengdu Aerotech Mfg. Co. and South P&W Aero Engine Co. – an engine overhaul facility in Shanghai, a customer training center in Beijing and two registered offices.

Recently we announced that Citic Offshore Helicopter Company (COHC) in Shenzhen had been appointed a designated maintenance facility for the line maintenance and mobile repair of PT6C-67C engines for Leonardo AW139 helicopter customers in the country.

Today we have more than 1,100 professionals in China, including 25 field support representatives located in more than 10 cities. We are committed to the development to the Chinese market and are prepared to respond with new solutions and facilities as warranted.

fleets the flexibility they need for their operations. Most recently, in response to feedback from our customers, we introduced a Fleet Service Plan (FSP) for fleets of two to five helicopters, combining the simplicity of ESP with the flexibility of FMP.

For those who aren't on an hourly program, we also have maintenance solutions designed to keep more mature engines and aircraft flying economically. This includes everything from new engines through our Fleet Enhancement Program (FEP) to lower-cost solutions like flat-rate engine exchanges and overhauls, as well as capped-cost parts offerings.

Finally, we offer several digital engine services. For example, our FAST™ solution allows us to analyze full-flight engine data and compare it to fleet-wide trends, arming customers with alerts and trend analyses to better plan their maintenance. When combined with a pay-per-hour program, we can deliver proactive recommendations to keep engines at peak performance, durability and reliability.

WHAT IS THE ESP™ PLAN?

ESP™ is an hourly engine service plan for single aircraft that is fully transferrable upon aircraft sale. The operator pays a set fee for every hour flown, with payment made every month or at the maintenance visit. This service is popular with customers because it avoids any maintenance surprises and allows for ease of budgeting.

Even more attractive to aircraft owners, ESP is proven to protect aircraft residual value and could enhance resale price – that's because the industry recognizes the built-in value of having engines maintained to OEM standards.

WHAT ARE THE LATEST INNOVATIONS FROM PRATT & WHITNEY?

Our award-winning PW800 turboprop engine has quickly become the engine of choice for the next generation of business aircraft. It's built to exceed industry standards in performance, efficiency and availability. The engine is optimized to provide an unsurpassed passenger experience, with a low-noise and low-vibration design – for an exceptionally quiet and smooth cabin experience. With 40% less scheduled on-wing maintenance, it's the easiest engine in its class to access and maintain – and it's backed by our highest levels of proactive service and our large global support network.

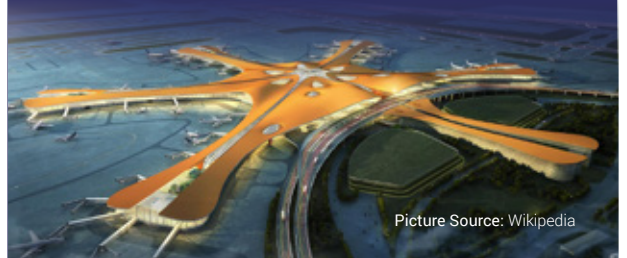
And now, with Know My PT6 mobile app, customers from around the world can optimize the performance and availability of their PT6-powered aircraft. Upon opening the app, users can select aircraft model and manufacturer, so that information is curated accordingly. The app includes all the Know Your PT6 booklet content, excerpts from Service Information Letters, access to our customer portal, contact with our Customer First Centre, and a map to identify and reach authorized service centres and parts distributors. Customers can receive news alerts, watch videos on a range of topics, explore articles from our Airtime blog, view models of PT6 engines with descriptions and schematics of design features, engine controls and operational and maintenance recommendations.

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WE'RE SEEING PARTICULAR GROWTH FOR HELICOPTERS IN THE CHINESE MARKET.

This is most evident in the emergency medical services sector. We're also seeing an increase in the number of helicopters used for both onshore and offshore renewable energy, such as windfarm inspection and repair.

We believe that through China's regional and general aviation policies – including investments in airports and liberalization of air space – both the regional and general aviation markets are poised for a great future in the country.



Picture Source: Wikipedia



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REGULATIONS AND POLICIES

Policies stimulating foreign investment and relaxing previous restrictions, along with those aimed at incentivizing investment in infrastructure have, in the past, turned China into a promising market for stakeholders. In a bid to further develop its general aviation (GA) industry, aviation authorities have continued to unveil policies that reduce red tape, promote and standardize the industry.

In December 2018, the CAAC revealed its action plan to transform itself into an aviation powerhouse by 2050. The initial phases of the plan will focus on building up infrastructure, while later phases will focus on more air routes, by way of strategic cooperation between carriers. While much of the action plan focuses on commercial aviation, GA is likewise considered with many phases already in progress.

Accelerating the development of GA is the transfer of regulatory power from the central government to provincial governments. Local governments have now begun creating the necessary ecosystem, including building airports, as well as simplifying license applications and approval procedures. This, along with legislation allowing operators to conduct their business more autonomously, has led to the much-needed rise in personnel and GA-based careers.

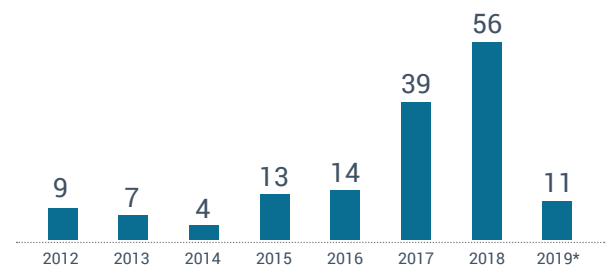
One challenge that the central government currently faces is that of completing its final stages of technological development. This means becoming less dependent on foreign-produced aircraft parts, which is part of the country's 10-year 'Made in China 2025' policy, focusing on developing high-tech industries including aerospace engineering.

Another challenge of the industry is to improve the country's low-altitude airspace. In 2018, the CAAC announced its plan to

implement a three-level service system for low-altitude flights by the early 2020s, which would provide operational information and scheduling arrangement. Previous initiatives aimed at airspace have done little, as there is still a lengthy process to endure.

While handling these challenges, the industry will also need to balance flight quality and passenger safety. An inflow of private investment to be spent on safety regulation is now expected. And, the CAAC will continue to place its focus on safety, alongside ensuring the smooth progress of this rapidly-developing industry.

NUMBER OF GA POLICIES 2012-2019



Note: For the period from January through June 2019



DATE	POLICY	DETAILS	LIST OF POLICIES 2018
JAN 8	SIMPLIFICATION OF PARTS REPLACEMENT - APPROVAL REQUIREMENTS	<ul style="list-style-type: none"> • CCAR-91 operators do not need an approval for the spare parts that already obtain the airworthiness certificate from the authorized aircraft manufacturer, parts manufacturer and MRO centers; • CCAR-135 operators could submit the required documents to the CAAC regional office for approval. 	
JAN 10	MEDICAL EXAMINATION: GUIDELINE FOR CLASS I (PILOT) MEDICAL EXAMINATION	Students from aviation schools who plan to prepare for CCAR-135 must follow up with CCAR-67 Grade I medical examination.	
JAN 18	UPDATE: SIMPLIFICATION OF GA CHARTER INFORMATION	Due to the limited space on flight vouchers (ticket), information related to the rights and liabilities of both parties can be provided through other means.	
JAN 19	SIMPLIFICATION OF GA AIRWORTHINESS CERTIFICATION	<p>Simplifies the current airworthiness certification procedure:</p> <ul style="list-style-type: none"> • Reduces the requirements for products and parts airworthiness certification; • Regional bureaus can approve special airworthiness certificate for experimental aircraft; • Minor modification of the aircraft is not required for approval (the list of minor modifications can be submitted at the end of the year annually); • Cancels the management procedures for kit assembly, self-made, aviation competition and exhibition aircraft; • Airworthiness certificate and nationality registration certificate online application system is available from the first quarter of 2018. 	
JAN 25	SIMPLIFICATION OF SMALL AIRCRAFT OPERATIONS	<p>Simplifies the procedures for CCAR-135 small aircraft operations, including:</p> <ul style="list-style-type: none"> • Operators can allocate pilots at their own discretion; • Cabin crew are not compulsory. 	
JAN 29	PILOT LICENSE: PROMOTION OF PRIVATE AND SPORT FLIGHT TRAINING	Implements a pilot plan for promoting sport and private flight training.	
FEB 1	MAINTENANCE PERSONNEL EXAMINATION: EXAM FREQUENCY AND DIFFICULTY ADJUSTMENT	<ul style="list-style-type: none"> • Adds two extra exams per month and new exam centers for GA mechanics qualification; • Mechanics qualification exam for sports aircraft can be taken online; • Reduces the difficulty of the mechanics exams. 	
FEB 1	REDUCTION OF REQUIREMENTS FOR GA OPERATORS	Eases GA operations and reduces the requirements for oxygen supplement products, GA crew with an electronic license and mechanics' experience.	
FEB 2	STANDARDIZATION OF GA AIRPORT DEFINITION: MENTIONED IN THE "CLASSIFIED ADMINISTRATION OF THE GA AIRPORT" (2017)	<ul style="list-style-type: none"> • Classifies airport types; • Separates the regulations from commercial airports to GA airports. 	
FEB 6	UNMANNED AIRCRAFT SYSTEM: IMPROVEMENT OF OPERATIONAL SAFETY	<ul style="list-style-type: none"> • Provides unmanned aerial vehicle industry background; • Utilizes cellular networks to achieve the goal of high reliability, low cost, and self-positioning. 	
FEB 6	OPERATIONAL REQUIREMENTS FOR INSTRUMENT FLIGHT RULES (IFR)	<ul style="list-style-type: none"> • Implements new technology, such as a satellite navigation (map navigation) system based on the Performance Based Navigation (PBN) operation manual • Enhances the safety requirements for fixed-wing aircraft with a weight lighter than 5,700kg and helicopters with a weight lighter than 3,180kg, respectively; • Formulates aviation Standard Operating Procedures (SOPs); • Implements database management. 	
FEB 7	AERIAL TOUR: ENHANCEMENT OF SECURITY AND FLIGHT QUALITY	<ul style="list-style-type: none"> • Enhances the safety standards of aerial tour operations; • Formulates safety requirements on aircraft, operational personnel, passengers and equipment; • Introduces the safety and water rescue equipment and system. 	

DATE	POLICY	DETAILS	LIST OF POLICIES 2018
FEB 8	UPDATE OF GA REGULATION	<ul style="list-style-type: none"> GA flight information can now be reported via online GA management system; Light sport aircraft without required airworthiness certificate are not allowed to conduct commercial flights. 	
FEB 13	SIMPLIFICATION OF LICENSE APPLICATION FOR GA OPERATORS	The Central-South regional bureau has approved conducting a pilot implementation plan for two years by focusing on optimizing GA operations, reducing application and approval time, and simplifying the procedures.	
MAR 2	SIMPLIFICATION OF GA AIRWORTHINESS CERTIFICATION	<ul style="list-style-type: none"> Adds an airworthiness certification for experimental category (self-made aircraft); The type certificate and production license for light sport airworthiness (LSA) and ultra-light airworthiness (ULA) are on a voluntary basis; The airworthiness certificate of any modifications for EMS and SAR missions has to be pre-approved, however, any urgent modifications are allowed to conduct without approval; Sets up the requirements to supply aviation fuel for general aviation companies; The above announcement was implemented May 1, 2018. 	
MAR 19	CIRCULAR: CAAC STATISTICAL INFORMATION	Publishes the industrial statistics about airports (transport airport and general airport), aviation industrial park, aviation towns, and aviation tours.	
MAR 21	UNMANNED AIRCRAFT SYSTEM: REGULATORY AND MONITORY REQUIREMENTS	Regulates drone monitoring and management.	
MAR 27	STANDARDIZATION OF OPERATIONS FOR ROTARY MEDICAL SERVICES	<ul style="list-style-type: none"> Standardizes the helicopter rescue and emergency medical services (EMS) operations, including pilot and crew training and special mission training Introduces new technology to support rescue operations including but not limited to drones, Real Time Kinematic [RTK] positioning and big data verification. 	
MAR 29	CIRCULAR: ANALYSIS OF MH5001 AND FAA AC70 OUTDOOR LASER OPERATIONS	Conducts comparative analysis between MH5001 and FAA AC70.	
APR 2	MAINTENANCE PERSONNEL EXAMINATION: SUBJECT REQUIREMENT ADJUSTMENT	Adjusts the requirements for mechanics license exams by adding written M10 subjects.	
APR 9	PILOT PROGRAM: BUREAU SUPERVISION ON GA ACTIVITIES	The Central-South regional bureau is approved to conduct pilot implementation plan in the region.	
APR 9	PILOT PROGRAM: BUREAU SUPERVISION ON GA ACTIVITIES	The North-East regional bureau is approved to conduct pilot implementation plan in the region.	
APR 13	PILOT LICENSE: GUIDELINES FOR PILOT LICENSE REQUIREMENT	<ul style="list-style-type: none"> Holds a CCAR-61 Commercial Pilot License or equivalent flight experience; Requires 40 hours of theory training and 25 hours flight training including at least 15 hours instrument training; Formulates the requirements and rules for flight instructors. 	
APR 17	MAINTENANCE PERSONNEL EXAMINATION: GA OPERATOR'S INTERNAL TRAINING FRAMEWORK UPDATE	<ul style="list-style-type: none"> The exam and qualification of the maintenance management personnel have been canceled under CCAR-66R2. The training of maintenance personnel should be included in the operator's internal training framework. 	

DATE	POLICY	DETAILS	LIST OF POLICIES 2018
APR 26	IMPROVEMENT OF LAW ENFORCEMENT FLIGHT OPERATIONS	<ul style="list-style-type: none"> • Develops POI/PMI systems and provides recommendations; • Improves the law enforcement system to solve the situation of low flight activity level caused by the law enforcement department undertaking fewer operational risks; • Clarifies the responsibilities among the different departments; • Coordinates law enforcement between Civil Aviation Administration and local bureaus. 	
APR 26	DETAILS OF GA AIRWORTHINESS CERTIFICATION	<ul style="list-style-type: none"> • Grants a special-use permit for scientific and test flights; • Regulates aircraft modifications for general aviation companies; • Sets restrictions and requirements for self-made aircraft; • Introduces civil aviation fuel management system on general aviation companies. 	
MAY 28	MAINTENANCE PERSONNEL EXAMINATION: CLARIFICATION OF QUALIFICATION REQUIREMENTS	Clarifies CCAR-66 mechanics qualification exams and standardizes the license approval process.	
JUN 1	PILOT LICENSE: AMENDMENT OF PILOT APPLICATION AND TRAINING SCHOOL OPERATIONS	<ul style="list-style-type: none"> • Reduces the application time for the first-time CCAR91 and CCAR135 applicants by imposing Flight Standards Oversight Program (FSOP); • The CCAR-61 and CCAR-141 training school without night training qualifications are still allowed to conduct training courses but limited to the night flight; • The application has to be processed within five days. 	
JUN 1	CLASSIFICATION OF SPECIAL GA FLIGHT ACTIVITIES	<ul style="list-style-type: none"> • Civil Aviation Transport Department would not involve in any special GA flights conducted Mainland China and Taiwan airspace boundaries, Mainland China and Hong Kong and Macau airspace boundaries, as well as restricted air zones; • The applicants have to submit all the documents at the same time within 20 days before the flight. 	
JUN 8	CIRCULAR: PROGRESS UPDATE OF GA PROJECTS	Progress updates on major GA projects in 2018, including 5 completed projects.	
JUN 11	CLARIFICATION OF PRIVATE FLYING REQUIREMENTS	<ul style="list-style-type: none"> • Defines the private flight; • Formulates criteria for private flight activities including license, documentation and insurance. • Requests flight plan management, credit records and other specific regulations for foreigners. 	
JUN 13	AMENDMENT OF POLICY: GA CHARTER FLIGHT MANAGEMENT INTERIM MEASURES	<p>Sets a pilot transition period less than two years; during the transition period, the GA operator can:</p> <ul style="list-style-type: none"> • Sell charter flight tickets to the public; • Choose sales model like agreements, direct sales etc. • Clarify the insurance duty, fulfilling the obligation to inform the customers. 	
JUN 14	UPDATE OF GA REGULATION	<ul style="list-style-type: none"> • Clarifies CAAC's responsibilities and jurisdictions; • Enhances efficiency by adding online system and WeChat; • Simplifies the procedure for GA flight applications and approvals by having clear deadlines, such as four hours before flight plan (sub-controlled zone), eight hours before flight plan (beyond sub-controlled zone) and at 15:00LT the day before flight plan (cross-controlled zones or foreign aircraft/pilot). 	
JUN 20	ESTABLISHMENT OF GA MEDICAL SERVICE CENTERS	Establishes two new aviation medical service centers in Heilongjiang and Yunnan.	
JUN 25	INVESTIGATION OF FLIGHT SAFETY	<ul style="list-style-type: none"> • Self-investigation on safety related issues have been tested in the North-East region; • Other regional authorities are notified to prepare conduct self-investigation on safety. 	

DATE	POLICY	DETAILS	LIST OF POLICIES 2018
JUN 26	PILOT LICENSE: CLARIFICATION OF APPLICATION PROCEDURE	Clarifies the application procedure for pilot license.	
JUN 27	FLIGHT PLANNING: UPGRADE OF ONLINE APPLICATION PLATFORM	<ul style="list-style-type: none"> • Upgrades online application platform for GA flights; • The system allows accepting flight plans in advance for GA flights but excluding business/corporate flights. 	
JUN 28	MEDICAL EXAMINATION: ONLINE APPLICATION	<ul style="list-style-type: none"> • Civil Airman Medical Certification Management (AMS) system is available online for GA pilots to express register; • CCAR-91 operators and private pilots can register via an online system. 	
JUL 9	PILOT PROGRAM: BUREAU SUPERVISION ON GA ACTIVITIES	<ul style="list-style-type: none"> • A pilot plan has been implemented in Central-South and North-East regions; • Collects the problems and issues from the pilot plan in order to improve the GA supervision model. 	
JUL 10	OPTIMIZATION OF GA FLIGHT DATA GATHERING	<ul style="list-style-type: none"> • The flight data reporting procedure has been optimized; • Commercial and non-business GA activities are to be reported through the GA information management system from October 1, 2018. 	
JUL 18	AMENDMENT OF GA OPERATION POLICIES	<ul style="list-style-type: none"> • Reviews and standardizes current regulations; • Trains on aviation professionalism; • Improve GA monitoring mechanisms; • Develops online platforms for approval, monitoring and information sharing; • Guarantees policies and support. 	
JUL 26	CLASSIFICATION OF EMERGENCY AND NON-EMERGENCY EVENTS	<ul style="list-style-type: none"> • Provide examples of the emergency events; • The two types of events should be processed through different reporting channels. 	
AUG 8	CIRCULAR: EMPHASIS ON GA REGULATION	<ul style="list-style-type: none"> • Explains the importance of developing GA industry; • Revises safety standards and simplifies the procedures; • Improves working efficiency and quality. 	
AUG 14	DEVELOPMENT PLAN ON IMPROVING GA INFRASTRUCTURE AND MILITARY CO-ORDINATION	<ul style="list-style-type: none"> • Prepares the layout for GA airports; • Promotes GA airport construction by coordinating with the military; • Regulates the upgrading of GA airports with strict criteria and clear procedures. 	
AUG 23	PILOT PROGRAM: BUREAU SUPERVISION ON GA ACTIVITIES	The East, North and North-East regional bureaus are approved to implement the pilot plan by working with three local operators within four months from August to December 2018.	
AUG 31	UNMANNED AIRCRAFT SYSTEM: CLASSIFICATION AND OPERATIONAL REQUIREMENTS	<ul style="list-style-type: none"> • Categorizes unmanned aerial vehicles with clear explanation; • Formulates requirements of operator and management of systematic operators. 	
SEP 1	SIMPLIFICATION OF GA FLIGHT APPLICATION	<ul style="list-style-type: none"> • Simplifies the application procedure; • All of the applications can be approved within 20 days; 10 days extension is allowed upon approval by the Head of Department. 	

DATE	POLICY	DETAILS	LIST OF POLICIES 2018
SEP 4	MEDICAL EXAMINATION: CLASS II (PILOT AND CABIN CREW) EXAMINATION CRITERIA	Announces Grade II medical examination criteria	
SEP 26	AMENDMENT OF AIRPORT FEE STRUCTURE FOR GA OPERATIONS	<ul style="list-style-type: none"> Standardizes the airport charges for the GA flights; GA emergency flights (e.g. medical, emergency, firefighting and military) are waived from airport charges; No additional fee shall be incurred; Establishes a system to collect the feedbacks on airport over-charges. 	
SEP 28	GUIDELINE FOR LOW-ALTITUDE FLIGHT IMPROVEMENT	<ul style="list-style-type: none"> Provides a better understanding of the need for low-altitude flights; Develops mission types suitable for low-altitude flight activities such as corporate use or tourism; Builds a long-term development plan to support low airspace flights; Develops an initial low airspace information management system by 2022. 	
SEP 29	AMENDMENT OF GA AIRWORTHINESS CERTIFICATION	The issuance of any new Special Airworthiness Certificate (SAC) process will now be based on the incumbent scientific SAC application procedure. No expiration unless specifically stated.	
OCT 8	CLARIFICATION OF GA POLICIES	Innovates GA operation and monitoring modes, and publishing pro-GA development policies	
OCT 8	CLARIFICATION OF GA POLICIES	<ul style="list-style-type: none"> The annual inspection for the aircraft with less than 10 seats could be carried out by operators themselves; Classifies the Commercial Passenger and the Private Passenger; Improves Flight Standards Oversight Program (FSOP) and Supervision and Enforcement System (SES) to assist the pilot plan. 	
OCT 12	UPSET PREVENTION & RECOVERY TRAINING (UPRT)	<ul style="list-style-type: none"> Defines Upset Prevention and Recovery Training (UPRT); UPRT is now required for operators to train the pilots. 	
NOV 8	MEDICAL EXAMINATION: GUIDELINES FOR CLASS II (PILOT) APPLICATION PROCEDURE	<ul style="list-style-type: none"> Clarifies regional bureau's responsibilities; Lays out the application procedures for licenses and examination for national pilots and foreign pilots. 	
NOV 27	PILOT PROGRAM: BUREAU SUPERVISION ON GA ACTIVITIES	<ul style="list-style-type: none"> Continues developing the GA oversight model and makes corresponding adjustments; Increases the effectiveness of relative systems and policies; Facilitates the GA activities. 	
NOV 30	STANDARDIZATION OF GA FLIGHT DATA GATHERING	<ul style="list-style-type: none"> Standardizes GA flight data related to aviation information submission request; Increases transparency. 	

DATE	POLICY	DETAILS	LIST OF POLICIES 2019
JAN 7	CIRCULAR: GA POLICY PERFORMANCE	<ul style="list-style-type: none"> The new GA policy has solved 94.8% of overmonitoring problems Achieve the high performance 	
JAN 16	AMENDMENT OF CIVIL AVIATION BACKGROUND INVESTIGATION REGULATIONS: GUIDELINES FOR INVESTIGATION OF ILLEGAL CRIMES IN DOMESTIC TERRITORIES	<ul style="list-style-type: none"> Amends civil aviation background investigation regulations; States an integrity declaration of criminal records should cover the information of the respondent, his or her parents and spouse. 	
FEB 15	CIRCULAR: GA COMPANY SUMMARY 2018	Statistics: 22 general aviation companies dissolve their business in 2018	
FEB 15	CIRCULAR: NON-OPERATING GA COMPANY REGISTRATION SUMMARY (DECEMBER 31, 2018)	Statistics: 18 non-profit registered GA companies	
FEB 15	CIRCULAR: GA COMPANY REGISTRATION SUMMARY (DECEMBER 31, 2018)	Statistics: 422 general aviation companies	
FEB 25	ADJUSTMENT OF GA AIRPORT FEE STRUCTURE	<ul style="list-style-type: none"> The GA airport fee should be lower than commercial airport fee. If not, the case should be reviewed and recorded by the CAAC; GA airports should clearly provide the price for each service; Non-profit activities, such as medical rescue or military use, do not need to be charged. 	
MAR 6	NOTICE ABOUT ENSURING COMMERCIAL AIRPORT SUPPORTS GA ACTIVITIES	<p>Emphasizes on promoting GA industry and ensures commercial airport needs to provide support on GA activities, including:</p> <ul style="list-style-type: none"> Commercial airports should improve the services; Complies with the fee structure and strictly prohibits any surcharges. 	
APR 10	CIRCULAR: GA MEDICAL RESCUE FLIGHT SITUATION SUMMARY (2010-2019)	Publishes the industrial statistics about 15 GA companies that engage in the medical rescue services over 10 years.	
APR 11	ADJUSTMENT OF CIVIL AVIATION BRANCH MODEL: GA DEVELOPMENT FUND FEE	<ul style="list-style-type: none"> Passengers do not need to pay the fee as of April 1, 2019; Passengers can ask for refund if they've already paid. 	
MAY 16	ACTIVATION OF GA FLIGHT PLAN MANAGEMENT SYSTEM	<ul style="list-style-type: none"> The system allows applicants to search application process, registration and results; It provides a cyber platform to enhance the efficiency. 	
JUN 13	NOTICE ABOUT DEVELOPMENT OF RIZHAO AIRPORT	<ul style="list-style-type: none"> Develops Rizhou Airport as a "1+N" GA airport; Promotes GA activities with the support from CAAC department, local bureau and military force. 	

FIVE YEARS OF SUCCESS

HK Bellawings is continuing its climb to the top. The IS-BAO II registered business jet operator was founded in 2014 and has quickly grown, along with its fleet, to offer business jet management and maintenance, along with aircraft brokerage and aviation consulting. The past five years have been monumental for the company. Established on the foundation of providing safe and high-quality services, HK Bellawings is moving forward with the same commitment to its clients.

The company's fleet has grown exponentially with aircraft from all the major manufacturers: Airbus Corporate Jets, Boeing, Bombardier, Dassault Falcon, Embraer and Gulfstream. In May 2019, a Letter of Intent was signed for five additional Global 7500s, after firming up an order for four Global 7500s in April of this year. The company is now Bombardier's largest customer and will become the largest operator of the Global 7500 in China.

Thanks to a recent collaboration with Honeywell, the Bellawings' fleet will now be decked out with GoDirect™ Cabin Connectivity applications. Not only does this technology better control overhead costs by helping to manage passenger data consumption, but it also increases the capability to offer better connectivity for a range of needs, like participating in a video conference.

Each aircraft is served by an extensive team on ground and in the air. Monitoring and organizing each flight is the Flight Operations team, responsible for everything from flight plans to



ground handling support, eliminating delay and interruption. In the cockpit, HK Bellawings' Pilots all have over 15 years of experience, guaranteeing maximum safety during each journey. Ensuring each trip is without disruption, the Cabin Crew is trained to handle every detail from catering to Chinese tea ceremonies.

The combined effort from all teams at HK Bellawings has led to measurable success as an operator. HK Bellawings was awarded with a Luxury Lifestyle Award, in the category of Luxury Private Jet Management Service. The award considers the best luxury goods and services from all over the world, confirming HK Bellawings' position as a competitive, global operator. For three years in a row (2016 – 2018), the operator was also named 'Best Business Jet Operator' by the Robb Report, further cementing the team's operational excellence.

As HK Bellawings continues its success during its fifth year, the company is expanding in all directions. One of its latest partnerships is with Boeing's Jeppesen JetPlanner Pro. The company signed a multi-year agreement with Boeing, becoming the largest business aviation customer to utilize Jeppesen JetPlanner. The solutions will enhance global flight planning

capabilities and reduce costs, as well as help HK Bellawings' clients further enjoy advantages brought about by this front-end technology.

www.hkbellowings.com

“ **THE COMPANY
IS NOW
BOMBARDIER'S
LARGEST
CUSTOMER AND
WILL BECOME THE
LARGEST OPERATOR
OF THE GLOBAL
7500 IN CHINA.** ”

HK BELLAWINGS' SERVICES

- **Management:** Acting as a comprehensive management service, HK Bellawings supports its clients with all aspects of their trips: flight planning and scheduling, maintenance, aircraft transactions or asset management.
- **Maintenance:** HK Bellawings obtained HKAR-145 approval by the Hong Kong Civil Aviation Department in 2018. It has also recently been granted Maintenance Organization Approval by the Civil Aviation Authority of Cayman Islands (CAACI), allowing the company to carry out maintenance service for VP-C registered business jets.
- **Brokerage:** The Sales Team at HK Bellawings supports its clients with new or pre-owned aircraft transactions, assisting with finding the right aircraft, managing the legal aspect of an aircraft sale or acquisition, as well as with delivery.
- **Consulting:** Offering a wide-range of business aviation consulting services, HK Bellawings' consultants can provide services including market intelligence, financing, interior renovation and aircraft registration.



2019 MACAU BUSINESS

AVIATION EXHIBITION



—2019—
11.1-3

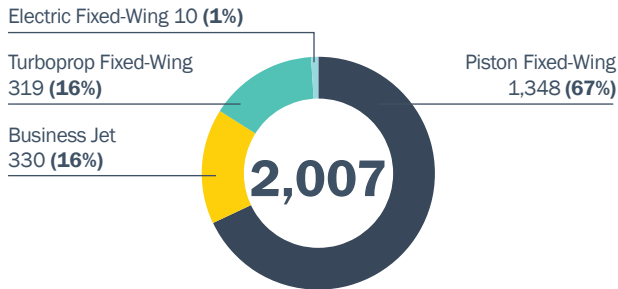
📍 The Parking Apron of Macau
International Airport



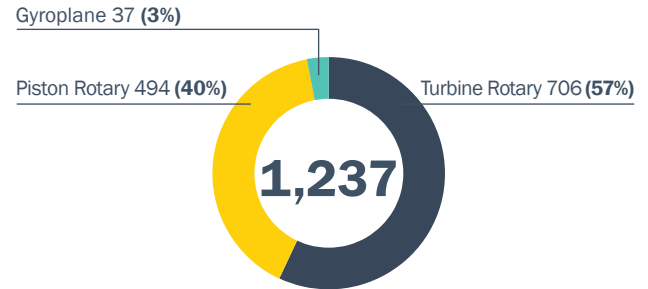
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CHINA GA AIRCRAFT MARKET

FIXED-WING FLEET BY TYPE

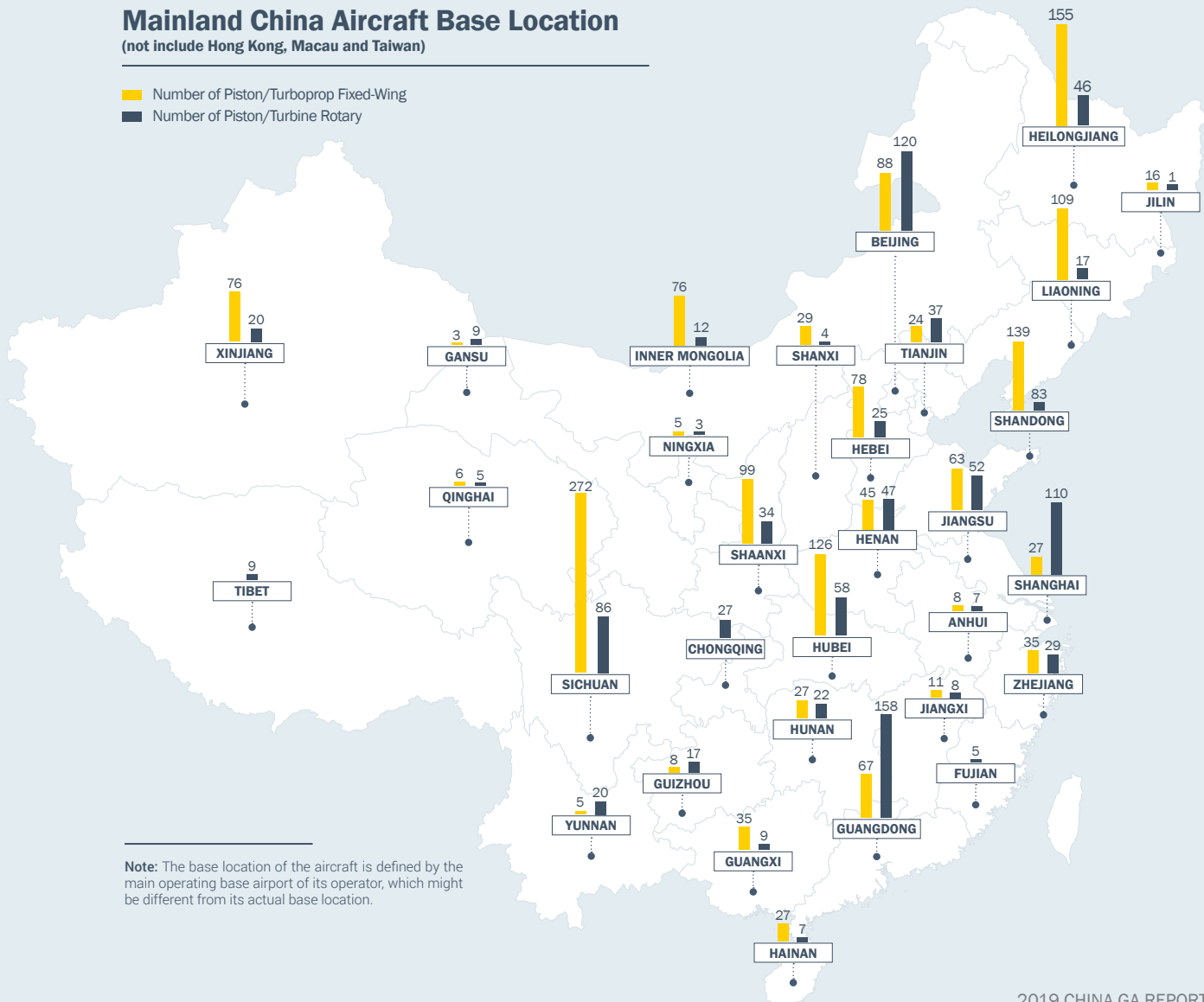


ROTARY-WING FLEET BY TYPE



Mainland China Aircraft Base Location (not include Hong Kong, Macau and Taiwan)

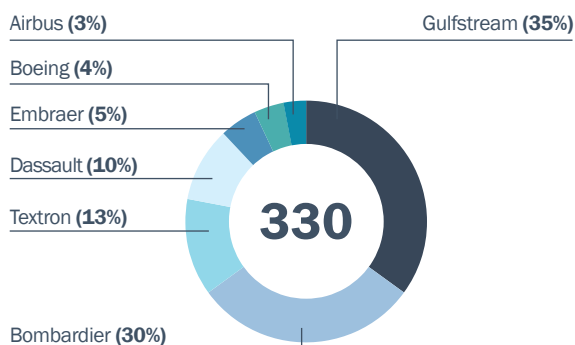
- Number of Piston/Turboprop Fixed-Wing
- Number of Piston/Turbine Rotary



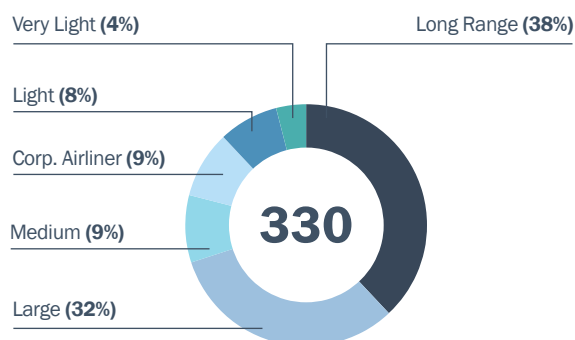
Note: The base location of the aircraft is defined by the main operating base airport of its operator, which might be different from its actual base location.

BUSINESS JET MARKET

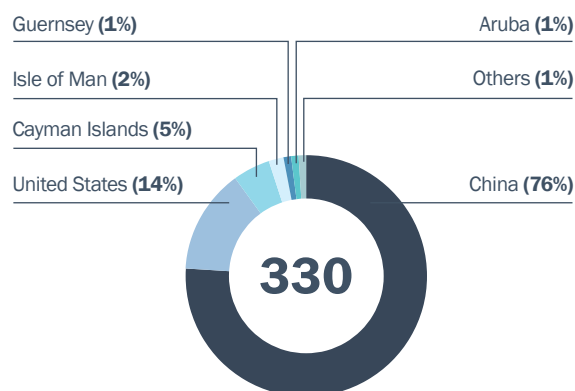
FLEET BY OEM



FLEET BY SIZE CATEGORY



FLEET BY REGISTRATION



“ LONG-RANGE BUSINESS JETS ARE THE MOST POPULAR SIZE CATEGORY, MAKING UP 38% OF THE FLEET. ”

Of the 3,317 GA aircraft in Mainland China, 330 (10%) are business jets. Gulfstream and Bombardier continued their reign as the top OEMs in the market. Gulfstream's fleet, which makes up 35% of the market, is also the OEM's largest fleet in the Asia-Pacific region. Bombardier's fleet makes up 30% of the market; Mainland China is also home to its largest regional fleet. Textron holds a 13% market share, while Dassault Falcon has a 10% share.

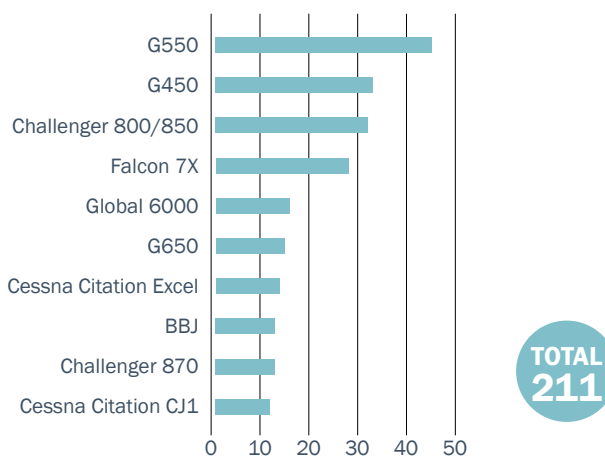
The top OEMs market share is reflective of the size preference in the Mainland China market. Long-range business jets are the most popular size category, making up 38% of the fleet. Large cabin jets fall closely behind, making up 32% of the fleet. Medium-sized business jets, corporate airliners and light-sized jets make up 9%, 9% and 8% of the fleet, respectively. The top four business jet models in Mainland China are the Gulfstream G550 and G450, along with the Dassault Falcon 7X and Bombardier's Challenger 850, which all fall into the long-range and large cabin size categories.



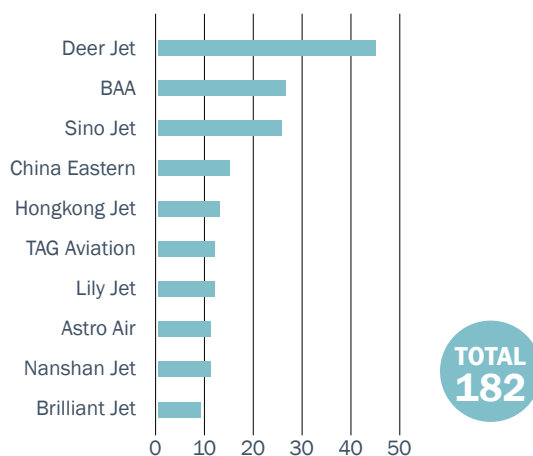
In terms of registration country, over three-fourths of business jets in Mainland China are registered in Mainland China (B-reg). Approximately 14% of business jet are registered in the US (N-reg) and about 5% are registered in the Cayman Islands (VP-C reg).

The top operator in Mainland China is Deer Jet, followed by BAA and Sino Jet. Sino Jet was the fastest growing operator in Mainland China in 2018, while Deer Jet's business jet contracted between 2017 and 2018.

TOP BUSINESS JET MODEL

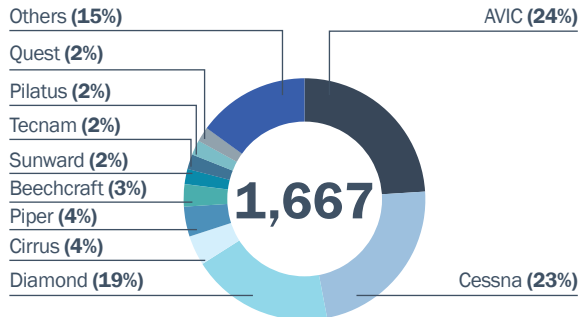


TOP BUSINESS JET OPERATOR

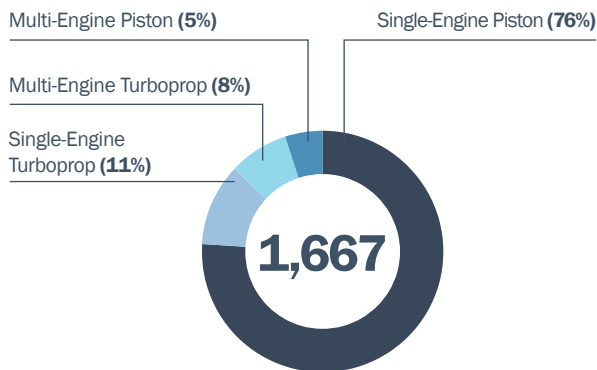


TURBOPROP & PISTON FIXED-WING

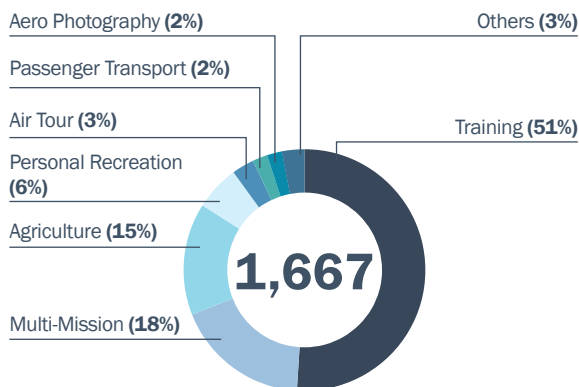
FLEET BY OEM



FLEET BY SIZE CATEGORY



FLEET BY MISSION



“THE DEMAND FOR TURBOPROP AND PISTON AIRCRAFT IN MAINLAND CHINA IS EXPECTED TO GROW, IN LIGHT OF RECENT GA DEVELOPMENTS.”

Mainland China's piston and turboprop fleet is the largest GA fleet in Mainland China, making up 50% (1,667) of all GA aircraft.

The majority of these aircraft are single-engine pistons (76%), while only 11% are single-engine turboprops and 8% are multi-engine turboprops. State-owned AVIC and Cessna Aircraft hold comparable amount of the market share in Mainland China, with 24% and 23% respectively. Diamond Aircraft holds a 19% share in the market. Top piston models include the Cessna 172, Diamond DA40 and AVIC Y5 respectively, while top turboprop models include the Cessna 208, AVIC Y12 and Kodiak 100. By mission type, over half (51%) of the fleet is used for training purposes, while 18% is categorized as multi-mission and 15% is used for agriculture purposes.

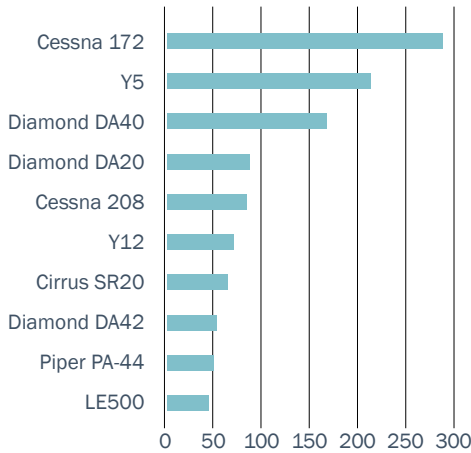
The Civil Aviation Flight University of China is the largest operator of turboprop and/or piston. Beidahuang GA has the second largest fleet, followed by Hainan Aviation Academy and Civil Aviation University of China.

The demand for turboprop and piston aircraft in Mainland China is expected to grow, in light of recent GA developments, as well as the increased demand for aviation personnel which will require training.



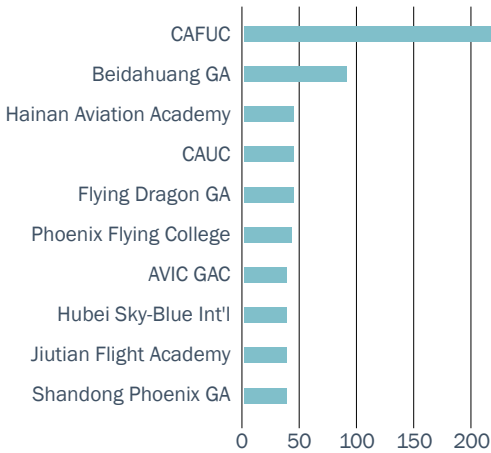
Picture Source: Wikipedia

TOP TURBOPROP & PISTON FIXED-WING MODELS



TOTAL
1149

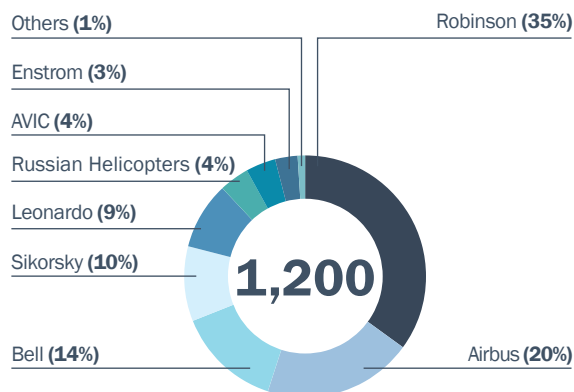
TOP TURBOPROP & PISTON FIXED-WING OPERATORS



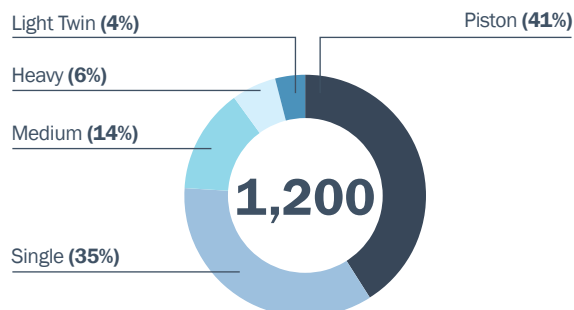
TOTAL
631

HELICOPTER MARKET

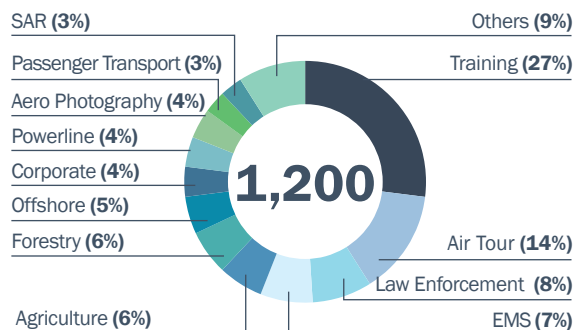
FLEET BY OEM



FLEET BY SIZE CATEGORY



FLEET BY BY MISSION



“THE TOP OEMS MARKET SHARE IS REFLECTIVE OF THE SIZE PREFERENCE IN THIS MARKET.”

The civil helicopter market in Mainland China makes up 36% of the GA aircraft fleet; a total of 1,200 helicopters. In terms of the fleet number, Robinson Helicopter holds the largest market share in China, with 35% of the fleet, followed by Airbus (20%), Bell (14%) and Sikorsky (10%). Leonardo holds a 9% share in Mainland China's helicopter market, which is the manufacturer's largest fleet in the Asia-Pacific region.

The top OEMs market share is reflective of the size preference in this market. Of the helicopters in Mainland China, 41% are piston, 35% are single-engine, 14% are medium-sized and 6% are heavy. The top piston models in this market include Robinson R44, R22 and Schweizer S-300. Airbus H125, Bell 407 and Bell 206 are the top turbine models in the market. By mission category, helicopters in Mainland China are mostly used for training purposes (27%), followed by air tourism (14%), law enforcement (8%) and emergency medical services (7%).

Citic Offshore Helicopter Company (COHC) is the largest operator, in terms of fleet size. Kingwing General Aviation, State Grid General Aviation and China Dragon General Aviation are also notable helicopter operators in the Chinese market.



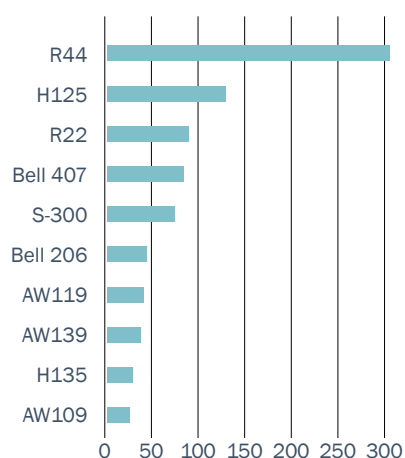
FOR MORE INFORMATION ON HELICOPTER FLEET, PLEASE REFER TO UPCOMING ASIA PACIFIC CIVIL HELICOPTER FLEET REPORT 2019

Picture Source: Melody Sky

The civil helicopter market in Mainland China is expected to grow, due to the continuous expansion of low-altitude airspace and the opening of cross-boundary helicopter services in the Greater Bay Area (GBA), which has received much government support. A helicopter service between Macau-Shenzhen and Hong Kong-Macau has already been established and is expected to expand in the coming years. The first helicopter flight between Hong

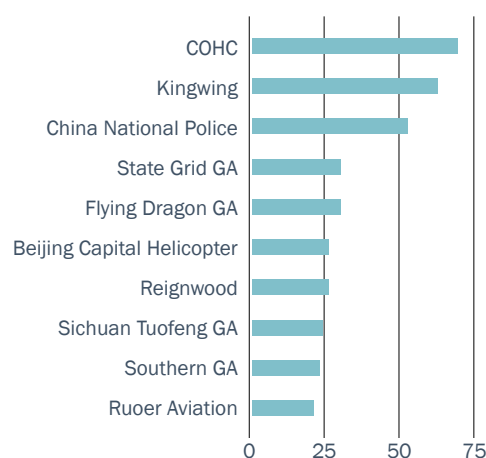
Kong and Shenzhen was completed in July 2019. While the test flight is a turning point in the Government's GBA initiative, the flight required approval by respective regulators, governments and military authorities. Still, the development of a helicopter service will significantly contribute to the development of China's helicopter industry, as well as to transport links in the GBA.

TOP HELICOPTER MODELS



TOTAL
861

TOP HELICOPTER OPERATORS



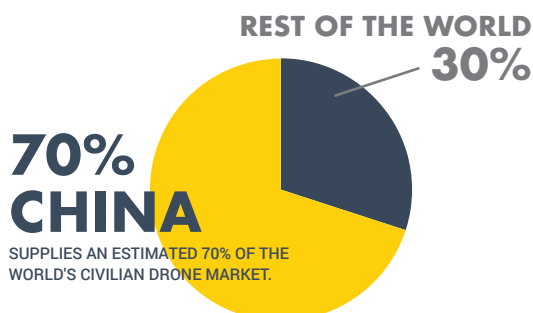
TOTAL
366

SPECIAL FEATURE: COMMERCIAL DRONES IN CHINA

THE GLOBAL DRONE POWERHOUSE BY Ipsos Business Consulting

China has quickly grown to become the drone industry's manufacturing and technological powerhouse over the past 10 years, unlocking new market opportunities through affordable and accessible drone equipment.

It is estimated China supplies up to 70% of the world's civilian drone market, with the number of Chinese civilian drone manufacturers still on the rise. In 2013, there were approximately 130 drone manufacturers in China; a figure that has increased to an estimated 1,200 drone companies by the beginning of 2019.



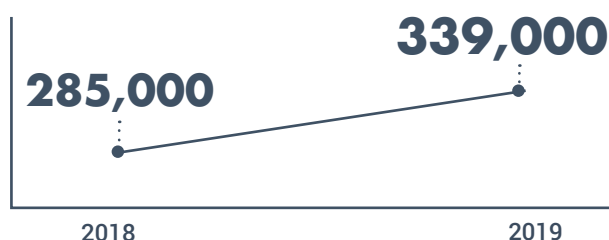
The growth in China's production capabilities is, in part, driven by increasing global demand. However, recent trends indicate a big shift in the drone industry from manufacturing consumer and hobbyist drones towards aircraft for commercial applications.

Beyond videography, photography, and aerial imaging, drone technologies have become increasingly important to support applications in construction, energy, agriculture, forestry, security and emergency operations, logistics, and transportation. Commercial applications are also driven by favourable domestic policies in China to promote technological advancement of industrial sectors.

The widening application areas for drone technology has increased demand for these aircraft in China. According to the Civil Aviation Administration of China, there were 285,000 drone aircraft registered at the end of 2018. By June 2019, the number of registrations increased to 339,000 drone aircraft*.

***Note:** These figures do not reflect all civilian drones sold and used in the market, nor reflect China's total production capability.

REGISTERED DRONE AIRCRAFT



China's drone manufacturers are mainly located along the Eastern and Southern coasts of China, with the highest concentration of drone companies in Guangdong province. In 2017 alone, production by the Chinese drone industry is estimated to have exceeded 2.5 million units (including aircraft for exports).

While consumer hobbyist drones used to dominate the civilian drone market in China, commercial and government (public security and emergency rescue) drones are estimated to account for half, or more, of drone aircraft usage in 2019. Agriculture accounted for the largest commercial sector, followed by energy inspection.

DRONE MANUFACTURERS









TOP CHINESE DRONE BRANDS FOR COMMERCIAL APPLICATIONS

While DJI has become synonymous for consumer drones and videography across the world, over the past years DJI has also been systematically developing expertise across commercial segments and developing data services that it markets to companies as enterprise solutions.

However, across commercial segments DJI does not have the same level of expertise that enables it to command the same dominating position as it does in the consumer/hobbyist and videography segments. Most notably, DJI is not active in urban

air mobility (also known as drone taxis and UAM) nor has it yet marketed drones for the emerging last mile logistics segments.

The Top 10 list of Chinese commercial drone brands — other than DJI — provides a glimpse of 10 unique drone brands that have been quietly and intelligently developing their expertise away from the limelight. This is taking place across various commercial segments and more importantly these brands are also transforming their businesses from being a hardware manufacturer to providing integrated enterprise solutions.

	PORTFOLIO		COMMERCIAL CIVILIAN APPLICATION SEGMENTS							OTHER SEGMENTS	
	Multi-rotor	Fixed-wing	Hardware				Software			Military	Consumer
			Imaging ¹	Logistics ²	Agriculture	Mobility / Passenger	Data / Analytics	Flight Control	UTM ³		
EHANG	✓		✓	✓		✓		✓	✓		
AEE 一电航空 AEE AVIATION TECHNOLOGY	✓	✓	✓					✓			✓
YUNEEC	✓		✓					✓			✓
dji	✓		✓		✓		✓	✓			✓
 北京航空航天大学无人系统研究院有限公司 BEIHANG UAS TECHNOLOGY CO., LTD.		✓	✓	✓				✓		✓	
XAG XAG INTELLIGENT SYSTEMS	✓		✓		✓		✓	✓			
ZERO TECH 零一科技	✓	✓	✓	✓				✓			✓
PowerVision	✓		✓				✓	✓			✓
 一飞智控 efy technology	✓		✓	✓			✓	✓			
 TTA	✓	✓	✓		✓		✓	✓			
 walkera	✓		✓	✓	✓			✓			✓

Note(1): Includes sensor, monitoring, inspection and videography.

Note(2): Includes delivery services.

Note(3): Unmanned traffic management

Ipsos Business Consulting

The use of commercial drones for inspection, monitoring, surveying and surveillance is the primary application for commercial drones today. This includes industries such as construction, infrastructure, agriculture, energy, mining, telecommunications and insurance. Typical examples of applications across these industries include using drones to monitor construction sites, transmission lines, stockpiles and analyse the health of plants and fields.

This is a very competitive segment with many drone brands trying to establish themselves with a competitive offering. Drone companies which wish to be successful in this segment will need to increasingly focus on data analytics services to provide an added value to their clients.

ZEROTECH is a drone company from Beijing and sets itself apart from many of the other mainstream from many of the other mainstream drone companies in China as it offers gasoline and electric powered fixed-wing and hybrid fixed-wing drones for surveying and mapping.

YUNEEC INTERNATIONAL is based in Jiangsu and is leveraging its experience in consumer drones and videography applications to transition into commercial applications, including search and rescue and inspection.

Another unique segment for the use of unmanned aircraft is agriculture. Here, drones are not only used to analyse the health of plants and fields, but also used for spray applications. In China the leading use of drones in agriculture today is in fact for spray applications. While DJI has aggressively been developing capabilities in this segment, other companies that provide drones with spray application include XAG, TTA and Walkera.

XAG is headquartered in Guangzhou and focuses purely on the agriculture segment and can be considered a leading player for agriculture drone applications. XAG has made a remarkable development since its founding in 2007 and today has the ambition to become a leading global smart agriculture solution provider. Today, XAG provides drones for spray applications, surveying and seeding, as well as offering cloud-based analytics solutions for analysing field data such as plant growth, germination rate and crop stress from the surveying and mapping data. With its focus on developing AI-based agriculture solutions, XAG is focusing on becoming a leading precision agriculture ecosystem player.

The application of drones continues to develop, with two emerging segments which will bring major changes to our cities – UAM and logistics. In both segments, players from China are at the forefront.

EHANG can be considered one of the pioneers in electric UAM with a focus on developing autonomous air mobility solutions. Ehang has showcased its drone during several high-profile test flights in Dubai, Qatar, Guangzhou and Vienna. With its focus on unmanned traffic solutions, Ehang is also active in logistics after recently signing a strategic partnership with DHL-Sinotrans to develop and launch a fully automated and intelligent smart drone delivery solution to tackle the last-mile delivery challenges in urban areas of China. The company is also developing a logistics drone capable of carrying up to 260kg of cargo.

Some other notable drone companies are involved in long-distance logistics, as well as the gasoline and electric industries.

BEIHANG UAS TECHNOLOGY CO. LTD has a military background and is developing an autonomous long-distance logistics drone with a payload delivery of 1500kg.

EFY TECHNOLOGY CO. has an impressive portfolio of gasoline and electric logistics drones, and automated platforms. As drone delivery starts to ramp up, it will be low population density areas in remote or difficult to access regions which will benefit first. Scalability will require beyond visual line of sight missions and most likely larger payloads. Efy has an especially well-positioned portfolio for this emerging logistics application.



**“ THIS IS A VERY
COMPETITIVE SEGMENT
WITH MANY DRONE
BRANDS TRYING TO
ESTABLISH THEMSELVES
WITH A COMPETITIVE
OFFERING. ”**

CHINA'S DRONE INDUSTRY LANDSCAPE TRANSFORMATION

Even though the drone industry in China is clearly still emerging, it is already undergoing a strong transformation.

Together with increasing demand, policies, and growing application areas for drones in commercial sectors, drone companies have matured with increasing specialization into specific application areas, or, have expanded their aircraft portfolio to cover segments beyond consumer hobbyist customer segments.

Venturing into precision and data-based commercial applications has elevated the level of aircraft quality and capabilities from Chinese drone manufactures. This shift has also transformed the domestic drone ecosystem away from hardware manufacturing and towards services such as software analytics, pilot training, and other professional drone services catering to specific industry applications.

However, mass adoption of autonomous commercial drones integrated into the civilian airspace flying beyond visual line of sight missions will require a further technological leap. Drone

services will need to be priced at a service level that consumers will want to buy, and at a safety level, regulators are willing to allow. This will require an autonomous system to fly each drone without the need for a pilot to be in direct control.

Ipsos Business Consulting expects China's drone industry will continue pushing the development of drone aircraft capabilities and standardization. With China's leading position in artificial intelligence, we also expect to see an increase in artificial intelligence applied to drones, not only for interpretation of video and sensor information but also for improving decision performance and transparency of decision-making to enable true autonomous applications.

Ipsos Business Consulting

FOR MORE INFORMATION ON COMMERCIAL DRONE APPLICATIONS: **WWW.IPSOSCONSULTING.COM**





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INFRASTRUCTURE OVERVIEW

Infrastructure in Mainland China is a significant factor in developing the GA industry to cater to the increased demand. In December 2018, the Civil Aviation Administration of China (CAAC) published its action plan set to transform China into an aviation powerhouse by 2030.

Notably, the CAAC placed an emphasis on infrastructure and particularly airports, which is targeting to reach 450 airports by 2035. Considerable work is already being done to major international airports, with the completion of the Beijing Daxing International Airport. The focus will continue with provincial airports. Likewise, with the increased demand for air travel — with commercial and general aviation — there lies a need for supporting maintenance facilities and operational hubs, or fixed-based operators (FBOs), for business aviation.

GA infrastructure in Mainland China is categorized as: certified GA airports and uncertified landing spots. In 2019, there were 228 certified GA airports in China. The country's northernmost province of Heilongjiang, which is also China's largest agriculture base, is home to the largest number of GA certified airports— 84. There were 234 combined heliports and helipads, with 33 of them based in the manufacturing hub of Guangdong province, which is also the highest earning economy of all provinces in the country. In terms of supporting GA infrastructure, there are 9 FBOs and 47 major maintenance, repair and overhaul (MRO) facilities.

NUMBER OF AIRPORTS / HELIPORTS / HELIPADS

CERTIFIED GA AIRPORTS



228

HELIPORTS & HELIPADS



234

NUMBER OF FBOs IN OPERATION

9

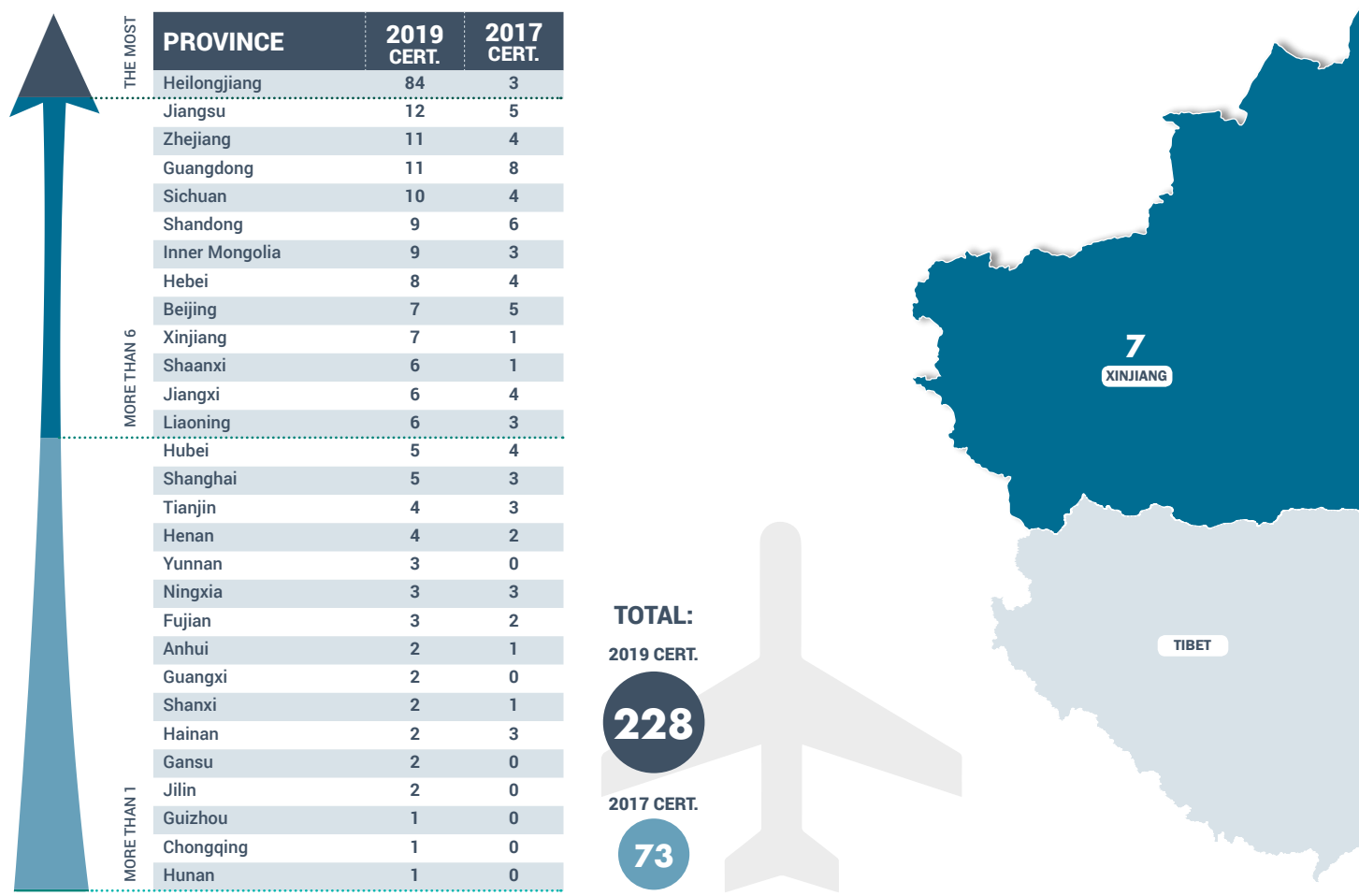
NUMBER OF MAJOR MROS*

47

*Note: Facilities actively provide MRO services for fixed-wing (business jet/turboprop/piston) and turbine rotary aircraft.

GA AIRPORTS

As of June 30, 2019, there were 228 CAAC approved GA airports, with 84 located in the northernmost province of Heilongjiang, which is also China’s largest agriculture base. Jiangsu Province was home to 12 GA airports, while Zhejiang and Guangdong provinces both had 11 GA airports. Most of these airports are situated in the eastern coastal areas, with much less in the northwestern regions.



Compared with 2017, the number of certified GA airports in 2019 (228) tripled that in 2017 (73). Heilongjiang Province saw significant growth. In 2019 (84) there was 28 times as many certified GA airports as in 2017 (3), attributed to several airport certifications being completed during the past few years. These GA airports are mainly used for aircraft in the agriculture, forestry and pilot training segments.

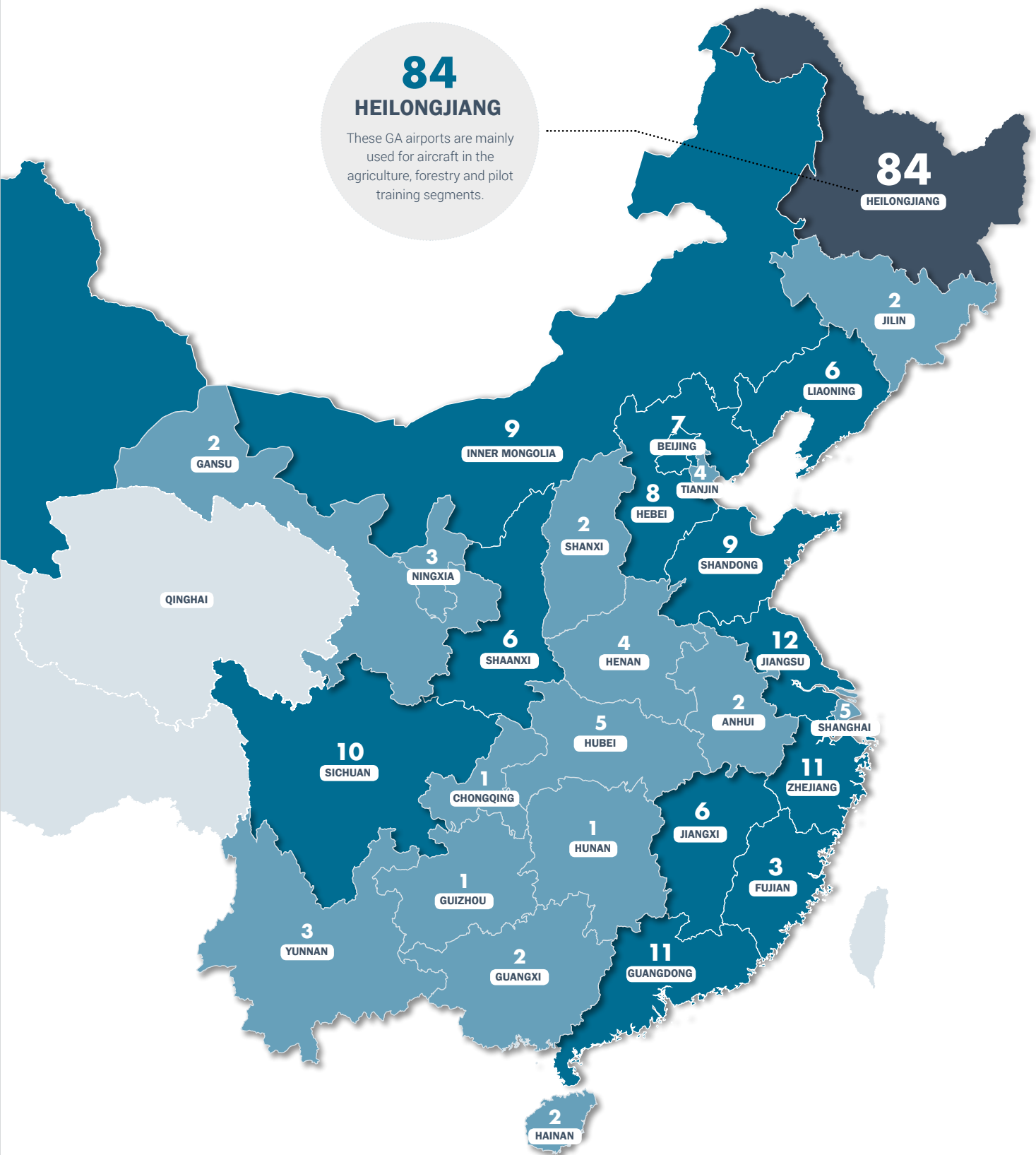
The Chinese GA industry has made breakthroughs under the guidance of the CAAC. In recent years, under the premise of ensuring safety, the CAAC has simplified admission

qualifications and flight procedure management of GA airports, which has played an important role in the rapid growth of certified GA airports.

This industry has become a very attractive and promising market. According to the International Air Transport Association, China will become the world's largest civil aviation market by 2024-2025 and its air passenger volume in the Chinese market is expected to reach 1.6 billion by 2037. As such, the demand for airports will continue to increase and the coming years will see more GA airports become certified.

Mainland China Cert. GA Airports

(not include Hong Kong, Macau and Taiwan)



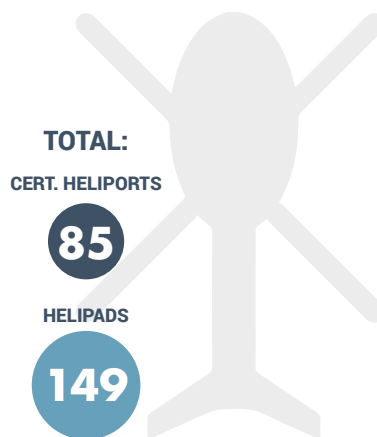


With the advancement of low-altitude airspace reform in China, all sectors of GA are developing including the rotary market. As of June 30, 2019, there were 234 heliports and helipads. 71 of those are certified heliports with a hangar, maintenance and refueling service, as well as some with passenger terminals. 149 of the 234 are helipads, located mainly at hospitals, or on top of luxury

hotels and high-rise office buildings. Another 14 are runway GA airports also serving as heliports. These heliports and helipads are mainly situated in coastal provinces and cities along the eastern regions such as Guangdong, Zhejiang, Jiangsu and Shanghai. The number of heliports and helipads in the northwest region make up the smallest amount, accounting for only 4.3%.

In terms of total number, Guangdong has the largest number of heliports and helipads (33). The development plan for the Greater Bay Area proposes to deepen the reform of low-altitude airspace management, accelerate the development of GA, develop cross-border helicopter services, and promote the development of the Guangdong Airport Economic Zone. Promoting cross-border services will consequently increase the demand for heliports and helipads in the Guangdong province.









PROVINCE	CERT. HELIPORT	HELIPAD
Guangdong	7	26
Beijing	7	16
Zhejiang	6	13
Jiangsu	9	10
Shanghai	5	13
Heilongjiang	16	-
Shandong	3	9
Sichuan	7	5
Fujian	3	9
Yunnan	3	4
Hainan	1	5
Chongqing	-	6
Henan	2	3
Shaanxi	-	5
Hunan	-	5
Tianjin	1	3
Jiangxi	4	-
Guangxi	2	2
Hubei	2	2
Guizhou	-	3
Liaoning	1	2
Hebei	1	2
Anhui	1	2
Ningxia	1	1
Xinjiang	1	1
Inner Mongolia	1	1
Chongqing	1	-
Qinghai	0	1



CAAC CERTIFIED GENERAL AIRPORT

 Runway Airport
  Heliport

PROVINCE	AIRPORT NAME	TYPE
ANHUI	Wuhu Sanyuan General Airport	
	Ningguo Qinglongwan Airport	
BEIJING	Beijing Badaling Airport	 
	Beijing Haidian Airport	 
	Beijing Miyun Mujiayu General Airport	 
	Beijing Shifo Temple Airport	 
	Beijing Dingling Airport	
	Beijing Pinggu Airport	
	Beijing Red Cross 999 Huairou Airport	
CHONGQING	Longxing General Airport	 
FUJIAN	Fuzhou Bamboo Pole Heliport	
	Xiajinwan Heliport	
	Zhangzhou Changtai General Heliport	
GANSU	Dunhuang Mingshashan General Airport	
	Zhangye Danxia General Airport	
GUANGDONG	Shenzhen Bay No. 1 Elevated Heliport	
	Guangdong Yangjiang Heshan Airport	
	Luoding Airport	
	Zhuhai Baijiao General Airport	 
	Zhuhai Lianzhou General Airport	 
	Zhongshan Triangle Airport	 
	Zhuhai Jiuzhou Airport	 
	Dongguan Zhengyang Tianwei Heliport	
	Guangzhou Shawan General Airport	
	Shenzhen Nantou Heliport	
	Zhanjiang Potou Heliport	
GUANGXI	Guilin Gaotian Heliport	
	Guilin Rongjiang Heliport	
GUIZHOU	Huangping Old State Airport	
HAINAN	Xiqing Airport	
	Sanya Phoenix Heliport	
HEBEI	Baiyangdian General Airport	
	Hebei Cangzhou Yinzhou Zhongjie General Airport	
	Hebei Huanghua Zhihuang Airport	
	Hebei Pingquan Airport	
	Hebei Weilong General Airport	
	Shijiazhuang Yucheng Airport	
	Yifei General Airport	
	Qian'an Wuzhong Airport	

PROVINCE	AIRPORT NAME	TYPE
HEILONGJIANG	Bei'an Beidahuang Changshuihe General Airport	
	Bei'an Beidahuang Construction General Airport	
	Bei'an Beidahuang Red Star General Airport	
	Bei'an Beidahuang Xunke General Airport	
	Bei'an Beidahuang Zhaoguang General Airport	
	Beidahuang 290 Branch General Airport	
	Beidahuang 291 Branch General Airport	
	Beidahuang 853 Branch General Airport	
	Beidahuang 856 Branch General Airport	
	Beidahuang 859 Branch General Airport	
	Beidahuang Qindeli branch General Airport	
	Beidahuang Xingkai Lake Branch General Airport	
	Beidahuang Xinhua Branch General Airport	
	Friendship Farm General Airport	
	Gannan Beidahuang Check Hayang General Airport	
	Gongqing Farm Beidahuang General Airport	
	Heihe Beidahuang Frontier General Airport	
	Heihe Beidahuang Nenjiang General Airport	
	Heilongjiang 597 Farm Changlin Island General Airport	
	Heilongjiang 597 Farm Dagushan General Airport	
HEILONGJIANG	Heilongjiang 850 Farm General Airport	
	Heilongjiang 852 Branch General Airport	
	Heilongjiang 855 Farm General Airport	
	Heilongjiang 857 Farms General Airport	
	Heilongjiang Baoquanling Farm General Airport	
	Heilongjiang Beidahuang 854 Office General Airport	
	Heilongjiang Beidahuang Riverside Branch General Airport	
	Heilongjiang Chuangye Farm General Airport	
	Heilongjiang Daxing Farm General Airport	
	Heilongjiang Erdaohe Farm General Airport	
	Heilongjiang Forward Farm North General Airport	
	Heilongjiang Forward Farm South General Airport	
	Heilongjiang Honghe Farm General Airport	
	Heilongjiang Hongqiling Farm General Airport	
	Heilongjiang Junchuan Farm General Airport	
	Heilongjiang Outpost Farm General Airport	
HEILONGJIANG	Heilongjiang Puyang Farm General Airport	
	Heilongjiang Qianjin Farm General Airport	
HEILONGJIANG	Heilongjiang Qingfeng Farm General Airport	

CAAC CERTIFIED GENERAL AIRPORT



Runway Airport

















































































Heliport

PROVINCE	AIRPORT NAME	TYPE
HEILONGJIANG (CONT.)	Heilongjiang Qinglongshan Farm General Airport	Runway Airport
	Heilongjiang Red Wei Farm General Airport	Runway Airport
	Heilongjiang Seven Star Farm General Airport	Runway Airport
	Heilongjiang Shengli Farm General Airport	Runway Airport
	Heilongjiang Weibin Farm General Airport	Runway Airport
	Heilongjiang Yaluhe Farm General Airport	Runway Airport
	Hulin Beidahuang 585 General Airport	Runway Airport
	Hulin Beidahuang Yunshan Farm General Airport	Runway Airport
	Jiagedaqi Forestry Airport	Runway Airport
	Jiamusi Sanhe International Airport	Runway Airport
	Nenjiang Beidahuang Daxijiang General Airport	Runway Airport
	Nenjiang Beidahuang Mountain General Airport	Runway Airport
	Nenjiang Beidahuang Seven Stars Bubble General Airport	Runway Airport
	Nenjiang Forestry Airport	Runway Airport
	Nenjiang Mergen General Airport	Runway Airport
	Nenjiang North Daqing Heshan General Airport	Runway Airport
	Qiqihar Beidahuang Fuyu Ranch General Airport	Runway Airport
	Qiqihar Beidahuang Keshan General Airport	Runway Airport
	Suihua Beidahuang Suilin General Airport	Runway Airport
	Targan Forestry Airport	Runway Airport
	Tongjiang Beidahuang Nongjiang General Airport	Runway Airport
	Wudalian Chilong Town General Airport	Runway Airport
	Wudalianchi Beidahuang Erlongshan General Airport	Runway Airport
	Wudalianchi Beidahuang Geshanshan General Airport	Runway Airport
	Wudalianchi Beidahuang Longmen General Airport	Runway Airport
	Wudalianchi Beidahuang Weihe General Airport	Runway Airport
	Wudalianchi Beidahuang Yanlonghe General Airport	Runway Airport
	Yichun Forestry Airport	Runway Airport
	Zhaodong Beidahuang Airport	Runway Airport
	Xingfu Forestry Airport	Runway Airport (H)
	Dongfanghong Airport	Heliport (H)
	Golden River Bay General Aviation Airport	Heliport (H)
	Heihe Hailan General Airport	Heliport (H)
	Huzhong Forestry Airport	Heliport (H)
	Nenjiang Maihai Heliport	Heliport (H)
	Nenjiang River Dudu Heliport	Heliport (H)
	Qiqihar Iron Front Kyushu General Airport	Heliport (H)

PROVINCE	AIRPORT NAME	TYPE
HEILONGJIANG	Songling Forestry Bureau Nanfeihe Heliport	Heliport (H)
	Tuqiang Heliport	Heliport (H)
	Wuchang Weiguo General Airport	Heliport (H)
	Wudalianchi Scenic Area Heliport	Heliport (H)
	Xingfu Forestry Heliport	Heliport (H)
	Xunke Xinli General Airport	Heliport (H)
	Yichun Grand Platform General Airport	Heliport (H)
	Yiziquan Heliport	Heliport (H)
HENAN	Xinxiang Tangzhuang General Airport	Runway Airport
	Zhongmu Yanming Lake Airport	Runway Airport
	Anyang Beijiao Airport	Runway Airport (H)
	Xihua General Airport	Runway Airport (H)
HUBEI	Wuhan Yaxin Hospital	Heliport (H)
	Jingmen Weihe Airport	Runway Airport
	Wuhan Hannan General Airport	Runway Airport
	Xiantao Airport	Runway Airport
HUNAN	Suizhou Lishan Airport	Heliport (H)
	Zhuzhou Lusong General Airport	Runway Airport
	Arong Airport	Runway Airport
	Aru Kerr Airport	Runway Airport
INNER MONGOLIA	Genhe Lulu Guya Airport	Runway Airport
	Hulunbeier Tianying General Airport	Runway Airport
	Molidawa Banner Airport	Runway Airport
	New Barr Right Banner Bulgard General Airport	Runway Airport
	Urad Zhongqi Airport	Runway Airport
	Xilinhot Bayan Baolige General Airport	Runway Airport
	Etuoqe Qianqi General Airport	Heliport (H)
	Yancheng Sheyang General Airport	Runway Airport
JIANGSU	Yangmiao Airport	Runway Airport
	Zhenjiang Road General Airport	Runway Airport
	Yancheng Jianhu General Airport	Runway Airport (H)
	Danyang Shenghao General Airport	Heliport (H)
	Jiangsu Shuyang Jinheng Heliport	Heliport (H)
	Jiangyin Huaxi Heliport	Heliport (H)
	Nanjing Laoshan Heliport	Heliport (H)
	Suzhou Chenghu General Airport	Heliport (H)
	Suzhou Park Heliport	Heliport (H)
	Zhangjiagang Jinshazhou General Airport	Heliport (H)
	Zhangjiagang Shuangshan Island General Airport	Heliport (H)

CAAC CERTIFIED GENERAL AIRPORT

 Runway Airport
  Heliport

PROVINCE	AIRPORT NAME	TYPE	PROVINCE	AIRPORT NAME	TYPE
JIANGXI	Ji'an Tongping General Airport		SHANXI	Shajiazhuang Airport	
	Nanchang Yaohu Airport			Taiyuan Airport School Yucheng Airport	
	Jiangxi Jingdezhen Gaoxin General Airport			Suining Airport	
	Jingdezhen Lumeng Airport			Xinjin Airport	
	Jiujiang Lushan Heliport			Zigong Fengming General Airport	
	Jiujiang Weijia Heliport			Guanghan Airport	 
JILIN	Baicheng Daqingshan General Airport		SICHUAN	Baiyun Village Heliport	
	Banyan General Airport			Chongzhou Haohao General Airport	
LIAONING	Panjin Fortune Building elevated heliport			Guanghan Xilin General Airport	
	Anshan Xinkaihe General Airport			Luodai Airport	
	Heishan General Airport			Pengshan Jiangkou General Airport	
	Panjin Chenjia General Airport			Yanyuan Heliport	
	Shenyang Faku Finance Lake Airport		TIANJIN	Tianjin Binhai Douzhuang General Airport	
	Yu Hong Quansheng General Airport			Tianjin Tanggu Airport	
NINGXIA	Yanchi General Airport			Tianzhi General Airport	
	Yinchuan Crescent Lake Airport			Binhai Oriental General Heliport	
	Yinchuan Flower Expo Park General Airport		XINJIANG	Bayinbulak Halsal General Airport	
SHAANXI	Baoji Linglong General Airport			Burqin General Airport	
	Danfeng Commercial Town General Airport			Corps 7th Division 129th Regiment General Airport	
	Pucheng Neifu General Airport			Turks Tianyi Aviation General Airport	
	Xianyang Suihua Jiangjiashan Airport			Urumqi Yaxin General Airport	
	Yan'an Qiaoshan Huangqu General Airport			Xinjiang Tianshan Eagle Airport	
	Yulin Mahe General Airport		YUNNAN	Hutubi Tianshan Diyipiao General Airport	
SHANDONG	Binzhou Da Gao General Airport			Baoshan Changlinggang Heliport	
	Jinan Pingyin Agricultural Airport			Jiangchuan Heliport	
	Laiwu Snowfield General Airport			Lijiang Baisha Heliport	
	Penglaisha Estuary Airport		ZHEJIANG	Anji Tianzihu General Airport	
	Pingyin Xiaozhi General Airport			Deqing Moganshan General Airport	
	Taierzhuang General Airport			Dongyang Hengdian General Airport	
	Texas Plains General Airport	 		Jiande Qiandaohu General Airport	
	Qingdao West Coast General Airport			Xinchang Wanfeng Airport	
	Yantai Qixia General Airport			Shaoxing Jianhu Heliport	
SHANGHAI	Shanghai Chemical Industry Park Medical Center Elevated Heliport			Zhoushan Dongji Helicopter Airport	
	Shanghai Gaodong Heliport			Zhoushan Lushan Heliport	
	Shanghai International Circuit Heliport			Zhoushan Qushan Heliport	
	Shanghai Jinqiao Heliport			Zhoushan Shengsi Helicopter Airport	
	Shanghai Longhua Heliport			Zhoushan Taohua Heliport	



FBO AND MRO FACILITIES

Serving the rapidly expanding, and still relatively young, general aviation fleet in China is an extensive network of fixed-base operators (FBOs) and maintenance, repair and overhaul (MRO) facilities.

As of June 30, 2019, 9 FBOs were established that provide ground support services for general aviation. These are in major cities, such as Beijing, Shanghai, Guangzhou and Shenzhen.

The latest FBO to join the network was the Guangzhou Yitong FBO located at the Guangzhou Baiyun International Airport. The Guangzhou FBO was opened at the end of 2017 and has a business jet terminal with CIQ and other FBO facilities — a 20,000-square-meter (215,000 sq ft) hangar and an 88,000-square-meter (947,000 sq ft) dedicated apron for business jets.

The next full FBO to serve China will be at the Beijing Daxing International Airport, which opened in September 2019. The FBO is a joint venture between US-based FBO chain Million Air and Capital Jet (CJET) and is set to begin operations in the summer of 2020.

As China's GA industry continues to evolve there will be a need for more infrastructure, including airports, FBOs and MROs. At present, the GA industry is in a period of rapid development, making FBOs a necessary tool to support the growing industry. Many of today's FBOs are learning from those in more developed markets to understand the most suitable operational model in China.

Maintenance, repair and overhaul (MRO) facilities provide the necessary support to aircraft and aircraft operators. With the growth of GA has come the rapid development of the MRO industry, dedicated to GA aircraft.

As of June 30 2019, there were 26 major MRO companies providing heavy maintenance (inspection of 12 month or higher, repair or overhaul) service to helicopters, 17 MROs providing for business jets and 11 MROs providing turboprop and piston airplanes. MRO facilities in China can be categorized to three types: OEM directly or cooperatively established MRO, OEM authorized MRO or third-party MRO approved by CAAC Part 145.

GA airports and policies aimed at further developing infrastructure are vital in ensuring the development of GA. The CAAC has planned for the total number of GA airports to exceed 2,000 by 2030, with policies aimed at local and provincial governments, which will consequently promote the development of MRO facilities in China.





FOR MORE INFORMATION ON INFRASTRUCTURE MARKET, PLEASE REFER TO UPCOMING ASIA PACIFIC INFRASTRUCTURE REPORT 2019

FBO AND MRO BY CITY

FBO

MRO

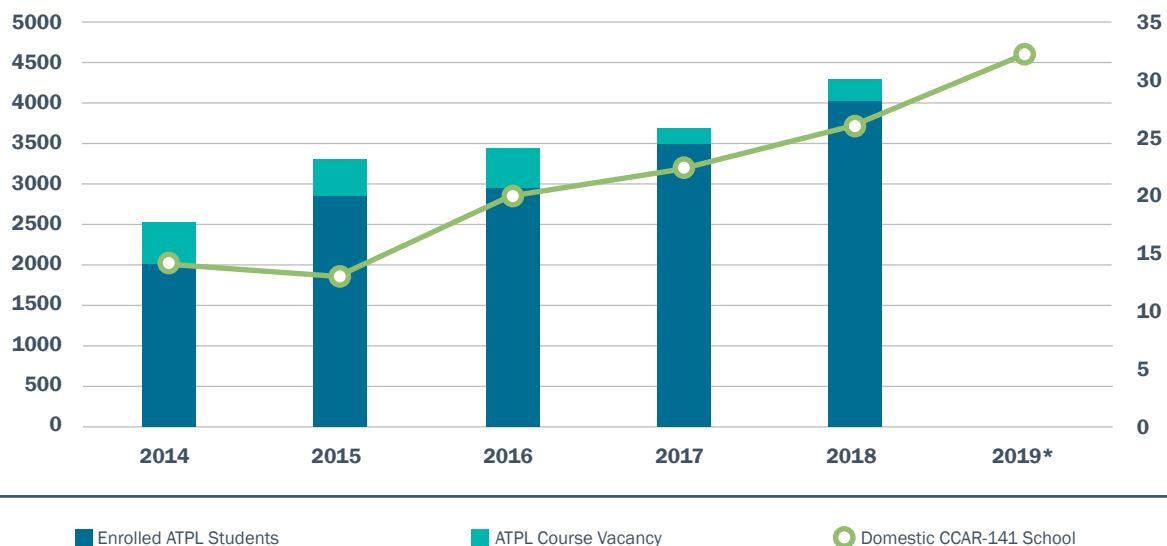




TRAINING AND PILOTS

In China, the training institutions can be categorized as a CCAR-141 training school or CCAR-61 training school. Training institutes operating under CCAR-141 guidelines are more strictly regulated and generally have a larger scale of aircraft and instructors. Training companies operating under CCAR-61 guidelines generally have a smaller scale of aircraft and instructors. Additionally, 141 schools can provide Airline Transport Pilot License (ATPL) integrated courses, while 61 schools cannot. While a considerable number of companies have authorization for CCAR-61 training courses, some of those GA companies do not actually offer CCAR-61 training despite being able to.

CCAR-141 TRAINING SCHOOL AND ATPL COURSE CAPACITY



Data Source: CAAC, China Civil Aviation Pilot Development Annual Report
*ATPL course capacity of 2019 has not been released yet.

From 2014 to 2018, there was an increase in the total capacity of ATPL courses offered in China, along with the number of enrolled students. The gap between these two decreased, with more students enrolling in ATPL courses during this five-year period. The number of CCAR-141 schools in China more than doubled from 14 in 2014 to 32 in 2019, a significant increase after decreasing by one from 2014 to 2015.

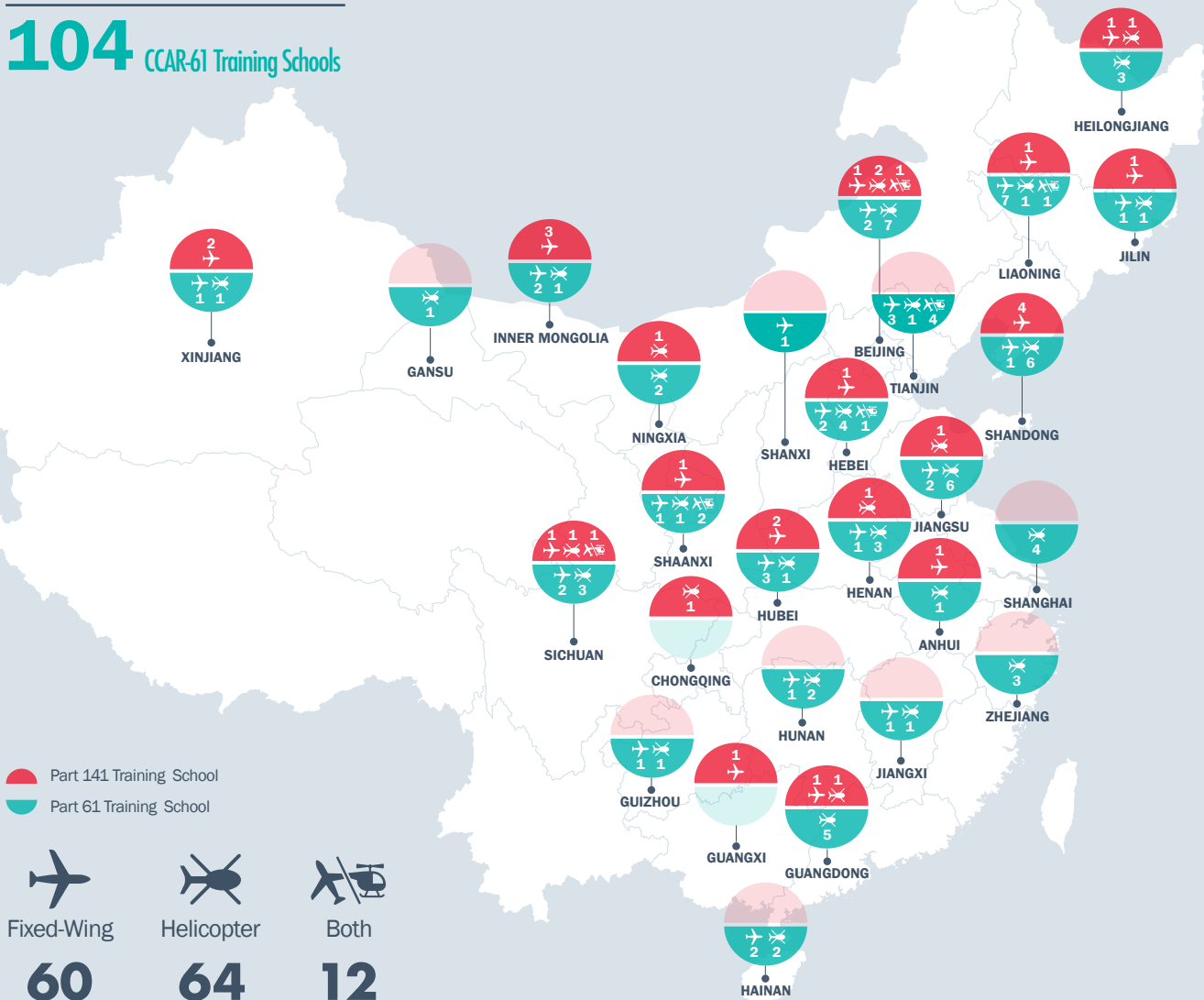
In 2019, there were 32 CCAR-141 schools and 104 CCAR-61 companies. Among the 141 schools, the majority (22) are fixed-wing training schools, while 7 are helicopter training schools. Additionally, the Civil Aviation Flight University of China (CAFUC), China Dragon GA and Beijing Reignwood Star

have both fixed-wing and helicopter training courses. Among the CCAR-61 companies, those with only helicopter courses (57) outnumbered those with only fixed-wing courses (38). Additionally, 9 companies offer both courses. Although the total number of CCAR-141 schools is less than CCAR-61 schools, the CCAR-141 schools play a more important role in the pilot training market.

FOR MORE INFORMATION ON TRAINING SCHOOLS AND PILOTS, PLEASE REFER TO UPCOMING ASIA PACIFIC TRAINING SCHOOL REPORT

32 CCAR-141 Training Schools

104 CCAR-61 Training Schools



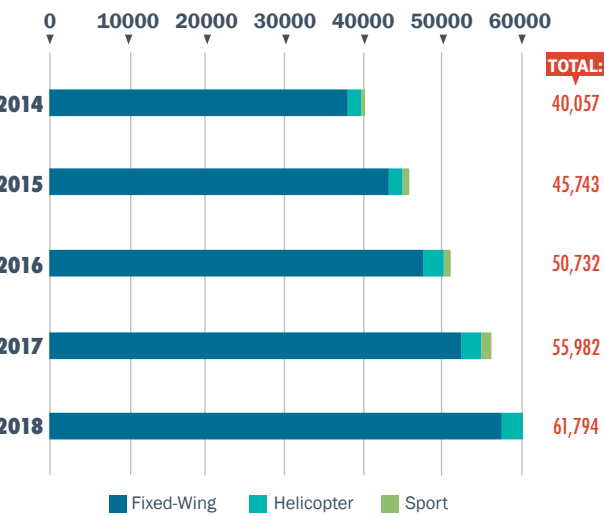
PILOT OUTLOOK

The number of CAAC pilot licenses showed an upward trend between 2014 and 2018, increasing to 61,794 by 2018. Still, the growth rate decreased during the five years. The number of fixed-wing and helicopter licenses increased steadily to 57,622 and 3,107, respectively, in 2018. The number of sport licenses also increased to 1,065 in 2018.

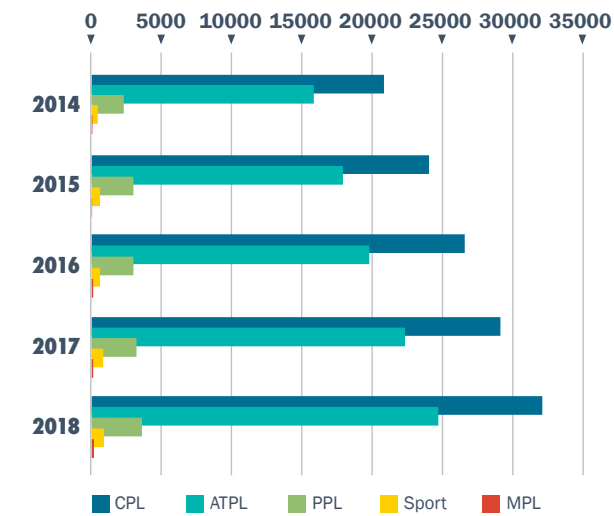
From 2014 to 2018, fixed-wing licenses accounted for the largest proportion – more than 90%. Helicopter licenses accounted for a little over 5% and sport licenses represented the smallest amount, at about 1% - 2%. The proportion of fixed-wing licenses decreased slightly from 94.7% in 2014 to 93.25% in 2018. Likewise, helicopter licenses witnessed a slowed growth. Sport licenses, on the other hand, saw a similar growth.

There are five CAAC Pilot license categories: CPL (52%), ATPL (40%), PPL (6%), SPL (1.5%) and MPL (less than 1%). The number of CAAC Pilot licenses increased from 40,057 in 2014 to 61,794 in 2018, showing a steady growth trend. The MPL had the most significant growth, increasing to 185 in 2018, nearly five times as many as that in 2014. The sport licenses saw the second highest growth, increasing by about 77%.

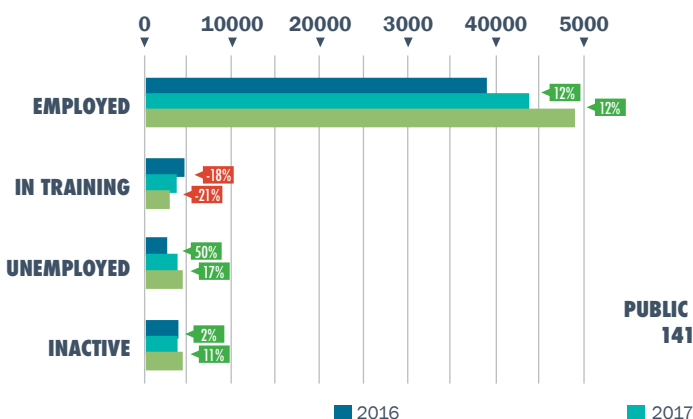
CAAC PILOT LICENSES BY AIRCRAFT TYPE



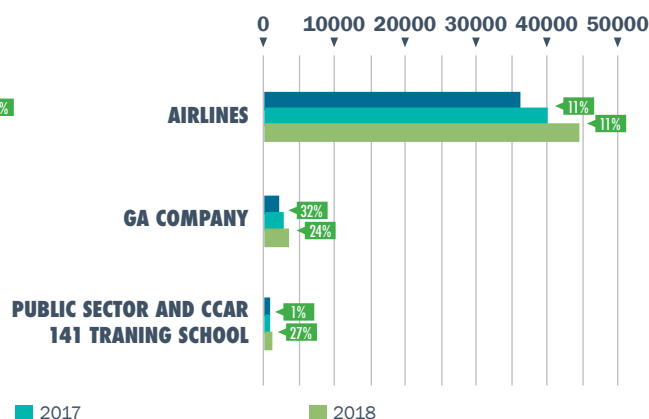
CAAC PILOT LICENSES BY LICENSE TYPE



PILOT LICENSES BY STATUS



EMPLOYED PILOT BY EMPLOYER TYPE

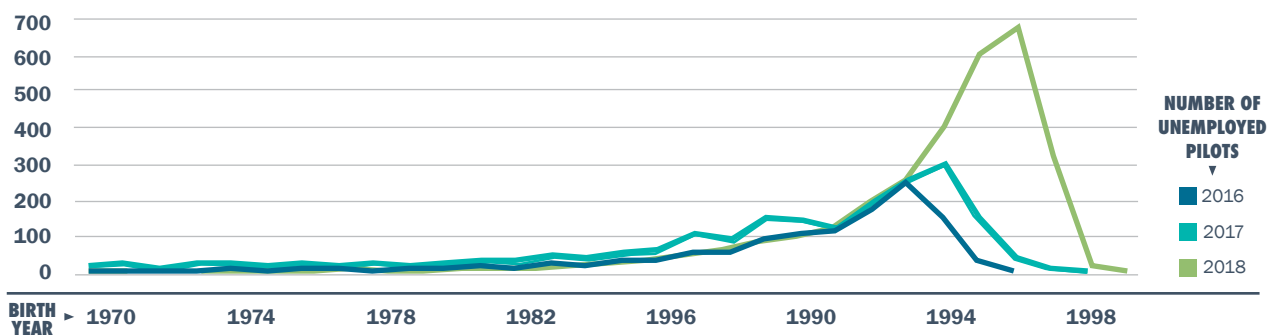


From 2016 to 2018, about 80% of licensed pilots were able to find jobs. The proportions of in-training, unemployed and inactive licenses were less than 10%.

The number of employed pilots has increased steadily in the past three years, reaching 49,221 in 2018, while the number of pilots in-training has declined to 3,071 in 2018. There were also a growing number of unemployed pilots in 2018, at 4,729. The number of inactive pilots remained almost unchanged from 2016 to 2017, and increased slightly in 2018 to 4,471.

Employers are divided into three main categories: airlines, GA companies, and the public sector & CCAR-141 training schools. Among those, airlines had the most pilots, which increased steadily to 44,628 in 2018, (more than 90%), followed by GA companies (8,462 in 2018). The public sector and CCAR-141 training schools accounted for only about 2%. The number of pilots employed in this last category remained almost unchanged from 2016 to 2017, although increased by 27% in 2018 to 2,793.

UNEMPLOYED PILOT BY BIRTH YEAR



The employment situation of pilots born after 1993 has deteriorated every year. In general, helicopter pilots are in abundance, in terms of total quantity, and the supply exceeds the demand. However, this segment still lacks experienced pilots, in terms of flight hours. The situation can be attributed to three leading factors:

1) The growth rate of new helicopter pilots is much faster than that of fleet growth, which has led to an oversupply of helicopter pilots in the market.

2) Large GA companies (such as COHC, SGGA and China Southern Airlines General Aviation Limited) have monopolized the main GA business and, as such, have attained the most experienced pilots.

3) The lack of airspace and the inadequate annual business volume of small and medium-sized GA companies has made it difficult for a single aircraft to fly more than 100 hours and, consequently, has left young pilots with less flying hours and lack of promotions at small and medium-sized GA companies.

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- Single-stage centrifugal compressor
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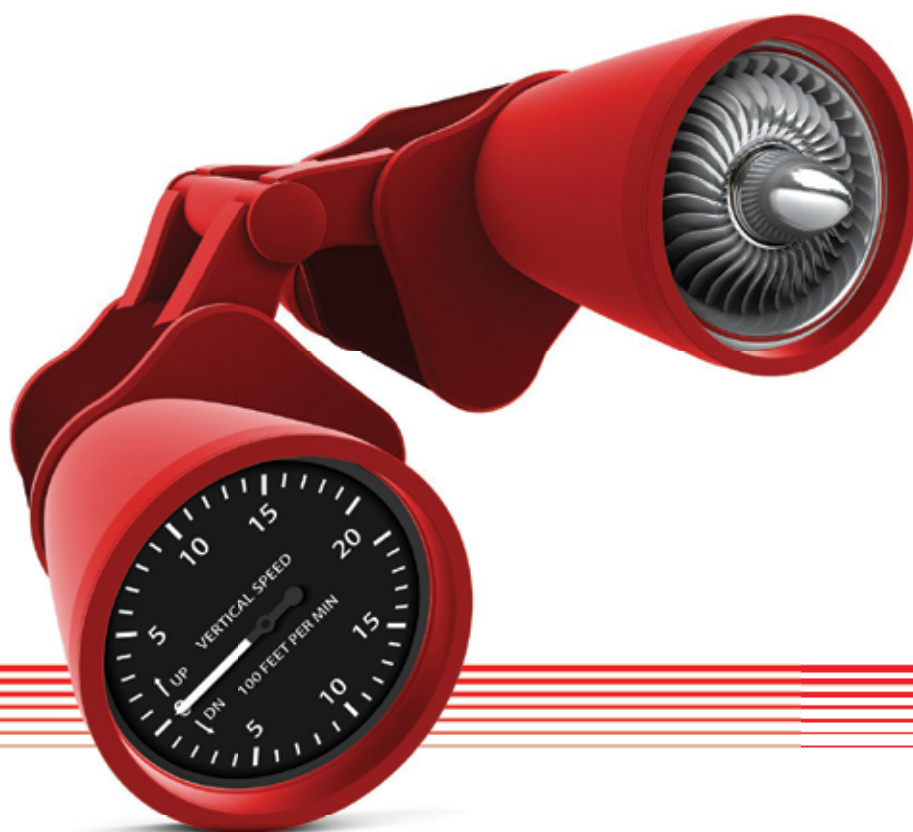
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ENGINE SPECIFICATIONS DATA

	THERMO POWER CLASS* (SHAFT HORSEPOWER)	MECHANICAL POWER CLASS* (SHAFT HORSEPOWER)	OUTPUT SHAFT SPEED (RPM)	DIAMETER** (INCHES)	LENGTH** (INCHES)
PW206 Series	640	430 to 560	5,900	22	36 to 41
PW207 Series	730	570 to 650	6,000 to 6,240	22	36 to 40

Note:** Powers are approximate values at take-off. Available at sea level, standard day, static conditions, uninstalled. *Note:** Dimensions are approximate values



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