ABSTRACT

The aim of the article is to analyse the possibilities of heavy and outsize air cargo transport in the field of humanitarian and medical services, as well as to identify factors influencing the organization and efficiency of the transport process during the COVID-19 pandemic. The research was conducted using qualitative methods. The period from 2019 to 2020 was subjected to a detailed analysis. As a part of the research procedure, process analysis was carried out using the method of case study.

The COVID-19 pandemic and related restrictions led to significant drop in transport demand. Air sector has been one of the first victim of new pandemic. Supply chain disruptions have become a major challenge for the global economy. Air cargo companies like Antonov Airlines play an active part in global response to the coronavirus delivering medical equipment and vaccines. The results of the study indicate that there was a visible increase in the number of heavy air cargo flights. Many civilian and military entities are involved in the organization of the transport process. The research results can be used to improve the organization of the air cargo transport process especially in the armed forces. The conducted research revealed several problems and challenges in the field of air cargo transport organization. According to the case studies presented despite of all steps taken by both military commands and civilian institutions there is a still room for improvements in the area of transport system optimizing. Detailed conclusions and comments contained in the article may be used to improve the applicable transport procedures.

Keywords:
Air transport, air cargo, logistics, COVID-19.
INTRODUCTION

Accounting for approximately 35% of global trade by value, the aviation sector plays a critical role in global economy. COVID-19 initially caused a 98% drop in global air travelers, and passenger aircraft ‘belly cargo’ capacity also became severely constricted due to the decline in overall flights.\(^1\) The new pandemic has caused a deep crisis for the world aviation industry. Multiple travel restrictions and regulations introduced by numerous governments affected global air traffic. Passenger airlines suffered the most, as they were forced to suspend flights and to ground their large fleet. The cancellation of 4.5 million flights across all regions reduced international belly cargo capacity significantly.\(^2\)

According to the Boeing World Air Cargo Forecast 2020-2039, in contrast to disrupted passenger markets, the higher-than-market-average growth seen in express markets over the last decade has increased during the COVID-19 pandemic.

E-commerce, which was growing at double-digit rates prior to the pandemic, has accelerated its impact on the air cargo market.\(^3\)

The COVID-19 pandemic required extraordinary countermeasures. One of them was conversion of aging passenger planes into a cargo carriers and giving them second life as a freighters. It requires approvals from the aircraft manufacturers and civil aviation authorities. Logistics giants in e-commerce like Amazon, are using the airline industry’s downturn to grow their fleets by acquiring passenger aircrafts at attractive prices.\(^4\) Another way to reduce losses is the use of widebody passenger aircrafts, to transport lightweight packages on cabin seats and in the bellyhold. One of the most important and problematic challenges was protection of the air crew, decontamination of aircraft and avoidance of crew rest in areas with high risk of infection. Air cargo plays a key role in the global distribution of COVID-19 vaccines.

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1. *Priority Brief Air Cargo* [online]. Available at: https://www.icao.int/sustainability/Documents/ICAO-PRIORITY-BRIEF_Air-Cargo_2021.04.19.FINAL.pdf [Access of the day 01 April 2022].
2. *Transporting vaccines by air* [online]. Available at: https://www.airlines.iata.org/analysis/transporting-vaccines-by-air?_ga=2.34719401.986648075.166673322-1992813130.1666733320 [Access of the day 02 September 2022].
3. *World Air Cargo Forecast 2020-2039* [online]. Available at: https://www.boeing.com/commercial/market/cargo-forecast [Access of the day 02 April 2022].
4. *The airline industry’s loss is Amazon’s gain as the e-commerce giant purchases 11 Boeing 767 airliners to use as cargo planes* [online]. Available at: https://www.businessinsider.com/amazon-makes-its-first-aircraft-purchase-for-11-boeing-767s-2021-1?IR=T [Access of the day 02 September 2022].
NATO REQUIREMENTS FOR OUTSIZE AND HEAVY AIR CARGO TRANSPORTATIONS ON THE EXAMPLE OF POLAND

The Polish Air Force fleet has only light transport aircrafts, which by NATO standards are categorised as tactical aircraft. Therefore, a reasonable need exists to acquire the lacking carriage capabilities through commercial solutions, and the country's participation in multinational initiatives and programmes run for a number of years by NATO and EU Member States to increase capabilities in this area. It is a priority airlift need to operate means of transport with a strategic range and able to carry oversized cargo, which by NATO standards exceed the loading capacity of the C-130 Hercules. Strategic deployment in the military terminology, refers to movement of troops and equipment over long distances (ca. 6,000 km from Brussels – in accordance with the concept of the use of NATO Response Force (NRF) and EU Battle Groups). An analysis of NATO air force assets shows that only very few nations other than the US and UK have their own limited strategic air transport capabilities. The others, including Poland, operate only tactical aircrafts which have technical and tactical parameters that are inadequate to the tasks they are in fact executing internationally, and do not provide for meeting their alliance obligations (short range, low loading capacity, low cruise speed, inability to carry most weapon and equipment types in service).

Table 1. Military air transport fleet classification

<table>
<thead>
<tr>
<th>Type of military air transport (depending on tasks)</th>
<th>Definition</th>
<th>Fleet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic</td>
<td>movements from the outside, or to the theatre of operations, or between theatres</td>
<td>C-5, C-17, AN-124, IL-76</td>
</tr>
<tr>
<td>Tactical</td>
<td>movements within an area of operations</td>
<td>C-130, C-295M, C-27J, C-160, Airbus A-400M</td>
</tr>
</tbody>
</table>

Source: own work by W. Biernikowicz on the basis on

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5 Oversized cargo: a. Large items of specific equipment such as a barge, side loading warping tug, causeway section, powered, or causeway section, nonpowered. Requires transport by sea. b. Air cargo exceeding the usable dimension of a 463L pallet loaded to the design height of 96 inches, but equal to or less than 1,000 inches in length, 117 inches in width, and 105 inches in height. This cargo is transportable on the C-5, C-17, C-141, C-130, and KC-10 and most civilian contract cargo carriers (Defence Transportation Regulation. Definition, DTR 4500.9-R, United States Transportation Command, 28 April 2022, p.43).

According to studies by the Joint Air Power Competence Centre (JAPCC), over 60% of military equipment in service with the NATO Response Force (NRF) cannot be carried on board C-130s, or C-160s due to its size or weight.  

The lack of capabilities, especially in the oversized cargo sector, can be complemented by resources offered by civilian carriers. Transport services in this area are offered by few airlines, particularly Russian and Ukrainian ones, which operate civilian fleets of AN-124 and IL-76 aircraft in various configurations optimal for special kinds of customers like armed forces. Summary of the largest AN-124 operators in various versions is shown in Table 2.

<table>
<thead>
<tr>
<th>Carrier</th>
<th>Country</th>
<th>Fleet</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volga Dnepr (VDA)</td>
<td>Russia</td>
<td>AN-124-100, AN-124-100M-150</td>
<td>12</td>
</tr>
<tr>
<td>TTF Air/224 FU</td>
<td>Russia</td>
<td>AN-124-100, AN-124</td>
<td>10</td>
</tr>
<tr>
<td>Polet Airlines (POT)*</td>
<td>Russia</td>
<td>AN-124-100</td>
<td>5</td>
</tr>
<tr>
<td>Antonov Airlines (ADB)**</td>
<td>Ukraine</td>
<td>AN-124-100, AN-124-100M-150, AN-225*</td>
<td>7+1</td>
</tr>
</tbody>
</table>

*bankruptcy in 2014 **AN-225 aircraft destroyed in Russia’s invasion of Ukraine in Kiev Gostomel

Source: own work by W. Biernikowicz on the basis on materials by Volga-Dnepr and Antonov Airlines

It is worth noting, that the AN-124/AN-225 is among very few designs around the world that offer a sufficient loading capacity to carry heavy military equipment including helicopters and tanks. Moreover, as a typical military design, because it was operated as such by the former USSR air force, the AN-124 is well suited to military transport operations (both nose and rear loading ramp, onboard cranes and winches, high wing design etc.), which is a great advantage over civilian freight aircraft, e.g. the B767-300F, when it comes to a possible deployment to "a primitive theatre of operations" where there is no well-developed aerodrome infrastructure. Following the disintegration of the USSR, some of them were purchased from the army, modernised and put into commercial use. The An-124-100 received civilian certificates in December 1992. The An-124-100M-150, with loading capacity increased to 150 t, improved avionics and longer range, was certified in 2007.

When analysing the AN-124’s transport advantages, one should also say that the aircraft’s loading ramps and on-board overhead cranes allow for loading

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7 C. Massai, Deploying the NRF-meeting the airlift challenge. JAPCC Journal, 2005, No.2,p.16.
8 Developed on the basis of references: [1], [6].
and unloading without any additional specialist loading equipment, like platform lifts, which reduces the turnaround time and cost at the destination aerodrome. The demand for services of this type is very high, especially for the so-called "government customers". Such types of aircrafts are self-sufficient in remote locations without infrastructure especially during humanitarian and military missions.

When assessing Poland’s current airlift capabilities, one can say that they allow the Polish Armed Forces to independently deploy a motorised battalion-size force, or an equivalent thereof. This calculation is based on coupling the potential held by the Air Force with the resources available through the Strategic Airlift International Solution (SALIS) and Strategic Airlift Capability (SAC) programmes.

According to many experts, transport services, particularly in the area of strategic movement, should not be outsourced due to the role this field plays in contemporary military operations. In keeping with the theory of outsourcing, core competencies should be handled only internally and with the use of own resources.

STRATEGIC AIRLIFT INTERNATIONAL SOLUTION (SALIS) PROGRAMME

Following the Prague Capability Commitment and Helsinki Headline Goals, NATO and EU signed a Memorandum of Understanding MoU on Strategic Air Lift (Interim Solution). The objective was to establish the means by which the participants intend to close the existing gap for strategic airlift for outsized cargo. Strategic Airlift Interim Solution (SALIS) – this agreement on acquisition of strategic airlift capabilities for NATO was signed on 23 January 2006 by 15 countries (Czech Republic, Denmark, Finland, France, Netherlands, Canada, Luxembourg, Germany, Norway, Poland, Portugal, Slovakia, Slovenia, Hungary, Great Britain) represented by the NATO Maintenance and Supply Agency (NAMSA), and RUSLAN SALIS GmbH, a joint venture of the Russian airline Volga-Dnepr and Ukrainian carrier Antonov Airlines. Under the agreement, NATO chartered six AN-124-100 Ruslan transport aircraft, two of which were stationed in Leipzig (full time charter - a total of 4,800 flying hours (FH) per year) on a 72 hours’ notice readiness to use, and the other four (two on a six days’ notice and two on a nine days’ notice to use) at the Kiev Operating Base in Ukraine, or in Ulianovsk, Russia. Additional costs included charges for activating further aircraft, preparation and maintenance of the required infrastructure and aircraft servicing. The cost of participation is based on the declared demand for flight hours reported
by individual member states to the NAMSA each year. The declared flight hours must be purchased.\(^9\)

Currently, the contract is administered by the NATO Support and Procurement Agency (NSPA), and its operation is managed by the the Strategic Air Lift Coordination Cell (SALCC) in Eindhoven, the Netherlands. The SALIS Steering Board, composed by representatives of all members is the highest directing body for all matters. Poland’s participation in the SALIS programme allows the Polish Armed Forces to make around 10 missions by AN 124-100 per year. A single AN-124-100 can transport up to 120 tons of cargo per flight. Membership in the programme is indefinite, and new members reduce the costs related the programme operation. Following the dissolution of the Ruslan International consortium, the programme was continued since January 2017 as the SALIS 2017-2019 under two parallel agreements signed between NATO and the respective operators: Volga-Dnepr and Antonov Airlines. In 2018, cooperation with Ruslan SALIS was terminated. The same year NSPA signed a new 3-year contract with the German-based Ukrainian company Antonov Logistics SALIS GMBH. On the basis of the contract, participants had access to AN-124-100, AN-225, AN-22 and IL-76 aircrafts.

The SALIS-contract consists of two fundamental parts. First, the assured access to strategic airlift capability for outsized cargo, and second the ownership and usage of participants agreed quota of FH per annum. The assured access guarantees the availability of two AN124-100 aircrafts under part-time charter, and the assured availability of up to five aircrafts on priority call for the rapid deployment of forces in support of NATO/EU operations.

Currently, a new 5-year contract \textit{SALIS 2022-2026} signed by NSPA with Antonov Logistics SALIS on 15 October 2021 is valid. The nine participating nations in the SALIS are Belgium, Czech Republic, Germany, France, Hungary, Norway, Poland, Slovakia, and Slovenia.\(^{10}\)

The share of hours contracted by SALIS members is presented in Tab 3.

\begin{table}[h]
\centering
\begin{tabular}{|l|c|c|c|c|c|c|}
\hline
\textbf{Nation} & \textbf{2022} & \textbf{2023} & \textbf{2024} & \textbf{2025} & \textbf{2026} & \textbf{2022-2026} \\
\hline
Belgium & 80 & 80 & 80 & 80 & 80 & 400 \\
Czech Republic & 45 & 45 & 45 & 45 & 45 & 225 \\
Germany & 830 & 830 & 830 & 830 & 830 & 4,150 \\
\hline
\end{tabular}
\caption{The share of Flying Hour contracted by SALIS 2022-2026 members}
\end{table}


\(^{10}\) Capability [online]. Available at: https://salcc.mcce-mil.org/capability [Access of the day 01 April 2022].
The war in Ukraine led to serious restrictions in air traffic, especially in relation to cargo carriers from Russia. Following the invasion, the European Union closed its airspace to all Russian airlines. The largest operator of the AN-124-100s in the world, Russian Volga Dnepr company is one of them.

Before the war part of ADB airlines’ fleet have been relocated to Leipzig/Halle Airport, Germany and continue to operate charter flights around the world. The rest have been destroyed during a Russian airstrike on Gostomel airport. The company confirmed the loss of several aircraft including AN-225 Mriya.

Prior to the invasion of Ukraine, Antonov Airlines operated a fleet of one AN-225 Mriya, seven AN-124-100 Ruslans, one AN-22 Antei, two AN-12s one AN-26, and one AN-74T.11

Ukraine is also demanding the handover of all Russian AN-124-100 aircraft, which have been detained at various airports following sanctions issued against Russia. One of the planes belonging to VDA company, was seized by Canadian authorities at the end of February while it was parked at Toronto’s Pearson Airport. It is known that this plane was carrying COVID-19 tests kits ordered by the Government of Canada and was detained as a protest against Russia’s military campaign against Ukraine.12

Due to the current situation in Ukraine and the uncertainty about the future, various scenarios regarding the functioning of SALIS are currently being considered in NATO. One possible solution is to build a new maintenance center which will be able to service all remaining AN-124-100 Ruslans, at the Leipzig Halle Airport.

<table>
<thead>
<tr>
<th></th>
<th>330</th>
<th>330</th>
<th>330</th>
<th>330</th>
<th>330</th>
<th>1,650</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>60</td>
</tr>
<tr>
<td>Norway</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>500</td>
</tr>
<tr>
<td><strong>Poland</strong></td>
<td>100</td>
<td>150</td>
<td>150</td>
<td>50</td>
<td>50</td>
<td>500</td>
</tr>
<tr>
<td>Slovakia</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>Slovenia</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,523</td>
<td>1,573</td>
<td>1,573</td>
<td>1,473</td>
<td>1,473</td>
<td>7,615</td>
</tr>
</tbody>
</table>

Source: own work by W. Biernikowicz on the basis on materials by Polish National Movement Co-ordination Centre PLNMCC

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11 Antonov Airlines updates on fleet as it gains access to Hostomel [online]. Available at: https://www.aircargonews.net/airlines/freighter-operator/antonov-airlines-updates-on-fleet-as-it-gains-access-to-hostomel [Access of the day 04 April 2022].
THE ROLE AND UTILIZATION OF SALIS PROGRAMME DURING COVID-19 PANDEMIC – THE CASE OF POLAND

As the COVID-19 pandemic turned into a global crisis situation, most NATO countries have looked to their national militaries to assist civilian efforts in such areas as emergency transport of supplies and personnel, border control, food and water distribution, public space disinfection, lockdown enforcement. The North Atlantic Council activated the Rapid Air Mobility Initiative on 31 March 2020 for the first time to support Allied military aircraft carrying supplies and personnel critical to the fight against COVID-19.13

NATO’s Rapid Air Mobility initiative has facilitated the delivery of medical supplies and (PPE) to and from several countries, including the United Kingdom, Turkey, the United States, and Italy. To deliver aid to wherever it is needed quickly, Supreme Allied Commander Europe (SACEUR) has managed through this initiative – in close cooperation with EUROCONTROL to reduce the time it takes for flights to be cleared by air traffic control. To facilitate flight plans, air traffic control now uses a dedicated NATO call sign for relief flights. This step ensures faster travel time and was made possible through coordination with EUROCONTROL.14

Since the beginning of the COVID-19 pandemic, SALIS has played an important role in providing urgent medical supplies and equipment to the member countries. Five NATO nations have used their AN-124-100 flying hours to airlift personal protective equipment (PPE) including surgical masks, goggles, face shields, isolation gowns, gloves and tests for a total of 17 missions moving more than 950 tonnes of medical supplies.15

According to Mr Franck Verdierre, NSPA Head of Transportation & Warehousing SALIS has demonstrated to be a successful multinational programme, assuring access to unique airlifting capabilities to the nine nations in crisis time. During the pandemic, the majority of our SALIS customers have used their flying hours to deliver the required medical cargo and protect their population in

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13 The role of NATO’s armed forces in the COVID-19 pandemic [online]. Available at: https://www.nato-pa.int/download-file?filename=sites/default/files/2020-06/091%20DSC%2020%20%20-%20COVID-19%20SPECIAL%20REPORT_1.pdf [Access of the day 05 April 2022].
15 NSPA Response to the COVID-19 Pandemic [online]. Available at: https://www.nspa.nato.int/covid19/ [Access of the day 07 April 2022].
this difficult time. The crews have flown a total of 468 hours in support to the nations.\textsuperscript{16}

During the period from March 19, 2019 to June 03, 2019 a total of 964 tons of medical supplies were transported for Germany, France, Poland, Czech Republic, and Slovakia (see Fig. 1).

![Fig. 1. The total number of Anti COVID-19 operations used by SALIS members in 2020 by nation (mission number, cargo)](image)

Source: own work by W. Biernikowicz on the basis on materials by Movement Coordination Centre in Europe (MCCE)

Thanks to the assured access to the AN-124-100 aircraft, the Polish side quickly organized five missions to request the Material Reserves Agency delivering urgent medical equipment from Shanghai and Tianjin to Poland. In total, over 308 tons of medical supplies were transported. Poland used a total of 131 hours of flying hours for the amount of approximately EUR 4.8 million.

A detailed analysis of medical flights is presented in the table below.

<table>
<thead>
<tr>
<th>MISSION</th>
<th>DATA</th>
<th>FROM</th>
<th>TO</th>
<th>CARGO [t]</th>
<th>FH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>07-09.04.2020</td>
<td>SHANGHAI</td>
<td>WROCLAW</td>
<td>50,111</td>
<td>28:10</td>
</tr>
<tr>
<td>2</td>
<td>14-17.04.2020</td>
<td>SHANGHAI</td>
<td>WROCLAW</td>
<td>72,797</td>
<td>27:26</td>
</tr>
<tr>
<td>3</td>
<td>08-11.05.2020</td>
<td>TIJANJIN</td>
<td>WROCLAW</td>
<td>55,855</td>
<td>23:48</td>
</tr>
</tbody>
</table>

\textsuperscript{16} Strategic Airlift International Solution (SALIS): A key capability during the COVID-19 crisis and beyond [online]. Available at: https://www.nspa.nato.int/news/2020/SALIS-Key-capability-covid-19 [Access of the day 07 April 2022].
Requested by the Polish Ministry of National Defence (MoD) at that time Ukrainian An-124-100 heavy transport aircrafts delivered to Poland surgical masks, face shields, a mask-making machines, protective clothing and medical gloves for frontline healthcare personnel.

CONCLUSIONS

The analyses carried out by the authors and the synthesis of a number of conclusions contained in numerous studies included in the literature on the subject indicate that the functioning of heavy air cargo market during the pandemic was influenced by a number of factors, which include:

- disruptions in the global supply chain,
- dynamic development of e-commerce,
- capacity challenges,
- geopolitical uncertainty,
- rising fuel prices.

The results obtained in the process of research authorize the authors to draw a few the following conclusions of a general nature.

The SALIS programme has proved its enormous role during the COVID-19 pandemic by providing access to critical resources in a very short time. As a result of COVID-19 outbreaks the container shipping industry has been hit with container terminal shutdowns. China’s strict "zero Covid" policy has disrupted global supply chains.

Disruptions in maritime transport have increased the demand for air transport especially in the area of e-commerce and medical aid. Aircraft generally offer not only the fastest, but also the most secure way to move sensitive cargo including vaccines.

Air cargo demand has led airliners to the conversion of many passenger planes into temporary cargo planes “preighters”. As a result of passenger to freight conversion (P2F) the number of freighters is still increasing.

The air transport market in the oversized cargo segment has for many years been dominated by Russian and Ukrainian carriers. Volga Dnepr and ADB are the top two operators of AN-124-100 freighters.

The war in Ukraine has led to a fall in cargo capacity especially in Europe. So far all EU member states and many others including the United States, U.K.
and Canada have banned Russian aircraft from entering their territory and in response Russia has banned all flights from these countries from entering its airspace. Due to the sanctions, there is also a lack of capacity on Russian airlines, which mainly offer charters with oversized transport sector. Volga Dnepr has the largest AN-124 fleet in the world, consisting of 12 aircraft.

Demand for the AN-124 is still very high among cargo airliners. The loss of the many aircraft including AN-225 Mriya and grounding all Russian AN-124 fleet have negative impact on space and energetic sector.

The airspace and landing restrictions have led many commercial airlines to rerouting flight paths, what is costly (fuel use) and time consuming.

At the same time, the authors would like to mention that the oversized air cargo market is a very extensive research area, while the publishing framework limits the scope of this study only to selected and most important issues. The adopted limitations allowed to achieve the assumed goal, while indicating the directions of further research.

REFERENCES

[1] Antonov Airlines updates on fleet as it gains access to Hostomel [online]. Available at: https://www.aircargonews.net/airlines/freighter-operator/antonov-airlines-updates-on-fleet-as-it-gains-access-to-hostomel [Access of the day 04 April 2022].

[2] Antonov Airlines no other name carries more weight, [online]. Available at: https://antonov.com/en/airlines, [Access of the day 06 April 2022].


[10] NSPA Response to the COVID-19 Pandemic [online]. Available at: https://www.nspa.nato.int/covid19/ [Access of the day 07 April 2022].


[13] The airline industry’s loss is Amazon’s gain as the e-commerce giant purchases 11 Boeing 767 airliners to use as cargo planes [online]. Available at: https://www.businessinsider.com/amazon-makes-its-first-aircraft-purchase-for-11-boeing-767s-2021-1?IR=T [Access of the day 02 September 2022].


ROLA OPERATORÓW CIĘŻKIEGO TRANSPORTU LOTNICZEGO PODCZAS EPIDEMII COVID-19 NA PRZYKŁADZIE PROGRAMU STRATEGIC AIRLIFT INTERNATIONAL SOLUTION (SALIS)

STRESZCZENIE


Firmy zajmujące się ponadgabarytowym transportem lotniczym, takie jak Antonov Airlines, odgrywają aktywną rolę w minimalizowaniu skutków koronawirusa, dostarczając sprzęt medyczny i szczepionki. Wyniki przeprowadzonych badań w analizowanym okresie wskazują, że nastąpił wyraźny wzrost liczby przewozów ładunków lotniczych. W analizację procesu transportowego zaangażowanych jest wiele podmiotów cywilnych i wojskowych. Wyniki badań mogą być wykorzystane do usprawnienia organizacji procesu transportu lotniczego ładunków, zwłaszcza w silach zbrojnych. Przeprowadzone badania ujawniły szereg problemów i wyzwań w zakresie organizacji lotniczych przewozów towarowych.

Jak wynika z przedstawionych wyników badań, pomimo działań podejmowanych zarówno przez dowództwa wojskowe, jak i instytucje cywilne, wciąż istnieje pole do usprawnień w zakresie optymalizacji systemu transportowego w odniesieniu do sytuacji kryzysowych. Szczegółowe wnioski i uwagi zawarte w artykule mogą posłużyć do usprawnienia obowiązujących procedur transportowych.