

Statistical Bulletin of Civil Aviation Industry Development in 2018

I. Transport Aviation

In pursuing development in 2018, China faced a complicated and challenging domestic and international environment of a kind rarely seen in many years, and its economy came under new downward pressure. Chinese civil aviation focused on the main contradictions and bottlenecks in the development of the industry and took solid steps to overcome difficulties, with the industry maintaining stable growth while making further progress.

1. Transport Turnover. In 2018, the whole industry recorded a total transport turnover of 120.653 billion ton-km, up by 11.4% from 2017. The transport turnover on domestic routes reached 77.151 billion ton-km, increasing by 11.1% over the previous year, among which the transport turnover on Hong Kong, Macao and Taiwan routes stood at 1.751 billion ton-km, increasing by 8.8% from 2017. The international routes witnessed a transport turnover of 43.502 billion ton-km increasing by 12.0% over that of 2017 (refer to Figure 1).

A passenger turnover of 1 071.232 billion person-km was registered, representing an increase of 12.6% from 2017. The passenger turnover on domestic routes hit 788.970 billion person-km, an increase of 12.1%

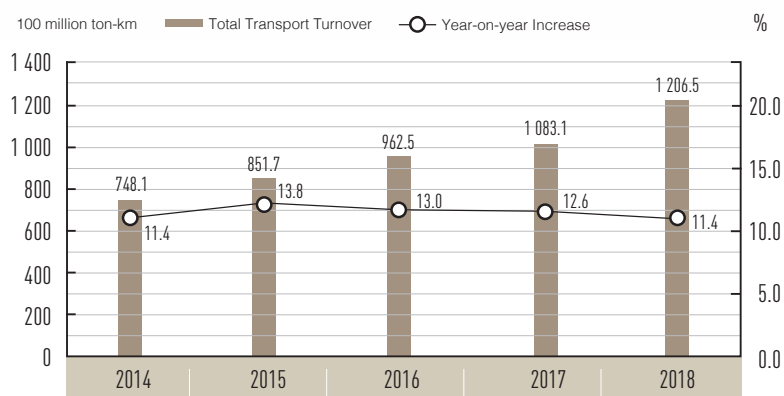


Figure 1 Total Transport Turnover of Civil Aviation 2014-2018

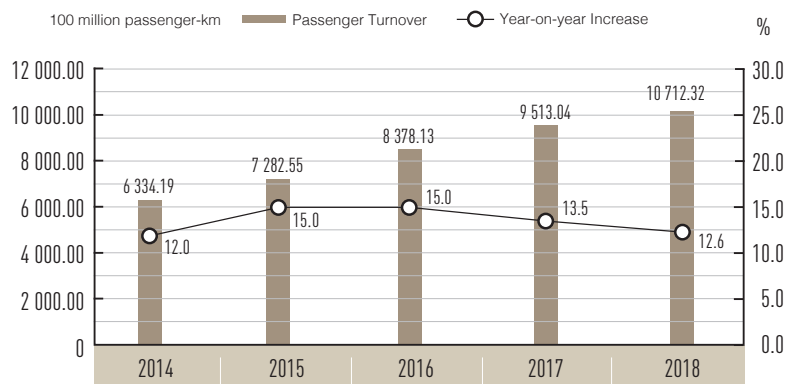


Figure 2 Passenger Turnover of Civil Aviation 2014-2018

from 2017, of which 16.505 billion person-km was attributable to Hong Kong, Macao and Taiwan routes, an increase of 11.3% from 2017. The passenger turnover on international routes reached 282.261 billion passenger-km, an increase of 14.0% from 2017 (refer to Figure 2).

The whole industry completed a cargo and mail turnover of 26.250 billion ton-km, increasing by 7.8% from 2017, of which 7.547 billion ton-km was attributable to domestic routes, increasing by 3.4% from 2017, including 301 million ton-km on Hong Kong, Macao and Taiwan routes, decreasing by 1.2% from 2017. The cargo and mail turnover on international routes



reached 18.703 billion ton-km, increasing by 9.6% over 2017 (refer to Figure 3).

2. Passenger Traffic. In 2018, the whole industry transported 611.738 million passengers, up by 10.9% from a year earlier. 548.065 million passengers were transported on domestic routes, up by 10.5% from 2017, including 11.271 million on Hong Kong, Macao and Taiwan routes, up by 9.8% from 2017; the international routes saw a passenger traffic of 63.673 million, up by 14.8% from 2017 (refer to Figure 4).

3. Cargo and Mail Turnover. In 2018, the whole industry transported 7.385 million tons of cargo and mail, up by 4.6% from a year earlier. 4.958 million tons of cargo and mail was transported on domestic routes, up by 2.5% from 2017, including 234.8 thousand tons on Hong Kong, Macao and Taiwan routes, down by 2.8% from 2017; the international routes saw a mail and cargo traffic of 2.427 million tons, up by 9.3% from 2017 (refer to Figure 5).

4. Flight Hours and Take-off Movements. In 2018, the transport airlines in the whole industry posted 11.535 million flight hours, up by 8.9% from a year earlier. 9.340 million flight hours were flown on domestic routes, up by 8.4% from 2017, including 197.3 thousand flight hours on Hong Kong, Macao and Taiwan routes, up by 8.3% from 2017; the international routes saw 2.195 million flight hours, up by 10.8% from 2017.

In 2018, the transport airlines in the whole industry realized 4.695 million take-off movements, up by 7.6% from a year earlier. 4.260 million take-off movements

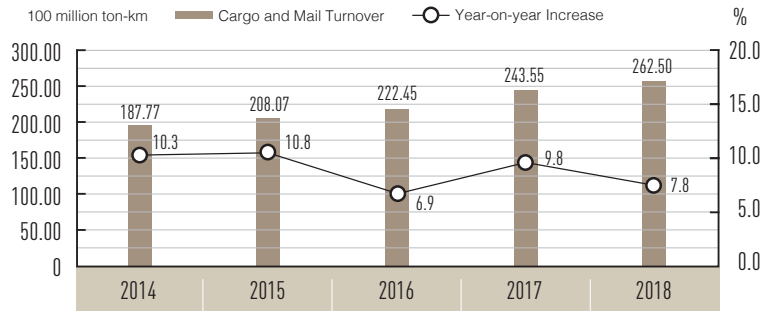


Figure 3 Cargo and Mail Turnover of Civil Aviation 2014-2018

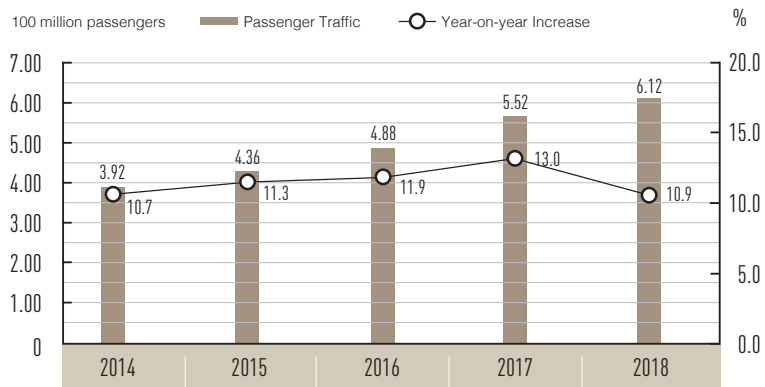


Figure 4 Passenger Traffic of Civil Aviation 2014-2018

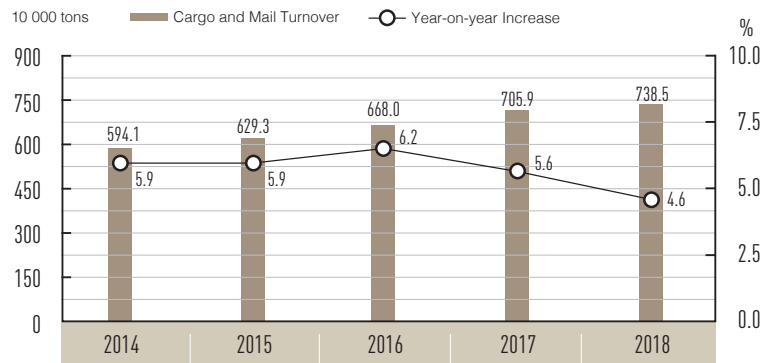


Figure 5 Cargo and Mail Transported by Civil Aviation 2014-2018

were finished on domestic routes, up by 7.3% from 2017, including 82.2 thousand take-off movements on Hong Kong, Macao and Taiwan routes, up by 7.3% from 2017; the international routes saw 435.2 thousand take-off movements, up by 10.8% from 2017.

In 2018, the transport airlines in the whole industry achieved 44.6 thousand non-production flight hours, including 16.3 thousand

training flight hours; 72.9 thousand non-production take-off movements were realized.

5. Number of Transport Airlines. By the end of 2018, there were a total of 60 transport airlines in China, a net decrease of 2 from that in 2017. By the type of ownership, there were 45 state-holding airlines and 15 private and privately-holding airlines. Among all the transport airlines, there were 9 all-cargo airlines, 10 joint venture airlines and 8 publicly listed airlines.

6. Transport Aircraft Fleet. By the end of 2018, the civil aviation industry had 3 639 registered transport aircraft, 343 more than that by the end of 2017 (refer to Table 1).

7. Route Network. By the end of 2018, there were 4 945 scheduled flight routes in China, 4 096 domestic routes among which 100 were connecting Hong Kong, Macao and Taiwan, and 849 international routes, with a mileage of 12.191 million km including overlapped distance, or 8.380 million km excluding the overlapped distance (refer to Table 2).

By the end of 2018, there were 230 Chinese cities with domestic scheduled flights (excluding Hong Kong, Macao and Taiwan); Chinese airlines operated scheduled international flights to 165 cities in 65 countries; domestic airlines operated scheduled flights to Hong Kong from 32 mainland cities and to Macao from 14 mainland cities and to Taiwan from 48 mainland cities.

8. Operations of Transport Airlines (Groups). China National Aviation

Table 1 Number of Transport Aircraft in 2018

| Aircraft Categories | Number of Aircraft | Increase from 2017 | Percentage of Transport Fleet (%) |
|----------------------|--------------------|--------------------|-----------------------------------|
| Total | 3 639 | 343 | 100.0 |
| Passenger Aircraft | 3 479 | 331 | 95.6 |
| Including: | | | |
| Wide-body Aircraft | 409 | 47 | 11.2 |
| Narrow-body Aircraft | 2 883 | 273 | 79.2 |
| Regional Aircraft | 187 | 11 | 5.1 |
| Freighters | 160 | 12 | 4.4 |

Table 2 Number of Scheduled Flight Routes and Mileage in China in 2018

| Indicator | Value |
|--|-----------------|
| Number of Air Routes | 4 945 |
| Domestic Air Routes | 4 096 |
| Including: Hong Kong, Macao and Taiwan Air Routes | 100 |
| International Air Routes | 849 |
| Air Route Mileage Including Overlapped Distance (10 000 km) | 1 219.06 |
| Domestic Air Routes | 806.54 |
| Including: Hong Kong, Macao and Taiwan Air Routes | 15.63 |
| International Air Routes | 412.52 |
| Air Route Mileage Excluding Overlapped Distance (10 000 km) | 837.98 |
| Domestic Air Routes | 478.09 |
| Including: Hong Kong, Macao and Taiwan Air Routes | 15.31 |
| International Air Routes | 359.89 |

Holding Group recorded 2.708 million flight hours and a total transport turnover of 31.25 billion ton-km, up by 9.1% from a year earlier; it carried 137 million passengers, up by 8.6% from 2017 and 2.091 million tons of cargo and mail, up by 4.0% from 2017.

China Eastern Air Holding Group recorded 2.248 million flight hours and a total transport turnover of 23.273 billion ton-km, up by 9.1% from a year earlier; it carried 121 million passengers, up by 9.4% from 2017 and 1.443 million tons of cargo and mail, up by 0.3% from 2017.

China Southern Air Holding Group recorded 2.772 million flight hours and a total transport turnover of 30.334 billion ton-km, up by 11.2% from a year earlier; it carried 140 million passengers, up by 10.8% from 2017 and 1.732 million tons of cargo and mail, up by 3.6% from 2017.



Hainan Airlines Group recorded 1.852 million flight hours and a total transport turnover of 19.442 billion ton-km, up by 15.5% from a year earlier; it carried 109 million passengers, up by 10.3% from 2017 and 861.4 thousand tons of cargo and mail, down by 10.1% from 2017.

In 2018, all other airlines together recorded 1.956 million flight hours and a total transport turnover of 16.351 billion ton-km, up by 14.9% from a year earlier; they carried 105 million passengers, up by 16.8% from 2017 and 1.257 million tons of cargo and mail, up by 8.9% from 2017(refer to Figure 6).

9. Transport Airports. By the end of 2018, there were 235 certified transport airports in China, up by 6 from 2017. Newly built airports in 2018 were Longnan Airport in Gansu, Ruoqiang Airport in Xinjiang, Haibei Airport in Qinghai, Xinyang Airport in Henan, Yueyang Airport in Hunan and Tumushuke Airport in Xinjiang.

In 2018, Ankang Airport and Wuzhou Changzhoudao Airport ceased operation.

In terms of index of movement areas of certified transport airports, 12 were 4F airports, 35 were 4E, 40 were 4D, 142 were 4C, 5 were 3C and 1 was below 3C.

In 2018, new and continuous construction projects of airports reached 174, 6 runway, 305 parking stands and 1.331 million square meters of terminal floorage were newly added. By the end of 2018, transport airports in China have 255 runways, 5 800 parking stands and 14.546 million square meter terminal floorage (refer to Table 3).

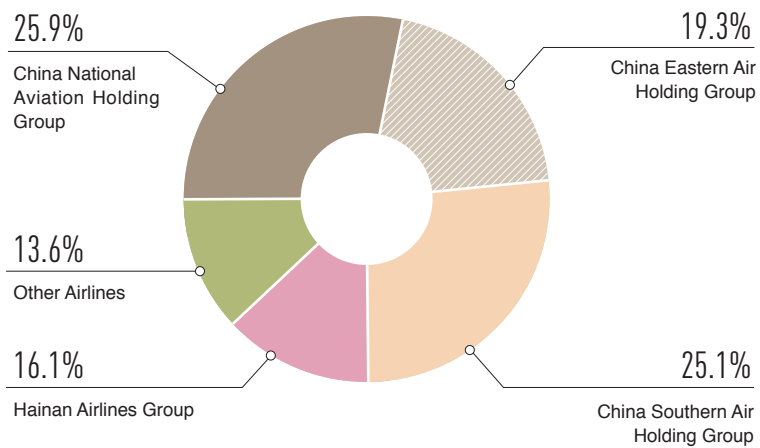


Figure 6 Proportions of Total Transport Turnover by Airlines (Groups) in 2018

Table 3 Number of Certified Transport Airports by Region in 2018

| Region | Number of Certified Transport Airports | Percentage of the Total (%) |
|-----------------------------|--|-----------------------------|
| Nationwide | 235 | 100.0 |
| Including: Northeast Region | 27 | 11.5 |
| East Region | 54 | 23.0 |
| West Region | 118 | 50.2 |
| Central Region | 36 | 15.3 |

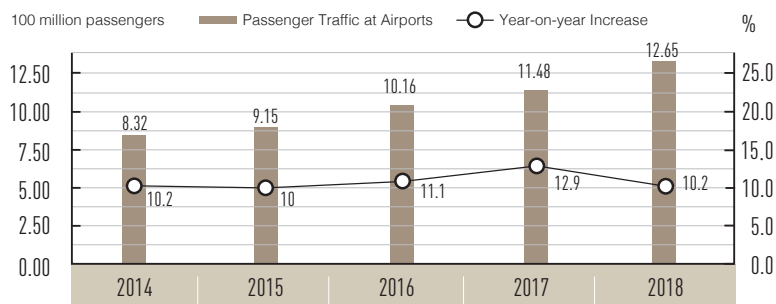


Figure 7 Passenger Traffic at Civil Transport Airports 2014-2018

10. Traffic at Airports. In 2018, the civil transport airports nationwide realized a passenger traffic of 1.265 billion, up by 10.2% from 2017 (refer to Figure 7).

Specifically, 673 million passengers were transported by airports in East China; 79 million by airports in Northeast China; 140 million by airports in Central China; and 372 million by airports in West China in 2018, representing year-on-year increases of 9.7%, 9.7%, 14.8% and 9.4% respectively (refer to Figure 8).

In 2018, the civil transport airports nationwide realized a cargo and mail traffic of 16.740 million tons, up by 3.5% from 2017 (refer to Figure 9).

Specifically, 12.458 million tons of cargo and mail was transported by airports in East China, up by 2.5% from the previous year; 550.7 thousand tons by airports in Northeast China, up by 0.6%; 1.134 million tons by airports in Central China, up by 10.5%; and 2.598 million tons by airports in West China in 2018, up by 6.3% (refer to Figure 10).

In 2018, the civil transport airports nationwide realized 11.088 million flight movements, up by 8.2% from 2017, among which transport flight movements reached 9.373 million, a year-on-year increase of 7.4% (refer to Figure 11).

In 2018, there were 95 transport airports with a passenger traffic exceeding 1 million, among which the airports of Beijing, Shanghai and Guangzhou contributed 23.3% to the total, a decrease of 1 percentage point (refer to Table 4).

In 2018, there were 53 transport airports with a cargo and mail traffic of more than 10 thousand tons, among which, the cargo and mail traffic at the airports of Beijing, Shanghai and Guangzhou accounted for 48.8% of the total, a decrease of 1.1 percentage points (refer to Table 5).

In 2018, Beijing Capital International Airport posted a traffic of 101 million passengers, ranking the second in the world for 9 straight years; Shanghai Pudong Airport realized a cargo and mail traffic of 3.769 million tons, ranking the third in the world for 11 years in a row.

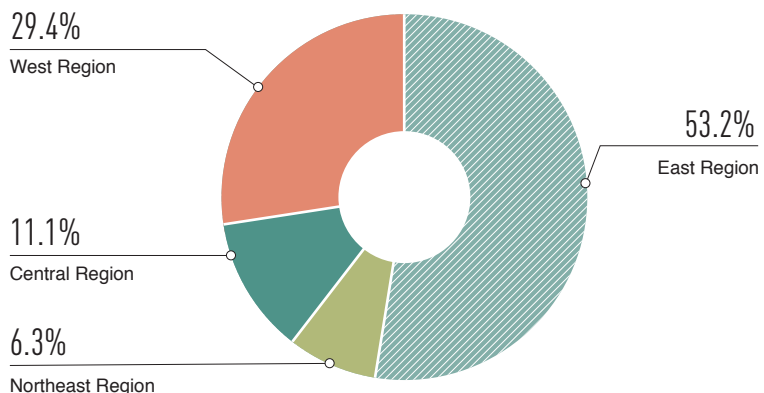


Figure 8 Distribution of Passenger Traffic at Airports by Region in 2018

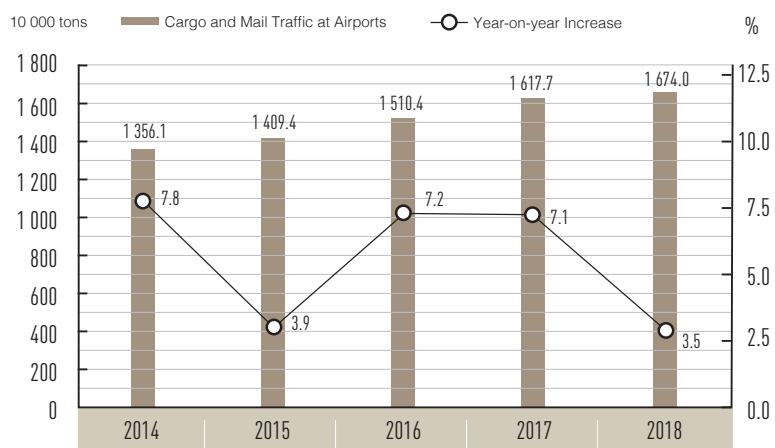


Figure 9 Cargo and Mail Traffic at Civil Transport Airports 2014-2018

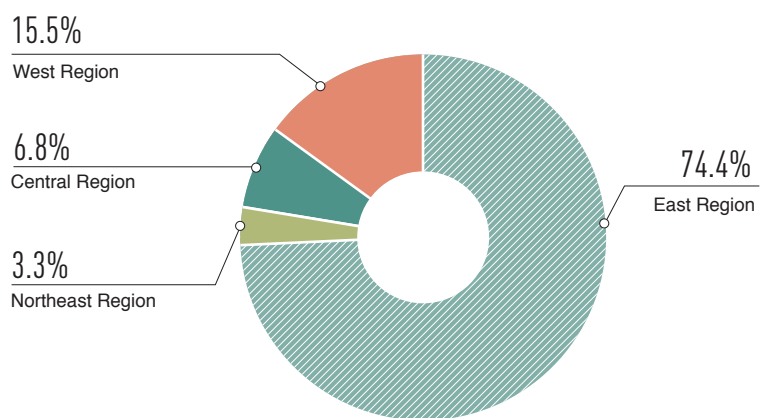


Figure 10 Distribution of Cargo and Mail Traffic at Airports by Region in 2018

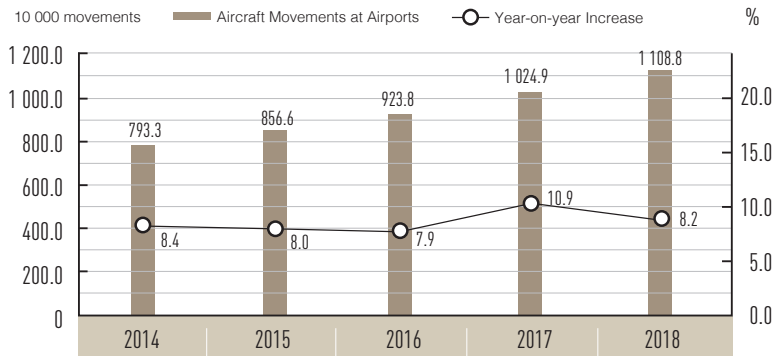


Figure 11 Aircraft Movements at Civil Transport Airports 2014-2018

Table 4 Number of Airports with Passenger Traffic Exceeding 1 Million in 2018

| Annual Passenger Traffic | Number of Airports | Increase from 2017 | Percentage of Total (%) |
|---------------------------------|--------------------|--------------------|-------------------------|
| More Than 10 Million Passengers | 37 | 5 | 83.6 |
| 1~10 Million Passengers | 58 | 6 | 12.7 |

Table 5 Number of Airports with Cargo and Mail Traffic Exceeding 10 000 Tons in 2018

| Annual Cargo and Mail Traffic | Number of Airports | Increase from 2017 | Percentage of Total (%) |
|-------------------------------|--------------------|--------------------|-------------------------|
| 10 000 Tons or Above | 53 | 1 | 98.4 |

II. General Aviation

1. General Aviation Enterprises. By the end of 2018, there were 422 certified general aviation enterprises, including 96 in North China, 37 in Central Southern China, 106 in East China, 89 in Northeast China, 52 in Southwest China, 27 in Northwest China and 15 in Xinjiang.

2. Aircraft Fleet Size. By the end of 2018, there were a total of 2 495 registered general aviation aircraft, including 692 aircraft for training.

3. General Aviation Airports. In 2018, there were 126 general aviation airports certified adding the total general aviation airports to 202.

4. Flight Hours. In 2018 the whole general aviation industry posted 937.1 thousand flight hours, up by 11.9% from a year earlier, including 84.7 thousand hours of passenger carriage, up by 7.9% from 2017; 153.9 thousand hours of industrial aviation operations, a year-on-year increase of 6.4%; 306.5 thousand hours of training, up by 18.6%; 49.9 thousand hours of other general aviation operations, up by 200.5%;

and 342.1 thousand hours of non-commercial operation increasing by 0.8%.

5. Unmanned Aircraft. By the end of 2018, registered users of unmanned aircraft reached 271 thousand, including 240 thousand individual users, 31 thousand enterprises, non-profit entity and legal person users.

By the end of 2018, the number of valid licenses of UA in the industry stood at 44 573.

By the end of 2018, 287 thousands of UA were registered, and the commercial flight activities of UA in the industry hit 370 thousand hours.

III. Transport Efficiency and Financial Performance

1. Transport Efficiency. In 2018, the average daily use rate of registered transport aircraft industrywide stood at 9.36 hours, down by 0.13 hours from 2017. Specifically, the average daily use rate of medium and large sized aircraft was 9.48 hours, down by 0.15 hours from a year earlier, whereas that of small-sized aircraft was 6.91 hours, down by 0.13 hours.

In 2018, the passenger load factor for scheduled flights averaged 83.2%, remained at same level over that of 2017.

In 2018, the weight load factor for scheduled flights averaged 73.2%, down by 0.3 percentage points from 2017 (refer to Table 6).

Table 6 Passenger Load Factor and Weight Load Factor for Scheduled Flights in 2018

| Indicator | Value (%) | Increase from 2017 (Percentage Points) |
|---|-----------|--|
| Passenger Load Factor of Scheduled Flights | 83.2 | 0.0 |
| Domestic Air Routes | 84.8 | 0.0 |
| Including: Hong Kong, Macao and Taiwan Air Routes | 80.9 | 0.7 |
| International Air Routes | 78.9 | 0.0 |
| Weight Load Factor of Scheduled Flights | 73.2 | -0.3 |
| Domestic Air Routes | 75.6 | -0.3 |
| Including: Hong Kong, Macao and Taiwan Air Routes | 67.7 | 0.2 |
| International Air Routes | 69.5 | -0.1 |

2. Financial Performance. According to preliminary statistics, in 2018, the whole civil aviation industry made 1 014.25 billion yuan in business revenue, up by 18.5% from 2017, and 53.66 billion yuan in profit, down by 12.27 billion yuan from a year earlier. Specifically, airlines made 613.02 billion yuan in business revenue, up by 14.5% from a year earlier, and 25.03 billion yuan in profit, down by 16.04 billion yuan from 2017; airports made 110.42 billion yuan in business revenue, up by 16.0% from 2017, and 17.32 billion yuan in profit, up by 2.82 billion yuan from 2017; support businesses made 290.81 billion yuan in business revenue, up by 29.2%, and 11.31 billion yuan in profit, up by 940 million yuan from a year earlier.

According to preliminary statistics, in 2018, across the whole industry, the revenue per ton-km was 4.69 yuan, up by 0.11 yuan from the previous year. Passenger revenue per ton-km was 5.61 yuan, up by 0.09 yuan from 2017; cargo and mail revenue per ton-km was 1.56 yuan, up by 0.07 yuan from 2017.

According to preliminary statistics, in 2018, the taxes payable by the whole civil aviation industry stood at 36.68 billion yuan, up by 10.6% from 2017.

IV. Aviation Safety and Service Quality

1. Aviation Safety. In 2018, the civil aviation industry of China maintained a stable and controllable safety situation. The 10-year rolling value of the major transport accident rate per one million hours stood at 0.013 compared with the world average level of 0.153. There were 13 general aviation accidents, resulting in 15 deaths

From August 25, 2010 to the end of 2018, transport aviation had been operating safely for 100 months, with an accumulated 68.36 million hours of safe flight.

2018 saw 568 incidents, including 16 severe transport aviation incidents representing decreases of 1.22% and 23.81% respectively from 2017. The rate of severe incidents and the rate of incidents caused by human factors per 10 000 flight hours were 0.013 9 and 0.032 9 respectively. All safety indicators fell within the value ranges set for the year.

In 2018, 38 transport airlines of the industry were free of human factor incidents.

2. Aviation Security. In 2018, the civil aviation security inspection departments screened 616 million passengers, 336 million items of checked baggage, 469 million items of air cargo (excluding mails and express deliveries), and 244 million mails and express deliveries, and handled 41 cases of unlawful interferences involving falsified terrorist threat information, and addressed 17 515 instances of security incidents, a decrease of 9.58% over that of previous year, including such cases as April 15 Case of Air China and July 19 Case at Capital Airport among other major and sensitive ones. The aviation security was maintained. By the end of 2018, civil aviation realized security for 16 years and 8 months.

3. Flight Regularity Rate. In 2018, passenger airlines in China operated 4.346 million flights in total, among which 3.482 million flights were regular, with an average flight regularity rate of 80.13%.



Table 7 Causes of Flight Irregularity in 2018

| Item | % of the Total | Growth from 2017(%) |
|---|----------------|---------------------|
| Causes of Flight Irregularity for All Airlines | 100.00 | 0.00 |
| Including: Weather | 47.46 | -3.83 |
| Airlines | 21.14 | 12.52 |
| ATC | 2.31 | -5.42 |
| Others | 29.09 | -3.29 |
| Causes of Flight Irregularity for Major Airlines | 100.00 | 0.00 |
| Including: Weather | 48.62 | -2.85 |
| Airlines | 21.00 | 11.75 |
| ATC | 2.75 | -5.38 |
| Others | 27.63 | -3.52 |

In 2018, major airlines operated 3.164 million flights in total, among which 2.530 million flights were punctual, with an average flight regularity rate of 79.95% (refer to Table 7).

In 2018, the average delay time of passenger flights in China was 15 minutes, down by 9 minutes on a year-on-year basis.

4. Service Quality. By the end of 2018, 229 airports in China launched Hangxintong, 32 airports realized digitalized whole process check-in for domestic flights, and passengers using paperless check-in in the whole year reached 225 million. There are now 12 airlines offering internet connection on 301 aircraft.

In 2018, CAAC, its regional administrations, CAAC Consumer Affairs Center and CATA handled 20 761 complaints, 4 020 or 16.2% less than that of 2017.

In 2018, passengers satisfaction towards airlines and airports hit 4.30 and 4.32 (full score 5).

V. Education and Science and Technology

1. Education. In 2018, the enrollment by universities and colleges directly under CAAC totaled 23 119, among which, 1 037 were postgraduate students, 19 639 undergraduates and junior college students, 2 443 adult students and 5 521 flight students.

In 2018, the number of registered students at universities and colleges directly under CAAC stood at 72 944, among which 3 198 were postgraduate students, 64 908 undergraduates and junior college students, 4 838 adult students.

In 2018, a total of 18 715 students graduated from universities and colleges directly under CAAC, among which, there were 825 postgraduates, 16 334 undergraduates and junior college students, and 1 556 adult students.

2. Scientific and Technological Innovation. In 2018, 12 innovative leaders, 33 top notch talents and 20 innovative teams in civil aviation science and technology were elected for the first time throughout the industry. 31 civil aviation research institutes with four salient features in scientific and technologic innovation or bases with five major characteristics passed the assessment. One national key research project was filed.

In 2018, CAAC inspected and accepted a total of 17 scientific and technological achievements, and elected 18 for the awards for science and technology of CATA.

3. New Navigation Technologies. By the end of 2018, 14 airlines in the industry were capable of HUD operation, 1 133 aircraft were equipped with HUD, 82 airports were installed with special category I HUD facilities (8 more than that of 2018), 19 airports were capable of special category II HUD, and 10 airports were capable of HUD RVR 150 take-off.

225 transport airports were capable of PBN flight procedures, 22 airports with complex terrain were installed with RNP AR procedures, 98% of the transport aircraft were equipped with ADS-B system, and 32 airlines were utilizing EFB.

VI. Professionals

1. Number of Pilots. By the end of 2018, there were 61 492 licensed pilots in the industry, up by 5 727 from 2017, including SPL 894, PPL 3 735, CPL 32 084, MPL 185 and ATPL 24 594 (refer to Table 8).

2. Other Professionals. By the end of 2018, the licensed mechanics of the industry reached 55 243 up by 3 076; and licensed dispatchers 7 643, an increase of 950 from the previous year.

By the end of 2018, there were 17 757 ATM technicians in 4 categories, an up by 443, including 8 851 air traffic controllers, an increase of 481 from the previous year.

VII. Foreign Relations

In 2018, China had bilateral aviation talks or written consultations with 29 countries or regions. By the end of 2018, China had already signed 126 bilateral air service agreements with other countries or regions, up by 4 (Republic of Congo, Côte d'Ivoire, Rwanda and Dominica) from 2017, including 44 in Asia (including ASEAN), 27 in Africa, 37 in Europe, 11 in Americas and 7 in Oceania.

Table 8 Statistics of Civil Aviation Pilot Licenses of China in 2018

| Type of License | | Number | Year-on-year Increase |
|-----------------|---|--------|-----------------------|
| On-the-job | Part 121 Airlines (Operational Personnel) | 39 435 | 3 458 |
| | Part 121 Airlines (Non-operational Personnel) | 5 193 | 1 058 |
| | General Aviation Airlines | 3 504 | 684 |
| | Part 141 Flight School Instructors | 985 | 230 |
| | Government Affairs | 104 | 1 |
| On-training | Part 141 Private License Holders | 2 186 | 380 |
| | Part 141 Commercial License Holders | 470 | -1 117 |
| | On-training Students of Part 61 Training Institutes | 415 | -89 |
| Off-job | Private Pilots | 801 | 28 |
| | Sports Pilots | 894 | 89 |
| | Pilots Not Employed | 3 034 | 565 |
| Inactive | | 4 471 | 440 |
| Total | | 61 492 | 5 727 |

VIII. Airworthiness Certification

In 2018, 862 aircraft nationality registrations were added in the entire industry, including 444 newly registered commercial aircraft and 418 general aircraft. The number of newly registered general aircraft exceeded 400 for two consecutive years.

In 2018, civil aviation airworthiness certification department issued a total of 212 aircraft type approvals, 18 production certificates and 24 approvals for aviation fuel and chemical products, which strongly supported the use of domestic aviation products and ensured the development of civil aviation industry (refer to Figure 12).

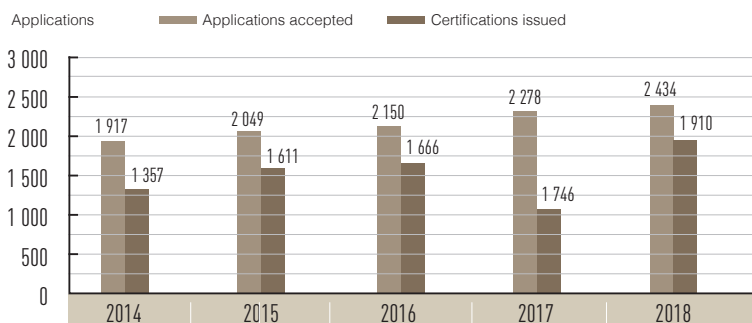


Figure 12 Number of Type Certification and Validation of Type Certification from 2014 to 2018



IX. Investment in Fixed Assets

In 2018, China's civil aviation made investment in fixed assets to the tune of 195.78 billion yuan, of which 85.79 billion yuan went to civil aviation infrastructure development and technological upgrading, down by 1.3% from 2017 (refer to Figure 13).

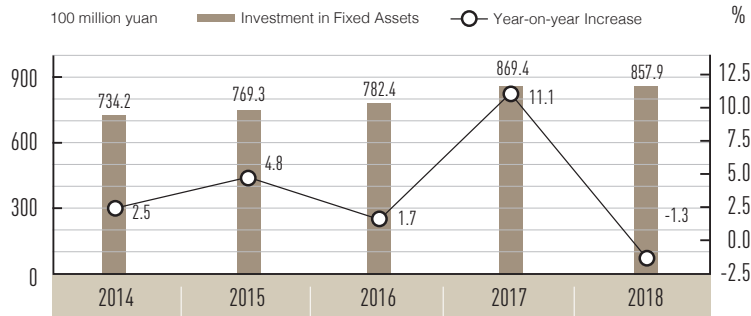


Figure 13 Investment in Civil Aviation Infrastructure Development and Technological Upgrading 2014-2018

Investment in infrastructure development and technological upgrading can be classified as follows: airport system made investment in fixed assets worth 67.86 billion yuan; the ATM system made investment in fixed assets to the tune of 4.45 billion yuan; and 370 million yuan investment in aviation security screening and fire-fighting systems. 1.40 billion yuan investment was made in civil aviation information system development, 1.46 billion yuan in civil aviation scientific studies and education system, 270 million yuan in scientific and technological and education system; 2.19 billion yuan in fuel system, 600 million yuan in civil aviation mechanic maintenance system, 2.86 billion yuan in transport service system, 430 million yuan in public facility investment and 5.37 billion yuan in other systems.

X. Energy Conservation and Emissions Reduction

In 2018, the ton-km energy consumption of China's civil aviation stood at 0.287 kg, down by 15.6% from 2005 (the benchmark year for the industry's energy conservation and emissions reduction target); the energy consumption per passenger at airports fell by about 12% from the end of the 12th Five-Year Plan period.

In 2018, 390 thousand flights used temporary routes, cutting the flight

distance by 15.74 million km, saving fuel consumption of 85 thousand tons and cutting carbon dioxide emissions by 268 thousand tons.

By the end of 2018, more than 95% of the airports with an annual traffic volume of over 5 million passengers completed the APU alternative equipment installation and put them into operation. Among the ground support vehicles at civil airports, 1 524 were electric ones, accounting for 5% of the total vehicles and there were 827 recharging facilities.

In 2018, green operation the airports remained stable, photovoltaic power generation amounted 20 million kilo watt-hours, and in the energy consumption mix, electricity, natural gas and procured thermal power accounted for 80%.

XI. Legal and Credit System Development

On December 19, 2018, the fifth amendment to Civil Aviation Law of People's Republic of China was finished. In 2018, 20 industrial regulations were developed or amended.

In 2018, there were 149 administrative punishments, 10 natural persons and 2 entities were listed as persons with serious discredits in civil aviation industry due to their serious discreditable behaviors in accordance with the Civil Aviation Credit Administrative Rules (Trial). 4 209 passengers were listed as air travel restricted persons due to their serious discreditable behaviors. ■