Aarhus University
Systems Engineering
Company H

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Concept of Operations

BEUMER Group

Group members:
Martin Jespersen (201706221)
Tristan Møller (201706862)
Rikke Christensen (201704464)
Jesper Jakobsen (201708777)
Mikkel Jensen (201708684)
Jens Bendtsen (201708413)
Mads Dahl (201705285)
Marie Bærentzen (201608667)

Supervisor:
Stefan Hallerstede, Lektor

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1 Version History

Ver.	Date	Initials	Description
1.0	04-03-2021	MJ, TM, MD, JB	First draft of document.
1.1	07-03-2021	TM	Added purpose and capability need sections
1.2	08-03-2021	MJ, TM	Added Operations and Support section

Contents

2 Purpose

The Concept of Operations (ConOps) is investigation and identification of system phases, design functions and operations - often from the users' and stakeholders' perspective. It should describe high-level capability requirements necessary to achieve the mission of the organization with focus on meeting stakeholder requirements and expectations.

Identifying capabilities and associated needs often involves analyzing system phases, e.g. what system phases are known, are there any associated concepts or requirements needed to operate the system phase or the transition between phases. It could also be identifying explicit and implicit needs from the users and stakeholders [1].

The setup and layout of this document is inspired by SDLCform's Concept of Operation document [2].

2.1 Output

The final output is the Concept of Operations document that describes the systems capabilities, operations, phases and mission goals.

2.2 Executive Summary

An executive summary is given in the project description: 'A larger airport client has requested an additional extension to the baggage handling system which is currently been delivered.

The airport Baggage Handling system comprises a primary screening level, a baggage transportation system to the sorting loops and a bypass to the future additional and ultimate control screening process.

The solution requested deals with designing, integrating and testing the additional and ultimate control security screening process' [3].

Please refer to the case description for more information.

3 Capability Need

3.1 Business needs and current solution

This section describes the capability needs required to accomplish the mission. As stated in the executive summary, the client has requested an extension to an already implemented and integrated CRISBAG baggage handling system. The principal business need is additional screening as the current system yields to frequent manual

screening operations. It is clear that this is an issue for the client and must be accommodated in the extension (i.e. operation should be automated). Another aspect of this is the handling of dangerous luggage as this is not part of the clients current baggage handling system.

Another more implicit business need is a 'long' operation trial period. The client has requested a change order concerning a 4-month operation trial period. As it is an amendment to the original contract, it will affect the work plan. It is therefore essential that this is taken into account when it comes to scheduling.

To summarize crucial business needs:

- Additional screening
- Handling / Destruction of unsecure bags
- Prolonged integration phase (for client)

The requested extension has its foundation from these needs/requirements. To summarize crucial system (extension) capabilities:

- Baggage rejected from first screen (prior extension) will be subjected to additional screening before manual inspection.
- Baggage rejected by both screenings will be transported to dedicated unsafe baggage area for additional screening and destruction.

This should result in less manual baggage inspection and an increase in airport safety (regarding handling of unsafe baggage). The requested operational trial should be integrated into the time schedule.

4 Operations and Support

4.1 Missions

The business needs/missions can be categorized as either primary or secondary. They are listed in priority:

Primary

- Provide a reliable baggage transport, screening and sortation system that allows secure handling of passenger baggage and its *connection* to already existing sorting loops.
- Extend the existing CRISBAG solution with additional screening, secure handling and destruction of baggage.

Secondary

- Ensure adequate time intervals between screenings.
- Ensure navigable environment that allows manual withdrawal / removal of baggage.
- Ensure a comprehensive 4-month operational trial is designated for client.

4.2 Users and other stakeholders

A user is an individual or group that benefits from a system during its utilization on a daily basis [4]

- Airport staff that 'feeds' baggage into CRISBAG system
- Airport staff that oversees screening and manually remove baggage system
- Airport staff that handles ultimate control room (final screening and possible destruction)
- Airport staff that contribute to the general maintenance of the system. This is a combination of trained staff and engineers (software, mechanical and electrical).

A group or individuals who is affected by or is in some way accountable for the outcome and undertaking [4].

- The main stakeholder of the company is BEUMER Group, where the company is the preferred supplier and functions as an integrated part of BEUMER Group.
- The company is structured to have 3 different departments which is a software, workshop and commissioning department. All members are technical stakeholders.
- 3rd party company that is in charge of electrical components.

The installation of the different mechanical elements will be handled by the commissioning department consisting of 3 commissioners. They will be on-board the project for the full duration of the project. There will also be staff needed to train the different commissioners. There also needs to be staff that handles the transportation of the different mechanical elements to the client side, where the commissioners will handle the installation. The company has limited resources in the electrical department so this part of the project needs to be outsourced to an external company.

The different components of the system needs to comply with the European regulations for industrial electrical components, so at some point regulators will be at the workshop or client side and will need documentation for the different components.

4.3 Policies, Assumptions and Constraints

4.3.1 Policies

- All electrical components must comply with European regulations for industrial electrical components.
- All installed modules must be from the range provided by BEUMER Group.
- All employees work 37 hours per week.

4.3.2 Constraints

- As mentioned in previous sections not all staff will have a full time commitment to the project so it is important to take this into account in the planning stages. Some of the software developers as an example, will work on the project from April and August 2020 with the project starting in January 2020.
- Resource limitation in electrical department; installation of electrical components should be outsourced to 3rd party.
- The system should be implemented and tested before 1st of September 2020, so the client will have a 4-month operational trial.
- Mechanical components must be ordered from BEUMER Group facilities and have an expected lead time of two weeks from elements being ordered to they arrive at workshop.

4.3.3 Assumptions

- It is expected that 3rd party in charge on installation of electrical components fulfill their end of the contract without major deviations (cost, time etc).
- It is assumed that the time schedule is planned so minimal amount of testing is required in the requested operational trial period.
- It is expected that the BEUMER component price list is fixed and will not change during the implementation of the system (see section 2.4 in case description [3]).

4.4 Operation Description

4.4.1 Operating Concept (OpCon)

The primary goal of the system is to create an extension to a baggage handling system, that will transport baggage through additional screening having already been through primary screening prior to the extension. From the additional screening, baggage can be rejected or cleared. In case the baggage is cleared the baggage is transported

out of the system that is the extension to the baggage handling system. In case baggage is rejected by the additional screening the baggage should be transported to an ultimate control area, where the baggage goes through manual screening. From this area baggage can still be approved and transported out of the system or it can be rejected. If the baggage is rejected the baggage can be manually transported to the a destruction area, where it will be destructed.

4.4.2 Employment modes

Different modes of the system:

- One mode of the system is the case where baggage goes through the additional screening area without any complication and is cleared out of the system. This part of the process will be fully automatic and no manual intervention is needed.
- A second mode is the case where the additional screening will catch a clear problem in the screened baggage and the baggage is manually removed from the system.
- In case the baggage goes through additional screening and the baggage is found to be suspicious the baggage will transported through the system to the Ultimate control area, where the baggage will be manually inspected.
- When baggage has been inspected at the Ultimate control area the baggage can either be added unto the system again in case the baggage is found to follow the security guidelines or it can stay off the system and the owner of the baggage will be contacted. Worst case the baggage will be transported to the destruction area, where the baggage will be destructed.

4.4.3 Scheduling and Operation Planning

The schedule is very important for this project, so a plan must be made that takes into consideration things like delivery time for elements, time of installation, time for testing and the 4 month operation period from September 1st 2020 to January 1st 2021 that is the deadline for the project. The first thing to look at is the delivery of different components to the workshop. This is assumed to take two weeks, but it is important to expect variation in delivery of different components. To minimize the impact of variation in delivery times it is important to have a close relationship with the suppliers of the different components so precautions can be taken. This will be a big help for the staff in the workshop, since they will be employed as needed and a plan must be made to synchronize the delivery of components with the hours the workshop staff will be available. The goal must be to minimize the time every component spends in the workshop so to have components quickly delivered to the commissioning department. Since the commissioners in the commissioning department

will be employed for the full span of the project they should be ready to install the elements as soon as they arrive to the client side.

4.4.4 Operating environment & Environmental Conditions

The system will be build to fit in a specific airport, but the system can easily be adjusted to fit in other airports as well, since the system is build up by smaller self contained components. As soon as the baggage handling system is installed, it will go through a operational trial period, where the system most likely will have considerable downtime, because of adjustments to the system. The operational trial period is important, since the system will be under heavy load after deadline and the system should be robust enough to avoid considerable downtime in the future. In the area the system will operate there are specified space constraints to the Ultimate control area that must be taken into consideration. The constraints are as follows:

- Search office: 15m^2 (6m x 2.5m)
- Destruction area: 10m^2 (5m x 2m, with free high 3m)

4.4.5 Geographic Area(s)

The system will be operated in the following areas:

- An airport

4.4.6 Interoperability with Other Elements

The system will be an extension to the already existing CrisBag baggage handling system. The system will add additional and manual screening of baggage to a system that already includes primary screening. Baggage leaving the already existing system will be input to the extension and in the case baggage is cleared from the system the baggage will leave the extension and enter the already existing system again.

4.5 Product Support Description

Support is a crucial part of the concept of operation since it is interlaced with operations. The system provided is a bottleneck for the airport, if the baggage delivery system fails to work all other client operations are affected by this. To mitigate potential downtime of the system several support operations are provided (or offered):

- Spare parts on-site. In case a module breaks it should easily be replaceable - either by internal or external staff.
- 24/7 BEUMER Group support service (not included in contract expenses)

- Dedicated BEUMER Group representatives for client
- Continuous monitoring of component compliance. Some system modules/components are required to meet specific requirements (e.g. European regulations). In the case of new regulations BEUMER Group will alert the client.

4.6 Potential impacts

The system is anticipated to have impacts on the client's current organisational setup, where the most apparent ones are listed below:

- Automation of baggage should reduce manual inspection time and staff expenses associated with this operation.
- Additional screening and dedicated area to handling of insecure baggage should increase the overall security level in the clients facilities.
- The automation of several manual processes should result in a larger throughput of baggage - this both benefits the client and airline passengers.

5 Function Capabilities

This section describes the functional capabilities of the system and how it archives the mission operation objectives. It will also contain a short discussion of the support operations needed to complete the main mission.

5.1 Operations

The operation is sorted into 4 stages:

1. *Primary Screening (not actual part of extension)
2. Input
3. Additional screening
4. Ultimate control
5. Output

The Primary screening stage: This stage could be put in under the input stage. Every piece of luggage must go through the primary screening process.

The input stage: Every piece of luggage that enters the system is loaded on the transport band which leads the luggage throughout the system.

The Additional screening stage: This stage handles luggage that was not cleared in the primary stage. For luggage in this stage there exists two possible outcomes.

1. Luggage is cleared and moves to the output stage.
2. Luggage is not cleared and moves on to the ultimate control stage.

The Ultimate control stage: Here luggage that was not cleared in the Additional screening stage will be checked by an operator. The operator can send rejected items to the manual handling area for inspection, where cleared items will move to the output stage.

The Output stage: In this stage cleared items are transported to existing sorting loops.

5.2 Support

Support should depict how the asset or system conducts mission support activities and include appropriate users. Figure 5.1 illustrates the support scenario, where a module breaks and how the client should proceed. It is mentioned in the product support description that spare parts should be stored on-site for the client, so they might be able to repair broken modules on-site. In case that it cannot be handled by on-site personal, the client will be able to contact BEUMER support.

Figure 5.2 shows the support activities performed in the case that a module 'expires' and fails to meet legal requirements.

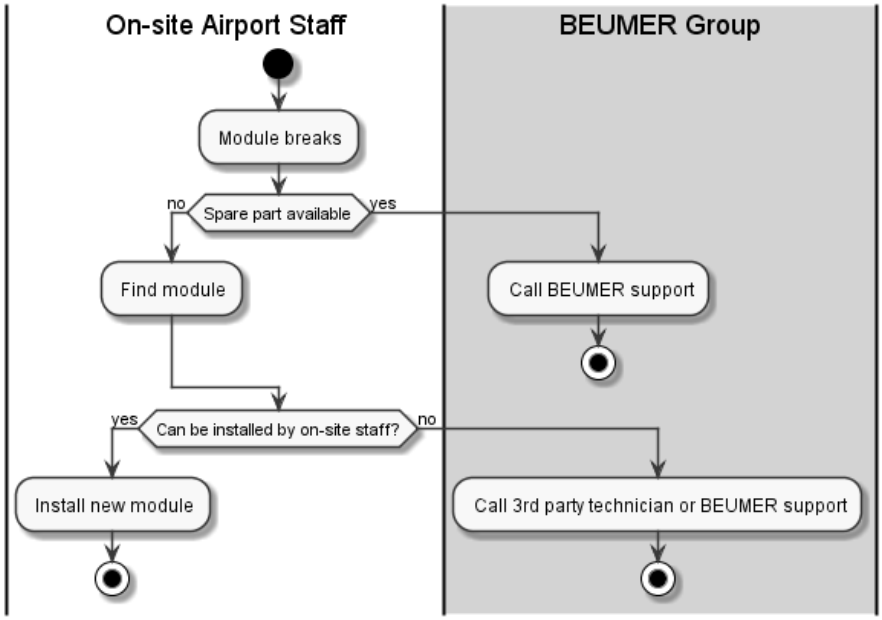

Figure 5.1: Mission support activities in case of module breakdown. Some operation can be done on-site.

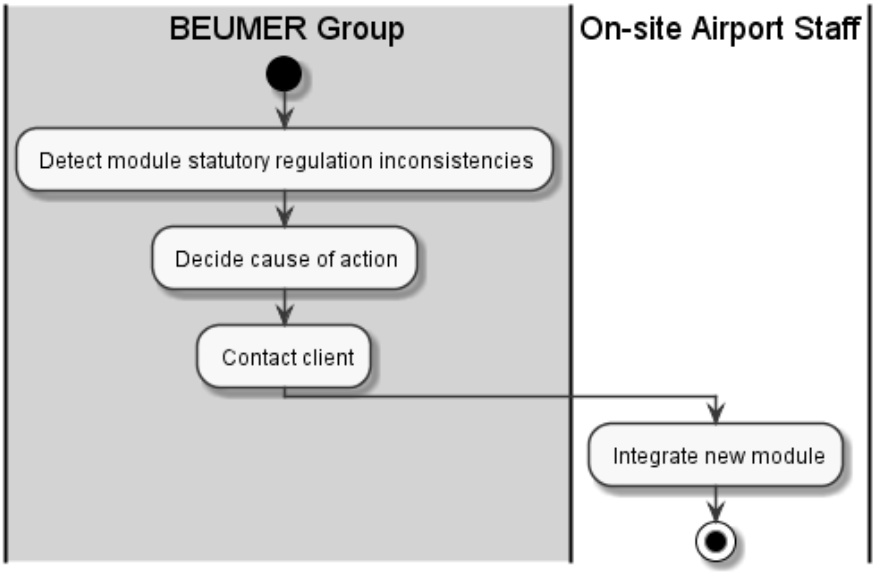

Figure 5.2: Mission support activities in case a module does not meet legal requirements.

For general maintenance and problem identification BEUMER will be able to give a short course or include a manual to select employees, this way there will be at least a basic amount of maintenance knowledge on-site at all times.

6 CONOPS Development Team

In this section there is given a list of the personnel and organizations that made contributions to the document. The list is made to make it possible for the reader to contact the personnel or organizations if there are any follow-up questions.

Name	**Organization**	**Email Address**	**Phone Number**
Martin Jespersen	Company H	MJ@CompanyH.com	+45 XXXX XXXX
Tristan Møller	Company H	TM@CompanyH.com	+45 XXXX XXXX
Rikke Christensen	Company H	RC@CompanyH.com	+45 XXXX XXXX
Jesper Jakobsen	Company H	JJ@CompanyH.com	+45 XXXX XXXX
Mikkel Jensen	Company H	MJE@CompanyH.com	+45 XXXX XXXX
Jens Bendtsen	Company H	JB@CompanyH.com	+45 XXXX XXXX
Mads Dahl	Company H	MD@CompanyH.com	+45 XXXX XXXX
Marie Bærentzen	Company H	MB@CompanyH.com	+45 XXXX XXXX

References

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