

Chartering vs. Commercial Air-Freight from UNHRD Subang in Response to Disaster in Southeast Asia

By: Song Yang

Thesis Advisor: Dr. Ioannis N. Lagoudis

Summary: A natural disaster is a major adverse event resulting from natural processes of the Earth; examples include floods, volcanic eruptions, earthquakes, tsunamis, and other geologic processes. The complex natural disaster is always accompanied by the enormous effect on large number of people, buildings and infrastructures. Disasters are unpredictable, and there is no regular pattern for the number of disasters occurred every year. The uncertainty and the unpredictability of disaster relief demand create constraints on the availability of resources the NGOs have on hand. To deliver the relief items to beneficiaries, presently the WFP uses two channels to deliver goods during an emergency, which are chartered flights and commercial flights. The WFP needs to determine the cost effectiveness and service levels for each of the two channels. This paper will study the factors that WFP concerns the most on the decision making process, and to understand the selection criteria and processes of choosing between chartered and commercial flights under different scenarios in responding to emergencies.

Key Insights

1. The demand pattern of relief items in different regions varies because of the variable conditions caused by different type of disasters. The pre-positioning strategy is indeed determined by those variable conditions.
2. Regardless of the uncertainty and vary situations, the evaluation process of choosing between chartered flight and commercial flight will always focus on three key factors, cost, time and capacity.
3. Chartered flights are preferred in most cases for big volumes of cargo. Commercial flights are preferred in the situations of small volumes of cargo since the cost is much cheaper compared to chartered flights.
4. Both methods of air transportation have advantages and disadvantages. No method can be completely replaced. Chartered and commercial flights perfectly complement each other in this region.

Introduction

In the World Disaster Report 2012 published by International Federation of Red Cross (IFRC), and according to the Centre for

Research on the Epidemiology of Disasters (CRED), 336 natural disasters were reported worldwide in 2011. The number of natural disasters is the lowest of the decade and is 15% below its decade's average.

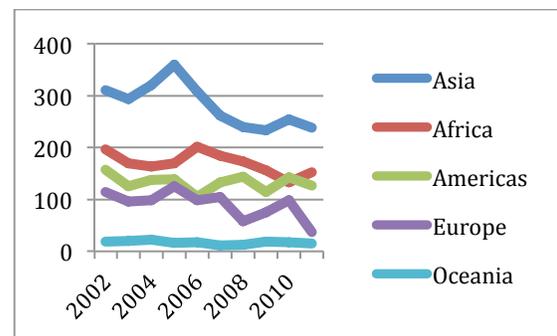


Figure 1, Total number of reported disasters, by continent

The dark blue line represents the disasters happened in Asia, around 250 to 350 reported disasters each year, which is way above other continents from 2002 to 2011. In Asia, different disasters have different degree of damage. Figure 2 shows almost 50% of the total population been affected are caused by floods in Asia.

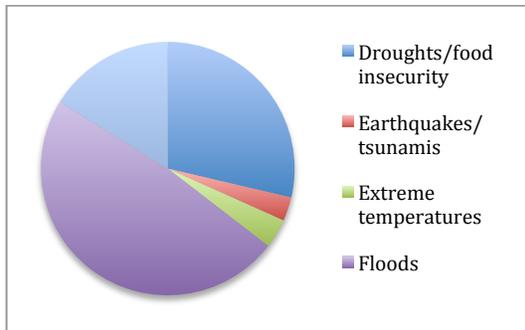


Figure 2, total number of people reported affected, by type of disaster in Asia from 2002 to 2011

The uncertainty and the unpredictability of disaster relief demand create constraints on the availability of resources the NGOs have on hand. To deliver the relief items to beneficiaries, presently the WFP uses two channels to deliver goods during an emergency, which are chartered flights and commercial flights. WFP needs to determine the cost effectiveness and service levels for each of the two channels.

Case Studies

When there is a food crisis or disaster, about half of the relief supplies distributed by WFP is sourced directly within the region or country where the demand comes from. The other half is sourced internationally. In order to provide a rapid response to emergencies, the key element in this response is the WFP-managed network of United Nations Humanitarian Response Depots (UNHRD). These are logistics hubs strategically located near disaster-prone areas across the world, where emergency supplies are stored in readiness. This paper mainly focuses on the disaster in Southeast Asia region and UNHRD Subang is the depot located in Southeast Asia. In UNHRD Subang, over 60% of the total value of relief items are the items for operational supplies. The decision of choosing inventory category matched the demand pattern of disasters relief items. Over 50% of the people affected are due to floods. People affected are homeless and a temporary shelter is really the most valuable item for them before they rebuild their

homes. Another reason is due to climate condition in Southeast Asia. The climate in this region is humid and hot, therefore the demand for blankets is not as critical as in other regions with colder temperatures. The demand pattern in different regions varies because of the variable conditions caused by different type of disasters. The pre-positioning strategy is indeed determined by those variable conditions.

In the Japan earthquake 2011, WFP supplied 265 metric tons of relief items with approximate total cargo value of 3 million USD. Among the 265 metric tons of relief items, the most demanded items are Prefab Unit and Wiikhalls (alumina structure), as well as other operational supplies. WFP chose commercial cargo flight which direct connected KUL and NRT and the duration is around 6 hours. The fleet is B747-400F that has more than 100mt capacity. Due to the high frequent direct flight route from KUL to NRT, low cost per kg compared to chartered flight, and more than enough flight capacity, choosing commercial flight is the optimal solution for the disaster relief operations in Japan.

In the Philippines tropical storm Shanshan, WFP dispatched 65 metric tons of relief items, which were owned by the four users and had already been pre-positioned in the UNHRD facility in Subang. The destination airport is DVO, which is a small airport with a single 3000 meters runway. The DVO airport only has two scheduled international destinations and none of them are in Malaysia. Commercial flight has maximum load was less than 5 metric tons at the route KUL to DVO, and only one or two flights operating every week. Therefore WFP might need more than 10 flights to delivery everything. The dispatch plan would last more than two months. Chartered flight is the only feasible choice. Among a few options of chartered flight with different type of fleet and cost, WFP evaluate the trade off of cost and lead-time between IL76 and B727/B737, WFP finally chose B727/B747 for the relief operations.

Simulation

The next part of the work is to develop the simulation model. In the problem faced by WFP, the trade off between chartered flight and commercial flight is not easy to evaluate, since uncertainty, ambiguity, and variability of the unpredicted situations are part of the equation. In order to help WFP to find a better way to determine, this paper uses Monte Carlo simulation as the methodology. In this paper, Monte Carlo method simulated different levels of cargo volumes to test the effect on cost and lead time of both charter flights and commercial flights in different countries in Southeast Asia. After few assumptions are made, the key equations of the analyses are as below,

Chartered flight cost = number of flights * cost of each aircraft per flight

Commercial flight cost = total volume * rate per kg

Number of flights = total volume / capacity of each aircraft

Lead time for chartered flight = number of flights * 1 day

Lead time for direct commercial flight = number of flights * 1 day

Lead time for transit commercial flight = number of flights * 5 days

This simulation gives a basic idea about how different levels of cargo volumes will have different costs and lead times under different transportation methods and assists the decision making process on how to calculate the cost and lead time based on the volume. The brief result shows that for big volumes of cargo, chartered flight is a better choice since less flight is needed, and lead time is short. For small volumes or when the destination airport is connected with origin

airport with direct flight service, commercial flight is better since the cost is less and lead time is also short.

Conclusion

The decision made by WFP may not be the optimal one, since the uncertainty of the ongoing situation and budget constraints along with the time pressure push WFP to make a fast decision. In most cases, the situation after a disaster is really crucial given the 72 hours window. But regardless of the uncertainty and vary situations, the evaluation process will always focus on three key factors, cost, time and capacity. Money is the foundation of humanitarian aid, time is crucial for saving life, and capacity ensures the successful delivery.

The simulation results determine the ideal solutions based on different level of relief items demanded. Chartered flights are preferred in most cases for big volumes of cargo, since they offer higher reliability, and shorter lead-time. Commercial flights are preferred in the situations of small volumes of cargo since the cost is much cheaper compared to chartered flights. The fixed high frequency of the flight schedule can contribute significantly to the lead-time only if the destination is in a major city with direct flight service from KUL.

Both methods of air transportation have advantages and disadvantages. No method can be completely replaced. Chartered and commercial flights perfectly complement each other in this region. Although sometimes it is impossible to make the optimal solution, according to Mr. Kazuhiko Yamazaki, who in charge the logistics operation in UNHRD Subang, "Saving life and helping people is the aim of what we are doing here, sometimes we might not choose the optimal solution with the cheapest cost and shortest lead time. Time is critical and it never gives us enough time to find the optimal solution. Our job is just finding the best solution we have now, and just do it."