Research on General Aviation Industry Policy Quality Evaluation Based on Fuzzy Comprehensive Evaluation

Liang Zhang, Chengwei Hu

Guangzhou Civil Aviation College, Guangzhou, 510000, China

Abstract. In view of the problems existing in China's general aviation industry policy, the dissertation builds a comprehensive system of general aviation industry policy quality assessment indicators based on the characteristics of general aviation industry operation, and uses this index system to adopt a fuzzy comprehensive assessment method to evaluate the general aviation industry policy quality. According to the assessment results, the general aviation industry policy quality analysis provides the basis for the general aviation industry policy formulation.

1. Introduction

According to incomplete statistics, from 2010 to the present, the State Council, national ministries and commissions, civil aviation bureaus, and local governments have issued policies to promote the development of the general aviation industry that have reached as many as hundreds. The introduction of these policies has strongly supported the development of national and local general aviation industry. However, behind the achievements, there are still many problems in the setting of policy objectives or policy management, implementation, and effects. The structural reforms in the supply side of the "new era" do not require the efficiency of industrial development. Conformity, therefore, is of great significance to the quality assessment of general aviation industry policy.

2. Construction of General Aviation Industry Policy Quality Evaluation Index System

2.1. Constructing the Guiding Ideology of General Aviation Industry Policy Quality Evaluation Index System

The construction of a general aviation industry policy quality assessment index system is actually a quantitative and qualitative description of the development quality of general aviation industry policies using specific indicators. Each indicator in the index system is used as a measure of the quality of policies. The "perspective", through the cooperation between the indicators, makes the operational status of the policy "visible" and "explicit", so that it can accurately and timely monitor the operational status of the general aviation industry. Since the formulation and implementation of general aviation industry policies is a systematic and complex operation process, the guiding ideology for the construction of general aviation industry policy quality assessment index system is: Focusing on the assessment of the effectiveness of general aviation industry policy implementation, combining the special characteristics of the general aviation industry, it follows the principles of combining independence and correlation, comprehensiveness and keyness, dynamic and static combination, quantitative and qualitative integration, and objective and subjectivity. Establish indicators based on systematic viewpoints and systematic analysis methods, and establish an index system that can be used to evaluate the quality of

general aviation industry policies, and make comprehensive judgments and evaluations on the effects, benefits, and effects of general aviation industry policies. Provide reliable intellectual support.

2.2. Construction of General Aviation Industry Policy Quality Evaluation Index System
The general aviation industry policy quality performance evaluation index system is divided into two levels, and the top level is considered from four aspects, including: policy coordination and adaptability, policy operability, policy system compatibility, policy innovation and forward-looking. Each indicator system also correspondingly refines the corresponding three indicators. As shown in Table 2-1.

Table 2-1 General Aviation Industry Policy Quality Assessment Indicator System

First-level indicators	Secondary indicators	Third-level indicators
Policy quality	Policy coordination and adaptability	Policy compliance with other relevant laws and policies
		Policy and General Aviation Industry Development Adaptation
		Whether the policy adjustment is appropriate and timely
		Whether there is a conflict between policies
		Whether the policy helps rationalize government, market, and social relations
		Whether the process of policy making is fair, public and impartial
	Policy operability	Whether the definition of the policy concept and the goal is clear
		Whether the specific implementation rules of the policy are clear
		Is there a phased inspection of policy implementation
		Whether the policy has a standardized operational process to facilitate implementation
		Whether the policy clearly defines the main body and the object of implementation
	Policy system compatibility	Whether the policies cover all aspects of general aviation industry development
		Whether there is a need but not a policy
		Is it consistent with previous policies
		Whether there is a policy that should be revised or abolished
		Whether the supporting measures and factual rules are appropriate
	Policy innovation forward-looking	Whether the policy is original
		Whether the policy meets the future development trend of the industry
		Does it help promote general aviation market policy operations and fair competition

3. General aviation industry policy quality assessment based on fuzzy comprehensive evaluation

3.1. Determining the Set of Judgment Factors
According to the general aviation industry policy quality assessment index system, the given factors are divided into U:
    The first factor:

U = $\{U_1, U_2, U_3, U_4\}$ = {policy coordination, policy operability, system compatibility, innovation and forward − lookingness}

$U_1 = \{U_{11}, U_{12}, U_{13}, U_{14}, U_{15}, U_{16}\}$= {The degree of compliance with policies and other relevant laws and policies, the degree of adaptation of policies and general aviation industry development, and whether the policy adjustment is appropriate and timely Whether there is a conflict between policies, whether policies help to rationalize the relationship between the government and the market, and the industry, whether the policy-making process is fair, open, and fair}

$U_2 = \{U_{21}, U_{22}, U_{23}, U_{24}, U_{25}\}$= {Is the definition and goal of the policy concept clear, whether the specific implementation rules of the policy are clear, whether the implementation of the policy is checked in stages, and whether the policy has a standardized operation procedure is convenient? Whether the implementation and policy are clearly defined by the implementing entity and the object of implementation}

$U_3 = \{U_{31}, U_{32}, U_{33}, U_{34}, U_{35}\}$= {Does the policy cover all aspects of the development of the general aviation industry, whether there is a need for a policy that has not been established, whether it is consistent with the policies that have been established before, and whether there are any changes that should be made, Whether the abolished policies, supporting measures, and factual rules are appropriate (explicitly stated, operable)}

$U_4 = \{U_{41}, U_{42}, U_{43}\}$= {whether the policy is original, whether the policy meets the industry's future development trend, whether it helps to promote general aviation market policy operations and fair competition}

3.2. Establish Evaluation Set V of Each Factor

Determine the general aviation industry policy quality comprehensive evaluation index: 1 represents excellent policy quality, 2 represents good policy quality, 3 represents normal policy quality, 4 represents low policy quality.

3.3. Determining the Weight Matrix of Each Factor

For the determination of the weight of each factor, the combination of the AHP method and the matter element analysis method is used to determine the weight of each indicator. Only the calculation of the first-level indicators U = $\{U_1, U_2, U_3, U_4\}$ and the weighted vector $W_A(B_1, B_2, B_3, B_4)$ will be described as follows. To establish a judgment matrix by issuing questionnaires to three experts in the field of civil aviation.

$$A_1 = \begin{bmatrix} 1 & 3 & 5 & 7 \\ 1/3 & 1 & 3 & 5 \\ 1/5 & 1/3 & 1 & 5 \\ 1/7 & 1/5 & 1/5 & 1 \end{bmatrix} \qquad A_2 = \begin{bmatrix} 1 & 3 & 5 & 5 \\ 1/3 & 1 & 3 & 5 \\ 1/5 & 1/3 & 1 & 5 \\ 1/5 & 1/5 & 1/5 & 1 \end{bmatrix}$$

$$A_3 = \begin{bmatrix} 1 & 3 & 3 & 5 \\ 1/3 & 1 & 3 & 5 \\ 1/5 & 1/3 & 1 & 5 \\ 1/5 & 1/3 & 1/3 & 1 \end{bmatrix}$$

According to the judgment matrix of three experts, the eigenvectors can be obtained by calculation, and the weight of the first layer of the three experts can be determined after the consistency check is done. In order to construct the weight compound element matrix R:

$$R = \begin{bmatrix} & M_1 & M_2 & M_3 & M_4 \\ c_1 & 0.4328 & 0.2162 & 0.1632 & 0.1878 \\ c_2 & 0.4312 & 0.3011 & 0.1588 & 0.1089 \\ c_3 & 0.5148 & 0.2241 & 0.1882 & 0.0729 \end{bmatrix}$$

c_1, c_2, c_3 are the weights of B_1, B_2, B_3, B_4 determined by three experts respectively.

We calculate the standard matter element and the nodal domain matter element, so that we can get the correlation function matter element.

$$R_{ij} = \begin{bmatrix} & M_1 & M_2 & M_3 & M_4 \\ c_1 & 0.7180 & 0.5252 & 1 & 1 \\ c_2 & 0.5656 & 1 & 1 & 0.5158 \\ c_3 & 1 & 0.4961 & 1 & 1 \end{bmatrix}$$

Calculate the validity matrix of each expert $R_V = \left(v_1, v_2, v_3 = (0.3108, 0.3591, 0.3301)\right)$

Correcting the original right repetitive element matrix R to obtain a modified composite matter element matrixR_ω, that is, the weight of the first-level index factor of general aviation industry policy quality

$$W_A = (0.4815, 0.2138, 0.1734, 0.1313)$$

Similarly, the secondary index vector B_1 (policy adaptation coordination), B_2 (policy operability), B_3 (policy system compatibility), and B_4 (policy innovation prospectiveness) weights of general aviation industry policy quality assessment can be determined as follows:

Policy adaptation coordination weight values:

$$W_{B1} = (b_{11}, b_{12}, b_{13}, b_{14}, b_{15}, b_{16}) = (0.1901, 0.1892, 0.2384, 0.1195, 0.1018, .01061)$$

Policy operability weight values:

$$W_{B2} = (b_{21}, b_{22}, b_{23}, b_{24}, b_{25}) = (0.2895, 0.2238, 0.1122, 0.1971, 0.1774)$$

Policy system supporting weight values:

$$W_{B3} = (b_{31}, b_{32}, b_{33}, b_{34}, b_{35}) = (0.3021, 0.2655, 0.2081, 0.1321, 0.0922)$$

Proactive weights for policy innovation:

$$W_{B4} = (b_{41}, b_{42}, b_{43}) = (0.3621, 0.3855, 0.2524)$$

3.4. Establishing a Second-level Factor Fuzzy Evaluation Matrix R
Invited experts in general aviation industry policy research, representatives from the business community, experts from industry associations, experts from scientific research institutes, and university experts, and a total of five experts were formed. Assess the quality of general aviation industry policy, and evaluate the binary logic that belongs to or does not belong to a certain evaluation factor at the time of evaluation. That is, when it is considered that the element belongs to this level, it is counted as 1, otherwise Mark 0. When R_{ij} is counted, $R_{ij} = P'/P$ is taken, where P is the total number of experts participating in the evaluation, and P' is the number of experts selected to belong to that level, according to the judgment of five experts, the following evaluation matrixes are obtained:

$$R_1 = \begin{bmatrix} 0.3 & 0.1 & 0.5 & 0.2 \\ 0.2 & 0.1 & 0.5 & 0.1 \\ 0.3 & 0.3 & 0.2 & 0.1 \\ 0.3 & 0.2 & 0.4 & 0.2 \\ 0.2 & 0.1 & 0.4 & 0.2 \\ 0.2 & 0.2 & 0.3 & 0.2 \end{bmatrix} \qquad R_2 = \begin{bmatrix} 0.1 & 0.2 & 0.3 & 0.2 \\ 0.1 & 0.2 & 0.1 & 0.4 \\ 0.1 & 0.1 & 0.4 & 0.4 \\ 0.1 & 0.2 & 0.5 & 0.2 \\ 0.1 & 0.2 & 0.3 & 0.3 \end{bmatrix}$$

$$R_3 = \begin{bmatrix} 0.2 & 0.3 & 0.4 & 0.1 \\ 0.2 & 0.3 & 0.4 & 0.1 \\ 0.1 & 0.1 & 0.3 & 0.4 \\ 0.1 & 0.1 & 0.4 & 0.4 \\ 0.1 & 0.1 & 0.3 & 0.5 \end{bmatrix} \qquad R_4 = \begin{bmatrix} 0.5 & 0.1 & 0.2 \\ 0.1 & 0.2 & 0.4 \\ 0.1 & 0.2 & 0.3 \end{bmatrix}$$

3.5. Fuzzy comprehensive evaluation results

After the synthesis calculation, the second level comprehensive evaluation result B_i is obtained:

$$B_1 = W_B°R_1 = (0.1928, 0.1256, 0.2891, 0.0588)$$

$$B_2 = W_B°R_2 = (0.1001, 0.2118, 0.3498, 0.2648)$$

$$B_3 = W_B°R_3 = (0.1514, 0.3618, 0.3395, 0.1482)$$

$$B_4 = W_B°R_4 = (0.1832, 0.1857, 0.3206, 0.3132)$$

The first level of evaluation results are

$$A = W_A°B = (\mathbf{0.1742, 0.3028, 0.1811, 0.2482})$$

According to the principle of maximum degree of membership, we have obtained a comprehensive evaluation rating for China's general aviation industry policy quality as policy quality is good.

4. Analysis of General Aviation Industry Policy Quality Performance

4.1. Analysis of Coordination and Adaptability of General Aviation Industry Policies

First, the poor compatibility of long-cycle and short-cycle policies, the general and long-term policies and short-term policies of China's general aviation industry lack integrated planning, and they have their own characteristics of governance. It is difficult to form consistency and consistency in long-term optimization of long-term development forces, and it is difficult for the general aviation industry to develop in the short-term and long-term.

Second, the coordination of policies at the national level and the local level is poor, and various local general aviation industry policies are difficult to co-operate with the central government's policies that promote the development of the general aviation industry. It is difficult for the policies to produce a positive interaction and it is difficult to form a kind of Effective policies work together to promote general aviation industry support.

Third, the poor coordination and adaptability of the timeliness of policy adjustment and industrial development rate, the relatively fragmented policies, the policy dynamic mechanism are not yet perfect, and the introduction of various policies has not been adjusted in line with changes in the industrial environment, and timely dynamic tracking and control adjustments have not been made. There are regulatory loopholes and lack of adjustment incentives, and it is difficult to achieve the established strategic goals of the policy system.

4.2. Operational Analysis of General Aviation Industry Policy

First, national policies for various types of operations are not strong. Various types of policies that promote the development of the general aviation industry are mostly promulgated in the form of planning and guiding opinions. The relevant provisions of the policy content are too broad and the detailed rules are not detailed enough to provide specific guidance for the general aviation industry and it is difficult to operate.

Second, the operability of policies and regulations at the national level is generally not strong. There are no general operational aviation comprehensive policies and regulations that are directly operational. Various ministries and commissions have issued "normative measures", "opinions", and "notifications" in the form of regulatory documents that promote the development of the general aviation industry. They lack legal force, and they do not. It will help guide and control general aviation behaviors.

Third, the operability of various types of policies at the local level needs to be improved. Local governments' policies to promote the development of the general aviation industry often use too much of the economic policy goal as the policy's foothold. They are merely "clones" and "replicas" of policy objectives at the national level, and neither reflect the local government's own promotion of universal use. The characteristic policy measures for the development of the aviation industry cannot truly become an operative means to guide the development of the local general aviation industry.

4.3. Analysis of the Supportability of General Aviation Industry Policy System

First, the macro-policy and micro-implementation methods are not matched. Although the approval of the General Airport has been delegated to the provincial government, the approval process still needs to go through the military, the Civil Aviation Administration, the Provincial Environmental Protection Agency, the Provincial Water Resources Department, the Provincial Department of Land and Resources, the Provincial Development and Reform Commission, and the earthquake management department. , cultural relic investigation and exploration teams, surveying and mapping institutes, exploration teams and many other departments have examined and approved. How these agencies and departments coordinate planning and how to work together to accomplish this goal still lacks specific and effective implementation details and safeguards mechanisms. This has caused macro-policies to encounter considerable resistance in the process of landing.

The second is that the supporting policies of various general aviation enterprises are not matched with the needs of industrial development. Due to the lack of effective implementation details and safeguard mechanisms required for the implementation of this policy, the input of capital elements is even more unbalanced and the development of general aviation industry really needs. Public products and public services such as airport construction and utilization, oil facilities, navigation services, and public service maintenance systems have not received effective financial support.

Third, the strong supervision of the government is not compatible with the use of market mechanisms. Taking the "General Aviation Market Supervision Manual" as an example, the purpose of this policy is mainly to regulate the supervision of the general aviation market and to ensure the procedural rules and standards are unified. Market supervision provides a basis and guidance for operations. However, how to comply with the laws of general aviation market and make full use of market mechanisms to manage the general aviation market is not covered.

4.4. Forward-looking Analysis of General Aviation Industry Policy Innovation

First, there is not enough policy innovation to promote the upgrade of the general aviation industry structure. In 2016, the State Council issued the Guiding Opinions on Promoting the Development of the General Aviation Industry. Up to now, the policy has been implemented for more than two years. Due to the lagging nature of policies and the lack of guidance and regulations on relevant laws, regulations, and policies, many new things in the general aviation field have a policy gap, and there is still a long way to go before policy goals are realized.

Second, policies and general aviation market mechanisms are not organically integrated, and the direction of policy innovation is ambiguous. General aviation industry policy does not fully consider the

role of the general aviation market mechanism in the innovation process, and even replaces the market mechanism with "government choice". The consequence is that it loses its grasp of the direction of policy innovation. Such a policy is obvious. It is difficult to promote the development of the general aviation industry.

Third, it is not in line with the actual situation of China's general aviation industry development, and the effect of industrial policy innovation is not obvious enough. At present, China's general aviation industry is lagging behind foreign countries in terms of market capital allocation, human resources supply, and technology research and development. Some local general aviation industry policies ignore these actual conditions and blindly formulate policies that are not compatible with the development of the navigation industry. These policies are inconsistent with the actual situation, and it is difficult to solve the problems facing the current general aviation industry. The policies have had little success.

References

[1]   Zhao Jiahui. Theoretical Analysis and Effect Evaluation of Industrial Policy [M]. China Economic Press, 2013.

[2]   Wang Jue. Research on General Aviation Industry Development in Heilongjiang Province [J]. Modern Economic Information, 2015 (5): 489 - 490.

[3]   Wang Shouwen, Yan Peng. Policy Evaluation of Industry-University-Research Cooperation Area Based on Multilevel Fuzzy Synthesis [J]. Science and Technology Progress and Policy, 2014 (23): 121 - 126.

[4]   Mei Shijiang. Review of Public Policy Assessment Research [J]. Reform and Opening, 2013 (8): 32 - 33.