# Application of Computer Load Optimization Model in an Aircraft Load Planning Process

A

**Yelyzaveta Sahun**
https://orcid.org/0000-0003-4837-4688
*Flight Academy of National Aviation University, Ukraine*

**Yuliya Sikirda**
https://orcid.org/0000-0002-7303-0441
*Flight Academy of the National Aviation University, Ukraine*

**Oleksandr Tymochko**
*Flight Academy of National Aviation University, Ukraine*

## INTRODUCTION

Ground handling of aircraft is one of the key elements of ensuring the safety and regularity of air transportation. Ground handling covers all types of services that provide aircraft on the ground (aerodrome/platform). The flight ground handling process is an important part of milestone events for airport collaborative decision-making. (Li et al., 2022). One of the main challenges in air cargo transportation is how to assign cargo in an aircraft without exceeding safety constraints and including profit aspects. Changes in the aircraft ground handling process should focus on the positions of ground handling equipment before the arrival of the aircraft, the deployment of staff, routes of ground handling equipment, and others. (Szabo et al., 2021)

Therefore, challenging work planning must be done on every flight. Loading an aircraft is an extremely complex process in the face of many variable aspects that determine the planning of each flight separately.

Thus, the need to increase the efficiency of air transportation and at the same time maintain flight safety by fulfilling the requirements for the alignment and balancing of aircraft determines the need of developing a planning model for optimizing the loading of cargo ramp aircraft in a multi-leg route.

A virtual computer load planning model enables personnel who are responsible for flight planning to make faster decisions and predict the additional load on other sections of the route.

The successful application of the model in the operating activities of the airline contributes to improving the efficiency and safety of ground handling services. This contributes to the intensification of the use of the aircraft fleet by increasing the speed of commercial cargo handling.

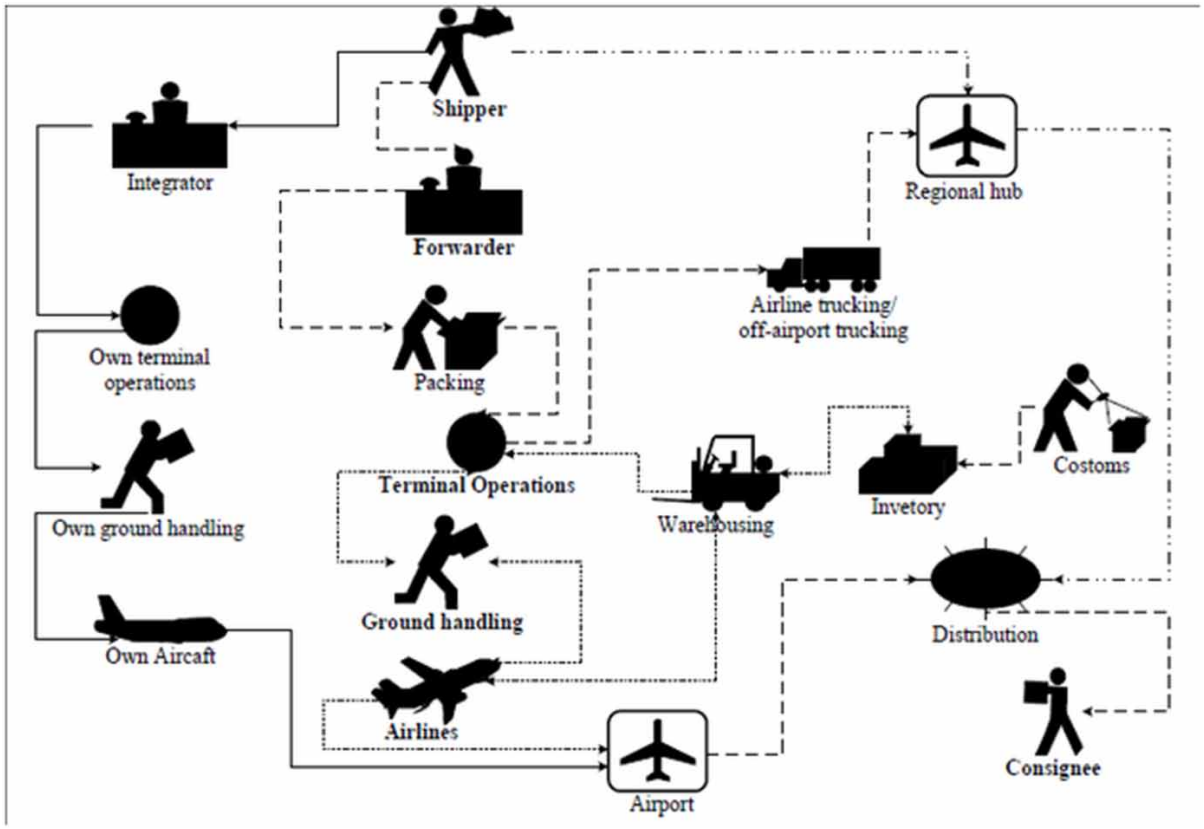
In the future, the computer model can serve as the basis for a rule-based expert system to prevent the reloading of containers on intermediate sections of the route.

DOI: 10.4018/978-1-6684-7366-5.ch012

## Peculiarities of the Loading Process

Air cargo transport provides a range of services from point to point and also midpoints to move cargo with a help of a *shipper*, a *forwarder*, a *truck transport* (road feeder service), an *airline* (or carrier), and a *consignee*. The shippers' main goal is to send products/items to any place in the world with the lowest price and with a required service level. The forwarder plays a role of a link between the shipper and the career. The road feeder provides ground transportation service before and after the air flight. The airline provides a chain of services such as receiving, storage, transfer, loading and unloading cargo, assignment, and managing the compartment's capacity. The consignee gets the shipment. Figure 1 shows the process chain of the air cargo operations.

*Figure 1. Air cargo operations technological chain (Sahun, 2020)*




Sabine Limbourg (Limbourg, Schyns, Laporte, 2011), defines a ULD as an assembly of components consisting of a container or of a pallet covered with a net, whose purpose is to provide standardized size units for individual pieces of baggage or cargo for rapid loading and unloading. The aircraft loading process of them can differ and depends on the ULD's content and quantity. Inside the boxes are stacked and united in such a way as to avoid the instability and fragility of the cargo items. Weight constraints inside the ULD allow loading it in an appropriate way (Mongeau & Bes, 2003; Souffriau, Demeester, Berghe, & De Causmaecker, 2008). Inside the aircraft, the ULDs are placed in designated loading positions and locked into position by latches on the floor. As the aircraft fuselage has a near-circular