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**Integration of high-speed rail baggage traffic in relation to the Central Communication Port**

**Abstract:** The 2024 SITA Baggage IT Insights report highlights advancements and persistent challenges in baggage handling within the aviation industry. Despite a drop in mishandled bags from 7.6 to 6.9 per 1,000 passengers in 2023, the increasing number of passengers translates to approximately 40 million mishandled bags in 2024. Delayed bags constitute 77% of these, with transfer bags being the primary type affected, especially with the rise in long-haul flights. Automation efforts, including self-service bag drop technologies and IATA Resolution 753 for luggage tracking, are helping reduce mishandling, supported by RFID technology improvements.

Simultaneously, aviation faces pressure to reduce greenhouse gas emissions by 70% by 2050, as mandated by EU climate protection goals. Shifting short-haul traffic to rail is a strategic focus, with existing rail-airport integrations supporting this transition. Programs like “Check-in at the Train Station” in Switzerland showcase potential efficiencies.

Poland's planned CPK airport may pioneer similar initiatives, marking baggage with RFID to ensure tracking amidst complex logistics. Successful tests by HADATAP and implementations at Polish airports demonstrate the viability of such systems. Introducing more logistics checkpoints could exacerbate delays unless effectively managed, emphasizing RFID's role in sustaining the system's integrity and passenger experience. The integration of these technologies suggests a promising path forward, aligning with both operational efficiency and environmental sustainability.

**Keywords:** RFID; IATA; Baggage; High speed rail; CPK; Mishandled bags

According to 2024 SITA Baggage IT Insights report number of mishandled bags is dropping from 7.6 to 6.9 per 1,000 passengers in 2023. Taking into account the increase in the number of passengers to 5.2-5.4 billion in 2024, this gives a total number of around 40 million units of mishandled bags in 2024. In 2023, delayed bags accounted for 77% of all mishandled bags. At the same time, the number of lost and stolen bags decreased slightly to 5% in 2023. Meanwhile, the number of damaged and tampered bags increased to 18%. The majority of mishandled bags are still transfer bags. In the past, we saw an increase in the number of long-haul flights, which fueled this trend. This continued into 2023, when more passengers arrived, leading to even more long-haul flights. As a result, the number of delayed bags at transfer points increased to 46% of all mishandled bags, an increase of 4 percentage points compared to 2022. At the same time, the number of mishandled incidents due to lack of loading decreased slightly by 1%, accounting for 16% of cases in 2023. Ticket errors, misplaced bags, security issues and other miscellaneous factors combined to account for 14% of mishandled bags. Mishandling attributed to airport operations, customs clearance, weather or space

weight restrictions remained stable at 8%. Mishandling of arrivals remained steady at 4%, while delayed bags due to airport loading errors remained at 8%, reflecting 2022 data.

Airlines and airports continue to automate baggage processes. At the moment 85% of airports already introduced self-service bag drop technologies. Baggage mishandling rate is dropping, in part due to messaging improvements. This was followed by the introduction of IATA Resolution 753 for the tracking of luggage, which became effective in June 2018. IATA Recommended Practice (RP) 1740c contains RFID specifications for interline baggage that were revised in 2018 to reflect the latest developments in RFID technology and to include a set of tests to ensure that global performance standards are met.

The above data clearly indicate that the issue of baggage logistics in the aviation sector is of great importance and still constitutes a serious challenge, which, according to IATA recommendations, can and should be supported by RFID technology.

In addition to baggage handling issues, the aviation sector is also facing increasing climate protection requirements. According to limitation in temperature rise by 2050 in the EU, greenhouse gas emissions in the transport sector must be lowered by 70% compared with 2008. Given the assumption that mobility will continue to increase and, consequently, traffic volumes will increase, greenhouse gas reductions can only be achieved through increased use of environmentally and resource-saving modes of transport. For this purpose, the European Commission has set ten objectives for the transport sector in the document entitled "Roadmap to a Single European Transport Area - Towards a Competitively Oriented and Resource-Conserving Transport System". One of these objectives targets long-haul passenger traffic and proposes the following measures:

- Completion of a European high-speed railway network by 2050
- Tripling the length of the existing network by 2030 and maintenance of a dense rail network in all member states
- By 2050 the majority of passenger transport over middle distances should be allotted to the railway.

To best meet these goals, one feasible approach is to switch from air to rail for short haul flights, which serves as a feeder for medium- and long-haul flights. There are many opportunities for cooperation between the aviation and rail sectors in this regard. Currently, about 130 of all airports in the world are connected by rail, and more rail connections are planned. Initially, rail connections played only a limited role, mainly providing local transport and primarily connecting city centers and surrounding areas with airports. It is only in the last few years that concepts of connecting city centers with airports have been implemented, enabling fast connections (e.g. Heathrow Express in London) and in some cases also connections providing service functions such as check-in or baggage drop-off (e.g. CAT in Vienna).

The services "Check-in at the Train Station" and "Fly Rail Baggage" are offered in cooperation between SBB and the airports in Zurich, Bern and Geneva. Passengers can check in their flight baggage at 56 railway stations in Switzerland ("Check-in at the Train Station") and receive their boarding pass at the same time. The baggage is then checked into the aircraft.

The construction of the CPK in Poland opens up the possibility of introducing similar services at train stations in Warsaw, Łódź, Kraków, Katowice, Poznań, Gdańsk, etc., allowing high-speed rail passengers travelling to the CPK to check in their luggage and print their boarding passes themselves. Passengers can check in their luggage at the train station, which makes train travel easier, increases the amount of space for passengers and significantly speeds up the process of boarding and disembarking from the train. As experience from Japan shows, accelerating passenger movement is of great importance for the punctuality of high-speed trains. The introduction of such a service carries additional risks, as another baggage

reloading point appears in the baggage logistics process, which may cause loss or delays. Statistical data clearly indicate that in the aviation industry, it is transferred baggage that is most often the cause of delays. Baggage checked in at train stations must therefore be marked with RFID tags in accordance with IATA recommendations so that it can be tracked throughout the logistics process. RFID readers installed at train stations and in train luggage compartments will allow tracking of the baggage handling process at train stations, including the process of sorting and loading baggage onto individual trains. Additionally, in selected places by the railway tracks, it is possible to install RFID gates identifying baggage wagons and enabling tracking of the transport process itself. Luggage marked with RFID technology can be transferred directly to the luggage sorting room after being delivered to CPK. This solution will allow passengers to check where their luggage is using a simple mobile application on their phone. Whether it is travelling with them by train, or another train, how far it is from the airport, whether it is already at the airport and, most importantly, whether it is already on the plane. Thanks to the use of the international marking standard recommended by IATA (including massaging), even after landing at another airport, the passenger can check what is happening with their luggage. Whether it has already been unloaded, whether it is on the "carousel" and in the case of a transfer, whether it is loaded onto a new plane. HADATAP from Warsaw successfully implemented an RFID solution for the identification and tracking of railway rolling stock at Orlen. As part of the project, 150 dedicated RFID rail gates were installed throughout Poland (1).



1. RFID rail gates

The gates used in the project enable the identification of several thousand Orlen fuel tankers, which have been marked with RFID tags (2) resistant to environmental conditions (two for each tanker).



2. RFID tag marking

A similar solution can be used to mark high-speed railways between railway stations and CPK. In the area of application of RFID technology for marking baggage on the domestic market, some limited implementation projects were also carried out. HADATAP successfully launched a baggage control system at the Chopin Airport in Warsaw and Rzeszów-Jesionka. In summary, taking into account the above-mentioned problems in the field of baggage logistics in air transport and the growing requirements related to environmental protection, the implementation of intermodal solutions allowing for baggage drop-off at railway stations seems to be the only possible path of action. Unfortunately, expanding the number of baggage drop-off points outside the airport and adding complex logistics processes at railway stations can cause problems that cause delays. This is clearly visible in statistical data indicating baggage transfer as a key source of operational problems in the industry. Based on IATA recommendations and experience gained, it is possible to effectively implement the new model, but only when using an identification technique such as RFID. The use of multiple identification points, starting from the self-drop-off point, through the sorting process at the railway station, loading, transport by baggage wagon to unloading at the CPK and transfer to the airport sorting facility, will allow both railway and airport employees and passengers to monitor the logistics process in real time and dynamically respond to any irregularities. Currently, in Poland, HADATAP has successfully implemented an RFID solution that can be the basis for the implementation of the project presented in this publication.

#### Source materials

- [1] <https://www.sita.aero/resources/surveys-reports/sita-baggage-it-insights-2024/>
- [2] <https://www.rfidjournal.com/news/iatamandates-rfid-use-on-baggage-forairlines-airports/67539/>
- [3] Ruger, B., & Albl, C. (2018). Terminal OnRail - Air Baggage drop off during trainride to the airport. In 7th Transport ResearchArena (p. 7). <http://hdl.handle.net/20.500.12708/62604>
- [4] Chiambaretto, Paul; Decker, Christopher: Air-rail intermodal agreements: Balancing the competition and environmental effects, in: Journal of Air Transport Management, Volume 23, 2012, S. 36-40.
- [5] Givoni, Moshe; Banister, David: Role of the Railways in the Future of Air Transport, in: Transportation Planning and Technology, Volume 30, 2008, S. 95-112.