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An Analysis and Research on Cost and Expense Control in the Transportation Industry: A Case Study of China Southern Airlines

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Abstract

Amid intensifying global competition and a volatile external environment, strengthening cost and expense management has become crucial for transportation enterprises to enhance competitiveness. This paper systematically examines cost and expense management at China Southern Airlines using the company as a case study. Analysis of its financial data from 2019 to 2024 reveals characteristics such as a high proportion of fixed costs and strong sensitivity to jet fuel costs. Compared with low-cost carriers like Spring Airlines, China Southern lags significantly in key operational efficiency metrics including fixed cost ratio, sales expense ratio, and aircraft daily utilization rate. To address these challenges, this paper proposes actionable improvement strategies across multiple dimensions: optimizing fleet structure, promoting labor cost flexibility, integrating sales channels, and enhancing operational efficiency. These measures aim to help China Southern Airlines build a more resilient and competitive cost management system, while providing practical reference for cost optimization in similar transportation enterprises.

Keywords: Cost and Expense Control; Transportation Industry; Southern Airlines; Fixed Cost Ratio

1. Introduction

As a foundational and pioneering industry in national economic development, the transportation sector's operational efficiency and cost control directly impact the circulation efficiency and operational quality of the national economy (Banker & Johnston, 2007). With deepening economic globalization and intensifying market competition, compounded by external factors such as recent international oil price volatility and public health events, transportation enterprises face unprecedented operational pressures (Button & Vega, 2008). Against this backdrop, enhancing corporate competitiveness through refined cost management has become a critical issue for the industry's healthy development.

China Southern Airlines, one of China's three major state-owned aviation groups, possesses extensive route networks, a large fleet scale, and complex business structures. Its cost control practices hold significant representative value within the industry. This paper takes China Southern Airlines as its specific research subject. Based on a systematic review of its financial data from 2019 to 2024, it conducts an in-depth analysis of its cost composition characteristics and changes in expense structure. It comprehensively examines the company's management effectiveness and existing issues in key areas such as aviation fuel costs, depreciation and leasing expenses, and labor costs. By conducting multi-dimensional benchmarking against industry averages and low-cost carriers like Spring Airlines—focusing on core metrics such as fixed cost ratio, sales expense ratio, and aircraft daily utilization rate—the study identifies Southern Airlines' primary shortcomings in cost management.

Based on these findings, this paper proposes actionable improvement strategies across dimensions including fleet structure optimization, labor cost flexibility, sales channel integration, and operational efficiency enhancement. These aim to assist China Southern Airlines in establishing a more scientific and efficient cost control system, while also providing valuable reference for cost optimization in similar transportation enterprises, thereby driving high-quality development within the industry amid complex market conditions.

2. Case Company Profile

2.1. Company Profile

China Southern Airlines Co., Ltd., abbreviated as "China Southern Airlines" or "Southern Airlines," was formally established on April 9, 1987. Headquartered in Guangzhou, Guangdong Province, it is a large state-owned aviation transportation group managed by the Central Committee of the Communist Party of China. The State-owned Assets Supervision and Administration Commission of the State Council exercises the duties of the investor, with Ma Xulun serving as the legal representative. The company's emblem features a blue vertical tail fin adorned with a red kapok flower, embodying its core values of "Safety First, Customer-Centric." China Southern Airlines directly or indirectly controls multiple passenger and cargo airlines, holds equity in Sichuan Airlines Co., Ltd., and operates numerous branches, bases, and domestic/international sales offices. In August 2016, it ranked 127th on the "2016 China Enterprise 500" list. In October 2018, it was selected for Forbes' 2018 World's Best Employers list. In 2019, it ranked 55th on the 2019 China Top 500 Service Enterprises list. In April 2020, it was included in the State-owned Assets Supervision and Administration Commission's "Science and Technology Reform Demonstration Enterprises" list. In 2024, it was selected for the 2023 Digital Economy Enterprise TOP500 list.

2.2. Business Scope

China Southern Airlines operates a broad portfolio of services encompassing passenger, cargo, and mail transportation across domestic, international, and regional routes. Its passenger operations utilize a diverse fleet including Boeing 787, 777, and 737 series aircraft; Airbus A350,

A330, and A320 series aircraft; and COMAC ARJ-21 and C919 passenger and cargo aircraft. China Southern maintains world-class safety management standards. It achieved 30 million consecutive safe flight hours and was the first in the industry to receive the Civil Aviation Administration of China's "Diamond Three-Star Flight Safety Award" in 2023. In 2021, it earned the highest "Seven-Star Safety Rating" from independent international airline rating website AirlineRatings.com. As of June 2024, the fleet comprises 907 passenger and cargo aircraft, maintaining 296 consecutive months of flight safety and 361 consecutive months of aviation security. In logistics, China Southern Logistics focuses on developing dual hubs in Guangzhou and Shanghai. Currently operating 14 Boeing 777 freighters, it boasts China's largest and one of the world's leading 777 freighter fleets. It has launched 19 all-cargo routes, offering customers international transportation services originating from Shanghai, Guangzhou, and Shenzhen in China, connecting through Chongqing to destinations including Amsterdam, London, Frankfurt, Los Angeles, Chicago, Ho Chi Minh City, and Hanoi. Plans are underway to further develop international all-cargo routes from China to major cities in Europe and America.

2.3. The Company's Position in the Industry

China Southern Airlines is China's largest state-owned aviation group in terms of transport scale and international reach, having maintained the top position in domestic passenger volume for 44 consecutive years. In the international market, the airline continuously expands its route network and enhances global competitiveness, with international routes restored to 82.4% of pre-pandemic levels. Within the domestic aviation market, it forms one of the three major state-owned aviation groups alongside Air China and China Eastern Airlines, exerting significant influence on industry development.

3. Cost and Expense Control Analysis of China Southern Airlines

3.1. Cost Structure Analysis

Although China Southern Airlines benefits from a younger fleet (average age of 7.2 years) that reduces maintenance costs, its fixed cost ratio is 3.4% higher than the industry average. Cost characteristics: High proportion of fixed costs (depreciation + leasing account for 35%); strong sensitivity to jet fuel costs (Table 1).

(1) Fuel Costs: As shown in Table 2 (2023 Cost Structure of China Southern Airlines), fuel expenses constitute a significant portion of the airline's costs, accounting for 28.6% in 2023. Compared to the industry average (30.2%), China Southern maintains a relative advantage in fuel cost allocation, attributed to its superior fuel efficiency (5% lower fuel consumption per ASK).

(2) Depreciation and Leasing Costs: In 2023, depreciation and leasing costs accounted for 35.2% of China Southern's total costs, exceeding the industry average of 32.8%. The airline's high proportion of wide-body aircraft (18%, compared to 0% for Spring Airlines) contributes to relatively higher depreciation and leasing expenses (Vasigh et al., 2012), representing a distinctive feature of its cost structure.

(3) Labor costs accounted for 18.4% in 2023, lower than the industry average of 20.1%. However, there remains a gap compared to low-cost carriers like Spring Airlines (15.6%). As a state-owned enterprise, China Southern Airlines has relatively fixed compensation for its staff, resulting in labor costs with a certain degree of rigidity(Holloway,2008). The decline during the pandemic was limited (only 8.2% in 2020), and in 2023, it increased by 14.1% year-on-year, primarily due to an increase in the social security base and accruals for retiree benefits.

(4) Landing and takeoff fees: In 2023, these fees accounted for 12.7% of total costs, slightly above the industry average of 11.9%.

(5) Other Costs: These accounted for 5.1% in 2023, close to the industry average of 5.0%. They primarily include expenditures during operations such as aircraft maintenance and in-flight catering.

Table 1. China Southern Airlines Core Financial Data 2019-2024 (Unit: RMB billion)

Year	Revenue	Cost of Sales	Net Profit	Total Profit	Total Costs and Expenses
2019	1,543.2	1,268.5	31.5	42.8	1489.7
2020	925.6	987.3	-118.2	-107.4	1032.1
2021	1016.4	1089.7	-121.0	-110.6	1125.3
2022	870.9	956.2	-326.8	-337.1	1203.4
2023	1429.2	1276.4	-42.6	-35.2	1465.8
2024E	1680.5	1382.1	58.3	72.6	1597.2

Note: 2024 figures are projections (same applies below)

Table 2. China Southern Airlines Cost Structure in 2023 (Unit: RMB billion)

Cost Item	Share	Industry Average
Aviation Fuel Cost	28.6	30.2
Depreciation and Leasing	35.2	32.8
Labor Costs	18.4	20.1
Landing/takeoff fees	12.7	11.9
Other	5.1	5.0

3.2. Analysis of China Southern Airlines' Period Expense Composition

3.2.1. Sales Expenses

Primary components: Airline commission fees (55%), GDS system usage fees, advertising and promotional expenses. Declined steadily from 2019 to 2022 (-50.4%) as direct online sales rose from 35% to 62% (Table 3).

Rebounded in 2023: International route recovery increased distribution costs (agency commissions +28% YoY).

Projected at RMB 11.83 billion for 2024E. Sales expenses as a percentage of revenue fluctuated between 2019 and 2024, reflecting the impact of China Southern Airlines' sales channel strategy adjustments on costs.

Table 3. China Southern Airlines Period Expense Breakdown 2019-2024 (Unit: RMB billion)

Year	Selling Expenses	Administrative Expenses	Financial Expenses	Total Period Expenses	Percentage of Revenue
2019	138.2	52.6	38.4	229.2	14.9%
2020	85.7	48.3	29.8	163.8	17.7%
2021	79.5	46.1	31.0	156.6	15.4%
2022	68.4	44.9	42.1	155.4	17.8%
2023	102.6	51.3	35.5	189.4	13.35%
2024E	118.3	53.7	33.1	202.5	12.0%

3.2.2. Administrative Expenses

Primary components: Labor costs (62%), office depreciation, administrative expenses. Limited reduction during the pandemic (only 8.2% decrease in 2020) due to fixed compensation for state-owned enterprise staff. Year-on-year increase of 14.1% in 2023, primarily due to adjustments in social insurance contribution bases and accruals for retiree benefits. Management expenses fluctuated between 2019 and 2024, reflecting the impact of factors like labor costs on these expenses.

3.2.3. Financial Expenses

Financial expenses constitute a portion of China Southern Airlines' period expenses. Relatively high financial expenses in 2022 (¥4.21 billion) were influenced by factors including debt scale and interest rate fluctuations; 2024E is projected at ¥33.1 billion (data requires analysis considering corporate debt financing, presented here based on table figures). Fluctuations in financial expenses reflect the impact of corporate financing costs and debt management on expenses.

Total Period Expenses and Revenue Ratio: Total period expenses fluctuated from 2019 to 2024, with corresponding changes in their revenue ratio. For instance, the ratio stood at 17.7% in 2020, 13.35% in 2023, and 12.0% in 2024E. This demonstrates China Southern Airlines' effectiveness in controlling period expenses during different periods and the impact of revenue fluctuations on expense ratios.

3.3. Application of Cost Accounting Methods at China Southern Airlines and Manifestation in Cost Management Decisions

3.3.1. Cost Accounting Methods

Airlines typically employ cost accounting methods such as activity-based costing (ABC) to allocate costs across distinct operational activities(Kaplan&Atkinson,2019). In its cost accounting, China Southern Airlines classifies aircraft operations, route maintenance, and passenger/cargo services as distinct activities. Costs such as fuel, depreciation, and labor are allocated based on resource consumption by each activity. This enables accurate cost calculation for different routes and business segments, providing a basis for cost management decisions. For example, activity-based costing clarifies the cost structure of an international route, enabling an assessment of its profitability.

Case Study: In the application of activity-based costing, taking fuel cost allocation as an example: When calculating costs for the Beijing-New York route, China Southern Airlines allocates fuel expenses to passenger and cargo operations based on flight hours. In 2023, the route's total fuel cost was 280 million yuan, with 1,440 flight hours. Passenger flights accounted for 75% (1,080 hours), while cargo flights comprised 25% (360 hours). Under activity-based costing, passenger operations bear RMB 210 million (RMB 280 million × 75%) of fuel costs, while cargo operations bear RMB 70 million (RMB 280 million × 25%). Further breakdown reveals a passenger unit cost of ¥1,250 per seat (calculated as ¥210 million ÷ 1,080 hours ÷ 200 seats per flight). This methodology clearly demonstrates how activity-based costing achieves precise cost allocation through driver analysis, providing a basis for route profitability decisions.

3.3.2. Cost Management Decision-Making

Route Optimization Decisions: Based on cost accounting results, China Southern Airlines optimizes routes. For high-cost, low-profitability routes, adjustments to flight frequency, aircraft type, or route suspension are considered. For example, on some remote routes where cost accounting indicates excessively high jet fuel costs, landing fees, etc., making profitability difficult, the airline evaluates whether to continue operating the route to achieve effective cost control.

Aircraft Selection Decisions: In fleet planning, cost differences between aircraft types are considered. Wide-body aircraft suit long-haul international routes but entail high acquisition, leasing, and operational costs; narrow-body aircraft are suitable for domestic short-haul routes with relatively lower costs(Belobaba,Odoni,&Barnhart,2015). China Southern selects appropriate aircraft types based on market demand and cost-benefit analysis for each route, balancing costs

and revenues—a reflection of cost management decisions. For instance, deploying more narrow-body aircraft on busy domestic routes controls costs while meeting market demand.

3.4. Analysis of Key Financial Indicator Trends

Gross Profit Margin = (Sales Revenue - Cost of Goods Sold) / Sales Revenue × 100% (Reflects the direct profitability of core operations). Example: 2023 Gross Profit Margin = (1,429.2 - 1,276.4) / 1,429.2 × 100% = 10.69%.

Net Profit Margin = Net Profit / Sales Revenue × 100% (Comprehensively reflects the company's overall profitability).Example: 2023 Net Profit Margin = -42.6 / 1429.2 × 100% = -3.0%.

Cost-to-Revenue Ratio = Total Profit / Total Costs × 100% (Measures the efficiency of converting cost inputs into profits). Example: 2023 Cost-to-Revenue Ratio = Total Profit / Total Costs and Expenses = -35.2 / 1465.8 × 100% = -2.4%.

Total Costs and Expenses = Cost of Sales + Selling Expenses + Administrative Expenses + Financial Expenses

Table 4. China Southern Airlines Profitability Indicators, 2019–2024 (Unit: RMB billion)

Year	Gross Profit Margin %	Net Profit Margin %	Cost-to-Revenue Ratio %
2019	17.8	2.0%	2.9%
2020	-6.7%	-12.8%	-10.4%
2021	-7.2%	-11.9%	-9.8%
2022	-9.8%	-37.5%	-28.0%
2023	10.7%	-3.0%	-2.4%
2024E	17.7%	3.5%	4.5%

(1) Gross Profit Margin Analysis

Reflects the direct profitability of core operations. China Southern Airlines' gross profit margin was 17.8% in 2019. Affected by factors such as the pandemic, it turned negative from 2020 to 2022, rebounded to 10.7% in 2023, and is projected to reach 17.7% in 2024 (Table 4). This trend reflects the interplay between costs and revenues across different periods. During the pandemic, revenues plummeted significantly. While costs were managed to some extent, they could not offset the revenue decline, resulting in negative gross profit margins. As the market recovered, revenues grew, and the effects of cost control gradually materialized, leading to a rebound in gross profit margins.

(2) Net Profit Margin Analysis

This metric comprehensively reflects the company's overall profitability. China Southern Airlines recorded a net profit margin of 2.0% in 2019. From 2020 to 2022, with net profits remaining negative, the net profit margin also turned negative, reaching -3.0% in 2023. The projected net profit margin for 2024E is 3.5%. Fluctuations in the net profit margin are closely tied to the company's cost and expense management, market conditions, and revenue performance. During the pandemic, while costs and expenses were reduced, the decline in revenue was more significant, resulting in negative net profit. From 2023 onwards, as the market recovers and revenue grows, the effectiveness of cost and expense control will gradually manifest, with the net profit margin expected to turn positive and improve(Oum&Yu,2012).

Taking the fluctuation in 2022 financial indicators as an example: China Southern Airlines' net profit margin plummeted to -37.5% in 2022, a 52-percentage-point decline from 2021. This change was closely tied to a significant deterioration in cost structure:

Jet fuel costs surged from 22% of total costs in 2021 to 32% in 2022, a 10-percentage-point increase, directly driving the unit revenue cost ratio up to 110% (from 88% in 2021). Passenger revenue declined by 25% due to pandemic restrictions, while fixed costs (such as aircraft depreciation and airport lease fees) remained rigid expenditures accounting for 45% of total costs, further squeezing profit margins.

Linkage analysis indicates that every 1 percentage point increase in jet fuel costs reduces net profit margin by approximately 3.7 percentage points. Constructing a cost-revenue sensitivity model quantifies the impact weight of different factors on profits, enabling prioritization for cost control.

(3) Cost-to-Revenue Ratio Analysis

Measures the efficiency of converting cost inputs into profits. China Southern Airlines' cost-to-profit ratio was 2.9% in 2019, negative from 2020 to 2022, -2.4% in 2023, and is projected at 4.5% for 2024E. This metric indicates that during the pandemic, while total costs and expenses fluctuated, total profits were more significantly impacted by revenue fluctuations, resulting in negative cost-to-revenue ratios. As operational conditions improved, the efficiency of cost and expense inputs gradually increased, leading to progressively positive cost-to-revenue ratios.

4. Comparative Analysis of Peer Companies

4.1. Core Financial Metrics Comparison

This table 5 indicates that Spring Airlines' low-cost model demonstrates strong resilience against risks.Fundamentally, the gap in cost efficiency and profitability comes from business model-driven cost structures between Full-Service Carriers (FSCs) and Low-Cost Carriers (LCCs). China Southern, as a major FSC, adopts a hub-and-spoke network with large hub airports, which brings higher fixed costs for hub operation, terminal services, and connecting flights. Spring Airlines, as an LCC, uses point-to-point routes and prefers secondary airports with lower

charges, and provides no-frills services to reduce cost rigidity. These differences in network design and airport choice are the root causes of the cost gap.As its simplified business model and highly standardized operations make it more resilient during industry downturns (O'Connell & Williams, 2019).

Table 5. 2019-2023 Average (Unit: RMB billion)

Indicator	China Southern Airlines	Air China	China Eastern	Spring Airlines	Jiaxing Airlines	Industry Average
Revenue	1156.8	1089.5	1012.7	104.3	98.6	692.4
Cost of sales	1115.6	1033.2	963.4	89.2	85.3	657.3
Net Profit	-115.2	-126.8	-145.3	-2.1	-18.6	-81.6
Gross Profit Margin	6.8%	5.2%	4.9%	14.5%	13.5%	5.6%
Net Profit Margin	-3.4%	-4.1%	-5.0%	-2.0%	-3.8%	-4.2%
Cost-to-Revenue Ratio	-2.9%	-3.7%	-4.3%	1.2%	-2.4%	-3.6%

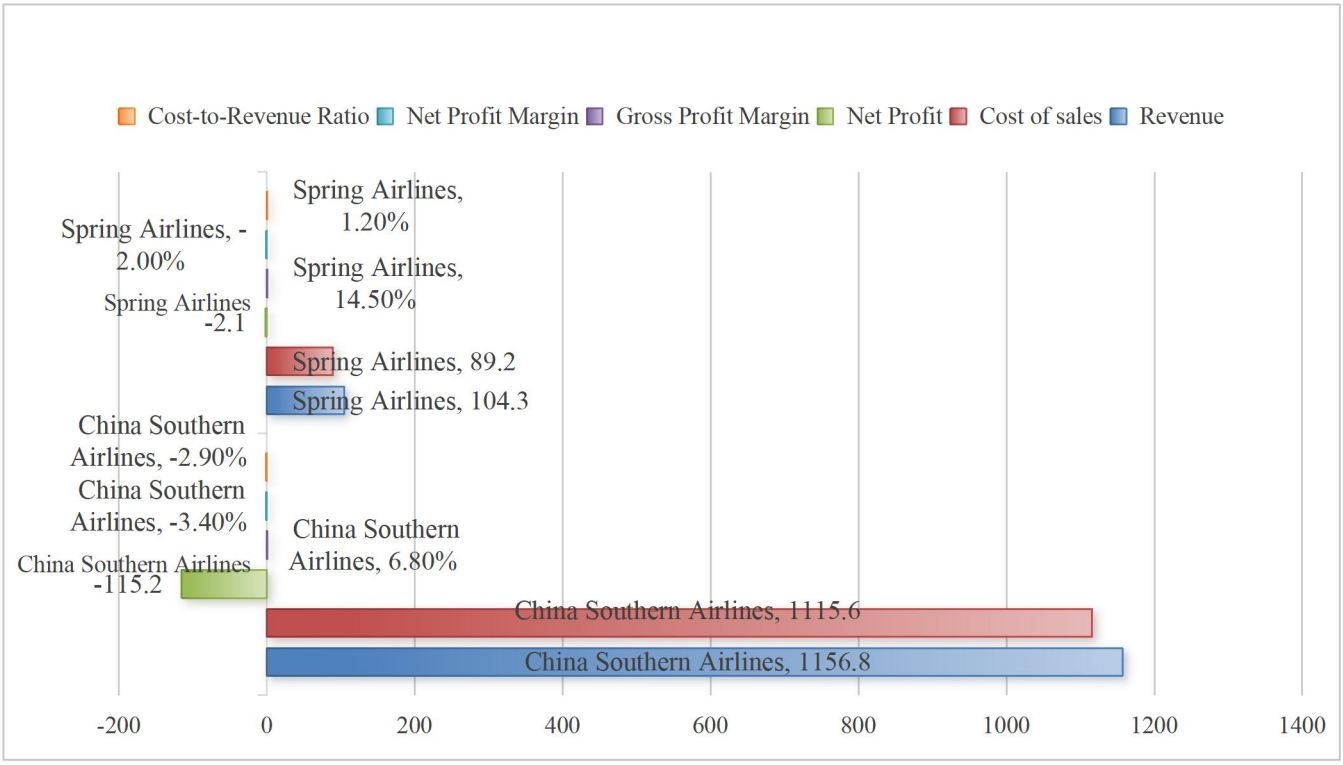

Figure 1. Line Chart of Cost-to-Revenue Ratios for China Southern Airlines and Spring Airlines, 2019-2023

(1) Comparison of Operating Revenue and Operating Costs

The 2019-2023 average figures 1 show China Southern Airlines' operating revenue at 115.68 billion yuan, higher than traditional carriers like Air China (108.95 billion yuan) and China Eastern Airlines (101.27 billion yuan), but lower than low-cost carriers such as Spring Airlines (due to differing business models and route networks). Regarding operating costs, China Southern's costs of RMB 111.56 billion align with its revenue scale. Air China and China Eastern also incurred high operating costs, while low-cost carriers like Spring Airlines maintained lower costs (RMB 8.92 billion). This reflects differences in business scale and cost structures among airlines. As a traditional full-service carrier, China Southern operates at a large scale with a correspondingly high cost base.

(2) Comparison of Net Profit and Profitability Metrics

China Southern Airlines recorded an average annual net loss of RMB 11.52 billion from 2019 to 2023. Traditional carriers like Air China and China Eastern Airlines also remained unprofitable, while Spring Airlines posted a smaller net loss of RMB 210 million. CSN's gross profit margin was 6.8%, outperforming Air China (5.2%) and China Eastern (4.9%) but trailing Spring Airlines (14.5%) and Juneyao Airlines (13.5%). Its net profit margin was -3.4%, better than China Eastern (-5.0%) but lower than Spring Airlines (-2.0%). China Southern Airlines' cost-to-revenue ratio was -2.9%, outperforming China Eastern Airlines (-4.3%) but trailing Spring Airlines (1.2%). This indicates that while China Southern demonstrates relative strength in cost control compared to traditional carriers, it lags behind low-cost airlines in profitability metrics, reflecting inherent differences between full-service and low-cost models in cost management and earnings capacity(Gillen&Morrison,2003).

4.2. Cost Structure Comparison

(1) Analysis of Table 6

Aviation fuel costs: China Southern Airlines has the best fuel efficiency (5% lower fuel consumption per ASK).

Depreciation and leasing: China Southern has a higher proportion of wide-body aircraft (18% vs. Spring Airlines' 0%) (Table 6).

Table 6. Cost Item Share Differences Among Peers (Unit: RMB billion)

Cost Item	China Southern Airlines	Air China	China Eastern Airlines	Spring Airlines
Aviation Fuel Costs	28.6%	30.1%	29.8%	32.4%
Depreciation and Leasing	35.2%	33.5%	34.7%	25.8%
Labor Costs	18.4%	19.2%	20.5%	15.6%
Landing and takeoff fees	12.7%	11.4%	10.9%	18.2%

Labor costs: State-owned enterprise staffing structure results in 30% higher per-capita costs

Landing/takeoff fees: Spring Airlines utilizes secondary airports more frequently (higher fees but lower fares)

(2) Structural Issues: Fixed Cost Lock-in Effect and Fuel Hedging Differences

Fixed Cost Lock-in Effect: Depreciation + labor costs account for 53.6% of China Southern's expenses, compared to 41.4% for Spring Airlines.Such a high fixed cost ratio is not merely a sign of inefficiency, but a necessary outcome of its FSC business model: hub-and-spoke network, high wide-body aircraft ratio (18%), full-service guarantee, and global route layout. These fixed costs are difficult to reduce during the pandemic, exacerbating losses when load factors fall below 70%. China Southern's high proportion of wide-body aircraft and rigid labor costs as a state-owned enterprise result in a larger fixed cost share. This limits cost control flexibility during low market demand, increasing loss risks.

Differences in Aviation Fuel Hedging:In terms of risk management theory, a fixed-ratio static hedging strategy is applicable to stable oil price environments but lacks flexibility in volatile markets, while a layered dynamic hedging strategy conforms to contingent risk control theory and shows better effectiveness when oil prices fluctuate sharply.Air China recorded RMB 1.2 billion in hedging gains in 2023, while China Southern incurred a RMB 500 million loss due to differing layered hedging strategies (China Southern employs a fixed-ratio approach). Aviation fuel hedging is a critical tool for airlines to manage fuel cost volatility risks. Effective management of financial instruments and aircraft financing strategies are key aspects of airline cost control (Morrell, 2013). China Southern's hedging strategy choices diverge from those of Air China and others, impacting fuel cost control effectiveness and highlighting room for improvement in its cost risk management.

4.3. Operational Efficiency Benchmarking

(1) Load Factor: Enhancing Capacity Resource Utilization Efficiency

Load factor reflects the actual utilization of aircraft seats. China Southern Airlines' load factor of 71.3% is higher than Air China's (68.9%), but 13.9 percentage points lower than Spring Airlines' (85.2%) (Table 7). Spring Airlines maintains consistently high load factors by precisely matching market demand through its "low-cost + high-density route" model. China Southern Airlines must optimize route pricing and marketing: First, segment route markets by introducing "peak-offseason variable fares" on popular tourist routes,which requires a deep understanding of passenger choice behavior (Garrow, 2016) — lowering prices during offseason to attract passengers while precisely targeting high-demand groups during peak seasons. Such dynamic pricing strategies have been proven effective in boosting load factors and total revenue (Tretheway & Andriulaitis, 2010). Second, strengthen connecting flight products by creating "domestic + international" and "mainline + feeder" connecting flight packages. This richer product portfolio will boost load factor, enabling each seat to generate more revenue.

Table 7. Comparison of Key Operational Metrics (Unit: % / CNY / hours / ratio)

Indicator	China Southern Airlines	Air China	Spring Airlines	Difference (China Southern - Spring Airlines)
Load Factor	71.3%	68.9%	85.2%	-13.9%
Unit ASK Cost (CNY)	0.38	0.41	0.31	+22%
Flight Day Utilization Rate (hours)	8.1	7.8	10.4	-2.3
Crew-to-Aircraft Ratio	1:120	1:115	1:90	+30%

(2) Unit ASK Cost: Reducing Per-Seat Capacity Cost

Unit ASK (Available Seat Kilometers) cost measures expenditure per seat kilometer provided. China Southern Airlines' cost is RMB 0.38, lower than Air China (RMB 0.41) but 22% higher than Spring Airlines (RMB 0.31). Spring Airlines significantly reduces unit costs through "single aircraft type (A320 series) + simplified service." China Southern Airlines can optimize in two areas: First, fleet standardization by gradually increasing the proportion of narrow-body aircraft to reduce maintenance, training, and operational costs associated with fleet complexity. Second, streamlining service processes by implementing a "self-service check-in + basic service" model on select short-haul routes to decrease service-related cost investments, thereby aligning unit ASK costs closer to Spring Airlines' levels.

(3) Daily Flight Utilization: Extending Effective Aircraft Operating Time

Daily flight utilization reflects actual flight hours per day. China Southern's rate of 8.1 hours exceeds Air China's (7.8 hours) but lags behind Spring Airlines' (10.4 hours) by 2.3 hours. Spring Airlines maximizes aircraft utilization through "dense scheduling + short turnaround times," enabling aircraft to "fly more and rest less." China Southern Airlines must optimize flight scheduling: First, implement "chain-flight operations" — e.g., operating the "Guangzhou-Shanghai" trunk route in the morning followed by the "Shanghai-Hangzhou" feeder route in the afternoon to boost daily utilization. Second, compress turnaround times using digital tools (electronic manifests, intelligent fueling systems) to further reduce turnaround durations below industry averages, enabling aircraft to generate greater operational value within a single day.

(4) Crew-to-Aircraft Ratio: Optimizing Labor Efficiency

The man-to-aircraft ratio reflects the personnel required to support aircraft operations. China Southern's ratio of 1:120 exceeds that of Air China (1:115) and Spring Airlines (1:90), indicating greater staffing requirements for fleet operations. Spring Airlines has significantly streamlined staffing through "multi-role crew members + digital substitution." China Southern Airlines must

advance "role consolidation + intelligent operations": train crew members in basic maintenance skills to reduce ground maintenance personnel; introduce aircraft health management systems that use AI-powered fault alerts to replace manual inspections. This will gradually lower the man-to-aircraft ratio, enabling efficient fleet operations with fewer personnel.

By benchmarking and optimizing operational efficiency metrics, China Southern Airlines can systematically enhance operational efficiency across dimensions such as capacity utilization, cost control, and workforce allocation. This will solidify the foundation for cost and expense management, granting greater initiative in aviation market competition.

5. China Southern Airlines Cost Control Optimization Strategy and Improvement Recommendations

5.1. Fixed Cost Ratio Optimization: Reducing Rigid Cost Pressure

China Southern Airlines' fixed cost ratio stands at 53.6%, exceeding Spring Airlines' ratio (41.4%) by 12.2 percentage points. This high proportion limits cost control flexibility during market demand fluctuations (Table 8).

Table 8. Summary of CHN's Cost Control Weaknesses (Unit: %/hour)

Dimension	Current Status at China Southern Airlines	Spring Airlines Benchmark	Improvement Potential
Fixed Cost Ratio	53.6%	41.4%	Reduce by a few percentage points
Selling Expense Ratio	7.2%	4.1%	Reduce agency commissions
Daily aircraft utilization rate	8.1 hours	10.4 hours	Increase narrow-body aircraft utilization to 9.5 hours

Fleet Structure Adjustment: Reorganize wide-body and narrow-body aircraft routes. Gradually replace wide-body aircraft on domestic short-haul routes with stable passenger volumes to reduce the proportion of high depreciation and maintenance costs associated with wide-body aircraft. Simultaneously, optimize aircraft leasing strategies by flexibly adopting short-term leases, wet leases (including crew leasing), and other methods based on seasonal demand fluctuations to reduce long-term fixed leasing costs.

Labor Cost Flexibility:

(1) Application of Drone Inspection Technology

According to mature applications in civil aviation maintenance (Balogh et al., 2020; Airline Maintenance, 2023), drone-based intelligent inspection has become a mature and cost-efficient technology. Drones are used for external aircraft inspections to replace manual checks. At China Southern Airlines' Guangzhou maintenance base, pilot projects demonstrate that drone

inspections reduce per-aircraft inspection time from 4 hours to 1.5 hours, cutting labor costs by 40%. Full implementation is projected to reduce annual maintenance labor costs by 8-10% (approximately RMB 400-500 million) while improving fault detection accuracy.

(2) Blockchain-Optimized Supply Chain Management

As verified in aviation logistics research (Tsang et al., 2021; ICAO, 2022), blockchain has reached mature application in aerospace supply chains. Establishing a blockchain platform to integrate aircraft parts procurement, inventory, and distribution processes enables real-time data sharing among suppliers, logistics companies, and airlines. By reducing redundant intermediate steps (e.g., shortening aircraft parts inventory turnover days from 35 to 20), this is projected to lower parts procurement costs by 5-7% and decrease capital occupation costs by approximately 300 million yuan annually.

(3) AI Dynamic Pricing System

Supported by mature airline revenue management literature (Chen & Gallego, 2022; Belobaba et al., 2015), AI dynamic pricing is a widely applied mature tool in civil aviation. AI algorithms analyze demand and adjust fares automatically. For example, dynamically increasing business class discount rates from 30% to 45% during off-peak seasons could boost seat occupancy by 8-10 percentage points, generating an estimated annual revenue increase of 500-800 million yuan.

5.2. Sales Expense Ratio Optimization: Reducing Agency Commission Dependency

China Southern's sales expense ratio of 7.2% exceeds Spring Airlines' 4.1%, with high ticket agency commission costs being the core pain point.

Deepening Direct Sales Channels: Upgrade the "China Southern App + Official Website" digital direct sales platform, launch member-exclusive discounts and double-points promotions to redirect passengers from agency channels to direct sales. For corporate clients, establish dedicated customer service teams, customize travel packages, secure long-term direct sales contracts, and gradually reduce agency commission expenditures.

Precision Marketing Substitution: Utilizing big data to analyze passenger profiles, deploying personalized "one-size-fits-one" targeted advertising — such as promoting premium cabin packages to business travelers and destination-linked discounts to leisure travelers. Reducing broad-based advertising spending, lowering sales expenses through precision marketing while improving conversion rates (Kumar & Reinartz, 2018).

5.3. Operational Efficiency Enhancement: Narrowing the Gap with Spring Airlines

China Southern Airlines' aircraft utilization rate stands at 8.1 hours per day, 2.3 hours lower than Spring Airlines (10.4 hours). Its crew-to-aircraft ratio of 1:120 exceeds Spring Airlines' 1:90, with this operational efficiency gap significantly impacting cost allocation.

Boosting Daily Aircraft Utilization: Optimize flight scheduling by adopting a "string-flying + night-flight" model—operating popular trunk routes during daytime while deploying aircraft for cargo and charter missions at night. Simultaneously, reduce aircraft turnaround time by

implementing digital support systems (e.g., electronic manifests, intelligent refueling) to achieve industry-leading turnaround efficiency, enabling aircraft to "fly more, stop less."

Optimizing Crew-to-Aircraft Ratio: Advance the "multi-role crew + intelligent maintenance" model by training flight crews in basic maintenance skills to reduce ground maintenance personnel. Implement an Aircraft Health Management System for real-time fault alerts, lowering manual inspection costs. Through process and technological enhancements, gradually align with Spring Airlines' crew-to-aircraft ratio to support fleet operations with fewer personnel.

Through these strategies, China Southern Airlines can address cost control weaknesses by precisely targeting fixed cost reduction, sales expense optimization, and operational efficiency improvements. This will gradually narrow the gap with low-cost airline benchmarks and establish a more competitive cost management system.

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