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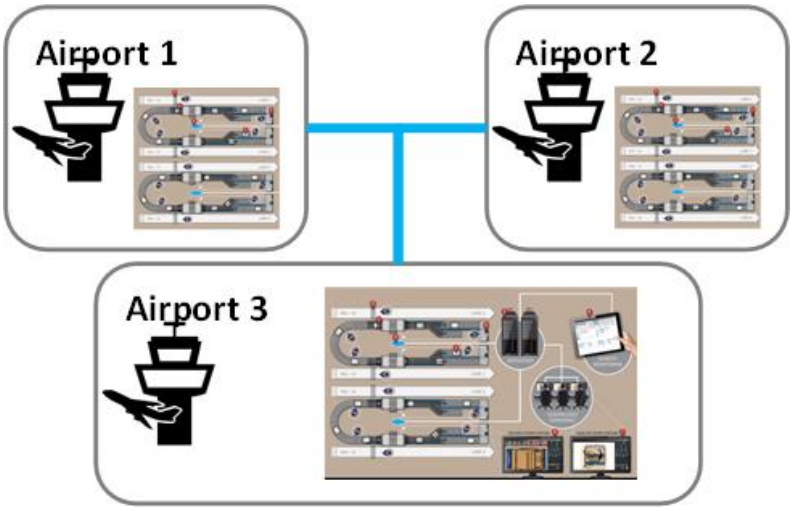

Remote Screening – Possible cost efficiency for Peripheral and Remote Airports

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ABSTRACT

Peripheral and Remote Airports face a range of very special challenges. The cost of safe and regulatory compliant airports continues to climb with practices and procedures developed mainly as a response to the challenges facing major airports, largely centring around very different sets of challenges such as significant congestion and environmental impacts. Remote airports face challenges with staffing cost as well as cost for training and certification of staff to be regulatory compliant. A potential method to reduce costs is to centralize different functions and operate them from a remote location hence reducing the work tasks for local personnel. By centralizing the x-ray image evaluation function peripheral airport may decrease their cost while keeping a high level of security. Each airport has it´s unique possibilities and limitations - size of airport, number of flights, size of workforce etc. Hence it is hard to calculate potential savings in numbers but remote screening could increase the airports efficiency and help in staffing challenges, reduce the cost for training and keeping certified screening operators.

TABLE OF CONTENTS

APPENDIX

INTRODUCTION

Smart Peripheral and Remote Airports (SPARA) is a three-year, €2.4m Northern Periphery and Arctic (NPA) Programme project, part-funded by the European Regional Development Fund (ERDF), and aims to address challenges faced at remote and peripheral airports.

All remote and peripheral communities recognize that accessibility and transport connectivity is critical for their well-being and future viability. Airports are looked upon very differently, and usually with great affection, in remote areas where their critical role is widely recognized by populations in fragile communities. These airports are usually loss-making and subject to low traffic volumes, which often have a strong seasonal component. Public funds are sometimes required to support and maintain airport infrastructure in such areas.

Peripheral and Remote Airports face a range of very special challenges. The cost of safe and regulatory compliant airports continues to climb with practices and procedures developed mainly as a response to the challenges facing major airports, largely centring around very different sets of challenges such as significant congestion and environmental impacts. These airports face challenges with staffing cost as well as cost for training and certification of staff to be regulatory compliant.

A potential method to reduce costs is to centralize different functions and operate them from a remote location hence reducing the work tasks for local personnel.

The intention of this study is to find ways within the security check of passengers where Peripheral and Remote Airports could reduce costs. Given the current technology and regulation framework possibilities, this study focuses on the potential cost saving if the x-ray image evaluation function at the airport could be carried out in a more efficiently and cost-effective manner with remote screening.

The concept of remote screening between remote locations have been tested in Finland with positive results. The goals of that trial were to assess: the software capabilities through a WAN; the possible lag of data transferring through the network and its effects on the network load; the impact on screening operations; and the potential benefits of the solution.

Could remote screening reduce costs for remote and peripheral airports and in which way could it reduce the costs? Will remote screening give other benefits for the airports?

MATERIALS AND METHODS

This is a theoretical study based on previous findings and knowledge, interviews and available technical solutions. This study will not cover the practical appliance of the system at the airports and the set of work routines that needs to be implemented at each airport to have the remote concept work in an efficient and regulatory compliant way. To evaluate these aspects would imply a live test and is not within the scope of this study.

RESULTS

Technology, the human being & regulations

Manufactures of security equipment are continuously developing new equipment with higher performance and security level, not only to meet the expectations from airports but also due to new regulations and/or higher security level demands from authorities. Authorities continuously develop security regulations and standards to stay ahead of i.e. threat form terrorists.

Today security personnel must operate a wide range of technical equipment to make a regulatory compliant security check of passengers and their belongings. For example, security personnel have to handle equipment as x-ray machines to inspect bags and belongings, metal detectors to find prohibited items on passengers, liquid explosive detectors to control liquids, explosive detectors to search for explosive substances etc. According to regulations, an operator must have the proper training to be allowed to operate each type of equipment mentioned above. Manufacturers strive to make the equipment user friendly but still personnel in the security checkpoint needs training for several different types of equipment from different manufacturers.

In a checkpoint environment where different types of security equipment are used, people are moving and handling trays, the noise level can sometimes be a distraction for an x-ray image evaluation operator. Potential threats need to be visually identified in the x-ray image of a bag and to carry out this task the screening operator needs to be focused on the task.

To become a certified screener there are some regulatory requirements. First, not everyone is suited to become a screening operator. A person cannot be colour blind to evaluate images where different materials are represented with colours. The ability to evaluate images is something we are born with and can only be trained to a certain extent. To be certified the operator needs a class training by certified instructors. The next step is to practise alongside an experienced screening operator and training at a CBT system. The last step is a certification test which the new screening operator needs to pass.

Regulation states different types of prohibited items for cabin baggage versus carry on baggage, i.e. knives and sharp items are prohibited in cabin baggage but can be brought in carry on baggage. A screening operator needs to know which type of baggage he or she is evaluating to be able to make a correct decision on a potential prohibited item.

Regulations stipulates a minimum time a screening operator needs to work with x-ray image evaluation to maintain their threat identification ability. Only screeners at larger airport with continuous traffic achieve this minimum time of image evaluation. The regulative solution for those screening operators who do not fulfil

this demand due to small number of flights is to train via an x-ray image Computer Based Training (CBT) system to maintain their ability. Typically, screeners at remote airports spend 30-60 minutes a week with this type of training.

Small Airports - Personnel challenges

Many peripheral airports face challenges with staffing cost and cost for training the x-ray operators at the airport as well as the availability of certified x-ray operators. Regulations stipulates high demands on the x-ray operators in terms of certification, image evaluation performance (threat identification), concurrent training etc. This creates challenges for the smaller airports as for example:

- High cost for training.
- Maintaining threat identification ability - operators continuously needs to evaluate larger amounts of real time bags. This is hard to achieve on a small airport with a small amount of flights per day.
- With a small number of flights per day, x-ray operators might only be needed for a few hours a day. The challenge for the airport is how to plan the work for the employees to make sure that there are other tasks to carry out for the x-ray operators in between the flights. Personnel often have multiple tasks as for example being responsible for loading bags on trolleys to be transported to the plane, fireman in case of an accident and screening operator. In between the flight they are for example responsible for service of airport equipment or carrying out repairs on buildings.
- A smaller workforce increase vulnerability if i.e. one of the employees gets ill.
- Vacation staff is hard to find or expensive to maintain during vacation periods in i.e. summer time.

Checkpoint personnel and tasks

To fulfil current regulations the minimum number of security personnel in the checkpoint is two persons. The number of security personnel working in the checkpoint varies from airport to airport and depends on the number of passengers for each flight as well as the layout of each checkpoint. The number of passengers depends of day of week, business travellers' schemes as well as a seasonal component since many peripheral and remote airports in northern Sweden handle summer and/or winter tourists.

A typical smaller airport like Hemavan Tärnaby Airport have two persons working in the checkpoint. One works at the walk through metal detector to clear alarms from the metal detector and also help passengers who are unloading their personal belongings to be inspected by the x-ray machine. The other person operates the x-ray machine and evaluates the x-ray images (screener). Both persons share the task to search bags for prohibited items found during the x-ray inspection. Above that there is one person operating the x-ray machine for the checked in baggage. This means that Hemavan Tärnaby Airport has total three persons involved in the security control of passengers, cabin baggage and checked in baggage for a normal flight. The two persons who operates the x-ray machine must be certified screeners to fulfil regulations. During peak periods (ski season) one extra person is added in the security checkpoint to have two persons involved in clearing alarms from the metal detector, search bags for prohibited items and help passengers who are unloading their personal belongings to be inspected by the x-ray machine. The third person is only responsible for operating the x-ray machine and evaluate x-ray images in the checkpoint. For this scenario there must be two certified screeners to fulfil regulations.

Flight routes

Flights to remote and peripheral airports typically has a low number of passengers. To find economy in these flights, airlines makes stops at several airports. For example, the route from Arlanda to Hemavan makes a stop in Vilhelmina to let passengers of and bring new passengers on the flight. The same is done in the other direction from Hemavan to Arlanda. The flight from Arlanda to Lycksele makes a similar stop in Kramfors. (Figure 1). (Cederberg, E; Olsson, G; 2017).

Each route is operated two times a day. In the diagram below, it is indicated when the x-ray machines at the different airports are manned with screening personnel. This applies for both the x-ray machine in the security checkpoint and the x-ray machine for carry on baggage. (Figure 2). (Cederberg, E; Olsson, G; 2017).

Check-in and security checkpoint typically open 45 minutes before departure of the flight at the airports mentioned above. Check-in and security checkpoint typically close about 5 minutes before departure. The x-ray machines for cabin baggage and carry on baggage are manned during this time.

Flight routes

Figure 1, Flight routes.

Manned position at x-ray machine

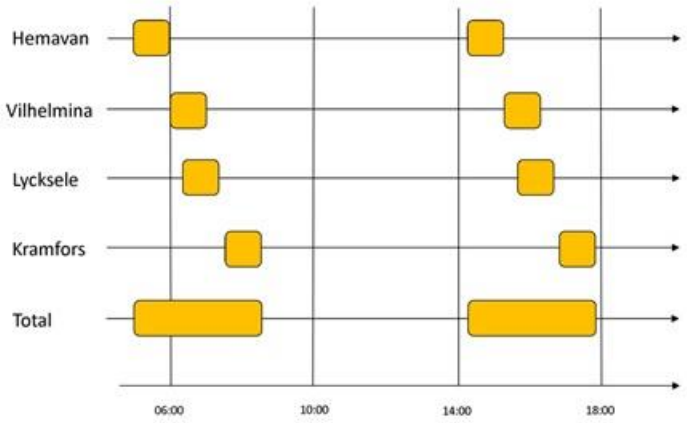

Figure 2, Manned position at x-ray machine.

Remote screening - Technical solution & possibilities

The method of sending x-ray images to a remote location for image evaluation (remote screening) in airports is a well proven concept when it comes to Explosive Detection System (EDS) x-ray units for Hole Baggage Screening (HBS) (Jentsch, H; 2018). This units are built in to a Baggage Handling System (BHS) and works automatically in terms of bag transportation and image decision handling. The EDS unit sends the image of an x-rayed bag to an image evaluation station (analyst station) where an operator makes a decision if the bag contains prohibited items or not. If it does not the operator “accepts” the bag and if it does the operator “rejects” the bag. The information is sent to the BHS which transports the bag to the correct position according to the decision on the bag. If it is accepted, it is sent to the loading station to be transported to the airplane and if it is rejected it is transported to the position for further investigation to locate the prohibited

item. Recent development in IT infra-structure and technologies gives the system a possibility to send these images to a remote image evaluation station located at a different geographical location using a Wide Area Network (WAN) concept, enabling an airport to operate the x-ray unit without a local operator on site if needed.

Manufactures have now introduced technical solutions to be able to use this benefit for security checkpoints used for Cabin Baggage Screening (CBS) as well (Jentsch, H; 2018). By connecting the x-ray unit to a server for image distribution an airport can send their images to a remote image evaluation station (Analyst workstation), similar to an EDS x-ray unit, but with specific checkpoint functionality and benefits. (Figure 3).

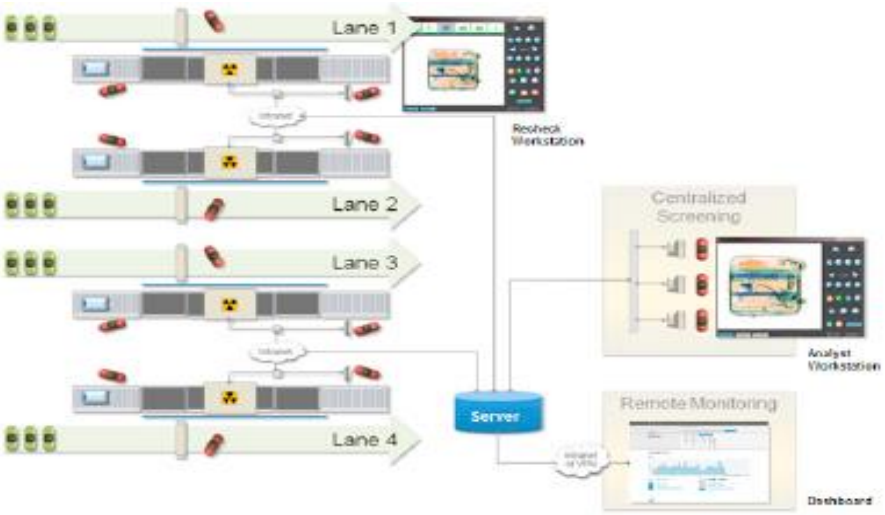

Figure 3. Remote screening concept.

The operator at this remote image evaluation station makes a decision if the bag contains prohibited items or not, reject or accept (Figure 4). The result is presented to the local operator in the checkpoint who hence can take appropriate action.

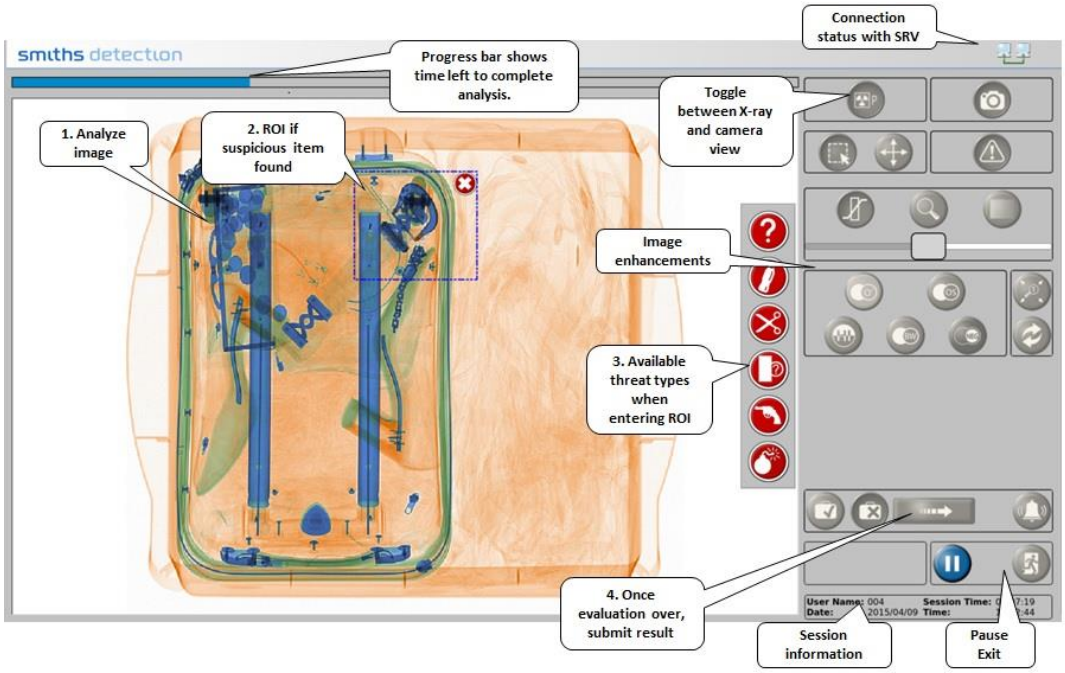

Figure 4. Analyst workstation – Graphical User Interface (GUI)

A recheck image evaluation station (recheck station) is located in the local checkpoint and gives the local operator information about which bag is rejected and which type of prohibited item the remote operator has found in the bag (Figure 5). The local operator can then carry out a directed search of the rejected bag to find the prohibited item.

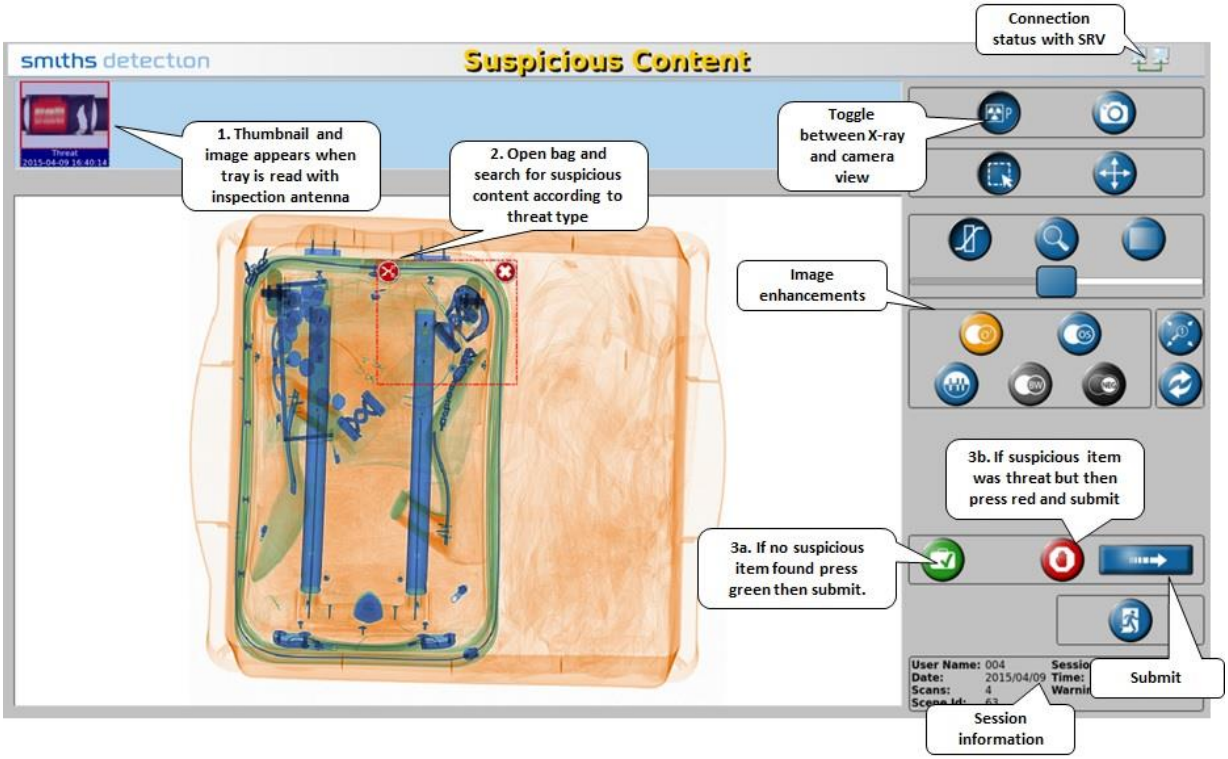

Figure 5. Recheck workstation – Graphical User Interface (GUI)

Taking this one step further, a recheck operator could do a directed manual search without the need to be a certified screening operator, reducing the cost of training operators even more (Jentsch, H; 2018).

To be able to use this effectively you will need a screening lane that works in a similar way as a BHS. Bags needs to be separated to make sure that each x-ray image only contains one unique bag for the operator to either accept or reject. In order to maintain security, it must be completely clear for the personnel in the checkpoint which bag is rejected by the remote operator and which bag that is cleared (accepted). This can be achieved with automated conveyors that separates the bag before it enters the x-ray and a diverting table that can separate cleared bags from rejected bags. For optimal bag and corresponding x-ray image identification a camera should be installed in front of the x-ray unit that present a real time image of the bag simultaneous with the x-ray image on both the analyst station and the recheck station. The recheck station increase the ability to identify the location of a threat in the bag and the camera ensures that the recheck operator makes a directed manual search of the right bag. (Figure 6).

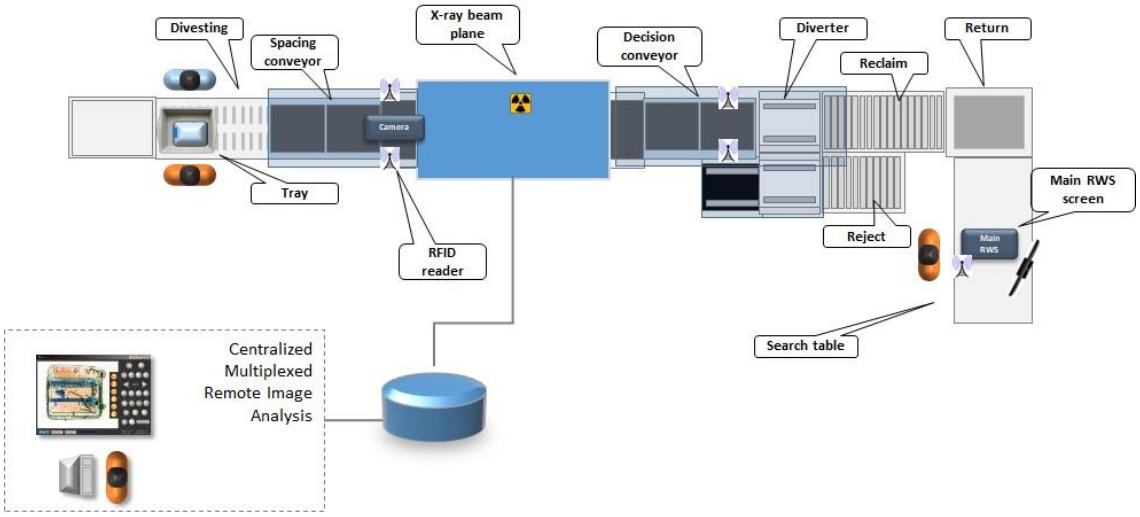

Figure 6. Remote screening checkpoint layout.

The screening operator can be located both locally, for redundancy and other functions, and at a remote site removing the need for one operator per x-ray unit. One analyst station can receive images from several x-ray units, possibly located at different airports. Images are sent from x-ray machines to analyst stations on an any-to-any scenario. This is done to increase performance since an x-ray image is sent to the first available screening operator.

By connecting several airports to a “Screening WAN” a group of operators can analyse all images from different airports remotely at a i.e. a Screening Centre in a different geographical location. The Screening centre could also be located at one of the airports or seen as a cluster of the local analyst stations at each airport. This way a local operator at one airport could also handle images from another airport. (Figure 7). In a bigger context. Larger airports with more screening personnel could help smaller airports with the image evaluation function (Jentsch, H; 2018).

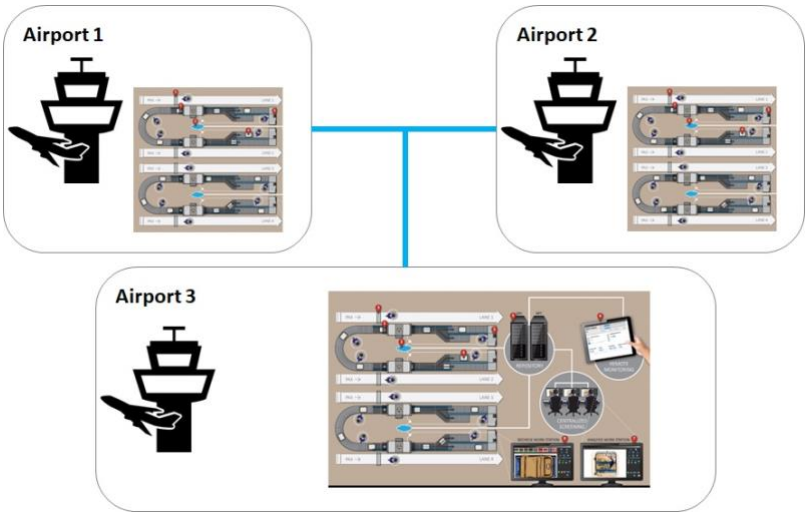

Figure 7. Remote screening WAN.

The concept of remote screening between remote locations have been tested in Finland with positive results. The goals of that trial were to assess: the software capabilities through a WAN; the possible lag of data transferring through the network and its effects on the network load; the impact on screening operations; and the potential benefits of the solution. (Elliot, M; 2017). (Finavia; 2017).

DISCUSSION

Remote and peripheral airports play a critical role in their respective communities. Transport connectivity is necessary for their well-being and future viability. Due to the low number of passengers' public funds are crucial for the existence of these airports. To stay alive these airports, need to find ways to reduce costs and carry out the different tasks needed to run an airport more efficiently. One way to do this is to operate different functions remotely and even centralize these tasks in the meaning that several airports can share resources and hence reduce the costs.

Certified screeners are a significant cost for these airports due to the regulative demands in terms of training and maintaining image evaluation ability. To handle personnel illness and vacation periods there must be a redundancy in the number of certified screeners at the airport. A higher number of certified screeners increases the cost for the airport.

The intention of remote screening is for one screener to evaluate x-ray images from several x-ray machines reducing the number of screeners needed and hence reduce the cost in terms of labour rates, cost for certification and cost for training.

Remote screening could have a cost saving potential at the airport it selves. One screener could operate both x-ray machines for cabin baggage and carry on baggage at the local airport. Due to the regulative difference in prohibited items for cabin and carry on baggage this would imply two Analyst workstations, one that presents images for cabin baggage and one that presents images for carry on baggage to be sure that the operator knows which types of items that are prohibited in the displayed image.

Since minimum number of personnel in the security checkpoint is two, this way the screener at the x-ray machine for carry on baggage could be removed in terms of saving costs. However, if screening only is done locally at the airport the airports still need redundancy for the screener function if i.e. on of the screeners gets ill with short notice. There has to be at least one extra certified screener at the airport.

It becomes more interesting when we look at the remote screening concept in a wider perspective and include several remote airports in the equation. The flight schedule for the airports in the study shows that there is a possibility for one or two screeners to handle the screening function for all of the airports. The screening function could be carried out in two ways:

- Centralized. A screening centre is set up on i.e. one of the airport's or in another geographical location. Images from x-ray machines at different airports are sent to the screening centre for evaluation by the screeners in the centre.
- Decentralized. All of the connected airports are seen as a cluster and screeners at the airports can handle the screening function together. A screener at airport X could handle the screening function one day, the next day a screener from airport Y could handle the screening function. There is also the possibility for screeners at two airports to share the load of images from the rest of the airports.

The centralized version has the benefit of being a specialized group of screeners that only handles image evaluation. The screeners in the centre will evaluate a larger number of x-ray images and hence maintain a high threat detection capability reducing the need for concurrent training. The solution makes it easier to maintain a sufficient screener workforce during vacation periods. The total number of screeners at the local airports can also be reduced. The downside is that each airport still needs one certified screener as redundancy locally if the connection between the airport and the screening centre is down. Also, due to redundancy there always has to be at least two screeners working in the centre.

The decentralized solution has the benefit that the local screener in fact is a screening resource in the cluster and can evaluate images from other airports. The local screener also works as a local redundancy in case of technical image transfer problems. There is a built in redundancy in the solution and airports can help each other out in case of occasionally larger flights which requires more personnel in the checkpoint, illness or during vacation periods. The downside is a higher total number of screeners at the connected airports compared to the centralized solution. There is also a bigger need for planning and communication between the airports to make sure at which time the local screeners are available in the cluster to make sure that there is someone manning the screening function in the cluster.

Both solutions imply a smaller total number of screeners for the connected airports which reduces the costs. The screeners will also evaluate a larger number of images which will enhance the threat detection ability and reduce the need for concurrent training. Both solutions also makes it easier for airports to handle personnel challenges during vacation periods in terms of screening personnel. Both solutions have the potential of reducing costs for the connected airports.

Manufacturers mentions the possibility for smaller airports to get screening assistance from larger airports with more capacity both in terms of personnel as well as financial capacity. This is for sure feasible but there are some problems with that solution. Smaller airports in Sweden have tackled the problem with few flights per day by giving the screeners other responsibilities in between the flights. They have a wide range of tasks to carry out within the airport organization. If one screener is removed from a smaller airport the other tasks that are carried out by this person must be handled by someone else. The number and type of different tasks varies between the different airports. Generally, it is not that easy to reduce the current personnel at the airport.

Looking at the problem in another way it might be more feasible for the smaller airport to help a larger airport with image evaluation. Larger airports often have “peak” times of passengers and small airport could then reduce a larger airport’s need for extra screening personnel during these peak times. This could be a business case for smaller airports to sell screening capacity to larger airports.

CONCLUSION

As this study has found, there is a potential for remote airports to reduce costs with remote screening. If airports connect their x-ray machines to a common remote screening system, it could increase their efficiency and help in staffing challenges, reduce the cost for training and keeping certified screening operators. As the technology moves forward, this method will become more and more effective and will be a natural way of operating a security checkpoint at all airports in a near future.

A decentralized remote screening solution would probably be the most beneficial solution for the remote airports since a larger work force locally at the airport could handle more tasks apart from screening and increase redundancy in case of image transfer problems between different geographical locations.

There is also a potential business case for smaller airports to sell screening capacity to larger airports which could create job opportunities in these communities and improve the financial situation of the smaller airports.

Each airport today has it´s unique possibilities and limitations - size of airport, number of flights, size of workforce etc. varies between the airports. Work routines and employment type may vary between the airports as well as the number of other tasks apart from image evaluation a screener performs. Every airport mentioned in this study has its own unique sets of possibilities and limitations. Hence it is very hard to calculate the potential cost saving in hard numbers. This would be an interesting subject for future research.

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