

Operation Mode of General Aviation Companies and Related Enterprises in China

Song Weiwei¹, Zhao Lijie², Xiang Song², Wang Yue², Li Zuoxue³

1. School of Civil Aviation, Shenyang Aerospace University, Shenyang 110136, China

2. General Aviation Research Institute, Shenyang Aerospace University, Shenyang 110136, China

3. School of Economics and Management, Shenyang Aerospace University, Shenyang 110136, China

Abstract: General aviation involves a diverse range of businesses and has attracted substantial attention in recent years. The number and scale of general aviation enterprises have increased rapidly. To maintain sustainable development and create higher social and market values, it is very important to choose an appropriate operation mode for general aviation enterprises. This paper presents an in-depth study on the operation mode of China's general aviation companies and related enterprises. It also draws on lessons from the experience of developed countries and combines them with the actual needs of China's general aviation enterprises. Additionally, in taking Liaoning Ruixiang General Aviation Co., Ltd. as an example, this study systematically analyzes the internal advantages, disadvantages, opportunities, and external threats of the company by using a SWOT-PEST method and combining theory with practice. The study also puts forward corresponding development strategies.

Keywords: transportation; general aviation company; related enterprises; operation mode; SWOT-PEST analysis method

1 Introduction

With the rapid development of China's economy, the demand for the general aviation market is growing and general aviation companies will experience a period of positive development. In 2010, the State Council and the Central Military Commission jointly issued the *Opinions on Deepening China's Low-altitude Airspace Management Reform* [1] to stimulate people's enthusiasm for the development of general aviation. In May 2016, the General Office of the State Council issued the *Guiding Opinions on Promoting the Development of the General Aviation Industry* ("Guiding Opinions"), which further promotes the development of the general aviation industry, proposing an economic scale in excess of 1 trillion yuan [2]. This would significantly promote the development of general aviation. During this process, a number of excellent general aviation corporations have emerged, and it is anticipated that an increasing number of investors and funds will enter the general aviation industry through cross-border mergers and acquisitions. With the increasing number of general aviation operators, fierce market competition will bring development opportunities to general aviation enterprises. Simultaneously, it will bring certain challenges to them as well.

In this context, it is crucial for the general aviation enterprise to choose an operating model to maintain sustainable development and give the enterprise a higher market value. This study takes the operation mode

Received date: April 11, 2018; **Revised date:** March 15, 2019

Corresponding author: Song Weiwei, Lecturer from Shenyang Aerospace University. Major research field is Transportation Planning and Management.

E-mail: wwsong1@126.com

Funding program: CAE Advisory Project "Research on Bottleneck Problems in General Aviation Development in China" (2017-XZ-03)

Chinese version: Strategic Study of CAE 2019, 21 (3): 127–132

Cited item: Song Weiwei et al. Operation Mode of General Aviation Companies and Related Enterprises in China. *Strategic Study of CAE*, <https://doi.org/10.15302/J-SSCAE-2019.03.021>

adopted by Liaoning Ruixiang General Aviation Co., Ltd. as an example, uses the SWOT-PEST method for detailed analysis, and proposes corresponding development strategies.

2 Development of general aviation in other countries

General aviation refers to all aviation activities with the exception of military and civil aviation. It covers a wide range, from business jets to delta wings. The market for general aviation aircraft is very concentrated. The majority of the top 10 countries are developed countries, such as the United States, Canada, France, Germany, etc. In addition, emerging market countries such as Brazil and South Africa are leading the development of general aviation because of their large land area [3]. The experience of developing the general aviation industry in the United States and Western developed countries can be used as a reference.

The United States has opened more than 85% of its airspace to civil aviation and more than 80% of its airspace is classified as E-class and G-class airspace, which are mainly used for general aviation flights. Low-level management is flexible and the approval process is simplified [3]. The United States has a large network of 19 786 general aviation airports, including 13 451 ordinary airports, 5 658 heliports, 498 seaplane bases, 13 balloon landing points, and 35 gliding airports. There are 131 take-off and landing points for ultralight aircraft [3,4]. The United States government has adopted a series of measures to support the construction of the general aviation airport. These include funding the airport through the National Plan of Integrated Airport Systems (NPIAS) and providing financial subsidies for the operation of state-owned airports through the levy of fuel taxes and the exemption of costs associated with general aviation flight takeoff and landing. Additionally, the airport adopts relatively loose technical standards and does not require Federal Aviation Administration (FAA) certification. Moreover, there is no uniform standard for airport runways. The United States is the world's largest general aviation manufacturing country, occupying an absolute market share worldwide. 85% of the world's fixed-wing general aviation aircraft needs are provided by six companies in the United States. Additionally, the United States has the world's largest general aviation operation market, totaling approximately 3 000 operators. There is a high level of concentration within general aviation operations – the top 2% of operators account for 60% of total industry revenue, while the remaining 98% are small operators that account for about 40% of the market [3,5]. At present, the number of FAA certified pilots is 590 038, of which 170 718 are private pilots. The United States has the world's largest flight training industry, including over 1 000 flight schools and 90 000 training instructors [3].

General aviation in developed countries has a high degree of openness in airspace, standardized management, flexible low-altitude management, simplified approval procedures, a large number of navigable airports, and a network throughout the country. The government also supports the construction of this network of navigable airports. The gap between the countries in the manufacturing industry is large and the United States is the leader. The concentration of general aviation operations is high while the number of small operators is huge. The aviation talent pool is sufficient and there are many training institutions. These experiences are worth learning for China based on actual conditions.

3 The analysis of traditional operation modes of general aviation enterprises in China

General aviation involves a wide range of aspects, including aviation in the areas of workers, agriculture, farmers, forestry and animal husbandry, and fishery and medical rescue [6]. Encouraging, expanding, and strengthening the application of general aviation in these fields will significantly promote the rapid development of the general aviation industry. In 2016, the national general aviation industry completed production operation flight hours of 7.647×10^5 h, of which industrial aviation operations completed 8.29×10^4 h, agroforestry aviation operations completed 5.1×10^4 h, and other general aviation flights were 6.308×10^5 h [7]. Approximately 120 small-scale general aviation companies only flew 1.26×10^4 h, totaling about 100 hours in each flight time. With the United States' annual flight time of 2.6×10^7 h, the gap is large. Small general aviation enterprises should reach 2×10^6 h flight time by 2020 by relying mainly on sports training, private photography training, flight experience, air tour, aviation competition, etc. If each small general aviation company has an annual flight time of 1 000h, the total goal of 2×10^6 h flight can be achieved.

The traditional general aviation operation mode is mainly based on custody, leasing, and maintenance. With the expansion of market demand and business model innovation, the “partial ownership” operation mode has developed rapidly in recent years. Compared to whole machine purchase, the “partial ownership” initial investment is lower. At least one-sixteenth of the price of the whole machine can be obtained for partial aircraft ownership, which provides the right to use the aircraft for 50 hours per year. Compared with renting a plane, a

“partially owned” investment can be counted in the company’s depreciable fixed assets; therefore, buyers can reasonably avoid tax. “Partial ownership” first stimulated the business jet market, resulting in 12% to 15% of business jets being purchased in this manner each year. Currently, this model has been extended to the turboprop, piston, and helicopter markets [3].

4 Case analysis

SWOT analysis (also known as the Dow matrix) [6,8,9] is a situational analysis method. In the early 1980s, it was proposed by a University of San Francisco management professor, Heinz Wehrich, to conduct an analysis of the advantages, disadvantages, opportunities, and threats of the organization itself. Analysis is carried out to help organizations combine strategies with internal and external resources. It is often used in corporate strategy formulation, in the formulation of a regional industrial development strategy, in competitor analysis, etc. [6,8,9]. PEST analysis is a model for analyzing an organization’s macro environment. It generally analyzes four major external environmental factors, namely politics, economy, society, and technology. The SWOT-PEST analysis combines the SWOT and PEST analysis methods into a new matrix and methodology.

Taking the alliance operation mode proposed by Liaoning Ruixiang General Aviation Co., Ltd. as an example, this study uses a combination of theory and practice to apply the SWOT-PEST analysis. We systematically analyze the internal advantages and disadvantages as well as the external opportunities and threats, and thereafter propose corresponding development strategies.

4.1 Internal advantages

4.1.1 Resources and geographic advantages

Liaoning Ruixiang General Aviation Co., Ltd. is approved by the China Civil Aviation Northeast Regional Administration. In addition, as a Class C General Aviation Enterprise, it is approved by the Shenyang Municipal Administration of Industry and Commerce. The directives of the Liaoning provincial government are to “make the Liaoning general aviation industry bigger and stronger.” Additionally, the Shenyang municipal government aims for the industrial deployment of “transport aviation for Southern China while general aviation for Northern China.” These efforts rely on the talents, scientific research, education, and superior industrial resources of the Shenyang Aerospace University and Liaoning General Aviation Research Institute. General aviation enterprises are also funded by the Liaoning General Aviation Research Institute. At the same time, the company is the test flight base of the Liaoning General Aviation Research Institute. It is also a platform for scientific research achievement transformation and industrial operation demonstration for the Liaoning General Aviation Synergy Innovation Center, the Shenyang Aerospace University Aircraft Maintenance Practice Base, the Shenyang Aerospace University student internship base, etc. Therefore, the company has certain resources and geographical advantages in cultivating general aviation talent.

(1) Talent resource advantage

Liaoning Ruixiang General Aviation Co., Ltd. relies on Shenyang Aerospace University and has unique talent resources. The general management consists of a safety supervision room, flight department, operation control department, engine engineering department, marketing department, finance department, and other functional departments. It constitutes a running team with a reasonable number of pilots as well as maintenance, ground command, and support personnel. Additionally, all the staff members have a higher education background in aviation related majors.

(2) Geographical advantage

Liaoning Ruixiang General Aviation Co., Ltd. has a 2 300 square meter operation service base and a 2 600 square meter comprehensive training building in Caihu Airport, Faku County, Shenyang. It has DA40, C42, J-160, Haiyan 650B, RX-1E, etc. In total, it has 11 general aviation aircraft, with strong flight training and operations. It can also provide strong air operational support for agriculture, forestry, and animal husbandry, and, as such, are an important force in the modernization of aviation agriculture.

(3) Independent research and development innovation advantages

With the depletion of carbon fuel resources, energy conservation and environmental protection have become China’s basic national policy. The developed countries of the world are also vigorously developing electric aircraft. The Liaoning General Aviation Research Institute, established in 2011, has made breakthroughs in the research and development of small electric aircraft with the support of the Ministry of Industry and Information Technology, Liaoning Province, China Aviation Industry Corporation, and the Civil Aviation Administration. It has obtained the

Model Design Approval (TDA) and Production License (PC) from the Civil Aviation Administration of China for Ruixiang RX1E – a two-seat electric aircraft with independent intellectual property rights. The aircraft, shown in Fig.1, has been put into trial and small batch production has begun.



Fig.1. China's first electric light sport aircraft – Ruixiang RX1E.

4.1.2 Broad operating advantage

Liaoning Ruixiang General Aviation Co., Ltd. mainly develops aviation forest protection, aerial fertilization, aircraft sowing, aerial spraying of plant growth regulators, aerial weeding, prevention and control of agricultural and forestry pests and diseases, grassland rodent control, prevention and control of health pests, aerial photography, aviation emergency rescue, and aviation clubs. It also engages in general aviation professional and technical personnel training, general aviation industry policy and technical consulting services, maintenance-repair-operations (MRO) processes, and multi-rotor unmanned aerial vehicle application operations.

4.1.3 Talent reserve advantage [10]

The *Guiding Opinions* [2] details that by 2020 the number of general aviation aircraft will reach 5 000, requiring at least 10 000 to 20 000 pilots. Mature pilots are now in short supply and are very well compensated, therefore a new mechanism for cultivating general aviation pilots must be explored.

In 2013, Liaoning General Aviation Research Institute established Liaoning Ruixiang General Aviation Co., Ltd. at the Faku Base to promote the exploration alliance operation model based on electric aircraft. In places where the right conditions exist (having an airport and capital investment), branch offices of Liaoning Ruixiang General Aviation Co., Ltd. should be established, based on the qualifications, operating specifications, electric aircrafts, pilots, maintenance, and various guarantees of the company. Rizhao Ruixiang General Aviation Co., Ltd. was introduced in accordance with this model.

In 2014, Liaoning Ruixiang General Aviation Co., Ltd. recruited nine university and master's students (including four females) and conducted training according to a sports pilot license syllabus approved by the Air Traffic Control Center of the General Administration of Sport of China. All of them obtained licenses. Thus far, all students have flown for approximately 150 hours and have reached the level where they are capable of performing tasks alone. In view of this, the company coordinated with the Rizhao City Government to establish a general aviation pilot program at the Rizhao Polytechnic to establish a general aviation pilot major and explore training of general aviation pilots according to the above model.

One problem to be solved by this model is the training fee. A sports pilot license costs approximately 150 000 yuan and it typically costs a pilot roughly 500 000 yuan to be trained as a captain. The method we envisage is to set up a college student aid fund by all levels of government. The students can borrow money from it and return it after working each year. The money can then be continuously recycled.

With the development of the general aviation industry, in addition to pilots, there will be considerable demand for maintenance, airworthiness, and management personnel. In coordination with the Rizhao City Government, these personnel will also be cultivated after the establishment of the General Aviation School at Rizhao Polytechnic.

4.1.4 Conditional advantage

In recent years, many regional airports have been established throughout the country. Each airport has a limited number of routes, which are vacant the majority of the time. There are 74 transport airports (out of a total of 210 airports) with average daily take-off and landing times of 10 or less, accounting for 35% of the total. The *Guiding Opinions* [1,11] detailed “priority support for the addition of general aviation facilities at regional airports, expansion of business scope, and comprehensive coverage of regional general aviation operations services.” Rizhao Ruixiang General Aviation Co., Ltd. was established in accordance with the *Guiding Opinions* [2,11]. It is a joint venture between Rizhao Shanzihe Spur Line Airport and Liaoning Ruixiang General Aviation Co., Ltd. The

aim is to explore the combination of regional airports and general aviation.

4.1.5 National relevant laws and regulations support advantages

In recent years, China has promulgated a series of general aviation operating standards, foreign investment in the general aviation industry, and other aspects of the laws and regulations. A relatively complete general aviation regulatory system has been established, as shown in Table 1.

Table 1. Relevant national laws and regulations.

Time	Policy	Significance
November 16, 2010	<i>Opinions on Deepening China's Low-altitude Airspace Management Reform</i> [13]	Promotes the development of general aviation
November 6, 2013	<i>General Aviation Flight Approval and Management Regulations</i>	With the exception of nine situations, general aviation missions do not need to apply for tasks and approval procedures for the first time.
May 17, 2016	<i>Guiding Opinions on Promoting the Development of the General Aviation Industry</i> [2,11]	To form a safe, orderly, and coordinated development pattern
August 17, 2016	<i>Air Tour</i>	Pre-flight preparations, personnel requirements, aircraft suitability requirements, operational site requirements, specific area flights, and experience flights are defined.
September 21, 2016	<i>Air Traffic Management Measures for Civil Unmanned Aerial Vehicle Systems</i>	Standardized the activities of civil unmanned aircraft system in the airspace
November 8, 2016	<i>Aviation Sports Industry Development Plan</i>	By 2020, the proposed overall scale of aviation sports will be 200 billion yuan, 2 000 aviation flight camps, 1 000 aviation sports clubs, and 20 million consumers.
December 22, 2016	<i>The 13th Five-Year Plan for the Development of Civil Aviation in China</i>	To comprehensively consolidate the foundation of civil aviation construction and provide strong support for building a well-off society in an all-round way.

4.2 Disadvantage analysis

4.2.1 General aviation flights are subject to seasonal and weather constraints

General aviation flights must meet visual flight conditions in order to carry out flight activities. Therefore, the operation of the aircraft will be reduced in low visibility weather, heavy rain, heavy snow, heavy fog, etc.

4.2.2 General aviation's corresponding supporting service guarantee facilities are few

The corresponding supporting service guarantee facilities such as aircraft maintenance, training, aviation emergency rescue, aviation navigation, air traffic management, and ground fixed base operators are not perfect.

4.3 Opportunity analysis

At present, under the conditions of vigorously promoting environmental protection, energy conservation, and emissions reduction [12], people have welcomed new energy general aviation aircraft. These aircraft are the first electric full-power manned aircraft in China (and the world) that have obtained a certificate issued by the Civil Aviation Administration. The aircraft are safe, reliable, easy to use and maintain, easy to learn, easy to operate, low cost, and have low operating costs. One of its shortcomings is the short air time; however, it can be used in sports pilot license training, flight experience, private flight, aviation sports competition, etc. With the support of the Civil Aviation Authority of China, this type of aircraft can be delivered in large quantities and will be favored by the market. By 2020, it will occupy a large share of the estimated 5 000 general aviation aircraft possessions. China has made significant progress in the development and manufacturing of general aviation aircraft and independent innovation. The other four new energy general aviation aircraft will contribute to an increased proportion among the general aviation fleet.

4.4 Threat analysis

With the improvement in people's living standards and the publicity and popularization of aviation culture in

recent years, more and more people have become enthusiastic about participating in the experience. In particular, the most influential are various types of airshows, flight conferences, and other activities. However, it is necessary to regulate flight activities such as air shows, otherwise there will be some negative effects. Such examples include the crash of an American aerobatic plane at the 2014 Faku Flight Conference, the crash of an American aerobatic plane at the 2016 Zhangye Air Show, and the crash of a Xiaoying 500 at the 2016 Shijiazhuang Air Show. These instances all increase the general public's fear of aviation. Therefore, it is necessary to formulate corresponding standards or norms, enhance the technical training and safety education of flight personnel, and resolutely end the occurrence of flight accidents in general aviation flights.

Based on an analysis of SWOT-PEST developed by Liaoning Ruixiang General Aviation Co., Ltd., the following strategic recommendations are proposed, as shown in Fig.2.

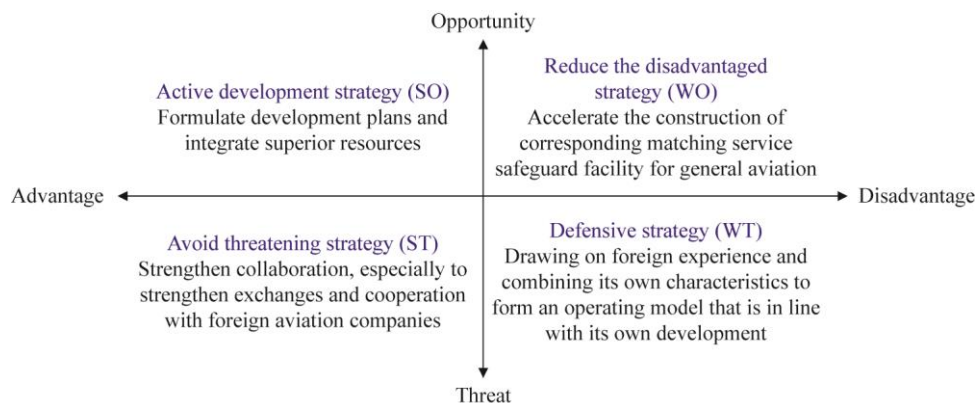


Fig.2. Liaoning Ruixiang General Aviation Co., Ltd. Strategic Matrix.

5 Conclusion

At present, China's general aviation industry is in a period of rapid development, which will drive the development of the regional economy. There will be an increasing number of general aviation enterprises in China, however it is necessary to choose the appropriate mode of operation in accordance with their own characteristics.

References

- [1] Wu J D, Lv Z P. Strengthen the adaptation of low-altitude airspace reform requirements of the general airport construction standards [J]. *China Civil Aviation*, 2011 (7): 26–27. Chinese.
- [2] Teng Y. Navigation policy frequently open the trillion-level market ice breaking road [J]. *International Brand Observation*, 2016 (7): 50–51. Chinese.
- [3] China Aviation Industry and Economics Institute. If you want to attack the beautiful jade, you must select the exotic stone [N]. *China Aviation Daily*, 2016-08-16 (1). Chinese.
- [4] Wang Q Y, Tang H J, Sun F W, et al. The status analysis of general aviation pilots and the countermeasures [J]. *Civil Aviation Management*, 2017, 1(1): 63–68. Chinese.
- [5] Wang F. Problems and countermeasures of low-altitude coastal tourism development in Sanya [D]. Sanya: Hainan Institute of Tropical Oceanography (Master's thesis), 2018. Chinese.
- [6] Pan Y J, Xu C H, Yang H. Research on application of SWOT analysis model in Chinese professional league [R]. Shenyang: 2016 2nd International Conference on Economics, Management Engineering and Education Technology (ICEMEET 2016), 2016.
- [7] General Aviation Branch of China Air Transport Association. China general aviation development report 2016–2017 [R]. Beijing: China Air Transport Association, 2017. Chinese.
- [8] Jin S Y, Wu L, Sun Z X, et al. Analysis of general aviation industry development in Liaoning Province based on SWOT-PEST matrix [J]. *Productivity Research*, 2013 (12): 131–133. Chinese.
- [9] He C X, Guan B. The Development strategies of Shanghai free trade zone based on SWOT analysis model [R]. Harbin: Northeast Asia Academic Forum, 2014.
- [10] Huang X D. Research on sustainable development strategy of hengyang general airlines [D]. Changsha: Hunan University (Master's thesis), 2006. Chinese.
- [11] Miu J R. A brief analysis of the role of navigation education in the development of general aviation industry—Based on the reflection on the development of Wenzhou navigation industry [J]. *Science and Technology Innovation Herald*, 2017 (6):

15–18. Chinese.

[12] Qiao L. On general aviation industry development [J]. *Science and Technology Information*, 2012 (9): 216–217. Chinese.

[13] Yi X Y. Research on the impact of low altitude opening to the development of general aviation economy in China [J]. *Accounting and Finance*, 2016 (5): 86–90. Chinese.