

調査報告

Geographical Advantages of Okinawa as the Center of East Asian Logistic Service: a Case Study of Air Freight Operations by All Nippon Airways at Naha Airport

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東アジア物流サービス拠点としての沖縄の地理的優位性 —那覇空港における全日空（ANA）の航空貨物事業を事例として—

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Abstract

Over the past several years, All Nippon Airways (ANA) has developed and significantly expanded its air cargo service network to convert Okinawa's Naha Airport into a center for international distribution in East and Southeast Asia. This paper attempts to examine the impact of ANA's distribution network on the East and Southeast Asian trade. Additionally, this paper will present a detailed analysis of the geographical advantages of Naha Airport as the center of a regional distribution network. This paper demonstrated the positive results of ANA's introduction of the hub and spoke distribution system in the Naha Airport. It showed that Okinawa's geographical advantages will accelerate the speed with which East and Southeast Asian countries can connect to each other for trade. Furthermore, the faster delivery flow by ANA has contributed to an expanded regional market especially for the exportation of Japanese perishable goods into the region. This research also suggests that ANA's hub and spoke system at the Naha Airport has proven how vital Okinawa's centralized location is to the cargo distribution systems of the East and Southeast Asia regions.

Keywords: air cargo service, international distribution networks, ANA, Naha Airport, geographical advantages

要 旨

2009年以降、全日空（ANA）は沖縄の那覇空港を東アジアおよび東南アジア地域の国際物流拠点にすべく、航空貨物サービスのネットワークを創設し大きく発展させてきた。本稿は、那覇空港を拠点とした全日空物流ネットワークが東アジアや東南アジア地域の貿易に及ぼす影響を考察している。那覇空港での全日空によるハブ・アンド・スポーク物流システムの導入が地域貿易にとってプラスの効果をもたらしたことを明らかにし、沖縄の地理的優位性が東アジアおよび東南アジア諸国が貿易でつながるスピードを加速させたことを論証している。さらに、那覇空港を拠点にした全日空の迅速な貨物配達は地域の物流市場の拡大、特に、日本の生鮮食品のアジア地域への輸出の増加に貢献した。本稿はまた、那覇空港で展開している全日空のハブ・アンド・スポーク物流システムが、東アジアおよび東南アジア地域の貨物物流システムにおける沖縄の地理的優位性を実証したことを検証している。

キーワード：航空貨物事業、国際物流ネットワーク、全日空、那覇空港、地理的優位性

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INTRODUCTION

In October 2009, All Nippon Airways (ANA), introduced a new business model for cargo air shipping in East and Southeast Asia, following the model set by the FedEx Corporation, an American company specializing in global delivery services. The key features of the new business model included overnight delivery and a hub and spoke distribution systems at Naha Airport. The airport is located in a key regional location where airlines can deliver cargo to a number of major Asian cities in less than four hours. The geographical advantages of a shortened delivery time are coupled with improved operational efficiency in the collection and dispersal of cargo. Products arriving from major Asian airports at night are readily available for delivery the following morning. The efficiency of this distribution system has helped contribute to an increase in the amount of international cargo at Naha Airport by 79 times (Japan Customs 2014). Additionally, ANA freight operations and transportation costs decreased in East and Southeast Asia (Okinawa Prefectural Government 2014).

The data presented in this article is from primary and secondary sources; particularly, documents and statistics from local and federal government agencies. In addition, we have recently collected information from interviews and fieldwork conducted at ANA Cargo Operations in Naha Airport. The data collected will be the primary source of information in this study while secondary data will complement our research by providing added empirical information.

In order to analyze the ANA international cargo business systematically, this paper is divided into four sections. The first section explains the “hub and spoke distribution system” of ANA’s cargo operations. The second section describes the ANA cargo business model and the advantages of the strategic location of Okinawa as a center for international air freight operations in the region. The third section provides a chronological examination of the perishable foods logistics network after ANA’s partnership with a land transportation company. The fourth section looks at recent improvements and current issues that ANA is facing and future developments.

1. HUB AND SPOKE DISTRIBUTION SYSTEM

In order to thoroughly examine the processes involved in the ANA hub project, an understanding of key aspects of the hub and spoke distribution system is essential. This section will provide a brief explanation and a general overview of the hub and spoke distribution system.

It is important to investigate ANA’s overnight delivery system and aspects of the hub and spoke distribution business model which take advantage of Okinawa’s geographical location. The hub and spoke distribution system involves placing the bulk of cargo in a centralized location, typically at a main airport (hub) and eventually transporting the cargo to outlying airports on the spokes. This distribution system is named after a bicycle wheel which has a strong central hub with a series of connecting spokes. In 1955, Delta Air Lines launched the hub and spoke distribution system. Then in 1978, aviation deregulations were established which allowed for major airlines to build hub and spoke distribution systems.

Although hub and spoke distributions are considered highly efficient systems for airport networks, there are several weaknesses that need to be pointed out. The most prevalent weakness of hub and spoke distribution involves the issue of risk management. For instance, this system is particularly vulnerable to terrorist attacks and natural disasters, such as typhoons or earthquakes. Impairment of a hub airport location could severely disable the entire distribution network (Hoshino 2012).

Despite these weaknesses, currently, a number of international cargo companies such as UPS and DHL, as well as a host of shipping and trucking companies around the world, are located near airport hubs. These transportation companies recognize the importance of being located near the central distribution network system. For instance, United Airlines, an American airline company, and Deutsche Lufthansa AG, a German carrier, have their hubs in Chicago and Frankfurt, respectively (Hoshino 2012).

The magnitude of operations in one of the world’s largest and most efficient cargo distribution systems may be seen in FedEx’s SuperHub at the

Memphis International Airport in the U.S. state of Tennessee. Each weeknight, approximately 150 to 200 airplanes land and unload cargo. The unloading of cargo typically takes less than half an hour, with aircraft taking off and landing every 90 seconds. The hub has its heaviest traffic between 11:00 p.m. and 4:00 a.m. The FedEx SuperHub processes an estimated 1.2 million to 1.6 million packages a night (Rayport 2010).

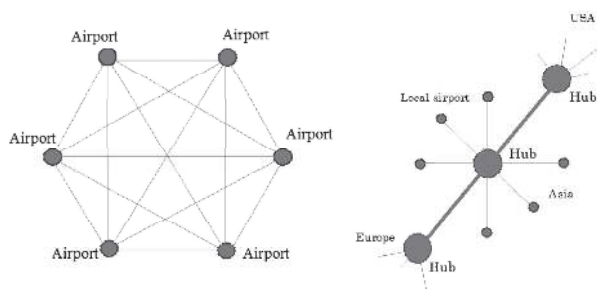


Diagram 1: Point-to-Point Transit System (left) and Hub and Spoke Distribution System (right)
(Source: Hanaoka, 2011, p. 1.)

The advantages of the “hub and spoke distribution system” become clear if we compare it with the “point-to-point transit system.” As seen above (Diagram 1), the point-to-point transit system needs fifteen lines (nodes) to distribute cargo when there are six airports. In contrast, the hub and spoke distribution system can connect to six airports using only six lines/nodes via hub airports. This reorganized structure can significantly reduce fuel costs and time. Additionally, this structure allows airlines to utilize aircraft transportation lines more efficiently (Hanaoka 2011). Furthermore, since all cargo airplanes use the hub airport at least once a day, airline companies can concentrate their limited investment funding solely on that airport (Hoshino 2012). In the next section, we will discuss aspects of ANA’s hub and spoke distribution system and Naha Airport.

2. ANA CARGO BUSINESS AND GEOGRAPHICAL ADVANTAGES OF OKINAWA

Thanks to Naha Airport’s extensive network of domestic flights, which in fact is the second largest in Japan after Tokyo’s Haneda Airport, ANA launched a new business company called ANA

Cargo, Inc., in April 2014. The start of this new cargo business at Naha Airport was largely a result of collaboration between ANA and the Okinawan prefectural government, which strongly aimed at development of Okinawan economy by connecting it to the rapidly expanding East Asian market (Interview with Nakamoto and Azama 2014). ANA Cargo determined that the geographical advantages of Okinawa merited an investment in locating its central freight business at Naha Airport, and it immediately adopted the hub and spoke distribution system. This section will present further details of the ANA Cargo operations and discuss the geographical advantages of Okinawa.

As the East and Southeast Asian region experiences significant economic growth over the last few decades, the geographical advantages of Okinawa in the region have been reasserted. Okinawa is located at the center of East and Southeast Asia, connecting it easily to a market of more than 2 billion people, including 1.3 billion Chinese, 600 million people from ASEAN countries, and 130 million Japanese. Naha Airport can promptly transport cargo to fourteen major cities in the region within a four-hours, thereby shortening lead times to other airports; hence, significantly decreasing costs (Interview with Nakamoto 2014; Okinawa Prefectural Government 2013). According to Konishi, a researcher at Kyoto University, reduction in operation costs enables the cargo industries to expand their markets (Konishi 2014).

Currently, Naha Airport is connected to nine major Japanese airports, including Haneda, Narita, Kansai and Nagoya as well as eight cities overseas, including Seoul, Qingdao, Shanghai, Guangzhou, Hong Kong, Bangkok, Singapore and Taiwan (Ministry of Land, Infrastructure, Transport and Tourism 2013; Okinawa Prefectural Government 2009). Therefore, Naha Airport is arguably the best location for a centralized distribution hub in East and Southeast Asia. It is also noteworthy that the Okinawa prefectural government is building “a new logistics center” in the international industrial clusters in the area surrounding Naha Airport, which will be operated in 2015. In addition, tax to be paid by international cargo planes using Naha Airport was significantly decreased in 2010 as one of the means to develop Okinawan economy. These two developments

further enhanced the geographical advantage of Naha Airport as a hub.

When ANA started the international cargo hub project in 2009, Naha Airport built cargo storage facilities measuring 27,700 m², designed to house both international and domestic cargo. This storage facilities, which are the largest in Japan, enables efficient and smooth customs processing and can load and unload cargos more than ten airplanes directly around the clock (All Nippon Airways 2013).

In addition, ANA Cargo developed a hub and spoke distribution system similar to FedEx's SuperHub in the United States. The most important aspect of this system is that it operates around-the-clock with cargo services working exclusively at night and continuing during the day alongside passenger airline flights. ANA Cargo airplanes often depart from major East Asian cities before midnight and arrive at Naha Airport late at night. Then, the re-departed airplanes arrive at the final destinations in Japan or in the East and Southeast Asian region between 5:00 a.m. and 8:00 a.m. ANA has continued to expand its cargo network by building an increasing number of physical distribution centers.

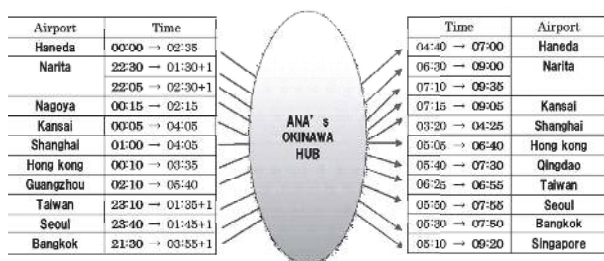


Diagram 2: The Time Schedule of ANA's Hub and Spoke Distribution System in Okinawa
(Source: ANA Cargo Freighter Schedule 2014)

Observations of the ANA Cargo system provided a great deal of insight into the distribution and trade network on both the domestic and international scale. According to statistics provided by the Naha Airport Branch of Customs, the total amount of cargo transported through Naha Airport in 2013 totaled 147,945 tons. The amount of cargo loaded consisted of 71,017 tons (Naha Airport Branch, Japan Customs 2014). After the initiation of the ANA Cargo project in 2009, there has been a substantial increase in the amount of freight transported.

Regarding international cargo, similar figures were seen after the introduction of the ANA Cargo system. For instance, the amount of international cargo in 2008 was 1,809 tons. In 2011, a total of 143,683 tons were transported (Naha Airport Branch, Japan Customs 2014). This is an increase of 79 times that of pre-2008 figures. These statistics demonstrate the substantial impact that the ANA Cargo system has had on distribution and trade in Okinawa (see Tables 1 and 2).

Table 1: Amount of Freight Transported Through Naha Airport

(Ton)			
Year	Total amount	Cargo loaded	Cargo unloaded
2008	935	18	917
2013	147,945	71,017	76,928

(Source: Naha Airport Branch, Japan Customs, 2014)

Table 2: Amount of International Cargo at Naha Airport
(Ton)

Year	The amount of international cargo
2008	1,809
2011	143,683

(Source: Naha Airport Branch, Japan Customs, 2014)

The statistical data above illustrates the increase in the amount of freight transported through Naha Airport after the introduction of ANA Cargo's hub and spoke system. The geographical advantage of Naha's centralized regional location in East and Southeast Asia has also impacted this growth.

3. EFFECTS ON EAST AND SOUTHEAST ASIAN TRADE: A CASE STUDY OF PERISHABLE FOODS DISTRIBUTION

This section examines the improved efficiency of the hub and spoke system via Naha Airport. ANA's innovative distribution system has had a positive impact on East and Southeast Asian trade. The most noteworthy benefit is the availability of exporting and importing perishable foods between Asian countries, a direct result of the significant reduction in delivery time. Many Asian consumers now can order perishable foods from Japan and

elsewhere with next-day delivery. That was impossible before ANA introduced the hub and spoke system at Naha Airport. Three factors made this change possible. Firstly, as mentioned earlier, flights from Naha Airport can arrive at any major city in Asia within four hours. Secondly, ANA has an extensive network of flights that include 126 domestic and 62 international lines (All Nippon Airways 2013). Thirdly, Yamato Transport Co., a Japanese land transportation company, can deliver consumers Japanese perishable foods via their refrigeration delivery systems (see Diagram 3). Yamato was the first company to offer cool carrier service in Japan. When transporting perishable foods by aircraft, exclusive refrigerated containers are used. This service enables Yamato to control temperatures correctly so that perishable foods maintain freshness and flavor (Interviews with Nakamoto and Azama 2014).

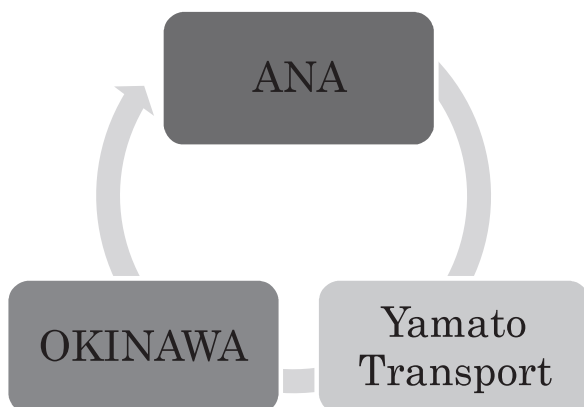


Diagram 3: ANA-Yamato-Okinawa Business Model
(Source: Interview with Masaaki Nakamoto 2014)

The distribution network between Japan and Hong Kong are provided in Diagram 4 as an example. Before Naha Airport adopted the hub and spoke system, it was impossible to export perishable foods to Hong Kong because it took three days for delivery. However, after ANA utilized the hub and spoke system at Naha Airport, consumers can get perishable foods, at least within a day. ANA Cargo operates non-stop and when items arrive at midnight, departure will inevitably occur early in the morning. This helps reduce the time of transportation by two days, so it enables the exportation of the perishable foods. The steps of the distribution process are

presented in the flowchart below:

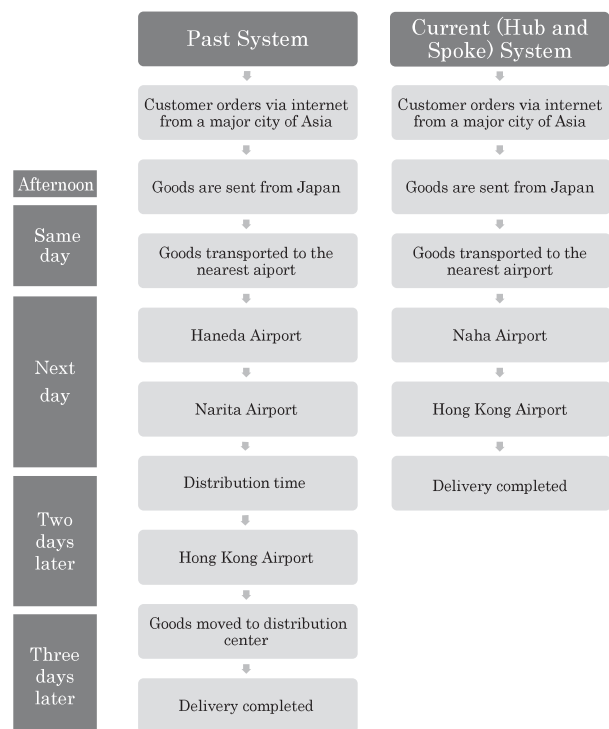


Diagram 4: Comparison of Past and Current Distribution Systems of ANA Cargo
(Source: All Nippon Airways, 2013)

According to Okinawa Regional Customs, exportation of perishable foods from Naha Airport has continued to increase since 2009, reaching a record high of 447 million yen in 2013 (Okinawa Regional Customs, 2013).

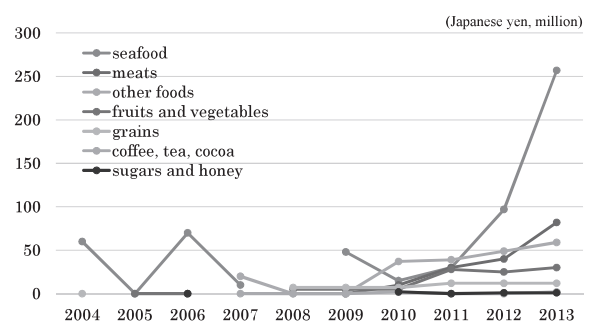


Diagram 5: The Value of Exportation Divided by Different Types of Food
(Source: Japan Customs, 2014)

As you can see in Table 3 below, the exportation of “fish and shellfish” and “various types of meat” has dramatically increased every year since 2011. In 2013, the export value of “fish and shellfish” reached 257 million yen. This was a record increase

with a jump of 42 times that of figures dating back to 2007. In addition, the export value of “various types of meat” has also increased significantly every year from 2008 onward. In 2013, “various types of meat” were listed at 82 million yen, an increase of 56 times that of 2008 estimates (Okinawa Regional Customs 2013).

Table 3: Exportation of Perishable Foods from Naha Airport
(Japanese yen, million)

Year	Food and Animals	Fish and Shellfish	Various Types of Meat
2007	1,862	6,160	—
2008	919	—	1,463
2013	44,660	25,749	82,400

(Source: Japan Customs, 2014)

Improved time efficiency in ANA’s cargo distribution systems has led to the creation of a new industry in international perishable food transportation in the East and Southeast Asia region. The emergence of this new industry amid ANA’s distribution services has had a positive economic effect on the perishable foods industry in general. Although these developments are encouraging, there remain some challenges for the distribution systems in dealing with this rapid growth. It is also noteworthy that many Japanese companies are benefited by importing various industrial parts for domestic consumption from parts manufacturers around the East and Southeast Asian region. ANA’s cargo operations at Naha Airport enabled these companies to import industrial parts more timely according to domestic demands.

4. ANA CARGO AND NAHA AIRPORT’S FUTURE VISION

In this section, the focus is on ways to improve the efficiency of ANA’s cargo operations in Naha Airport. Since the inception of ANA’s hub and spoke distribution system, Naha Airport has become the third largest airport in Japan in terms of the amount of freight shipped (The Cabinet Office 2012). ANA has continued to develop its system of operations in order to provide better services and establish Naha Airport as one of the prime hub airports in Asia-

Pacific trade.

Despite the progress thus far, the executive director of ANA cargo operations, Seiji Tonomachi says that there is room for improvement in ANA’s operations and Naha Airport in general; specifically, changes are needed in regard to handling cargo volume, interoperability, and efficiency (All Nippon Airways 2013). For instance, interoperability could be improved with additional runways and airplane parking areas (Okinawa General Bureau, 2008). This could further develop efficiency and increase operational capability at the airport. Additional changes that could improve the efficiency of operations include upgrading computer systems, for instance, by integrating existing systems with table devices such as smart phones or iPads (Tonomoto, 2011). Increasing the number of cargo planes would also be needed to handle a growing distribution network. Actually, ANA Cargo already has a plan to increase the number of cargo planes from ten to twelve in the near future (Interviews with Nakamoto and Azama 2014). Moreover, the company also has a plan to develop new markets by connecting Naha Airport with both Hanoi and Ho Chi Minh City (Interview with Nakamoto 2014).

However, a current weakness of Naha Airport is that its runway capacity is not large enough. Thus, building an additional runway is necessary to expand ANA’s cargo operation at Naha Airport in the future. Actually, the Naha airport runway expansion project already started in January 2014 and the construction is expected to finish by 2019, enabling ANA to use it by March 2020 (Ministry of Land, Infrastructure, Transport and Tourism, 2014). Recently, the Japanese government promised to provide about 200 billion yen for the runway construction to develop Okinawan economy (Ministry of Land, Infrastructure, Transport and Tourism, 2014). According to statistics given by Cabinet Office, the number of planes landing and taking off at Naha Airport is estimated to increase from 135,000 to 185,000 per year after the construction of a new runway (Cabinet Office 2012). The increase would certainly contribute to the development of Okinawa in general and ANA cargo business at Naha Airport in particular.

CONCLUSION

This paper demonstrated the positive results of ANA's introduction of the hub and spoke distribution system in the Naha Airport. It showed that Okinawa's geographical advantages will accelerate the speed with which East and Southeast Asian countries can connect to each other for trade. Furthermore, the faster delivery flow has contributed to an expanded market especially for the exportation of Japanese perishable goods. This research also suggests that ANA's hub and spoke system at the Naha Airport has proven how vital Okinawa's centralized location is to the cargo distribution systems of the East and Southeast Asia regions.

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