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Smart Peripheral And Remote Airports SPARA 2020

FINAL REPORT STORUMAN, WORK PACKAGE 5
REMOTE TECHNOLOGIES

Introduction

Before Storuman announced its ambition to participate in SPARA 2020, a feasibility study was conducted.

The preliminary study showed that ...

- Remotely controlled technology, which substantially could reduce cost exists, but is not adapted for smaller airports and their conditions.
- The operating requirements of small and medium-sized airports far exceed the earning capacity, and cannot keep pace with the larger ones, and risk decommissioning.
- The challenge lies in smartly adapting the existing remotely controlled technology to smaller airports and developing new ones.
- The values, assessments and analyzes carried out by the feasibility study strengthen the ambition to take the next step.

Needs and market ...

- The need is significant as smaller airports have difficulties in optimizing staff with uneven operations when very few movements are carried out at the airports, sometimes only two to four movements during normal opening hours, which are from early morning to late evening.
- The market is bigger than one might think. In Sweden alone, there are 11 smaller airports with regular traffic and another 5-6 small airports open by the total of about 37 airports that are outside the major national airports. Of these about 37, there are also about 10-15 controlled airports that could adopt the new remotely controlled technology.
- Sweden is also a world leader in this technology, with significant export opportunities.

Outlook …

- The need from the outside world, if we initially look at sparsely populated areas in, for example, the Northern Periphery (Northern Europe), where one can quickly identify at least about 100, possibly about 150 potential stakeholders who have a few flying movements per day. Worldwide up to around 500.

"Remote Functions" Design of the concept ...

- “Remote functions”, ie remote-controlled functions, are gaining ground in many business areas and are also beginning to enter the aviation market, such as driverless aircraft.

- The recently approved "Remote Tower" system, remote controlled tower, which the Swedish Civil Aviation Administration appoved and SAAB developed, is believed to be capable of replacing tower functions at a large number of airports.

- Now, other remote-controlled technology is also strong, such as security checks, check-in, monitoring and other areas.

- The challenge now is to connect these functions in a safe, economical and smart way.

Cost Estimation ...

- In order for the market to see this technology as attractive, the economy must be substantially improved, with the same level of security or higher.

- In this feasibility study, the calculations for, for example, the "Remote Tower" concept for smaller airports show that the cost of the tower function cold be reduced by between 20-50 percent.

Financing...

- Technology is expected to have a major impact in society, so financing such technology is also important for society. Financing should therefore find land in the entire social structure with both the state, county councils, municipalities and private financiers.

Socio-economic aspects ...

- Many airports are operated with significant government support, which is why savings, with this technology, have an impact on the entire community, both state and municipal.

- Remote controlled technology should also mean that the socio-economic aspects generate increased security when more airports can have longer opening hours, since they can easily be opened on demand for ie ambulance flights.

Others …

- Others are also investigating the effects of the shift to remote controlled towers such as "HIAL's Air Traffic Management 2030 Strategy" HIAL (Highlands and Islands) is an ANSP (Air Navigation Service Provider) in Scotland. Below are some, more towards ATC, but still applicable for smaller airports with AFIS:

  - Maintaining lifeline services to remote communities: ensuring that airports remain open and that air navigation services are provided is fundamental to HIAL's mission to support connectivity and tourism to the remote communities that HIAL operates in.

  - Continually improving safety: HIAL must meet minimum safety standards but also must strive to continuously improve safety levels.

  - Remaining financially sustainable: HIAL is expected to reduce its reliance on subsidies and to operate more as a commercial business where revenues as a percentage of total income increase over time.

  - Optimizing ANS: HIAL must also continue to modernize to be able to support the changing requirements of airspace users, including support for new technical and operational concepts that benefit aircraft, such as the implementation of more direct (time and fuel saving) routes.

  - Addressing the impact on staff: some of the ATM 2030 strategic projects involve centralizing operations from the current airports to a centralized location, which involves significant personal change for ATS staff.

  - Proving technical and operational feasibility: remote towers and, to a lesser extent, the introduction of an approach surveillance service (APS) at each airport can present significant technical challenges specific to the HIAL environments, most obviously in the availability of viable communications and power infrastructure.

  - Achieving stakeholder acceptability: each of the changes being examined may need to be subject to a level of public scrutiny, either through a political committee or via a full public consultation.

  - Ability to handle the scale of change: The ability to handle a large-scale change will rely on significant resources and experience. HIAL may therefore be constrained in what is realistically achievable, or at least in how quickly it is achieved.

We have mainly looked at the function "Remote Tower", but also the function "Remote security". See **Appendix I** "SAVE Remote Screening Final Report v3.pdf

Distinction between AFIS and Remote ATC

- During the project the issue of the term "AFIS" has come up on a regular basis. As it is a form of service at smaller airports it is not a known term so here is an explanation of the difference between ATC and AFIS:

  - ATC (Air Traffic Control) is as it says CONTROL, the ATCO (Air Traffic Control Officer) give orders to the pilot to comply in a specific way to maintain a secure approach, departure or fly-thru the area at an airport. Mostly at larger airports, 10 000 movements or more.

  - *The ATCO are responsible for separation between aircrafts.*

  - AFIS (Aerodrome Flight Information Service) is also as it says, INFORMATION SERVICE, the AFISO (Aerodrome Flight Information Service Officer) inform the pilots flying in the area about other pilots or other activity that can affect their approach, departure or fly-thru the area at an airport.

  - *The pilots are themselves responsible for separation between aircrafts.*

It is a matter of legal responsibility. AFIS is applicable at low density airports with few movements of aircrafts.

Business Case for this technology – ie representative costs and benefits

See background in **appendix II**, "Remote Tower industry – A paradigm in the making"

During the project there has been some work done calculating scenarios of cost and benefits and how it can affect the economy and the running of "Remote Tower" versus a "Regular Tower". As no actual test did take place in SPARA 2020, due to decisions or no decisions taken above our heads, all assumptions are calculated.

Small airports in periphery regions are struggling for attention in a world where urbanization is a reality and a factor to compete with.

Small airports do not have the means to develop in the same dignity as larger airports, so they have to rely more to "developing project"

One result during these meetings are that it is more difficult to size down than up. We see that benefits are more lightly to come out of try-outs from smaller airports more easily adapted to larger airports than the other way around.

Executive Summary

This business case outlines some of the challenges for smaller peripheral airports, preferably in the northern hemisphere. These airports have difficulties to develop systems by themselves due to lack of funds but are still essential for survival and development of the area it serves.

The study will address difficulties around smaller airports who struggle with,

- regulations optimized for bigger airports
- low usage due to few turnarounds during a workday for at least 15 hours
- dealing with poor economy that comes with these irregularities.

Issue

Due to the above, aviation strives to find new solutions that will reduce costs with the same level of safety, or better. In this case we are looking into optimizing the concept “Remote Tower Services”, a system with a digitalized tower, implemented on top of a mast, with cameras around to cover the critical angles of a tower-view and to run this from a center that can be placed on a site suitable for running digitalized towers. multiple towers. This could be close or at a greater distance from towers at an airport.

This system has been developed in Sweden, by SAAB Sensis and LFV (Luftfartsverket), a worldwide technology-provider and an Air Navigation Service Provider (ANSP). As of today, there is one place on earth where this is up and running. Sundsvall in Sweden is from a center handling air traffic control (ATC) at Ornskoldsvik airport.

The issue is to,

- optimize the system for smaller airports
- run multiple towers for improved economy
- enhance safety

Anticipated Outcomes

The anticipated outcome of a pilot should be,

- significant reduction of costs in the segment of air traffic management due to multiple towers being managed from one site

- enhanced safety due to digitalized support and augmented reality in various areas of remote functions at airports

Recommendation

The approach described herein allows us to meet our objectives of continuously improving efficiency, reducing costs, and capitalizing on technology by trying different approaches to enhance remote functions, reduce overhead costs, improve safety and still achieve a robust system.

Various options and alternatives will be analyzed to determine the best way to leverage technology to improve the business processes and reduce the overhead costs. The approach described herein allows us to meet our objectives of continuously improving efficiency, reducing costs, and capitalizing on technology. The Project will methodically migrate the data and functions of our current mainframe system to a new platform in order to preserve data integrity and allow adequate time to train employees on their responsibilities and respective functions. Some of the ways that this technology will achieve its desired results are:

- Q: Try various angles of vision. Today 360 degrees can possibly be decreased.
  A: If possible it will decrease technical and infrastructural costs.

- Q: Try numbers of towers handled from one position with optimized technical support.
  A: Anything exceeding one tower will decrease overhead exponentially.

- Q: Calculate further into emerging with “Remote Functions”, security, check-in, etc.
  A: If possible integrate into the “Remote Tower”- koncept

Justification

Calculating a “Remote Tower” – scenario estimates that the migration of multiple towers and other administrative functions will result in greater efficiency. The Project is also aligned with strategy and objectives since it uses technology to improve the way to do business. While other alternatives and the status quo were analyzed, the Project was selected for proposal in this business case because it provides the best opportunity to realize benefits in an expedited manner while also allowing for the greatest improvement in efficiency and cost reduction. Other alternatives assumed greater risk, provided less benefits, were too difficult to define.

Initial estimates for the Project are:

- 25-50% reduction in overhead costs for an airport
- 10-15% profit for a remote center due to number of towers handled

Business Case Analysis Team

The following individuals comprise the business case analysis team. They are responsible for the analysis and creation of the WP Project business case.

Role	Description	Name/Title
Executive Sponsor	SPARA 2020, Trafikverket, Storuman	Johan Holmér, Trafikverket
Technology Support	Provides all technology support for the project	Niclas Gustavsson, SDATS(LFV+SAAB)
Process Improvement	Advises team on process improvement techniques	Peter Norén, SDATS (LFV+SAAB)
Project Manager	Manages the business case and project team	Mikael Fredriksson, Project Manager
Software Support	Provides all software support for the project	Peter Norén, SDATS (LFV+SAAB)

Problem Definition

Problem Statement

Challenges,

- Optimizing technology to an acceptable level of spending with same level of safety, or higher.
- Finding the acceptable level of redundancy on the net
- Will “Cyber Security” stand up to the challenge
- How to address excess of staff
- Other ways with this technique to engage staff

Organizational Impact

Challenges,

- How to address excess of staff
- Other ways with this technique to engage staff

Technology Migration

In order to effectively migrate existing data and technique from our platform of this date and size is difficult. Going from a larger system to a smaller are most often more difficult than the other way around.

A new standard is undergoing test and verification at SDATS and will be the next generation for “Remote Towers”. This only 5 years after implementation so the pace of developing new techniques is rapid.

To the new platform, an approach has been developed:

Phase I: Hardware/Software will be implemented

Phase II: New technique will be run in “shadow-mode” beside ordinary tower function

Phase III: The web-based platform will be populated with all current payroll and administrative data. This must be done in conjunction with the end of a pay cycle.

Phase IV: All employees will receive training on the new platform.

Phase V: The platform will go live and as soon approval has been gained from the regulator Transportstyrelsen.

Time	Description	Criteria	Task	Sub task	partial description	Main goal / Goal
						Main goal Preparation of a report describing the possibility of a cost-effective operating system for remote control of smaller airports
A1, mån 1-2	Development of plans simulations, descriptions of systems	Finished plan	A1	A 1.1	Site survey ang kameraplacering på HMV, 25-26 jun-19 (LFV, HMV, Micke)	**Goal**
				A 1.2	Framtagande scenarios (HMV) aug-sep - 19	
A2, month 2-8	Simulation of different visual solutions	Simulations carried out	A2	A 2.1	Test 1 simulator på Sturup 23 oktober - 19 (Ivan, Jocke, Simon, Micke)	
				A 2.2	Justeringar av uppställning utifrån utvärdering test 1 (LFV)	
				A 2.3	Komplettera med nya scenarios (HMV)	
				A 2.4	Test 2 simulator på Sturup efter årsskifte 19/20 (Ivan, Jocke, Simon, Micke)	
A4, month 5-8	Study RTM AFIS - working position with technical need	Technical description ready	A4	A 4.1	Studie av nivå på RTM (Remote Tower Management) centralen. Samsyn främst mellan SDATS och Storuman, hösten/våren 19/20 (SDATS, Micke)	
A3, month 8-10	Study for the camera's "on-site" installation	Site survey completed	A3	A 3.1	Efter utvärdering simulationerna, skarp kameraplacering, hösten-19 (SDATS)	
A6, month 10-15	Installation tower and RTM, connection between systems	Installation finished	A6	A 6.1	Framtagande av hårdvara (SDATS)	**DM 1 (A 1-8)** **Develop and validate a specific concept for AFIS**
				A 6.2	Prissättning av tekniken	
				A 6.3	Finansieringsplan	
				A 6.4	Tillstånd TS (kontakt omgående, hösten-19,, även för andra frågor, SEC, mm)	
				A 6.5		
				A 6.6		
A8, month 22-27	Livetests	Tests conducted	A8	A 8.1	Tester på skarp hårdvara (SDATS) RTM möjligen från S-vall	
				A 8.2	Implementering i Storumans driftcentral	
				A 8.3		
				A 8.4		
				A 8.5		
				A 8.6		
A5, month 5-8	Possible flight plan system, e-strip on PC (standard computer)	System proposals clear	A5	A 5.1		
				A 5.2		
A7, month 17-21	Sequential operation study - 2 airports simultaneously, but up to 6 sequentially (2 plus 2 plus 2 within 60 min)	Report ready	A7	A 7.1	Påverkan på Finasieringsplan	**DM 2 (A 9)** **business Model** - Invest / Leasing - Organizational - Acceptance for the "smart little airport"
				A 7.2	Påverkan på CBA	
				A 7.3		
				A 7.4		
				A 7.5		
A9, month 28-32	Final report and CBA calculations	Final report ready	A9	A 9.1	Rapportskrivning	**DM 3 (A 9)** **realization** - Make visible savings - Realistic concept?
				A 9.2	CBA	
				A 9.3	Affärsmodell	
				A 9.4		

Cost Benefit Analysis

Action	Action Type	Description	costs (- indicates anticipated savings)
Renting a tower instead of investing	Savings	Cost instead of investment possible with a system easily moved to another location	-1 500,000€
Less staff	Savings	Cost for IT group to install new software and for the training group to train all employees	-100,000€
Combining several airports admin	Savings	1 manager for several towers (3)	-75,000€
Net Savings if renting a Remote Tower			**175,000€ /year**
Net Savings if renting a Remote Tower and not building a new		Additional total saving on investment	**1 500,000€**

A Project Activity Log

- During the course of the project a number of meetings have taken place in our pursuit of progress. Mainly persons from these establishments, both within this project but also outside:
  - Trafikverket, of course as a WP leader but also a provider for means to run a number of airports that are PSO (Public Service Obligation). Also procurement of airlines to secure national transport policy goals.
  - LFV (Luftfartsverket) as a swedish ANSP and also for research and innovation as they are designated buy the Swedish authorities to lead research in the field of ATM (air traffic Management) and development of airport safety.
  - SAAB SDATS as a technical provider for a lot of functions at airport in Sweden and worldwide. In this project mainly around the function “Remote Tower”.
  - Transportstyrelsen that is the regulator in Sweden for aviation.
  - Region Vasterbotten as a socioeconomic investigator.

All the above have been essential for the progress in our WP.

Summary and leverage of project leading TO FOLLOW ON WORK – Letter of Intent, extent of collaboration, and intended budgets

- As a result of, and during SPARA 2020 Storuman and SDATS signed a "Letter of Intent to develop the first "Remote Tower" for AFIS in Sweden that could also apply in other countries. Also to establish a "Remote Center in our "Remote Region" and not centered in a big city somewhere to further strengthen the image of urbanization. This might not have happened if we would not have had the opportunity to drive these questions in a project like SPARA 2020.

See **Appendix III** "Letter of Intent_Storuman_AFIS RTC_ver 1.0_signed(copy).pdf

- During this time and as a result of all the meetings we are now running a number of projects:

  - LFV-BRAS, (Basic Remote AFIS) where the new concept for AFIS is developed
    - Budget 500 000 €
  - LFV-SEC, (Remote security) Storuman/Hemavan involved but SENSEC is running
    - Budget 250 000 €
  - VINNOVA-TESTBED, developing a testbed at Storuman/Hemavan for the above
    - Budget 700 000 €

  - Probably upcoming, LFV-ACDM, follow-up from SPARA 2020
    - Budget ? €

- The above LFV financed by Trafikverket, performed by LFV and Storuman/Hemavan. The VINNOVA-project financed by VINNOVA (Swedish innovation agency), Region Vasterbotten and Storuman municipality.

- Arbetet i SPARA 2020 gav oss underlag för att gå vidare mot forskning och innovation med verkliga piloter och implementeringar av funktionerna. Då Sverige blev först I världen med att få en "Remote Tower" funktion godkänd fanns ett stort kunskapskapital nära och under projektets gång hölls många möten med LFV (Luftfartsverket) och SDATS (SAAB Digital Air Traffic Solutions) som tog frågan framåt. SPARA 2020 fick också förmånen satt besöka "Remote Tower" anläggningen i Sundsvall.

- Målet med en pilot inom området "Remote Security" kom aldrig till stånd då beslutet från kom så sent att utföraren SENSEC inte såg tiden räcka till, vilket var ledsamt. En kort slutrapport sammanställdes dock av SENSEC.

- This might not have happened if we would not have had the opportunity to drive these questions in a project like SPARA 2020.

What did Storuman / Hemavan get out of project and Region Vasterbotten

- The possibility to ease the burden for smaller airports in the region if the efforts now taken bear fruit. The aim is, even though staff must go or be transferred to another location, to strengthen economy, increase safety and reduce our environmental footprint. This will of course be useful for Storuman/Hemavan and the region.

- Put our region on the map being the first to implement the technique will hopefully gain us staff-wise, where the center will be established as we will be controlling a number of remote techniques outside our region.

- Like Sundsvall we will have visitors wanting to see these installations and testers on our testbed.

Derivative Issues that Pilot could tease out

During tryouts the pilots can not pin out if they are talking to a regular tower or a Remote Tower, as reported from airlines that service Ornskoldsvik and Sundsvall. If critics, it is more an opinion than factbased.

Location of jobs and location of centres

In our periphery region there are not so many options to find a location, even for one centre. Storuman is a crosspoint in our region with very rigid broadbandcapacity well suited for these kind of activities. The centre Swedens largest provider of electricity recently relocated to another place up in the north gave us an opportunity to establish remote functions that demand back-up power if electric power shuts down, redundancy for broadband, perimeter protection, entry control, etc. These facilities is give exactly what the system demands.

Other broadband services that could be bundled with the infrastructure

As earlier mentioned, one clear area for combining broadband usage is “Remote Security”. Others can be remote surveillance, remote check-in, ACDM (Airport Collaborative Decision Making) that handle available aviation information to be used both at the airport and also outside, for informative purpose.

Training, retention of staff

The AFISO training procedure is fairly uncomplicated. Training-courses are around 3-4 months at a training-facility and around 2-4 months in a Tower position at an airport.

Ad Hoc airport response improvements in both cost and timings

A system developed and trimmed will be an affordable system for small airports and also easy to handle ad Hoc situations with more permanent staff at the centre that can respond instantly. Today at off-hours staff often has to transport themselves for larger distances if called out.

The letter of intent written between SDATS and Storuman is a testimonial for their faith in Storuman as a partner and also the projects in collaboration with LFV that Storuman are involved in and have formed together.

The HIAL centre location report and its justifications

See **Appendix IIII** Air-Traffic-Management-2030-Strategy-Scoping-Study-2.pdf

Appendix I "SPARA Remote Screening Final Report v3.pdf

Appendix II, Remote Towers-The future of ATM.pdf

Appendix III “Letter of Intent_Storuman_AFIS RTC_ver 1.0_signed(copy).pdf

Appendix IIII Air-Traffic-Management-2030-Strategy-Scoping-Study-2.pdf