Proceedings of Business and Economic Studies, 2022, Volume 5, Issue 4
http://ojs.bbwpublisher.com/index.php/PBES
ISSN Online: 2209-265X
ISSN Print: 2209-2641

Airlines Cost Control in China: An Overlooked Perspective

Huiyun Wang*

Department of Economics and Management, China University of Petroleum, Beijing 100100, China

Corresponding author: Huiyun Wang, mandy_wang06@163.com

Abstract: With the deepening of economic globalization, the business environment has seen profound changes. The cost of aviation fuel has grown to represent a significant portion of air transportation costs for "energy-dependent" airlines. The cost of aviation fuel makes up a sizeable amount of Chinese airlines' cost structure and is increasingly limiting their profitability. The question of how to control the cost of aviation fuel from various perspectives has garnered widespread attention. This paper puts forward an overlooked perspective – the procurement strategy. Firstly, it describes the necessity of aviation fuel cost control, and then analyzes specific cases of aviation fuel procurement cost control. Finally, it proposes several effective suggestions from the perspective of aviation fuel procurement, aiming to improve the refined management of Chinese airlines' aviation fuel procurement.

Keywords: Airlines; Fuel procurement; Aviation fuel cost; Cost control; Pricing mechanism; Aviation refueling

Online publication: August 12, 2022

1. Introduction

Aviation kerosene is a type of petroleum product, mainly consisting of hydrocarbon compounds in different fractions. Nowadays, JET A-1 is the most commonly used aviation kerosene, which is produced according to international standard specifications. In the United States, there is another model, called JET A. Another commonly used aviation fuel is JET B, which is derived from a naphtha-kerosene blend formulation, mainly to improve performance in cold weather. However, JET B aviation fuel is only used when necessary, during cold weather, since it has a lower density and is more hazardous to handle.

Aviation fuel cost management refers to the control of costs generated from the whole process, from the beginning when aviation fuel is obtained to the end where aviation fuel is used up, such as procurement costs, transportation costs, refueling costs, and storage costs. According to the economic theory, obtaining maximized profits with marginal costs can be realized through rational and scientific means that strictly control cost at each level. For airlines, optimizing pilot operation and aircraft performance, strengthening the overall operation management, and aviation fuel hedging are the main means of controlling aviation fuel costs [1-3]. As these measures have been established, this paper discusses the overlooked perspective of aviation fuel cost management (only for international flights).

2. Pricing mechanism of international aviation fuel

The pricing mechanism of international aviation fuel is based on the transaction price of the international energy market, and the differential price is determined by both the buyer and seller through procurement negotiations or other methods. The final price comprises of the basic price plus or minus a differential price.

For example, Narita Airport's aviation fuel price is MOPS + 4.5 cents/gallon. "MOPS" (short for the Mean of Platts Singapore) is the basic price, while "4.5 cents/gallon" is the differential. The contract price of international aviation fuel can be broken down into basic price, differential, plus third-party fees (including service fees, implementation fees, and taxes).

Agreement price (US dollars/gal) = Basic price + Differential + Third-party fees

2.1. Basic price of market

Currently, in the international energy market, the basic price commonly referred to and quoted by buyers and sellers is Platts' price, and large Chinese airlines have purchased Platts' price to monitor oil prices. The prime basic prices in the industry are as follows:

(1) MOPS (Mean of Platts FOB Singapore, Trading days, previous month), which mainly applies to airports in the Asia-Pacific region, including those in Japan, Korea, Singapore, Thailand, and so on;
(2) High of Platts FOB Rotterdam (Trading days, previous month), which is mainly applicable to some European airports, such as Frankfurt (FRA), Munich (MUC), Vienna (VIE);
(3) High of Platts Cargoes FOB MED (Trading days, previous month), which is mainly for airports in Europe, including London (LHR), Paris (CDG), Stockholm (ARN), Madrid (MAD), and so on;
(4) Mean of Platts FOB Arab Gulf (Trading days, previous month), which is mainly applicable to some airports in Asia and the Middle East, such as New Delhi (DEL), Mumbai (BOM), and Dubai (DXB);
(5) Mean of Platts US West Coast Pipeline L.A. (Trading days, previous month), which mainly applies to airports in the western United States, such as Los Angeles (LAX) and San Francisco (SFO);
(6) Mean of Platts US Gulf Coast Pipeline (Trading days, previous month), which is mainly for airports in the southeastern US, such as New York (JFK), Washington (DCA), and Newark (EWR).

2.2. Differential price

The differential is determined by the parties through quotations and negotiations based on market supply and demand, which accounts for about 3% of the total cost of aviation fuel. The differential usually includes the aviation fuel company's forecast on future price trends, operating costs, financial costs, and expected profits, usually priced in "cents per gallon" or "euros per cubic meter."

2.3.Third party fee

International aviation fuel agreement prices also include third-party fees, which are collected and paid through the aviation fuel company, including service fees and infrastructure fees arising from storage, transportation, and refueling. In addition, some airports also include taxes. These fees account for about 2% of the total cost of international aviation fuel.

3. Aviation fuel management department and responsibilities of Chinese airlines

In recent years, with the rapid development of the economy in China, the civil aviation industry continues to develop and expand. China's civil aviation industry has become the second largest in the world after the United States. The Chinese demand for aviation fuel continues to rise.

The setting of the fuel consumption process and the supervision between the using departments will affect the aviation fuel cost. From the beginning of the flight plan to the end of the flight mission, it is the primary stage of aviation fuel use. The main departments of airlines involved in aviation fuel management include the operation control center, flight crew, aircraft maintenance department, and aviation fuel procurement department. **Figure 1** shows two types of aviation fuel management organizational structures in Chinese airlines.

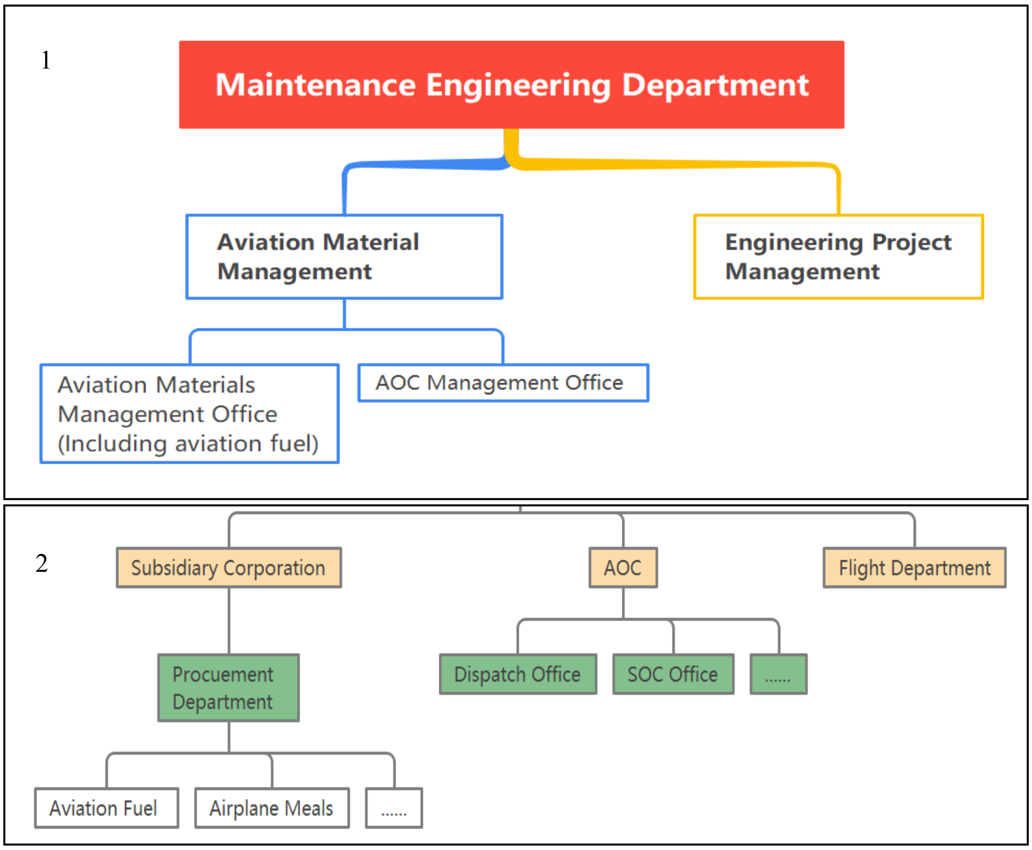

Figure 1. Aviation fuel management organizational structures in Chinese airlines

It can be seen that there are many departments involved in aviation fuel management. The main department of the operation control center is the signing and dispatching room, which is responsible for the calculation of aviation fuel distribution; the flight department is the most direct aviation fuel consumption department; it comprises of the crew members executing the current flight. The fuel consumption has a significant correlation with the flight altitude and initial fuel load, which are controlled by the crew. There is another department that is often neglected – the aviation fuel procurement department. This department is often neglected by enterprises because of the monopolistic characteristic of aviation fuel products, but it plays a decisive role in aviation fuel cost control.

4. Cost analysis of Chinese airlines

Airlines are "energy-dependent enterprises," and aviation fuel costs have long accounted for a relatively large proportion of Chinese airlines' expenses. Taking Air China, China Eastern Airlines, and China Southern Airlines as the subjects, the data of their aviation fuel costs and their proportion in operating costs in recent years are shown in **Table 1** [4].

After calculation, the average proportion of aviation fuel cost in the operating cost of Air China, China Eastern Airlines, and China Southern Airlines in recent years is 31.2%, 30.9%, and 31.2%, respectively. Such a large share of 30% has a direct impact on the profitability of airlines. The operating revenue and profit of major listed companies in China's air transport industry in 2019 are shown in **Table 2** [4].

Throughout the international aviation fuel market, the price of crude oil greatly fluctuates and has a rising trend at present. With the deepening of the internationalization of Chinese airlines, the proportion of aviation fuel cost in the enterprise cost structure is also increasing. A small change in aviation fuel cost will have a significant impact on aviation profits [5,6]. Optimizing aviation fuel management has become one of the most urgent tasks in airlines.

Table 1. List of aviation fuel costs and the proportion of operating costs of three major Chinese airlines (Unit: million RMB)

Carrier	**2020 (COVID-19)**		**2019**		**2018**		**2017**	
	Aviation fuel cost	**Percentage**	**Aviation fuel cost**	**Percentage**	**Aviation fuel cost**	**Percentage**	**Aviation fuel cost**	**Percentage**
Air China	14,817	19.59%	35,965	31.76%	38,481	33.42%	28,409	28.33%
China Eastern	13,840	19.55%	34,191	31.9%	33,680	32.89%	25,131	27.83%
China Southern	18,797	19.81%	42,814	31.56%	42,922	33.37%	31,895	28.56%

(Source: Annual Reports of Airlines)

Table 2. Revenue and profit of major listed airlines in 2019

Code	**Abbreviation**	**Operating income (billion RMB)**	**Operating profit (billion RMB)**	**Profit rate**
600057.SH	Xiangyu	272.4	1.8	0.66%
600029.SH	China Southern	154.3	3.2	2.07%
601111.SH	Air China	136.2	9.2	6.75%
600115.SH	China Eastern	120.9	3.5	2.89%
600221.SH	*ST HNA	72.4	0.83	1.15%
002183.SZ	Eternal Asia	71.8	0.02	0.03%
002928.SZ	Hua Xia Airlines	54.1	0.54	1.00%
603885.SH	Ji Xiang Airlines	16.7	1.3	7.78%
601021.SH	Spring Airlines	14.8	2.3	15.54%
603128.SH	CTS	10.3	0.48	4.66%
000099.SZ	CITIC COHC	1.6	0.26	16.25%
Average (arithmetic mean)		84.14	2.13	5.34%

(Source: Annual Reports of Companies)

At present, the Chinese airlines' measures for aviation fuel cost management are mainly reflected in the institutionalization of fuel saving management. At the macro level, special management is implemented to establish an effective long-term mechanism. At the micro level, it is divided into four aspects: route optimization, cost index implementation, accurate formulation of fuel volume, and standardization of fuel saving operation.

5. Aviation fuel supply system and a case study

5.1.International aviation fuel supply system

The whole process from the refinery to the aircraft involves negotiation, transportation, storage, refueling, and so on. The logistics facilities and transportation and storage equipment involved are very complex, and the supply chain has high requirements for technical operation and quality inspection.

Aviation fuel is transported from the refinery to the terminal by pipeline or land and water. After inspection, it is unloaded at the terminal and placed in the storage area. Generally, after 24 hours of sedimentation, the fuel, which is transported to the airport by pipeline or oil tanker, will be refueled by a pipeline refueling truck or tanker truck into the aircraft. The entire supply chain of aviation fuel involves refineries, aviation fuel suppliers, inventory and pipeline managers, as well as refueling service agents. Since some airports in Asia and Europe own the inventory, pipelines, and other facilities and equipment, the fuel suppliers provide the "into-plane" service. In other words, these airlines do not need to sign any cooperation agreements with third-party service companies. In North America, due to anti-monopoly laws, the whole aviation fuel supply chain can be divided into three open markets: fuel supply, inventory management, and refueling service. This achieves the goal of competition in every market. Therefore, the fuel supplier can be requested to provide "into-storage" service.

5.2. Case study

Domestic and foreign scholars have put forward operable opinions from various perspectives, but little attention has been paid to the procurement strategy.

Some markets are competitive in each part, so it is desirable to break the traditional model and create a new international aviation fuel procurement model, where fuel supply and refueling service are contracted to respective partners, circumventing the issue of intermediate price difference. However, innovation often entails a series of risk issues.

COSO considers risk as "the probability that an event will occur and negatively affect the achievement of objectives." It can be seen that risk mainly emphasizes the uncertainty generated in operations. Risk management involves managing various exiting and possible uncertainties in addition to promoting the steady growth of enterprises [7]. The risk management process can be summarized in **Figure 2**.

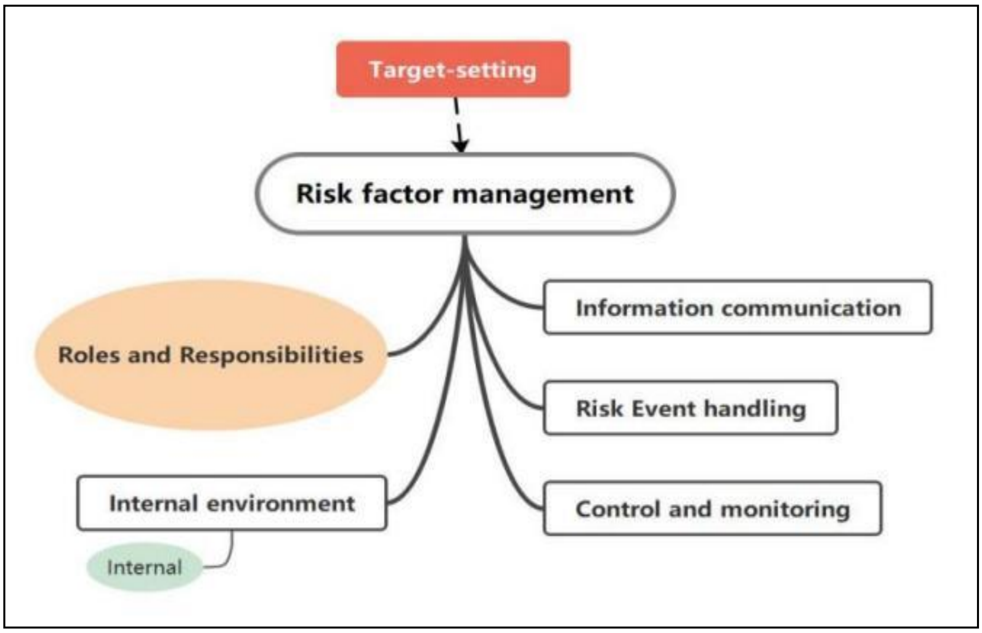

Figure 2. COSO risk management framework map (Source: COSO, The Enterprise Risk Management – Integrated Framework)

The possible risks related to the new procurement project are summarized in **Table 3**.

Table 3. Potential risks while conducting the project

Potential risks		Solutions
Oil supplier not available	Oil supply disruptions; Transportation disruptions Quality issues	Coordination with suppliers Internal coordination mechanisms Supplier option Emergency plans and safety spare

(Continued on next page)

(Continued from previous page)

Potential risks			**Solutions**
The factor of refueling company	Refueling equipment failure	Unable to refuel	Follow-up coordination Search for alternatives Refueling facility inspection
		Oil contamination	Follow-up coordination Search for alternatives
	Insufficient capacity of refueling company	Short-staffed	Refueling company visit
		Inadequate equipment	Refueling company visit
		Peak time	Enhanced communication (capacity matching)
		Lack of planning	Provide timely flight plans, changes, and reminders
	Cheating in metering		Refueling company visit Random checking
	Qualification risks	Qualification does not meet the standard	Supplier visits
	Late arrival of fuel truck	Management confusion	Contractual binding Enhanced communication (headquarters and airport management station in airlines)
			Examining the refueling company Tracking the performance of the service provider
	Security issue		Make a checklist Implement safety check
	Supplier strategy shift	Corporate restructuring	Advance notice Request a backup guarantee plan
		Exit markets	Advance notice Request a backup guarantee plan
Legal risks	Lack of understanding of the local legal		Seek help from the legal department
Insurance claims	Refueling companies are usually small Small insurance amount		Choose a larger company Stipulate minimum insurance Holding a copy of the insurance certificate Check the certificate with the insurance supervisor
Working cooperation issues	With the refueling company	Corporate headquarters	Strengthen communication Strengthen the force of supervision Interdepartmental collaboration
		Local office	Establishing direct connections Training Learning the contract Collecting service information of partners
		Aircrew	Establishing procedures for handling disputes Training Providing feedback of refueling company
	Between refueling company and fuel supplier		Establishing contact and monitor

(Continued on next page)

(Continued from previous page)

Potential risks		Solutions
Storage issues	Lack of inventory monitoring results in supply cuts	Additional staff Inventory management (warning mechanism)
Financial issues	Defaults in payment result in service disruption	Timely review and tracking of payments
	Incorrect billing and payment	Timely handling
Environmental issues	Environmental regulatory restrictions	Learning about and paying attention to local environmental policy in advance
Modification of contract	Unilateral	Timely handling
	Bilateral	Timely and properly resolving disputes
Force majeure	Strikes Natural disasters	Paying more attention Maintaining original model in high-risk areas

By managing the risks, this model can be used to perform experiments and achieve positive outcomes. Taking Vancouver Airport (YVR) as an example, suppose the original refueling fee is P_1, after adopting the new model, it is P_2 plus 5% tax. The aviation fuel consumption of these routes is averaged by Chinese airlines, and the cost saving is R. The following equation is obtained:

$$R = Q * P_1 - (1 + 5\%)Q * P_2$$

The original refueling fee is 4 CAD cents/liter and the new one is 0.2 CAD cents/liter, with a monthly aviation fuel consumption of 1.3 million gallons. According to a rough calculation based on relevant data, the new model can save about $1.75 million/year for Vancouver Airport. Certainly, it is necessary to exclude the direct costs arising from the implementation of this project, which is about RMB200,000 (approximately, $31,250) in travel costs for the site inspection. At the same time, the project has many other benefits to facilitate the later aviation fuel management work. For example, effective communication with the local station and refueling company can be established, as can a thorough understanding of the local supply chain.

6. Conclusion and proposal

As the aviation fuel operation requires a large number of factor inputs, the supply of aviation fuel is mostly monopolized due to the lack of resources. The majority of airlines believe that aviation fuel procurement is not significant in cost control. Therefore, the research on cost control from the perspective of aviation fuel procurement is rare. This paper summarizes the content and pricing of aviation fuel procurement as the basis for the analysis of aviation fuel procurement cost control cases.

6.1. Attach importance to price negotiation

In terms of aviation fuel purchase, airlines should negotiate the price of aviation fuel from two aspects. In particular, when purchasing foreign aviation fuel, the internal financial department of an airline should provide the payment schedule for the aviation fuel procurement project in advance and make reasonable payment for the procurement in strict accordance with the currency exchange rate between domestic and foreign countries. On the other hand, since foreign aviation fuel suppliers are neither centralized nor unified, local airlines should carefully consider the prices when purchasing fuel from abroad and choose the most favorable fuel supplier, so as to improve their economic efficiency while ensuring supply safety.

6.2. Aviation fuel procurement strategy

Faced with increasingly stringent cost control requirements and complex market conditions, aviation fuel purchasers need to innovate their procurement methods, improve their procurement operations, and explore efficient procurement paths. For example, although joint alliance procurement can be carried out under the following conditions, it is crucial to calculate whether the volume of the joint procurement exceeds the monopoly limit of that market:

(1) the duration of the aviation fuel contract is similar;
(2) members of joint procurement can share existing price by signing a confidentiality agreement;
(3) conditions such as profitability and credit status of airlines do not differ significantly;
(4) the market has adequate competition and sufficient supply to meet the needs of joint procurement;
(5) the airlines' standards for choosing suppliers are largely consistent.

6.3. Team building of fuel procurement

In addition to aviation fuel procurement and agreement signing, domestic aviation fuel procurement staffs also undertake governance monitoring and technical risk control, such as the quantity and quality inspection of new routes and daily aviation fuel as well as refueling panel operation training. It is clear that the activities involved in aviation oil procurement and support are highly complex, and the responsibilities associated with tasks other than aviation fuel procurement and supply consume an excessive amount of the procurement staff's energy. Aviation oil procurement and supply require the involvement of professionals from various fields, including but not limited to accounting, international business, oil and gas storage and transportation, as well as procurement and oil quality, so as to minimize potential safety and management risks as well as improve the airlines' technical ability in oil quality management and procurement management level.

6.4. Feasibility of aviation fuel reserves

Historically, prices tripled during the first oil crisis in 1973 and increased by 1.5 times during the second oil crisis in 1979. Correlatively, the rise in crude oil directly leads to higher prices of goods that use crude oil as raw material. This results in hyperinflation and an inevitable downturn in global economy that would undoubtedly worsen the situation for airlines. At present, due to the limitations of alternative fuel technology and large-scale production, it is expected that the civil aviation industry will continue to rely on aviation kerosene in the transition period of more than 10 years. Therefore, fuel prices will fluctuate sharply in response to changes in international oil prices. The aviation fuel supply contract of an airline typically lasts for two years. The airline is bound to be greatly affected if there are any significant developments during this period, such as the conflict between Russia and Ukraine. Under economically feasible conditions, airlines may consider establishing their own aviation fuel supply system and increasing their reserves to better cope with the impact of drastic fluctuations in oil prices.

Disclosure statement

The author declares no conflict of interest.

References

[1] Lee JJ, Lukachko SP, Waitz IA, et al., 2001, Historical and Future Trends in Aircraft Performance, Cost and Emissions. Annual Review of Environment and Resources, 2001(26): 167–200. https://doi.org/10.1146/annurev.energy.26.1.167

[2] Du Chenne J, 2008, Fuel Crisis to Change Russian Aviation. Airfinance Journal, 2008(312): 28.

[3] Singh V, Sharma SK, 2014, Evolving Base for the Fuel Consumption Optimization in Indian Air Transport: Application of Structural Equation Modeling. European Transport Research Review, 2014(6): 315–332. https://doi.org/10.1007/s12544-014-0134-4

[4] SINA Finance, 2017-2020, Annual Report of Air China Ltd., Annual Report of China Eastern Airlines Co., Ltd., Annual Report of China Southern Airlines Co., Ltd., Xiamen Xiangyu Co., Ltd. Annual Report, Annual Report of Hainan Airlines Holding Co., Ltd., Eternal Asia Supply Chain Management Ltd. Annual Report, Annual Report of China AMC Co., Ltd., Juneyao Airlines Co., Ltd. Annual Report, Spring Airlines Co., Ltd. Annual Report, Annual Report of China Travel China Trade International Logistics Co., Ltd., Annual Report of Citic Offshore Helicopter Co., Ltd., SINA Corporation, https://finance.sina.com.cn/

[5] Wadud Z, 2014, The Asymmetric Effects of Income and Fuel Price on Air Transport Demand. Transportation Research Part A: Policy and Practice, 2014(65): 92–102. https://doi.org/10.1016/j.tra.2014.04.001

[6] Hakim M, Merkert R, 2019, Econometric Evidence on the Determinants of Air Transport in South Asian Countries. Transport Policy, 83: 120–126. https://doi.org/10.1016/j.tranpol.2017.12.003

[7] SASAC, 2006, The Central Enterprise Comprehensive Risk Management Guidelines by the State Owned Assets Development and Reform Commission, China Government Network, http://www.sasac.gov.cn/n2588035/n2588320/n2588340/c4426962/content.html