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CONCEPT OF AIR CARGO SYSTEM OPERATION AND WAYS OF ITS INSPECTION AND SAFETY PROVISION

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У статті сформульовано концепцію системи управління авіаційним вантажем. Розглянуто процедури контролю та перевірки на безпеку при обробці авіаційного вантажу. Детальним дослідженням доведено важливість установки пристроїв контролю у вантажному комплексі аеропорту як основного чинника забезпечення безпеки.

Ключові слова: авіаційний вантаж, контроль, безпека, ризики безпеки, програма із забезпечення безпеки.

In this article the notion of air cargo system operation is being studied. Also there are considered such procedures of air cargo processing as inspection and security. The detailed research proofed the significance of inspection devices installation in the air cargo complex as the main factor in security maintenance.

Key words: air cargo, inspection, safety, security risks, security program.

Introduction

The air cargo system is a complex, multi-faceted network responsible for moving a vast amount of freight, express packages, and mail carried aboard passenger and all-cargo aircraft. The air cargo system consists of a large, complex distribution network linking manufacturers and shippers to freight forwarders, to airport sorting and cargo handling facilities where shipments are loaded and unloaded from aircraft. Business and consumer demand for fast, efficient shipment of goods has fueled the rapid growth of the air cargo industry over the past 25 years.

It is estimated that air cargo shipments, expressed in terms of revenue ton mileage (RTMs), will increase by 50 % domestically, and by 110 % internationally by Financial Year 2016 compared to Financial Year 2003 levels. Also, cargo shipments by air comprise a significant percent of the total value of cargo shipments [1].

When most people use shipping companies, they assume that their next day or two-day package is rushed to the airport immediately to hop onto the next flight. Only a small percent of packages actually make it onto an airplane. An even smaller amount is placed on a passenger-carrying plane.

For any business, the "killers" are usually time and distance (either of which equals money). Parts, supplies and materials need air cargo transport to get to the business, and finished products need to leave and get to customers. But the most significant factor is the security of cargo delivery.

Air freight transportation can do a lot to solve the supply chain problem, and there are more air freight options than ever for any kind of business. Air freight and air cargo are generally the same thing — an airline that does logistics either exclusively or in conjunction with a passenger business, an air courier, or an air cargo company that operates only cargo planes.

Nearly every passenger airline has an air cargo company division in nowadays (extra baggage room means more money) and there are hundreds of air cargo companies as well. Booking common carrier shipping space is first a matter of finding a company going an appropriate route, then getting bids.

Due to the partnership with the greatest airlines, every logistic company should be ready to satisfy the strictest requirements of the clients on the organization of routes for freight air transportations, and to offer the most advantageous tariffs to their clients.

The selection of partners is based on the detailed study of each airline: its experience of work, park of aircrafts, the quality of which is a direct criterion of transportation safety. As it is known, the transport for air transportation has different characteristics. The key characteristics are the maximal loading, the maximal volume, the dimensions of the freight compartment, the dimension of the freight hatch. Limitations and possible prohibitions exist in certain countries of the world. From the totality of these indices, subsequently the final offer for the client is prepared. The aircraft have different payload. As a rule, the airlines have their own park of aircraft.

Fully computerized network also plays a big role in cargo handling service. Nowadays it is possible to save more money and time due to using of systems which can help in capacity and productive work of cargo complex.

Problem statement

There are a lot of basic requirements which are to be implemented in the every logistic company like: comfortable offices and warehouse facilities; automated/semi-automated/mechanized freezing, cold and warm storage facilities; ramp handling equipment for all types of aircraft; modern, sophisticated stackers; distribution center (to the most popular destinations); professionally trained staff and the last but maybe the most important factor in terms of current situation – transportation security.

As for ramp and cargo handling, there should be such services as loading and unloading of all types of aircraft; short cargo unloading time, allowing clients to enjoy prompt and efficient service; full range of services, including documentation, customs, cold storage, phytosanitary control, build-up, storage, tie-down and more. Land transportation – means of the most efficient cargo processing, like fleet of refrigerated trucks and general cargo trucking transportation services.

The air cargo system is vulnerable to several security threats including potential plots to place explosives aboard aircraft; illegal shipments of hazardous materials; criminal activities such as smuggling and theft; and potential hijackings and sabotage by persons with access to aircraft. Several procedural and technology initiative to enhance air cargo security and deter terrorist and criminal threats have been put in place or are under consideration. Procedural initiatives include industry-wide consolidation of the "known shipper" program; increased cargo inspections; increased physical security of air cargo facilities; increased oversight of air cargo operations; security training for cargo workers; and stricter controls over access to cargo aircraft and air cargo operations areas. Technology being considered to improve air cargo security includes tamper-resistant and tamper-evident packaging and containers; explosive detection systems (EDS) and other cargo screening technologies; blast-resistant cargo containers and aircraft hardening; and biometric systems for worker identification and access control.

Since the series of terroristic attacks (e.g. September 11, 2001), a variety of air cargo security measures have been put in place or are under consideration. The purpose of these security measures is to mitigate: the risks associated with placing cargo on passenger and all-cargo aircraft; and the high level of access to aircraft during cargo operations.

Analysis of recent researches and publications

The problem of air transport security is being considered in the works of Jean-Paul Rodrigue, Claude Comtois, Brian Slack, Bart Elias, Gyrych V. Yu., Maria Buzdugan, etc. [1–6]. They are investigating the security in cargo transportation process but are not examining the possible ways of security inspection. The problem is being solved in terms of active ways of cargo screening and financial installations which also should be reasonable enough to produce a coordinated and harmonized process of cargo processing.

The aim of the research is investigating the concept of air cargo system operation and possible ways of air cargo inspection and safety assurance.

Air cargo security risks

Potential risks associated with air cargo security include introduction of explosive and incendiary devices in cargo placed aboard aircraft; shipment of undeclared or undetected hazardous materials aboard aircraft; cargo crime including theft and smuggling; and aircraft hijackings and sabotage by individuals with access to aircraft.

Undetected explosive or incendiary devices placed in air cargo are potential threats to aircraft. Air cargo may be a potential target for terrorists because screening and inspection of air cargo is currently not as extensive as required screening of passengers and checked baggage. Cargo carried aboard passenger aircraft may be at particular risk since passenger aircraft are generally regarded as highly attractive targets to terrorists and have been attacked in the past. It is considered that the likelihood of a terrorist bombing of a passenger airplane to be between 35 % and 65 % based on 2002 intelligence reports, and cargo is either likely to become, or already is, the primary aviation target for terrorists in the short term. However, other terrorism experts regard placing explosives in air cargo as less appealing to terrorists because typically a specific flight cannot be targeted without the assistance of an individual with access to aircraft. Furthermore, experts generally believe that all-cargo aircraft are less appealing targets to terrorists because an attack against an all-cargo aircraft is not likely to generate the degree of public and media attention that a bombing of a commercial passenger aircraft would have.

Despite increased oversight and enforcement efforts, undeclared and undetected shipments of hazardous materials continue to pose a significant safety problem for air carriers. Most explosives and

gases are prohibited aboard aircraft, however many properly handled hazardous materials are permitted aboard passenger and all-cargo aircraft within specified quantity limitations.

Risks are introduced when hazardous materials are not declared leading to the potential transport of prohibited materials by air or improper handling of hazardous goods during loading and while in transit.

While safety concerns regarding hazardous cargo shipments aboard passenger aircraft are of particular concern, preventing unauthorized shipments of hazardous materials is a challenge for all-cargo aircraft operators as well.

Screening and inspection of air cargo may be an effective means for detecting explosives, incendiary devices, and hazardous materials in air cargo. It is required to screen all the property, including mail and cargo, carried aboard passenger aircraft.

Current aviation security regulations require that each passenger aircraft operator and indirect air carrier develop a security program for acceptance and screening of cargo to prevent or deter the carriage of unauthorized explosives or incendiaries. However, the volume of air cargo handled and distributed nature of air cargo system presents significant challenges for screening and inspecting air cargo. Since many experts believe that 100 % screening of all air cargo is not a practical solution with currently available technology, security programs have relied on pre-screening of cargo to identify shipments for physical screening and inspection. The organization has adopted a risk based strategy that relies heavily on the vetting of shippers through a known shipper process and on screening shipments against databases of known shippers.

Air cargo inspection

Another issue for air cargo security is the adequacy of cargo inspection procedures and oversight of cargo inspections at air carrier and freight forwarder facilities. There have been established requirements for screening an inspection of all individuals, goods, property, vehicles, and other equipment entering a secured area of a passenger airport that assures the same level of protection as passenger and baggage screening.

Physical security of air cargo facilities

Air cargo facilities present unique challenges for physical security. The large physical size of these facilities and relatively continuous high-volume cargo operations introduce numerous individuals, vehicles, and shipments into secured access areas around aircraft [4; 5]. Key issues regarding physical security of these air cargo facilities include the adequacy of:

– inspections and oversight of air cargo facilities to ensure compliance with aviation security regulations and procedures established in the approved security programs of air carriers and freight forwarders;

– training for air cargo personnel with regard to security procedures and guidelines;

– access control requirements for personnel with access to air cargo facilities and aircraft.

Air cargo screening technology

Various technologies are available for detecting explosives, incendiary devices, and the presence of various chemical and biological agents and nuclear weapons in air cargo. Key technologies under consideration for screening air cargo for threat objects include X-ray screening, X-ray based explosive detection systems, chemical trace detection systems, and technologies based on neutron beams. In addition to these technological approaches, several experts and officials have been advocating and pursuing an increased use of canine teams for screening air cargo and mail. The main drawback to any of these screening techniques is that the screening process takes time and may significantly impact cargo delivery schedules. While the various technologies differ in their capabilities and performance, in general, more detailed screening analyses require more time and could affect cargo throughput. Another concern regarding these technologies is the cost associated with acquisition, operation, and maintenance of screening systems [3; 5].

Funding for air cargo security

The cost of air cargo security options is significant to both the government and the air cargo industry. Furthermore, the indirect costs of air cargo security on air cargo operations may pose significant long-term challenges. On the other hand, the potential costs of a terrorist attack, both in terms of the loss of life and property and the long term economic impacts may also be significant but are difficult to predict and quantify. An ongoing debate tied to air cargo appropriations and oversight of aviation security is the amount of physical screening and inspection of air cargo that is needed and achievable and whether risk-based pre-screening tools can provide an adequate means to ensure the security of air cargo by identifying risk cargo for targeted physical inspections. Besides the logistic complexities of inspecting large amounts or 100% of cargo on passenger flights, many are concerned that the cost of doing may outweigh the potential benefit given the capabilities of current screening systems and beliefs that comparable levels of security may

be achievable through risk-based targeting and selective screening of cargo shipments.

The implementation of air cargo security must be based on a partnership where each participant must bear its fair share of costs. Yet, the cost of implementing air cargo security measures can be quite onerous to both governments and the air cargo industry. One must also consider the indirect, long term costs of air cargo security on air cargo operations. However, the potential costs of a terrorist attack, both in terms of loss of life and property, could have a devastating economic and human impact that is impossible to predict and quantify.

To address concerns over funding security initiatives, some have suggested that a fee schedule be established to be charged to all shippers to cover costs associated with screening cargo, fee that would be similar to the security service fee imposed on airline passengers. Regardless of how such a fee is collected, i.e., either through fees assessed to air carriers or freight forwarders or through direct fees applied to each shipment, the cost will be borne by shippers and ultimately passed on to the users of their services. For air cargo of relatively high value, it is likely that the cost of a security fee in relation to the value of the shipment will be low which would minimize the economic impact of such a fee. Also, if such fees are imposed only in certain countries, there is a risk that increasing shipment costs would negatively affect the competitiveness of manufacturers and shippers using those air services.

Other Possible Implementation Challenges

The most challenging aspect of harmonizing international standards is to determine whether such international approaches are feasible in different country-settings. Lack of political will among governments to adopt comprehensive security measures or to place air cargo security sufficiently high on their domestic or international agenda will affect the process of adoption and implementation of adequate regulations.

In order to determine appropriate implementation mechanism, every country should designate the national authority in charge with air transport security. Such national authority would have then to conduct an inquiry to assess the security risks confronting aviation security in its region.

In response to the weaknesses identified during the security review, a security action plan will have to be prepared (including an emergency response plan) to address the security risks based on existing international standards. In addition, it is recommended that an annual review of the security plan is conducted.

Uniform international standards require uniform standard of implementation. In order to ensure a uniform implementation of measures, there is a need for mutual acceptance of data and a mutual recognition of authorizations or validations.

Conclusion

Current aviation security regulations require that each passenger aircraft operator and indirect air carrier develop a security program for acceptance and screening of air cargo to prevent or deter the carriage of unauthorized explosives or incendiaries. Since the ability to screen and inspect cargo may be limited by available technology, flight schedules, and cargo processing demands, alternative measures for screening and inspection at cargo handling facilities have been suggested.

REFERENCES

1. *Gyrych V. Yu.* Investigation of modern tendencies in designing of air cargo terminals in Ukrainians' airports / V. Yu. Gyrych // Політ–2009. Сучасні проблеми науки: IX міжнародна наук.-техн. конф. студ. та молод. учених, 8–10 квітня 2009 р. : тези доп. — К., 2009. — С. 327.

2. *Jean-Paul Rodrigue.* The Geography of Transport Systems / Jean-Paul Rodrigue, Claude Comtois, Brian Slack. — SECOND EDITION. — 2009. — New York, Routledge. — 352 pages.

3. *Bart Elias.* CRS Report for Congress / Air Cargo Security. — July 30, 2007. — 40 pages.

4. *Гирич В. Ю.* Особливості проектування систем зберігання вантажу вантажних комплексів аеропортів / В. Ю. Гирич // Авіа–2009: IX міжнар. наук.-техн. конф. студ. та молод. учених, 21–23 вересня 2009 р. — К., 2009. — Т. 3. — С. 19.12–19.15.

5. *Гирич В. Ю.* Аналіз досвіду проектування вантажних комплексів аеропортів СНД / В. Ю. Гирич // Будівництво України. — 2008. — № 8. — С. 15–18.

6. *Maria Buzdugan.* Current and emerging air cargo security and facilitation issues / Maria Buzdugan // Thesis submitted to McGill University, 2005. — 113 p.

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