

Optimizing Humanitarian Relief Operations with Transloads

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Author Note: Kevin Guadagno, Kevin Saval, Quinn Van Drew and Sophia Vasiliadis are class of 2015 graduates of the United States Air Force Academy. Philip Cho and Jesse Pietz are operations research faculty members at the United States Air Force Academy. This work is a result of a year-long operations research capstone project partnering with Headquarters Air Mobility Command Directorate of Analyses, Assessments, and Lessons Learned.

Abstract: The 2010 earthquake in Haiti caused nearly 112,000 fatalities making it one of the deadliest natural disasters ever recorded in the western hemisphere. In the weeks following the disaster, the United States Air Force Air Mobility Command moved over 29,000 passengers and 18,000 tons of relief aid in support of the relief effort, Operation Unified Response. During the first 96 hours of the operation 59% of aircraft transporting relief aid to Haiti arrived late. In order to assist planners in responding to future disaster relief efforts, we introduce a mixed integer programming (MIP) model that reduces the time required to deliver available relief aid into Haiti. The aircraft routing schedule outputted by the model demonstrates that our optimized airlift network increases the amount of relief aid delivered in the first 96 hours of the operation. Due to issues with the tractability of the MIP, we introduce an aircraft routing heuristic for use in real-world humanitarian relief operations. We show that our heuristic is able to produce similar results to the optimization, provides greater flexibility to account for realistic planning considerations, and solves within seconds.

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