NLR Air Transport Safety Institute
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Executive summary

RAMP RESOURCE MANAGEMENT TRAINING SYLLABUS DEVELOPMENT

Prepared by the ECAST Ground Safety Working Group

Problem area
The efforts of the ECAST GSWG have focused on safety culture in GSP and human factors emerging in the aircraft turnaround process. Since aircraft handling is a team effort, team-related elements should be included in training of ramp personnel to optimise the use of people, equipment and information. Since these are the resources available in the aircraft turnaround process, the concept has been called Ramp Resource Management (RRM). Appropriate allocation and management of these resources aim to avoid aircraft damage, incorrect loading and injuries.

Description of work
A RRM training syllabus has been developed, which aims to provide best practices in conducting team-related training to improve safety, communication, effectiveness and efficiency in aircraft ground handling.

Results and conclusions
The RRM documents consist of:
- Description of the RRM training syllabus development and its contents (this document);
- RRM training PowerPoint presentations;
- RRM training instructor's notes.

Applicability
The RRM training syllabus provides guidance material only and can be adapted to the users' needs, dependent on the organisation's size, needs, local circumstances and resources available. To make the RRM training accessible and comprehensible to all personnel, the training contents should be translated to the local language.

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Prepared by the ECAST Ground Safety Working Group

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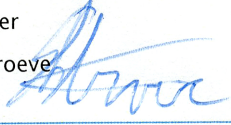
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Summary

In 2009, the Ground Safety Working Group (GSWG) was launched by the European Commercial Aviation Safety Team (ECAST). The establishment of the GSWG is the result of the ECAST process and the priorities identified by the ECAST Safety Analysis Team in 2006/2007. The GSWG promotes and facilitates at the European level the adoption of best practices on training for Ground Service Providers (GSP).

The efforts of the ECAST GSWG have focused on safety culture in GSP and human factors emerging in the aircraft turnaround process. Since aircraft handling is a team effort, it has been suggested to include team-related elements in training of ramp personnel [Balk et al, 2010] to optimise the use of people, equipment and information. Since these are the resources available in the aircraft turnaround process, the concept has been called Ramp Resource Management (RRM). Appropriate allocation and management of these resources aim to avoid aircraft damage, incorrect loading and injuries.

To address these issues in such a way that GSP and individual workers gain the maximum benefit, activities were started to develop a RRM training syllabus, which aims to provide best practices in conducting team-related training to improve safety, communication, effectiveness and efficiency in aircraft ground handling.

This document extends Crew Resource Management principles to the ground handling environment and provides the contents for the RRM training syllabus developed by the ECAST GSWG, together with a brief description of the development process. This document should be used in combination with the Ramp Resource Management training syllabus, which consists of PowerPoint presentations and corresponding Instructor's notes.

It is noted that the RRM training syllabus provides guidance material only and can be adapted to the users' needs, dependent on the organisation's size, needs, local circumstances and resources available. To make the RRM training accessible and comprehensible to all personnel, the training contents should be translated to the local language.

Contents

ABBREVIATIONS

ANSP	Air Navigation Service Provider
ATSI	Air Transport Safety Institute
ATTS	Training, Simulation & Operator Performance
CAA-NL	Civil Aviation Authority the Netherlands
CAA-UK	Civil Aviation Authority United Kingdom
CRM	Crew Resource Management
DNV	Det Norske Veritas
ECAST	European Commercial Aviation Safety Team
FOCA-CH	Federal Office of Civil Aviation Switzerland
FSF	Flight Safety Foundation
GAP	Ground Accident Prevention
GHOST	Ground Handling Operations Safety Team
GSE	Ground Service Equipment
GSP	Ground Service Provider
GSWG	Ground Safety Working Group
IATA	International Air Transport Association
ITRM	IATA Technical Reference Manual
ISAGO	IATA Safety Audit for Ground Operations
MRO	Maintenance, Repair and Overhaul organisation
NLR	National Aerospace Laboratory
PPE	Personal Protective Equipment
R-LOSA	Ramp Line Operations Safety Audit
RRM	Ramp Resource Management
SMS	Safety Management System
TEM	Threat and Error Management

DEFINITIONS

Aircraft handling
Activities associated with servicing of an aircraft on the ground, including aircraft access, equipment attachment and removal, and operation of vehicles and equipment in the immediate vicinity of the aircraft [IATA ITRM, 2009].

Ramp Resource Management
The effective use of all available resources – people, equipment and information – to optimise personal and flight safety, and the efficiency of the aircraft turnaround.

Ramp
A defined area on an airport intended to accommodate aircraft for loading or unloading of passengers, mail or cargo, or for fuelling, parking or maintenance [IATA ITRM, 2009].

Team
All organisations and people involved in the aircraft turnaround process with the common goal to ensure the safety, security and efficiency of their activities, as well as compliance with the requirements of the customer airlines and relevant authorities.

Teamwork
The activities done by several team members with each doing a part, but all subordinating personal goals to the common goal to ensure the safety, security and efficiency of the aircraft turnaround process, as well as compliance with the requirements of the customer airlines and relevant authorities.

1 INTRODUCTION

1.1 BACKGROUND

In aviation, the continuous attention to flight safety has led to the fact that it is nowadays one of the safest means of transportation. Due to the consecutive safety improvements in technology, systems, training and procedures, further improvement of flight safety poses an ever increasing challenge to the aviation industry. In answer to that challenge, safety improvement initiatives spread from airlines and Air Navigation Service Providers (ANSP) to airports, Maintenance, Repair and Overhaul (MRO) organisations and Ground Service Providers (GSP).

In 2003, the Flight Safety Foundation (FSF) started the Ground Accident Prevention (GAP) program. The GAP program developed information and products in a practical format, designed to eliminate accidents and incidents on airport ramps and adjacent taxiways, and during the movement of aircraft into and out of hangars. The GAP program already identified human factors emerging as a dominant factor in ramp accidents and incidents [FSF in Aero Safety World, 2007]. Since then, several studies have focused on aircraft damage during ground handling activities [Balk, 2007, Bjelkerud & Funnemark, 2008]. Despite the several efforts to address the safety of aircraft ground handling, preventing incidents and accidents during, or as a result of, the aircraft turnaround process still poses a challenge to GSP.

In 2009, a Ground Safety Working Group (GSWG) was launched by the European Commercial Aviation Safety Team (ECAST). The establishment of the GSWG is the result of the ECAST process and the priorities identified by the ECAST Safety Analysis Team in 2006/2007. The GSWG promotes and facilitates at the European level the adoption of best practices on training for GSP. The team coordinates with major ground safety initiatives including ISAGO by IATA and GHOST by CAA UK. The topics of human factors and training have been addressed as ground safety issues for which new safety enhancement plans had to be developed.

The efforts of the ECAST GSWG have focused on safety culture in GSP and human factors emerging in the aircraft turnaround process. Since aircraft handling is a team effort, it has been suggested to include team-related elements in training of ramp personnel [Balk et al, 2010] to optimise the use of people, equipment and

information. Since these are the resources available in the aircraft turnaround process, the concept has been called Ramp Resource Management (RRM). Appropriate allocation and management of these resources aim to avoid aircraft damage, incorrect loading and injuries.

To address these issues in such a way that GSP and individual workers gain the maximum benefit, activities were started to develop a RRM training syllabus, which aims to provide best practices in conducting team-related training to improve safety, communication, effectiveness and efficiency in aircraft ground handling.

RRM can be seen as a subpart within the general human factors-domain. Since the concept of Crew Resource Management (CRM) first was used in the late 1970's, it has developed significantly. From initially focusing on personality and attitudes in a classroom-based learning environment, CRM today is an integrated part of safety management in aviation, shipping and the Oil & Gas Industry. The different CRM-programmes utilise a range of different pedagogical tools, such as E-learning, workshops, simulator-based training and on-board training. There is also a growing understanding of the requirement for organisational support in order to make CRM an efficient safety tool in daily operations and there is a clear tendency in the development of CRM towards training of specific behaviours. The Threat and Error Management (TEM) approach to CRM is in line with this development.

This document extends the CRM principles to the ground handling environment and provides the contents for the RRM training syllabus developed by the ECAST GSWG, together with a brief description of the development process.

It is noted that the RRM training syllabus provides guidance material only and can be adapted to the users' needs, dependent on the organisation's size, needs, local circumstances and resources available. To make the RRM training accessible and comprehensible to all personnel, the training contents should be translated to the local language.

1.2 OBJECTIVE

The objective of this document is to deliver a prototype RRM training syllabus of best practices that covers the most important issues encountered during the aircraft turnaround process, and that can be adapted to the users' needs, dependent on size, needs, local circumstances and resources available.

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1.4 PREREQUISITES

Following the introduction of the concept of RRM training, the following prerequisites were indicated by GSP. The RRM training has to be:

- Closely related to the operational environment;
- As much as possible integrated in current (human factors) training;
- Scheduled outside peak hours;
- Highly practical and realistic.

1.5 SCOPE

1.5.1 RRM TRAINING SYLLABUS

The RRM training syllabus has been developed for airports and GSP, primarily to be used in training for ramp personnel involved in aircraft handling, including supervisors. After initial implementation of RRM training, the target group may be extended to include planners, managers, etc. in order to increase their awareness of the influence of their decisions on the actual aircraft handling during the turnaround.

Since various organisations and different professions are involved in the aircraft turnaround process, RRM training should ideally be provided by airports as part of their Safety Management system (SMS) activities, as prescribed in [ICAO Annex 14], or to fulfil proposed amendments on [EC regulation 96/67]. GSP's, in turn, may provide additional RRM training which addresses the particularities of the GSP's organisation and procedures.

RRM training should be provided when ramp workers apply for an airside badge, and is preferably given after the basic airside safety training has been completed. Recurrent training may be provided at badge renewal.

1.5.2 AIRCRAFT HANDLING

For the purpose of the RRM training syllabus, aircraft handling is defined as: Activities associated with servicing of an aircraft on the ground, including aircraft access, equipment attachment and removal, and operation of vehicles and equipment in the immediate vicinity of the aircraft [IATA ITRM, 2009].

1.5.3 TEAM AND TEAMWORK

Defining the team depends on the goal that has to be achieved during the aircraft turnaround. The airport ramp area is a dangerous environment. For all organisations and people involved in the aircraft turnaround process, the common goal may be described as to ensure the safety, security and efficiency of their activities, as well as compliance with the requirements of the customer airlines and relevant authorities. Therefore, the team comprises all organisations and people involved, each of them representing a link in the chain of activities that completes the aircraft turnaround process.

Viewed from the ramp worker's perspective, some team members may be more distant than others. For example, catering or fuelling operations do not directly interfere with the ramp worker's activities, although their vehicles have to be taken into account when manoeuvring equipment. Other ramp worker's activities, however, directly interfere; like opening a cargo door and attaching cargo loading equipment. Therefore, teams and teamwork can be viewed at different levels. Figure 1 shows the different teamwork relations in aircraft handling.
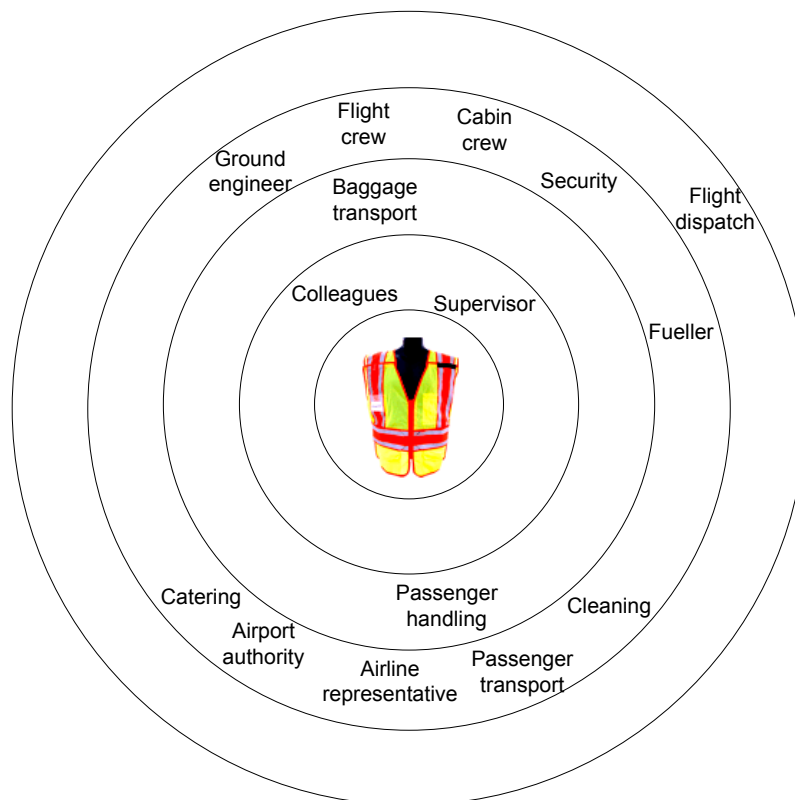
Figure 1: Teamwork relations in aircraft handling

The individual ramp worker has a direct teamwork relation with his/her colleagues and supervisor. At the next level, the ramp worker's activities depend on the baggage transport and delivery of hand baggage by passenger handling. At the next level, other organisations are present that fulfil a role during aircraft handling, but do not directly interact with the individual ramp worker. However, they have to be aware of each other's physical presence either in person or by means of a vehicle. At the outer level, support is provided by the GSP's flight dispatch, which provides loading instructions and work assignments.

It follows from the team definition that teamwork relates to the activities required to reach the common goal: to ensure the safety, security and efficiency of the aircraft turnaround process, as well as compliance with the requirements of the customer airlines and relevant authorities. In performing these activities, all team members subordinate their personal goals to this common goal.

2 APPROACH

The RRM training syllabus is developed according the standard approach for training design, developed by Det Norske Veritas (DNV). The rationale behind this approach is to make sure that all necessary activities are carried out in order to design a course that meets its objectives.

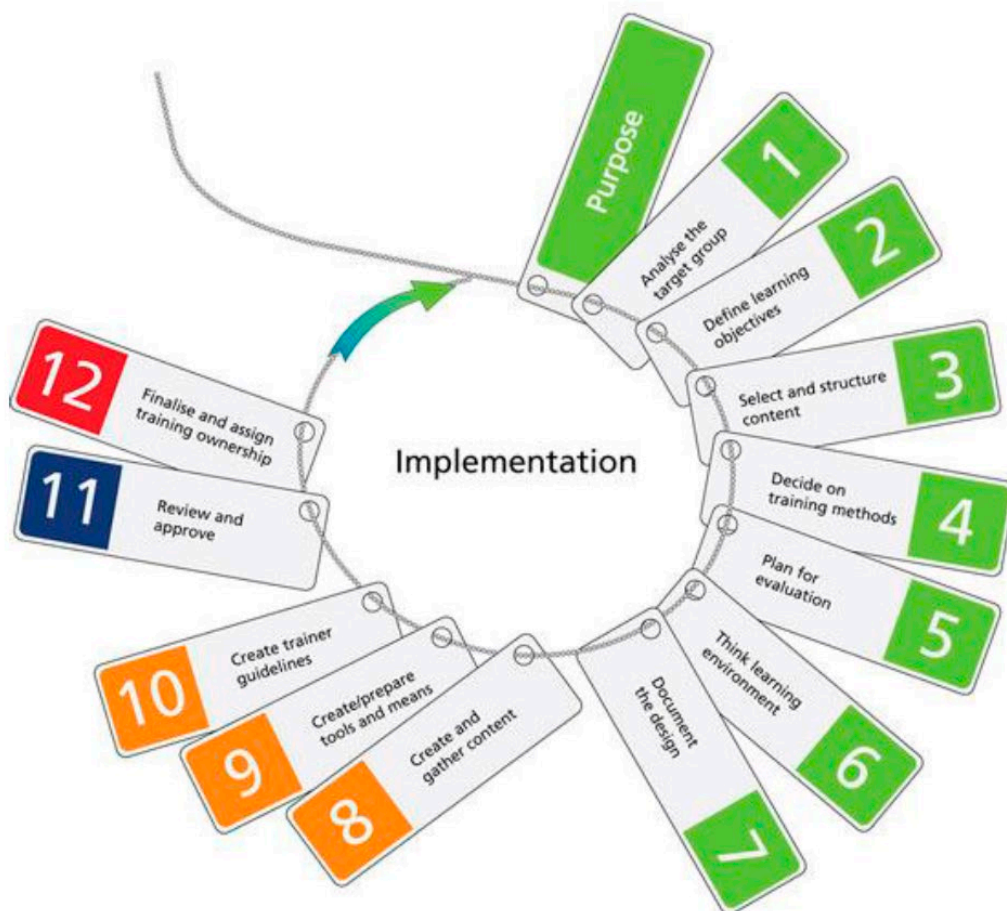Figure 2 shows the DNV standard approach for training design.

Figure 2: DNV standard approach for training design

All elements as depicted in figure 2 will be covered in the next chapter.

3 TRAINING DESIGN

This chapter describes the required elements for developing and implementing the RRM training syllabus.

3.1 PURPOSE

RRM training is team-related training to make effective use of all available resources – people, equipment and information – to optimise personal and flight safety, and the efficiency of the aircraft turnaround.

The purpose of RRM training is to:
- Decrease the number of incidents of aircraft/equipment damage and personal injuries;
- Increase awareness and recognition of human factors and their effect on the aircraft turnaround;
- Improve safety barriers against human error;
- Decrease operational disruptions;
- Increase efficiency;
- Increase individuals' awareness of being part of a larger and more efficient team.

The ultimate goal of RRM is to prevent fatal air accidents through reduction of errors during the aircraft turnaround process and management of the effects of errors that still occur.

3.2 TARGET GROUP

To make RRM training highly relevant for the target group, it has to be fully understood what the characteristics of the target group are, what end results have to be acquired and what potential constraints may exist for the target group to learn.

3.2.1 CHARACTERISTICS

The target group for RRM training is ramp personnel, consisting of permanent and temporary employees, supervisors and team leaders. After a first phase of training, this target group may be extended to e.g. planners and managers. This

does not mean that the content of the training has to be adjusted or extended, but that the dynamics of the training change (the managers are here too!) and this has to be taken into account by the instructor.

In general, the target group has the following characteristics:
- Basic education;
- Trained on technical skills;
- Relative high turnover;
- Mixture of permanent and temporary staff;
- Male dominated workforce;
- Possibly External Locus of Control: 'managers just tell us what to do and we have no influence in what happens or is decided.'

From a previous study it becomes clear that the target group considers personal factors (time pressure, stress, fatigue, peer pressure and motivation) and communication important factors in accident and incident causation during the aircraft turnaround [Balk & Bossenbroek, 2010]. Therefore, RRM training should at least cover those elements.

3.2.2 DESIRED RESULT

The desired result of the RRM training for each individual ramp worker is to:
- Create awareness that they are a link in the chain of the turnaround process and that each link is equally important;
- Create awareness of team dynamics and provide tools that improve team performance;
- Change the attitude and behaviour towards safe operations at the ramp;
- Create awareness about typical threats and errors in the turnaround process and provide tools on how to manage them.

3.2.3 POTENTIAL CONSTRAINTS

The following potential constraints have been identified for the target group:
- Scepticism about the relevance of the RRM training;
- Unfamiliarity with classroom training;
- Unfamiliarity with openly discussing the 'soft' skills involved in teamwork;
- The masculine culture prevents individuals from speaking up (negative peer pressure);
- Unavailability of adequate time and space.

3.3 LEARNING OBJECTIVES

Table 1 provides the learning objectives of the RRM training, which are distinguished by:

- The topic of RRM training;
- The underlying elements of each topic;
- The knowledge that has to be gained about each element;
- The behaviour that the training aims to accomplish.

Table 1: RRM learning objectives

Topic	Element	Knowledge	Behaviour
Turnaround process	Turnaround processes	• Understanding the 'bigger' picture	• Feels part of a larger process
	Type and role of actors	• Understanding the roles and interests of other actors • Understanding similarities and differences in interests	• Focuses on common goals • Considers interests of other actors
	Dependencies	• Understanding the dependencies between the various actors/processes	• Considers the importance of a safe aircraft handling • Considers the limitations of other actors
	Risk awareness	• Awareness of high risk situations/areas • Awareness of risk consequences	• Remains alert on hazards • Alerts colleagues/other actors to hazards
	Pressures on the process	• Awareness of pressures and their effect on the turnaround process	• Adequately manages pressures to avoid additional hazards
Safety regulations	Airlines/ Airports	• Awareness of regulations for airlines and airports concerning aircraft handling	• Adherence to procedures • Motivating others to adhere to procedures
	Security	• Awareness of regulations concerning aircraft security	

	GSP	• Awareness of the effect of regulations on GSP and procedures	
Teamwork	Team dynamics	• Knowledge of team objectives • Awareness of individual and team responsibility	• Understands the team objectives • Feels responsible for team performance • Understands his/her role in the team • Takes condition of other team members into account • Actively participates in the team • Encourages input and feedback from others • Offers assistance in demanding situations
	Leadership	• Awareness of being a role model • Understanding of various leadership styles and how they affect the team • Understanding of elements that build the team safety culture	• Leads by example • Motivates team members to work safely • Shares the workload • Applies assertive communication
	Communication	• Awareness of the importance of good communication • Awareness of the advantages of standardised communication • Awareness of potential communication breakdowns	• Uses standardised communication • Verifies if the message is understood • Asks for clarification if the message is unclear
	Cultural, ethnic and educational	• Understanding of cultural, ethnic and educational	• Treats others with respect

	difference	differences • Understanding of how differences may increase risk • Understand why conflicts arise and strategies to solve them	• Asks for clarification when unsure • Speaks up when necessary • Clarifies mis-understandings • Keeps calm in conflicts • Suggests conflict solutions • Concentrates on <u>what</u> is right instead of <u>who</u> is right
	Team situational awareness	• Awareness of the importance of knowing what is going on around you • Awareness of the condition of equipment • Anticipation on potential threats and errors	• Stays aware of activities going on around him/her • Checks equipment status • Reacts appropriately to potential threats and errors
Threat and Error Management	Threat identification	• Knowledge on how to identify threats	• Correctly identifies threats
	Threat management	• Knowledge on how to manage threats	• Appropriately manages threats
	Error	• Knowledge on error types and consequences (what can go wrong?)	• Identifies errors • Reports errors without losing face
	Error management	• Knowledge on how errors can be managed to reduce risks (how do you handle it?)	• Appropriately manages errors • Learns from errors
Human performance and limitations	Time pressure	• Knowledge on how time pressure affects human performance	• Notices when time pressure starts to affect human performance • Adequately manages time pressure

	Stress	• Knowledge on how stress affects human performance	• Notices stress factors • Adequately manages stress
	Fatigue	• Knowledge on how fatigue affects human performance	• Notices when fatigue starts to affect human performance • Adequately manages signs of fatigue
	Alcohol, medicines and drugs	• Knowledge on how alcohol, medicines and drugs affect human performance	• Refrains from alcohol use prior to work • Reports medicine use • Refrains from drug use

3.4 CONTENTS

3.4.1 TURNAROUND PROCESS

Several ways have been used to describe the aircraft turnaround process. For example, [Lindt, 2008] describes the turnaround as an activity based network of the turnaround process. Figure 3 shows the process that consists of various logistic flows with related activities.
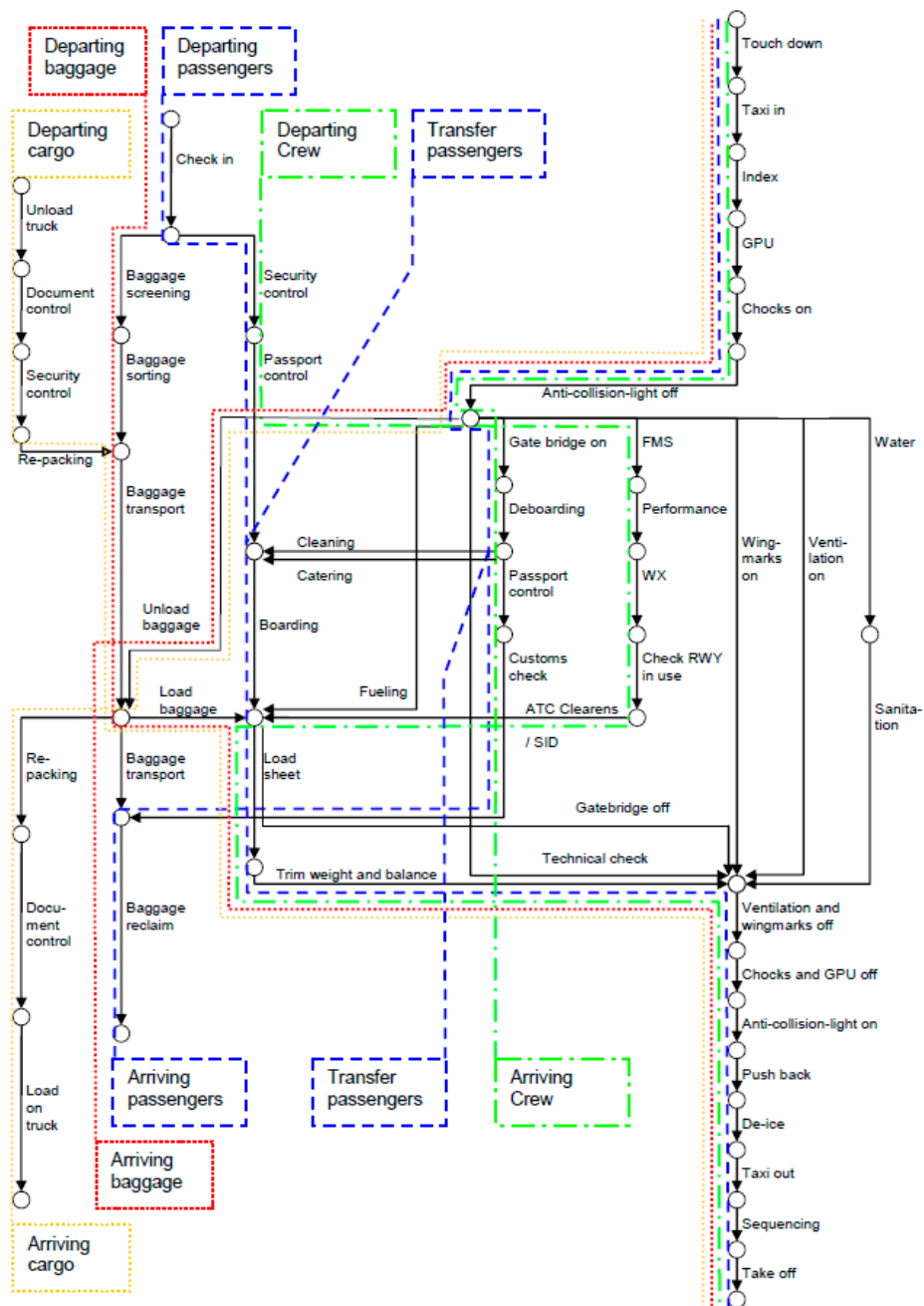
Figure 3: An activity based network of the turnaround process [Lindt, 2008]

A slightly different approach has been used by [Balk et al, 2009], in which the turnaround process is described as a series of simultaneous activities performed by various actors, which are at certain stages in the process dependent on each other. Figure 4 provides the basic process model of the aircraft turnaround.
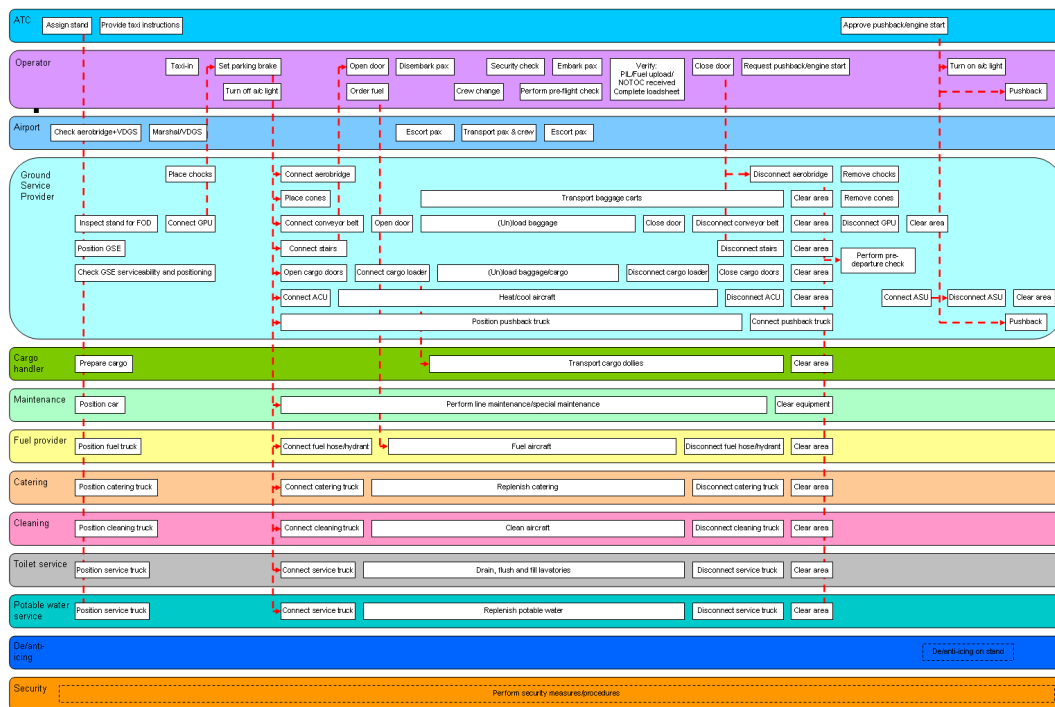
Figure 4: Basic process model of the aircraft turnaround [Balk et al, 2009]

Type and role of actors

Figure 4 shows the several actors involved in the aircraft turnaround process. These actors may come from different organisations, requiring additional coordination, or may come from one organisation that provides all ground handling activities. The first commonality between all actors is that they have the aircraft as their focal point. With the aircraft, all actors intend to make profit. This results in the fact that all actors converge on the aircraft during the turnaround with their personnel, activities, vehicles and equipment. With regard to safety, all actors aim at no injuries and no aircraft/vehicle/equipment damage.

Despite these commonalities, each actor delivers a specialised service to the aircraft (operator), which requires a certain amount of time and space in or around the aircraft. In an aircraft turnaround plan [IATA AHM 616], a detailed description is given of duties and their relation in a chain of activities during an aircraft turnaround. With the turnaround plan, the critical path can be identified that shows the mandatory activities which must be completed before other

activities can commence. When critical activities are delayed, the entire turnaround time is delayed. Additionally, all actors face shared threats, for example adverse weather or time pressure, but also threats related to the specialised service they deliver (e.g. risk of falling from heights or the risk of being hit by baggage).

Dependencies

Several dependencies may be distinguished in the aircraft turnaround process:

- Time;
- Place;
- Information.

Several actors depend on each other's timing of activities. For example, passenger cannot disembark when jetways or stairs are not connected to the aircraft. Likewise, baggage or cargo cannot be unloaded when cargo dollies or baggage trucks are unavailable. Since the (un)loading of cargo and baggage has been identified as the critical path during the aircraft turnaround [Lindt, 2008], the processes of (un)loading and transporting of cargo and baggage have to be carefully coordinated.

All actors in the aircraft turnaround process use their own vehicles and equipment, which require a certain amount of space around, or underneath, the aircraft. When a vehicle or equipment is incorrectly positioned, this prevents another actor from performing its required activity. More critically, evacuation paths may be blocked for passengers or fuel trucks. Additionally, incorrect positioning of equipment may damage the aircraft.

All actors depend on the information they receive concerning the aircraft which has to be serviced. The information may originate from their own organisation, but also from the airline, airport or maintenance department. Correct, timely and real-time information ensures that the effects of potential disturbances can be mitigated.

Risk awareness

According to the Flight Safety Foundation (FSF), the ramp area is not a safe place to work in. Based on IATA data the FSF estimates that 27.000 ramp accidents and incidents occur worldwide each year. This corresponds with one incident or accident per 1.000 departures. For a large airport with 500 aircraft turnarounds a day, this implies one incident or accident every two days. About 243.000 people are injured each year in ramp incidents and accidents, which equals 9 per 1.000

departures. These accidents affect airport operations, result in personal injuries or damage to the aircraft, facilities or Ground Service Equipment (GSE).

With regard to aircraft damage, this may go unnoticed until a catastrophic failure occurs. It is therefore of utmost importance to report any unusual contact with the aircraft by vehicles, equipment or tools.

Pressures on the process

Aircraft operators make money when their aircraft transport paying passengers and/or cargo. Therefore, the operator wants the time the aircraft is on the ground to be as short as possible. Airports make money when aircraft deliver passengers and/or cargo at their airport. To increase the capacity of aircraft the airport can accommodate, the aircraft have to be turned around as quickly as possible.

Figure 5 shows how the interests of the airline and airport create the objective to make the aircraft turnaround time as short as possible.
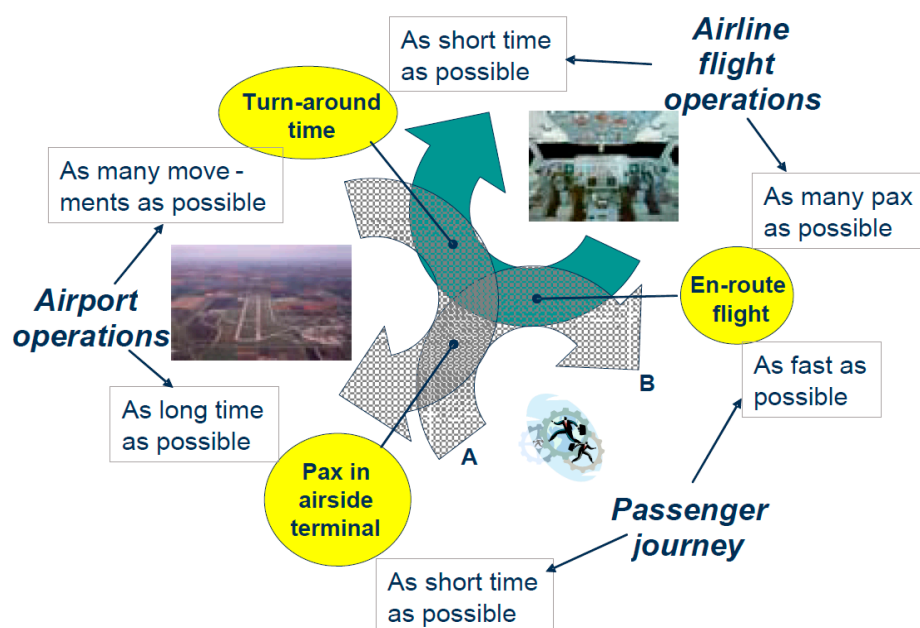
Figure 5: Airline, airport and passenger interests [Lindt, 2008]

Within the shortest possible turnaround time, all actors work within the same frame of:

- Disturbances;
- Weather;
- Resources available (time, space, equipment, manpower).

Figure 6 shows various factors that may affect the turnaround process and teamwork relations.
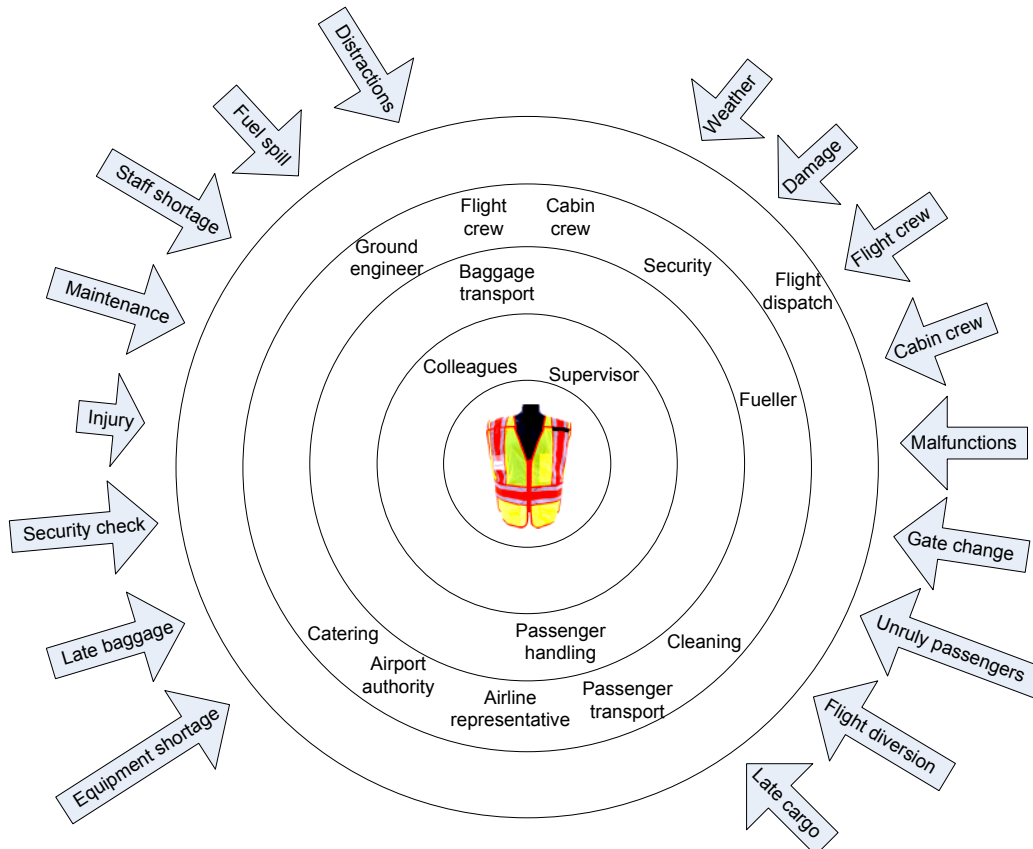
Figure 6: Factors affecting the turnaround process and teamwork relations

All these factors can be seen as threats to a safe and efficient turnaround. When adequately managed, these threats will not decrease the safety margins or efficiency. Paragraph 3.4.4 explains several strategies to manage threats in the aircraft turnaround process.

3.4.2 SAFETY REGULATIONS

The aircraft turnaround process is subject to several regulations imposed on the airline and airport, which in turn are imposed on GSP. These regulations have the objective to ensure the safety of the aircraft turnaround process and are translated into company procedures for the airline, airport and GSP.

The European Union (EU)-OPS regulations specify minimum safety- and related procedures for commercial passenger- and cargo fixed-wing transport. With regard to the aircraft turnaround process, EU-OPS regulations prescribe that airlines must arrange:

- Appropriate ground handling facilities to ensure the safe handling of its flights;
- Ground facilities and services required for the planned flight are available and adequate;
- The load is properly distributed and safely secured;
- The mass of the aircraft, at the commencement of the take-off roll, will be such that the flight can be conducted in compliance with the applicable regulations concerning aircraft performance.

Additionally, EU-OPS provides specific regulations for the processes of: Taxi-in, passenger (dis)embarkation, pre-flight check, receipt of Passenger Information List, receipt of fuel upload, receipt of NOTOC, loadsheet completion and pushback.

When an airport is certificated or licensed to ICAO Annex 14 standards, additional regulations may apply concerning the processes of: checking the aerobridge, checking Visual Docking Guidance Systems and transporting passengers and crew. Both ICAO Annex 14 standards and EU-OPS regulations apply to the fuelling process.

Next to these international and European regulations, additional national or local regulations may have been developed by States, airlines, airports or GSP to increase the level of safety even further. The regulations, for example, may prescribe the wearing of Personal Protective Equipment (PPE) during the aircraft turnaround, or to perform a brake check prior to driving vehicles or equipment on the ramp.

3.4.3 TEAMWORK

Due to the various activities that have to be performed in a confined space and short time frame, teamwork is essential for a safe and efficient aircraft turnaround. During the aircraft turnaround process, individual ramp workers of different specialism, education and experience, from different cultures and ethnic backgrounds, have to operate as a team and various interactions have to be established with e.g. flight crew members and other personnel working on the ramp (e.g. fuelling, catering, etc.).

The ability of everyone to work together with mutual respect is a vital element of the safety culture surrounding the aircraft turnaround and the safety culture within the organisations providing aircraft handling services. Therefore, adequate attention for teamwork is beneficial to increase work efficiency, to operate as a team, and thereby to increase the level of safety during the aircraft turnaround.

Based on [ICAO 9806], [ICAO 9683], [Eurocontrol, 1996] and [Balk & Bossenbroek, 2010], the following aspects are suggested to be considered when addressing teamwork:

- Team performance;
  - o Job design;
  - o Reward systems;
  - o Selection and staffing;
  - o Training;
- Information processing;
- Communication;
- Peer pressure;
- Leadership;
- Coordination.

Team performance

If correctly applied, the team concept increases team performance, resulting in a safe and efficient turnaround. Team performance can be encouraged by giving ramp personnel a certain degree of responsibility for their performance and participation in the way the work is carried out. This provides them with a so-called team identity and makes them feel key players in the aircraft turnaround process. Holding a team responsible for their performance rather than individual ramp workers is an important motivator for all team members. This applies to cases in which good team performance is rewarded, but also applies to cases in which the entire team may be involved in an incident or accident investigation. Either case ultimately increases team responsibility.

The effort to perform safely and efficiently will increase team performance, resulting in team pride. When performance is only monitored at the individual level, this may lead to well-performing ramp personnel adopting an indifferent attitude when ill-performing ramp personnel in their team continuously keep down the actual team performance.

Competition may be an additional motivator to increase team performance and team pride. Communicating for example the number of on-time-departures,

damages or injuries may increase the team effort to increase their performance and safety awareness. However, this motivator has to be carefully applied, since a team effort to reach the highest number of on-time-departures may lead to cutting corners, with is detrimental to a safe aircraft turnaround.

[ICAO Doc 9683] considers the following aspects in order to increase team performance:

- Job design;
- Reward systems;
- Selection and staffing;
- Training.

Job design

Job design is the way in which the activities are performed. Teams should be held responsible for their own activities and, to a certain extent, be involved in decision making regarding the way the work is carried out (e.g. working conditions, work schedules, status of equipment). It is important that all team members participate in the activities which have to be performed. Ideally, they should be interchangeable, within the limits of their specialism, so that the workload can be spread. Participation by all team members is encouraged when the team members feel that their contribution to the aircraft handling process is valued by management and that actions are taken on their input.

Reward systems

Team motivation and performance will increase when well-performing teams are rewarded. A common responsibility for team performance is obtained when both team performance and the contribution of individual team members in the team is assessed. This can, for example, be established by letting management assess overall team performance, and the team supervisor letting assess individual team member's performance on behalf of management. This way, individual performance is linked with the overall performance of the team and responsibility for the overall team performance is shared among all team members.

Selection and staffing

Good team performance starts with the selection of a team supervisor with adequate leadership skills to shape individual ramp workers into a coherent team. Coherent teams with supervisors with adequate leadership skills are a powerful tool in creating a just and mature safety culture. Supervisors have to lead by example, i.e.: they have to act as a role model, promote safe behaviour,

set the standards for communication and support fellow team members when addressing safety issues. In a blame culture, however, coherent teams may develop a team culture whereby errors or unsafe acts are concealed.

A challenge in teamwork in aircraft handling is the composition of teams. Due to their relative low cost, temporary workers may be hired for the activities that do not require professional skills or a certain amount of training. This makes that teams often are composed of both experienced and temporary workers. The team has to reform itself when new temporary workers are hired, the new workers have to settle in and experienced workers have to provide a certain amount of on-the-job training. It is important that all members of the team, including temporary workers, view themselves as full and appreciated members of the team. This will likely increase their professionalism, efficiency and job satisfaction.

Training

In aircraft handling, there is a clear distinction between education and training of ramp personnel. While education creates a basis of knowledge, values, attitudes and basic skills, training develops specific knowledge and skills for certain activities. Whereas ramp personnel, especially temporal workers, may be low-educated, training may make them highly skilled workers with excellent knowledge of their operational environment.

Ideally, team members should have interchangeable skills, so that the workload can be spread when necessary, for example during peak hours or disruptions in the aircraft handling process. Additionally, team members should be trained in team aspects like: group decision making, development of interpersonal skills and working with other teams of the same, or another, profession.

Information processing

A formal way of information processing is by means of documentation in which, for example, procedures are described or safety information is shared. Within GSPs, documentation has to be tailored to the personnel working in the organisation. For example, training documentation and safety information have to be easily accessible, easy to read and easy to understand. It may be necessary to involve ramp personnel in the development, compilation and distribution of safety information throughout the organisation.

When working with personnel from different cultural backgrounds, it is important that information is processed in such a way that it is correctly interpreted. From

the information received, conclusions are drawn and decisions are made about what to do and how to do it. Errors may be introduced in all stages of information processing and may partly be overcome by requiring adequate feedback to verify if the information is correctly understood. In the aircraft handling process, supervisors should verify if task assignments are correctly understood and have an open attitude to receive and answer clarifying questions.

In the aircraft handling process, adequate information processing is extremely important during shift handovers. The status of activities that have not yet been completed has to be timely and accurately transferred to the next shift; otherwise essential activities are not performed and thereby may endanger flight safety. It is important that shift handovers are organised and sufficient time is scheduled (overlapping of shifts) for ramp personnel to perform an accurate shift handover.

Information processing is improved when the following aspects are shared between team members or between teams (shift handovers):
- Knowledge about the task to be performed;
- Knowledge about team work;
- Knowledge about team mates;
- Attitudes and beliefs.

When teams and team members share the knowledge about the task that has to be performed, they have a common goal and a common understanding of what is required to perform the task. Then, less information and communication is necessary, since all team members know what is expected from them. A common understanding that team work is required to reach the common goal makes the team both effective and efficient. Knowing how to operate as a team ensures that activities are performed by team members with the required expertise and backup is provided when necessary. Finally, shared attitudes and believes lead to effective decisions and increase motivation.

Communication

The primary means of information processing on the ramp is by means of communication. Adequate communication involves the person who intends to pass on a message, the means of communication (speech, hand signals) and the person(s) who need(s) to receive and understand the message. The quality of communications may be affected by:
- Unclear or ambiguous contents;
- Background noises or distortions;

- Misinterpretations;
- Different expectations;
- Impaired hearing/speaking ability;
- Non-native tongue.

These factors are mitigated by using standard means of communication, like standardised hand signals or standard phraseology, and by verifying if messages are correctly understood.

Peer pressure

Working in teams introduces the risk that peer pressure is experienced during the aircraft handling process. Especially in the masculine culture of ramp personnel, it may be difficult for ramp workers to speak up when unsafe activities are detected or procedures are not followed. Team pride may also lead to actions that otherwise would be considered as unsafe.

Next to peer pressure during the ground handling process, peer pressure may also be experienced before and after the normal shift. Ramp personnel may not report ill because they feel pressure to go to work since they feel that the team is counting on his or her presence. Similar pressure may be felt when the work is continued after the normal shift has ended, although individual team members are extremely fatigued.

To counteract the negative effects of peer pressure, it is extremely important to establish a mature safety culture within the organisation, which disseminates to the teams and finally becomes an intrinsic team value.

Leadership

Due to the nature of the activities, ramp personnel primarily consist of male workers. This makes aircraft handling prone to the establishment of a macho-culture, in which leaders have a strong influence on their fellow workers.

A leader is a person whose ideas and actions influence the attitudes and behaviour of others. Since aircraft handling is performed in teams, the role of the supervisor is extremely important to manage the team in order to perform the activities in the most safe, effective and efficient way. Especially when working with teams that are composed of different cultural and ethnic backgrounds and education, the supervisor faces various challenges which have to be managed.

The leadership role (authority) of the supervisor may be assigned by the management of the organisation, but in order to be most effective, this kind of

leadership by authority must be complemented by the kind of leadership that has been earned from the team. This charismatic leadership may be acquired by experience, empathy, being a role model, etc. When the appropriate leadership role is acquired, a supervisor becomes a valuable asset who is able to shape and improve the safety culture within the team.

Leaders/supervisors have to be alert on factors that may increase the risk of human errors (e.g. weather, fatigue, stress, equipment). These factors may also affect the attitude and motivation of ramp personnel regarding their activities.

The importance of leadership and supervision is recognised by the management of the GSPs that participated in the human factors study of [Balk & Bossenbroek, 2010]. Due to the importance of the leadership role of supervisors, it is beneficial for GSPs to arrange leadership courses for supervisors in which they learn about team dynamics, adequate communication and alertness to human error inducing situations.

Coordination

Whereas crew coordination has a long history in flight crew training, several aspects can also be applied to ramp personnel in order to detect and correct individual errors and to use all available resources in the most efficient way.

The attitudes, motivation and training of the team members determine the extent of coordination or teamwork. During stressful periods, coordination amongst team members may decrease, which may result in communication breakdowns, errors, a lower probability of correcting errors, and conflicts between team members. It is therefore important that all team members continuously:

- Know what they are doing and why;
- Know what is going on around them.

In maintaining coordination, the role of the supervisor is extremely important. The supervisor needs to have open eyes and ears to sense a breakdown of coordination, and act adequately to re-establish coordination within the team, for example to spread the workload.

Next to coordination within, and between teams, some airports have appointed a supervisor to coordinate all organisations (e.g. GSP, fuelling, catering, etc.) involved in the aircraft handling process during the actual turnaround. This requires additional skills and a different authority, since several teams with

different objectives perform their activities within the confined space of the ramp in the (usually) short time frame available.

3.4.4 THREAT AND ERROR MANAGEMENT

In the effort to increase safety during the aircraft turnaround, both the individual ramp workers and the environment affecting them have to be considered. The Threat and Error Management (TEM) framework provides a practical way to describe all factors that may degrade safety and how they can be managed. The objective of the TEM framework is to enhance aviation safety and efficiency by understanding and managing system and human performance in the operational context. It helps to understand the relationship between human performance and safety on the ramp and basically asks the question: "What can go wrong and how do you handle it?"

Threats are defined as events or errors that occur beyond the influence of ramp personnel, increase operational complexity, and which must be managed to maintain the margins of safety. It is assumed that threats cannot directly be controlled by ramp personnel, like adverse weather conditions, so the focus is not on *avoiding* threats, but on *managing* them. Threats during the aircraft turnaround may be divided into:
- Expected threats (e.g. time pressure, adverse weather conditions, staff/equipment shortage, aircraft handling at adjacent stand, etc.), and
- Unexpected threats (e.g. equipment failure, fuel/dangerous goods spill, emergencies, etc.)

Threats may also be divided into:
- Internal threats (e.g. equipment, procedures, fellow workers, etc.);
- External threats (e.g. handling area layout, airport layout/equipment, adjacent handling areas, etc.);
- Environmental threats (e.g. weather conditions, fumes, etc.).

Most of these threats may be readily observable to ramp personnel involved, but may also lie hidden in the organisation, like a poor safety culture or a lack of training.

Errors are defined as actions or inactions by ramp personnel that lead to deviations from organisational or operational intentions or expectations. Errors in themselves may create hazardous situations, but in combination with a threat, safety margins are even more reduced (e.g. not wearing high visibility clothing in

fog). Errors are inevitable and shall not be confused with wilful misconduct, intentional non-compliance to procedures and negligence.

Undesired states are defined as operational conditions where an unintended situation results in a reduction in margins of safety. Both threats and errors may result in undesired states when not managed adequately. An undesired state is the last precursor before an incident or accident occurs and may be mitigated when adequate emergency action is taken (e.g. stopping a pushback to prevent a collision with a baggage trolley adrift).

Figure 7 provides the TEM framework and the actions required to prevent an incident or accident.
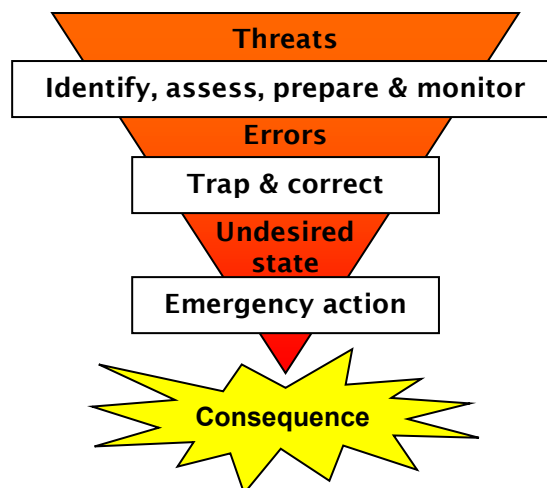
Figure 7: TEM framework

Threat management

GSP employ several countermeasures to manage threats, errors and undesired states during the aircraft turnaround, e.g. by training personnel, defining standard operating procedures or establishing regular (daily) shift briefings.

In addition, Figure 7 indicates several countermeasures to manage threats, errors and undesired states. The first countermeasure has the objective to manage the threats that the aircraft turnaround process is exposed to. Some of the threats may lie in the resources affecting the aircraft turnaround process, as indicated in figure 6. Other threats may be less obvious, like a poor organisational safety culture. Whether overt or latent, expected or unexpected, threats may be managed in four basic steps:

- **Identify** the threat (e.g. weather forecast, planning, equipment status);

- **Assess** the risk (severity, probability and exposure);
- **Prepare** (e.g. notify team members, request wing walkers, lock loose equipment);
- **Monitor** the threat (recognise distractions, interruptions and preoccupation).

The first responsibility in threat management rests with flight dispatch and supervisors. By means of planning, briefings and preparations they are able to manage anticipated and unexpected threats and employ the necessary resources (planning countermeasures). Supervisors have to show good leadership and establish adequate communication to best prepare their teams (team countermeasures) to manage known threats. In a good team safety culture, all team members take responsibility to perform the countermeasures individually. Therefore, team member participation is essential in adequate threat management.

During the actual aircraft turnaround, existing threats have to be monitored for possible deterioration, and vigilance has to be kept to identify new threats. For example, flight dispatch may relay real-time information to supervisors concerning weather developments or disturbances in flight/turnaround schedules. Countermeasures to employ during the turnaround are for example: scanning what is going on around you and cross-checking other ramp workers (execution countermeasures). When conditions or threats change during the turnaround, countermeasures have to be reviewed or modified to manage the existing or new threats adequately. When more threats are detected or the risk of existing threats becomes more severe, the more reason there is to adapt the operation. Timely recognition of threats and adequate threat monitoring also enables flight dispatch and supervisors to manage the workload and resources adequately.

Error management

All people make errors and the same applies to ramp personnel during the aircraft turnaround process. Errors are inevitable, but what matters are the responses to errors made. Errors can either be:
- Ignored;
- Exacerbated; or
- Trapped.

In the course of the activities during the aircraft turnaround, errors may be easily ignored due to the pressure to meet the scheduled turnaround time. Examples

may be: forgetting to place cones or parking of GSE within the aircraft movement zone.

However, errors may also be exacerbated, for example: the combination of a not fully opened cargo door and an inattentive high loader operator increases the risk of aircraft and equipment damage. The same applies when an aircraft is incorrectly (aft) loaded and boarding is started in the aft section of the cabin. Both examples describe chains of errors, creating an undesired state that could easily lead to an incident or accident when no emergency action is taken.

Therefore, to prevent incidents and accidents it is of vital importance to trap errors made during the aircraft turnaround. This requires team situation awareness and an active attitude from team members to trap and correct errors – not only their own, but also errors made by fellow workers.

Errors may have graver consequences when certain threats are present. For example, the risk created by forgetting to place cones underneath the wingtips or parking GSE within the aircraft movement zone is increased during low visibility conditions or a very congested ramp. Likewise, the risks of incorrect loading and an early boarding is increased when the turnaround process is delayed for whatever reason.

Undesired state management
When a combination of mis/unmanaged threats and errors lead to an undesired state, emergency action has to be taken to avoid an incident or accident. To recognise an undesired state, ramp personnel have to be aware of irregularities or anything that is unusual. For example, a fully extended nose strut may indicate that a tail tip is imminent due to, for example incorrect loading, incorrect boarding or a combination thereof. To avoid the tail tip (manage the undesired state) boarding has to be stopped immediately. Again, team situational awareness is of vital importance to detect an undesired state and take appropriate emergency action.

3.4.5 HUMAN PERFORMANCE AND LIMITATIONS

Some threats have a direct influence on the performance of individual ramp workers and their team. The following threats are described in more detail, since these personal factors have been indicated in [Balk & Bossenbroek, 2010] as the threats most frequently encountered during the aircraft turnaround process:

- Time pressure;
- Stress;
- Fatigue;
- Alcohol, medicines and drugs.

The use of medicines has been included in this paragraph since this issue has been indicated by the ECAST GSWG as a topic of attention for ramp personnel.

Time pressure

Since airlines are only able to make profit when passengers and/or cargo are transported, the aircraft turnaround process is mostly time critical for airlines. Preferably, all required turnaround activities have to be performed simultaneously to have the aircraft airborne again in the shortest time possible. This has led to a focus on meeting the scheduled departure time of the aircraft, introducing a certain amount of time pressure for all personnel in the turnaround process. When time pressure is considered as a given fact during the aircraft turnaround process, it is increasingly important to adequately manage the way time pressure is perceived and dealt with by ramp personnel.

A certain amount of time pressure is considered to improve performance: tasks are taken up quickly and performed in a swift manner. However, when excessive time pressure is experienced, performance may degrade. Negative effects of time pressure may include:
- Lack of concentration;
- Inadequate decisions;
- Inadequate communication;
- Taking shortcuts;
- Incomplete tasks;
- Omissions;
- Errors;
- Violations;
- Taking over/completing other's job;
- Stress.

Recognition

In recognition of time pressure, it is first important to determine the origin of the time pressure. It should be considered whether the time pressure is:
- Actual pressure (e.g. meeting a scheduled departure time due to contract arrangements with the airline);

- Perceived pressure (e.g. the perception that all airlines want to have the shortest turnaround time as possible);
- Self-imposed pressure (e.g. having the tasks finished before the shift handover).

When pressure is perceived, one should ask whether the perceived pressure is reality in that particular situation. Should pressure be self-imposed, one should realise that it is more important to work safe and that no actual time pressure is present.

Prevention and coping

Time pressure is best prevented by doing as much as possible in advance and being prepared for the time pressure. This can be done by:
- Being aware of the negative effects of time pressure on performance:
- Providing for sufficient resources (manpower, serviceable equipment);
- Positioning and checking equipment prior to aircraft arrival;
- Briefing ramp personnel about the work to expect;
- Planning to share the workload;
- Regular communication with supervisors or turnaround coordinators about progress and schedule updates.

In case of actual time pressure, it is important to:
- Prioritise tasks;
- Deal with one task at a time;
- Finish the task;
- Ask assistance when available.

Stress

In the (mostly) time critical aircraft turnaround process, stress may be experienced by ramp personnel for several reasons, which influences their performance.

Stress is a normal reaction on situations that are perceived as a threat and require additional actions beyond the normal operating procedures. A certain amount of stress is desirable to reach a certain level of performance and avoid boredom. Therefore, stress may have positive and negative effects. Particularly the negative effects of stress affect human performance, which introduce hazards on the ramp. A better understanding of stress and associated effects helps to adequately cope with stress, or even prevent stress factors at the ramp.

Ultimately, learning how to cope with stressful situations will improve ramp worker's performance and prevents the situation getting out of hand.

Causes

Several stress factors influence the aircraft turnaround process. However, each individual reacts differently to stress factors as a result of a difference in perception. Some factors may be perceived by one individual as extremely stressful, whereas the same factor is perceived as no threat at all by another individual. Additionally, the perception of stress factors depends on their duration and intensity. A long exposure to a stress factor (e.g. persistent Auxiliary Power Unit noise) may be perceived as stressful as a short exposure to the same stress factor with a higher intensity (e.g. engine noise during shut-down).

Table 2 lists several stress factors that may be present at the ramp.

Table 2: Stress factors at the ramp

Environment	Work-related	Organisational/ team factors	Personal factors
Engine/system noise	Time pressure	Reorganisation	Physical well-being (hunger/fatigue)
Extreme temperatures	Shift work	Disciplinary action	Death of relatives
Adverse weather	Workload (too much/too difficult/boredom)	New tasks	Divorce
Lighting conditions	Gate changes	Team/supervisor change	Birth
Confined space (aircraft holds, manoeuvring around aircraft)	Early/late arrivals	Unclear objectives and expectations	Fear of job loss
Dirty/untidy ramp	Equipment malfunctions	Supervision	Financial status
	Changes in procedures	Team role conflicts	Etc.
		Poor team relations	
		Staff shortage	

All stress factors have in common that they represent some kind of change on which an individual has to react. Whether stress factors cause a negative effect depends on the response, and the response is determined by an individual's perception of the stress factor. The way stress factors are perceived depends on:

- How a person feels;
- The stress factor itself;
- The evaluation of the stress factor;
- Personality;
- The ability and willingness of others to provide support.

The ramp worker's well-being is the first element that determines how a stress factor is perceived. A well-rested, healthy ramp worker perceives less situations as stressful and is better able to cope with stress factors.

The way a specific stress factor is perceived depends on the duration, intensity and its predictability. A situation is perceived as more stressful when the stress factor remains present for a longer time, has a high intensity and is not predicted.

The third element is the evaluation of the stress factor by ramp workers. When a stress factor is introduced, it is perceived as being a threat or not. If the stress factor is considered as a threat, it is evaluated if sufficient resources are available to cope with the threat. If so, positive stress is experienced: the stress factor becomes a challenge. If not, negative stress is introduced with potential negative effects.

Different personalities perceive stress factors differently. Some personalities have strong stress reactions, whereas others have strong defences against stress.

The way stress factors are perceived also depends on the team and family or friends. When there is confidence that the team or other team members are willing and able to provide support, the stress level is reduced. The same applies when family or friends provide adequate support in private issues that cause stress factors.

Recognition
Whereas stress may have various sources and people perceive stress factors differently, there are several common symptoms that show the negative effects of stress and may decrease performance. Table 3 shows four categories of stress symptoms:

Table 3: Four categories of stress symptoms

Physiological	Behavioural	Mental functioning	Emotional
Wet hands	Lateness	Lack of concentration	Irritability
Cold fingers	Absence	Indecision	Low self-esteem
Headache	Fatigue	Poor priorities	Cynicism
High pulse rate	Loss of sleep	Postponing tasks	Dissatisfaction
High blood pressure	Impotence	Worrying	Depressive
High blood cholesterol	Substance abuse	Lack of creativity	Emotional reactions
Ulcers	Reduced interest	Inflexible	
Back pain	Uncompleted tasks	Errors	
Stomach upset	Untidy work area	Focus on easily manageable details	
	Avoidance		
	Unsupportive		
	Cutting corners		
	Omissions, violations		
	Excessively hurried actions		
	Use of non-standard phraseology		
	Return to old procedures that are no longer applicable		
	Return to native language		

When looking honestly at oneself, all 4 categories of stress symptoms may be recognised once in a while or in certain situations. With regard to fellow team members, several of the behavioural, mental and emotional stress symptoms may be easily identified, like: lateness, untidy work area, lack of concentration or irritability. It is important to realise that stress is cumulative, i.e.: the

introduction of small stress factors may have a higher impact on performance when other stress factors are already present.

When one or more of these symptoms manifest or change relatively suddenly, it has to be ensured that safety is not compromised for the individual ramp worker, but also for other members of the team. It is therefore important for all team members to keep a keen eye on fellow ramp workers. Especially the supervisor has to closely monitor the individual well-being of the members of his team.

Prevention and coping

The best way to deal with stress is to prevent stress factors to emerge in the aircraft turnaround process. This may be accomplished by training and planning for emergencies, disruptions and other unexpected threats or scenarios. This way, ramp personnel are better prepared to perform their tasks and know what to do in case of unexpected situations or occurrences.

Another way of stress prevention is to brief ramp personnel in advance what is expected during the shift, what elements may affect their work (e.g. equipment shortage) and what has to be done to overcome these. Whenever possible, do things in advance, for example positioning of GPU and having all required equipment available, manned and ready for use.

Stress may also be prevented by adequate use of all resources during the aircraft turnaround process. Manpower and equipment has to be adequately scheduled and workload has to be shared as much as possible. Ramp workers should not be reluctant to ask for, or to provide help to, fellow team members.

Should stress symptoms still emerge during the aircraft turnaround process, communicate this to the supervisor, set priorities together, share workload when possible and focus on one task at a time. This way, coping strategies are applied to reduce the level of stress and to mitigate the threat that stress factors imply.

Next to team-related measures to prevent stress during the aircraft turnaround process, individual ramp workers can also reduce the negative effects of stress factors in their own work or private life by:
- Prioritising tasks;
- Dealing with one task at a time;
- Eating sufficient and healthy food (less calories, fat and sugar);
- Exercising;
- Relaxing;

- Taking sufficient sleep;
- Expressing stress factors to others who may provide support.

Fatigue

One of the reasons why it is important to prevent stress is that it causes and increases fatigue, which in turn greatly affects human performance. Fatigue is a condition of extreme tiredness that affects safety, efficiency, productivity and personal health. Therefore it is important to understand the underlying causes of fatigue, what the symptoms are and how fatigue can be prevented or dealt with.

Fatigue can be divided into acute, chronic and mental fatigue. Acute fatigue manifests after performing a series of heavy or difficult tasks, or after a loss of sleep. Acute fatigue results in chronic fatigue when consistently insufficient rest is taken between demanding tasks. Mental fatigue results from emotional stress or an extended period of chronic fatigue.

Causes

The main causes of fatigue lie in the quantity and quality of sleep, and in disruptions of the body rhythm. Next to these, several factors may contribute to fatigue, like: time on duty, stress, workload, health and environmental factors (noise, temperature, etc.).

The first cause of fatigue is a loss of sleep. When insufficient sleep is taken, one grows increasingly tired. When this is not compensated by an adequate rest period, fatigue, or even permanent and severe disturbance of the sleep pattern may result. Ultimately, it may cause chronic fatigue and behavioural changes, like persistent anxiety or depression.

Even an adequate period of sleep may cause fatigue, since the quality of sleep is also an important factor to consider. The quality of sleep may be decreased when the sleep is disrupted by environmental factors (e.g. noise, temperature) or sleep disorders. Afterwards it may not even have been noticed that the sleep has been disturbed, but the effects are felt indeed. Another element that lowers the quality of sleep is alcohol consumption. Although it may help to get to sleep, the quality of sleep is lowered and even after having been sleeping for a long time, the feeling of being fatigued may have increased. This negative effect of alcohol consumption on sleep is even exacerbated when alcohol is consumed by a person who already suffers from a loss of sleep. It is therefore important to consider the effects of alcohol prior to, and during, a series of shift that disrupts the normal sleep pattern.

In shift work, the sleep pattern is the most important factor that has to be changed, which results in a decrease in quality and quantity of sleep. Disturbances in sleep patterns may reduce the alertness during the working period, which may temporarily be increased by the use of stimulating substances like coffee or energy drinks. However, these substances have a negative effect on the ability to receive adequate (both in quantity and quality) sleep in between shifts. At the ramp, especially temporary staff, sometimes have two jobs to provide for sufficient income. This may increase the risk of fatigue and resulting accident risk. In the 12th hour on duty, the risk has more than doubled than during the first 8 hours, and the risk also increases with the number of successive night shifts.

Shift work also introduces disturbances in the body rhythm of ramp personnel, since it is continuously forced to adapt itself to new working schedules, with variations in human performance as result. One of the characteristics of the 24-hour body rhythm is that human performance and work efficiency at night are lower than during the day. Individual differences between ramp personnel make them more or less prone to problems associated with shift work. Morning active types are considered to have more difficulties in coping with night work than evening active types. Additionally, aging appears to negatively affect the ability to cope with body rhythm disturbances. Shift work also introduces social difficulties since it is harder to participate normally in social life, which usually occurs in the day and evening. This may have a negative impact on marital relations and social contacts, which in turn may negatively affect human performance at the work place.

Recognition

There are several symptoms that provide an indication of fatigue at oneself of fellow team members. Table 4 shows two categories of symptoms of fatigue:

Table 4: Symptoms of fatigue

Physical	Mental functioning
Feeling of tiredness	Memory lapses
Reduced alertness	Lack of concentration
Need to sleep	Inattention
Nodding/napping	Slow understanding
Lethargy	Forgetful
Increased reaction time	Withdrawn/bad mood
	Poor decisions

	Apathetic
	Poor message reception
	Errors
	Reduced social communication

These symptoms may increase the chance of interpersonal conflicts and may lead to a loss of awareness of what is going on at the ramp. Therefore, fatigue may lead to a breakdown of teamwork and team relations. Ultimately, fatigue lead to a greater risk of errors, especially under time pressure or when schedule disruptions occur.

Prevention and coping
It is best to arrive well-rested and physically fit at work. This may be accomplished by taking into consideration the coming pattern of shifts by planning meals, rest and sleep times at home. Prevention of fatigue largely depends on adopting a lifestyle that encourages good sleep. The following elements are considered to improve sleep and decrease the chance of fatigue:
- Use the bedroom only for sleeping;
- Adopt as much as possible fixed times to wake-up and go to sleep;
- Perform the same routine activities each night before going to sleep;
- Do not work, worry or exercise immediately before going to sleep;
- Do not consume alcohol, caffeine or too much food or drinks before going to sleep;
- Get out of bed after lying awake for 30 minutes.

The primary means for organisations to prevent personnel fatigue is to consider the effects of fatigue when developing the work schedules. Ideally, the work schedules and shift patterns are developed to have the least possible impact on off-duty rest. The work schedules should also provide for an adequate work demand, especially during night shifts, to prevent personnel being overcome by fatigue. Further measures may be taken by providing sufficient and adequate resources to perform the work (manpower, equipment) and to create awareness of the potential (deadly) effects of fatigue at the ramp.

Despite all preventive measures, circumstances may lead to being fatigued at work. In this case, fellow team members or the supervisor should be advised when one feels fatigued and fellow team members should be addressed when they appear to be fatigued. During night shifts, the readiness of a person for performing work (arousal level) may be temporarily increased by the consumption of stimulating substances like coffee, tea, tobacco, etc. Longer

lasting aspects to increase the arousal level during night shifts are an adequate work demand and motivation. Other coping strategies during night shifts are the provision of sufficient bright lighting throughout the shift and the timely provision and consumption of meals and snacks. Preferably, meals and snacks have to be consumed at the start of a rest period to prevent after-meal dips when performing tasks.

Alcohol, medicines and drugs

In performing safety critical activities related to oneself and to others, the negative effects of alcohol, medicines and drugs should be carefully considered.

As stated before, consumption of alcohol has a negative effect on the quality of sleep and should therefore not be used when an adequate rest period has to be taken prior to work or a shift pattern. Going to sleep after alcohol consumption may slow down the removal of alcohol from the blood since the metabolic system operates at a lower level. Alcohol remains in the blood for a considerable period of time, especially when the alcohol is taken in combination with food. Therefore, negative effects from alcohol may still be experienced about 8 hours after the last drink. Negative effects include dulled senses and increased mental and physical reaction times. These effects are worsened in combination with medicines or fatigue.

Medicines are used to treat the symptoms of some sort of illness. When medicines are used by ramp workers, they first have to ask themselves whether the reason for taking the medicines still renders them fit to perform their tasks safely. Working when being ill affects performance, may cause incidents or accidents, or fellow ramp workers may be infected, which has an increased impact on work schedules. When medicines are taken for the first time, a doctor has to be consulted about their potential negative effects on work performance. Moreover, care has to be taken when taking medicines for the first time, since unexpected reactions may be experienced. Potential effects of medicines may not be underestimated, since even medicines against colds or hay fever may cause drowsiness.

Drugs have a significant negative effect on performance and are not to be used in aviation. Even smoking cannabis impairs performance since it affects the ability to concentrate, retain information and make reasoned judgments.

3.5 TRAINING METHODS

The training will be classroom based, preferably with a mix of different actors in the turnaround process. The training will consist of a short theoretical introduction to each topic, followed by case studies (real or made-up), facilitated discussions or short assignments to highlight the theory and to facilitate a discussion about what would be the preferred solutions to the different challenges.

Considerable efforts should be put into making the training interactive with a high level of involvement and participation. Participants have to be encouraged to use their experience and skills, and to express their questions, doubts and uncertainties. By teaching how to give fellow workers feedback, ramp personnel are enabled to learn from each other's experience. When providing feedback is made part of their daily work, this will improve safe behaviour and the GSP safety culture.

The facilitator keeps the RRM training syllabus that includes the topics that need to be covered. Facilitating an open discussion will increase the relevance of the training to the course participants. It is the facilitator's responsibility to focus the discussion around the topics to be covered in order to carry the message across.

3.6 EVALUATION

The training will be evaluated by different means:
- Short discussion about strengths and weaknesses at the end of the training session;
- Evaluation forms;
- A follow-up of actual behaviour and practices on the ramp.

For the last means of evaluation, several options may be used. When an airport, GSP or airline has established Ramp Line Operations Safety Audits (R-LOSA), these audits may be used to check the effectiveness of the RRM training. In order to accomplish this, supervisors or R-LOSA auditors may have to receive additional training, authority and responsibilities.

Another way of evaluating RRM training effectiveness is the introduction of the NOTECHS behavioural marker system [Flin et al, 2003] in the area of aircraft handling. The NOTECHS behavioural marker system provides:
- An assessment of non-technical skills to meet the regulatory/licensing requirements;

- Individual feedback to ramp workers and trainees on their non-technical skills development;
- Feedback for integration into the training programme.

Since the NOTECHS behavioural marker system initially has been developed for evaluating CRM skills of flight crew, it has to be adapted to evaluate the RRM skills of ramp workers.

3.7 LEARNING ENVIRONMENT

The training should be conducted in a suitable classroom with participants seated preferably in a U-setting with a mix of participants from the different actors in the turn-around process. The classroom must be equipped with a projector, a sound system and a set of flip-overs. To create a sense of management support for this training the classroom should be 'nice', i.e. a new, modern and comfortable environment. What also helps is a manager being present for the introduction and who openly supports the event.

3.8 REMAINING ELEMENTS IN THE STANDARD APPROACH FOR TRAINING DESIGN

The DNV standard approach for training design indicates that the following remaining elements have to be covered before actual training can be provided:
7. Document the design (provided in this document);
8. Create and gather contents [NLR, 2012];
9. Create/prepare tools and means [NLR, 2012];
10. Create trainer guidelines [NLR, 2012];
11. Review and approve (responsibility of ECAST GSWG and ECAST plenary);
12. Finalise and assign training ownership (responsibility of future users).

It is noted in this list that all elements have been covered by providing the supporting document that describes the development of the RRM training syllabus (this document), the RRM Power Point slides and the accompanying instructors' notes.

The responsibility for review and approval of the RRM training syllabus and related documents lies with the ECAST GSWG and ECAST plenary. Finally, it is the responsibility of potential future users to adapt the training to their needs, finalise it and assign training ownership.

4 FACILITATION SKILLS

This chapter has been adapted from [CAP 737].

4.1 INTRODUCTION TO FACILITATION SKILLS

The following aims to explain why there is a need for facilitation, what facilitation is and some of the skills required to use this training technique, plus some general guidelines.

To be competent in any job a person requires a certain amount of knowledge, an adequate level of skills, and the right set of attitudes. This is true for doctors, hotel receptionists, lawyers, footballers, soldiers, artists and also for personnel working on the airport ramp. The role of a trainer in any discipline is to help people develop their knowledge, their skills and their attitudes so that they are able to do their jobs well. In many of the professions the formal training emphasis is often on developing knowledge and skills, with the examination of competence almost exclusively concerned with measuring knowledge and skills against a set of standards.

In aviation it is no different. The vast majority of training resources and all formal examination have been aimed at ensuring people have the appropriate knowledge and skills, rather than the right attitudes. The fact that attitudes are fundamental to competence has not been officially recognised, even though incorrect attitudes are suspected to have contributed to many of the major accidents - the ultimate consequence of a lack of competence. The reason for this omission is uncertain, but a reasonable assumption may be because training and examining 'attitudes' have been less precise and more difficult to carry out successfully.

CRM training has attempted, with variable success, to try and redress the imbalance. Most experts and practitioners are in agreement that the variability in the effectiveness of CRM training is largely linked to the quality of the delivery and not the content, and that training with a high degree of facilitation has been more successful.

This can be explained by exploring the two main techniques that are available to trainers, namely instruction and facilitation. Instruction can be described as

being primarily a telling activity, where knowledge and skills are developed in trainees through either direct communication or demonstration, with questioning primarily used to check understanding or reinforce key messages. Facilitation on the other hand, can be described as a technique that helps trainees to discover for themselves what is appropriate and effective, in the context of their own experience and circumstances.

Both techniques are useful and have their place. In order to transfer knowledge and many skills, instruction is the most efficient technique to employ; it would be laborious and unnecessary to teach a straightforward and precise subject such as an electrical system using facilitation. Furthermore, instruction can be used to train larger numbers of people, and is particularly useful if only certain answers are acceptable.

On the other hand, trying to encourage appropriate attitudes using instruction as the technique, normally has limited success. People, particularly adults, do not like being told how to behave and what to think. There are rare occasions when a sharp 'kick up the backside' delivered by the right person at the right time has the desired effect, but in general, telling people to change their attitude is not usually effective. This is particularly so if the person doing the telling does not have the respect of the recipient, or represents an authority that lacks credibility. Ironically, this is also consistent with the instruction of positive behaviour, such as 'keep up the good work' which has been known to produce an adverse reaction.

The reason for this is that a person's behaviour is based on their past experiences, values and beliefs which will be different from those of others. Therefore, telling people to behave differently carries the implication that their values and beliefs are wrong, and this is not convincing. People generally behave in a way that they think is rational, and often find it easy to justify their behaviour to themselves and others. However, what they may not be aware of is the effects of their behaviour on other people or the operation; and that an alternative behaviour, which does not question their values but has a more positive effect, may be something they might wish to consider.

The technique of facilitation allows this process to occur, although it is not just for the poor performer or for the development of attitudes. Facilitation can be equally used to reinforce effective behaviour because it gives people an understanding of why they are good which encourages their continued development. Furthermore it can be used in the development of skills and even

knowledge, because it is an effective tool for allowing self-analysis and in depth thought, which is an easier way for people to learn, as there is less recourse to memory techniques. The skills of self-analysis are not just to get the most from the training session, but can also be continually used for self-development on the line. Table 5 shows the differences between instruction and facilitation.

Table 5: Differences between instruction and facilitation [Dr Guy Smith NWA]

	Instructing	Facilitating
1. What do the words imply?	Telling, showing	Making easy, enabling
2. What is the aim?	Transfer knowledge and develop skills	Gain insight/self-analysis to enable an attitude change
3. Who knows the subject?	Instructor	Both
4. Who has the experience?	Instructor	Both
5. What is the relationship?	Top down	Equal
6. Who sets the agenda?	Instructor	Both
7. Who talks the most?	Instructor	Student
8. What is the timescale?	Finite	Infinite
9. Where is the focus?	Instructor/task	Student/attitudes/behaviour
10. What is the workload?	Medium/high	Intense
11. What are instructor's thoughts?	Judgemental	Non-judgemental
12. How is progress evaluated?	Test	Observation/self-assessment

Notes on Table

1) Although instructors have used facilitation techniques naturally for many years; in its purest sense instructing has a lot to do with telling, demonstrating and checking that the task is being done in accordance with a standard. Whereas facilitation means that students are given the opportunity to discover what they are doing and the effect it has on others and the task, so that they can make the decision themselves to alter their behaviour or even reinforce any positive behaviour. This process should be made as easy as possible.

2) The principle purpose of instructing is to transfer knowledge and skills efficiently, whereas with facilitation the principle purpose is to encourage a change in attitude or behaviour by the student gaining insight or becoming aware of what they are doing, and being motivated to change. People tend to only do things that they want to do; so telling people that they are wrong and

need to change is rarely effective. People generally do not behave in a way that they think is wrong. They are aware that others might disapprove, but they will rationalise their behaviour as being appropriate under the circumstances. Telling them that you think they are wrong gives them no new information and often motivates them to continue their current behaviour. The key is for them to understand why others disapprove and the consequences of continuing as they are.

3+4) When instructing, the trainer knows the subject and has the experience, otherwise it would be a pointless exercise. When facilitating both parties know the subject and have the experience, particularly when discussing behaviour. In fact, very competent facilitators are quite capable of being effective without knowing the subject or having any experience of it. In many respects this can be a useful pointer to know when to change hats from being an instructor to a facilitator. If you are certain that only you have the relevant knowledge, and the student would find it difficult to work it out for themselves in the time available, then instructing is probably the most appropriate technique to employ.

5) The relationship when instructing can be perceived as being top down in that the instructor knows more than the student, whereas when facilitating it must be apparently equal. A common mistake by inexperienced trainers when facilitating is to create the impression that they are in some way superior, by implying they know more or have a better attitude.

6) The agenda when facilitating must be set by both parties if the process of buy-in is to get the right start. Agreeing what you are going to talk about and how you will go about it is an important first step. The trainer can greatly assist the learning of the session by summarising and giving meaning to the students' discussions. It is still the trainer's responsibility to ensure that all the training requirements are included in the facilitative session.

7) One of the best measures of identifying which technique you are using, whether it is instructing or facilitating, is to note who is doing most of the talking. When facilitating, students need to be clear in their own minds and be able to self-assess what they are doing and the benefits of changing. It is difficult to do this whilst trying to listen to a trainer passing multiple messages.

8) The time taken to cover a subject when instructing tends to be finite and consistent; whereas with facilitation the timescale is indefinite. This does not mean that it takes forever, but that the process of facilitation must be given

sufficient time to achieve its aim. The CRMI should not be worried about longer debrief or exercise times, because the student's concentration period is much longer when they are actively involved in the thinking and discussion rather than passively listening. In a limited time period such as a debrief, the process may need to continue afterwards, while students try out new options back at work. Conversely, if the aim is achieved in a few minutes, the job is done and there is no point dragging out the discussion.

9) The focus when instructing is often on the task and the instructor – how well they are doing, did they get things in order, are they being clear, is the equipment working, are they on time. With facilitation the focus must be solely on the student, their attitudes and behaviour, and whether they are learning and are comfortable with the process that is being used. The focus should also be on the student demonstrating an understanding and willingness to change.

10) Because each student is different and it is difficult to read people's minds, the workload whilst facilitating is intense, and more so in a group. The facilitator in this respect is having several conversations simultaneously, both verbally and non-verbally, and having to think on their feet in reaction to what is being said. With instructing the workload is high in preparation and initial delivery, but then reduces over time as the instructor becomes more familiar with the material.

11) Although the instructor's observations and training objectives are inevitably judgemental; in order to prompt a student's self-analysis, the attitude of the instructor when facilitating a debrief should be non-judgemental. In other words, he or she must be prepared to accept that the opinion of the student is valid and not necessarily wrong, even though the instructor's own experience dictates otherwise. This attitude is the most difficult to genuinely achieve, particularly for instructors who have spent many years instructing and ensuring things are right.

12) The evaluation of an instructing session is relatively simple and measured by test, where a judgement is made whether the standard has been achieved. When facilitating evaluation is made by observation only and the student's self-assessment.

4.2   FACILITATION SKILLS

The skills required to use facilitation as a technique are as follows:

4.2.1   QUESTIONING

Asking the right questions at the right time is a fundamental skill of facilitation. Table 6 shows examples of the types of questions that can be used.

Table 6: Differences between instruction and facilitation

Type	Purpose	Response	Example
Open	To get a more accurate and fuller response	Unknown but they will say more than a few words	'What, when, why, where, who, how....'
Closed	To check understanding and to control the discussion	Can be 'Yes', 'No' or specific data	'Did you, were you, had you'....
Probing/building	To obtain further information	More in depth response	'Tell me more, why was that, explain....'
Summarising	To confirm agreement	Yes	'Is what you mean, have you agreed ...'

Avoid:
- Leading questions: 'You did do that didn't you, wouldn't you agree that......'
- Multiple questions at the same time
- Rhetorical questions: 'Who cares?'
- Ambiguous questions: An ambiguous question is a question that can have multiple meanings. For example: "Did you see the girl with the telescope?" The two possible meanings are: "Were you holding the telescope to see the girl?" or "Did you see the girl that was holding the telescope?"

4.2.2   LISTENING

It has often been said that hearing is done with your ears whereas listening is done with your mind. In this respect the term active listening means that a

person is concentrating carefully on what is being said, so that they can really understand the other person. This mnemonic helps to capture some key points:

- **L**ook interested;
- **I**nquire with questions;
- **S**tay on target;
- **T**est understanding;
- **E**valuate the message;
- **N**eutralise your thoughts, feelings and opinions.

4.2.3 BODY LANGUAGE

Reading body language and managing your own are essential when facilitating. A trainer should be able to know when a student is uncomfortable, confused, interested, distracted or bored. Furthermore it is important that trainers are able to manage their own body language so that the messages they are giving are accurate and consistent.

4.2.4 OBSERVATION OF BEHAVIOUR

The ability to observe and discuss behaviour and attitudes rather than technical issues is an important skill that trainers need to develop to become effective at facilitation. Also trainers should have the ability to observe behaviour objectively against established standards.

4.2.5 ROLE MODELLING

As attitude is an imprecise part of competency, there is no better way of demonstrating appropriate behaviour than role modelling. This is because the student can observe at first-hand what this behaviour is and experience the positive effects on themselves. Furthermore, in order to maintain credibility as a trainer in human factors, it is important that you behave to the highest level of RRM standards.

4.2.6 GIVING AND RECEIVING CRITICISM

A trainer should be able to receive criticism well in order to develop and be approachable. Furthermore, there may be occasions when it is appropriate and constructive to give students direct criticism and this must be carefully handled. Reacting to criticism can be done by asking open questions: "What is it exactly that you do not like about...?" This will force a student to think about his

criticism and make it more specific. The same strategy can be used when giving critique: "Why do you think I do not like your answer/behaviour….?"

4.3 CONTINUOUS DEVELOPMENT

In order to ensure that you are able to continuously improve your facilitation skills, the recommended method is to seek feedback from those you are training. This must be done regularly and genuinely, otherwise you may not be given anything useful – and a measure of whether you are doing this well is whether you do in fact get any criticism. If you find that people are not giving you any criticism then the following may be occurring:

a) You are perfect;

b) You have developed a reputation as someone who has difficulty receiving criticism;

c) You are not respected enough to deserve being told.

4.4 TRAINER CHECKLIST FOR FACILITATION SKILLS

Do:
- Give an introduction:
    - Purpose - to encourage self-analysis (research says that it is the best form of learning);
    - Participation from them is needed;
    - Allow participants to set the agenda order by asking:
        - Which bits of the session they want to discuss;
        - What went well;
- Use open questions (who, where, when, what, why, how);
- Deepen the discussion with supplementary questions - let them analyse:
    - What happened/why it happened/what could we improve on?
- Listen and encourage:
    - Use names, nod, smiles, eye contact;
    - Sit forward to show interest;
- Use silence/pauses (sit back and allow them time to think for several seconds);
- Mix instruction with facilitation for issues on which they don't have the knowledge themselves;
- Summarise discussion to meet training aims.

Don't:

- Miss the introduction - it is the most common way to spoil facilitative training;
- Lecture;
- Use your chronological agenda;
- Short change high performing crews with quick debrief;
- Interrupt;
- Don't train them not to discuss by:
    - Answering your own questions (better to reword the question);
    - Just use question and answer;
- Do the thinking for them.

Self-Check:

- Who is talking most - you or them?
- Have you used at least 2 questions per issue (to deepen discussion)?
- Are the participants doing the analysis themselves?
- Are the training points being covered?
- Have the participants spoken to each other?
- Has positive behaviour been reinforced?

5 Instructors competencies

This chapter has been adapted from [CAP 737] and details what instructors need to be competent in. There are four main areas of competence. The instructor:
A) Designs training;
B) Delivers training;
C) Assesses trainee progress;
D) Continuously improves the effectiveness of the training.

The areas are subdivided into twelve units of competence, each of which contains a number of performance elements and background knowledge. Those elements marked in bold are essential and the rest are options. To meet the requirements of a RRM instructor, trainers should be competent in the following elements:

- Initial RRM training: B1-B4, C1, C2, D1
- Recurrent RRM training: A2, B1-B4, C1, C2, D1, D2

Table 7 provides the twelve units of competence that have been applied to RRM training.

Table 7: Twelve units of competence

Unit	Performance element	Knowledge
A1 Designs RRM training sessions	**Identifies training requirements and delivery resources** **sets objectives** Builds in methods of evaluating training effectiveness Incorporates a variety of activities in design	Understanding objectives Company and industry requirements Training techniques Relevant regulatory requirements RRM standards
A2 Prepares resources	**Ensures activities are practical and realistic** Ensures facilities meet requirements Assists in the preparation of briefing materials Ensures materials are adequate and clear	Existing materials Copyright and intellectual property Company training standards

B1 Integrates RRM training	**Makes RRM links with technical training and Standard Operating Procedures (SOPs) where appropriate** Makes links with flight safety, customer service, company policy	Company technical and operational training procedures and requirements Human factors knowledge
B2 Creates a climate conducive to learning	**Establishes RRM credentials and rapport with trainees, and clarifies roles and confidentiality Clarifies training objectives and methods Ascertains and supports trainees' needs**	Potential barriers to learning, including awareness of cross-cultural issues How to put trainees at ease
B3 Presents knowledge	**Communicates clearly, accurately and adequately** Creates and sustains realism in the detail Maintains interest	Distinguish between process and content outcomes Ways to elicit participation Methods of giving information/adult learning styles Presentation techniques and visual aids
B4 Facilitates learning and coaches individuals	**Encourages trainees to get involved Focus is on trainees not on themselves Overtly supportive of RRM principles in word and deed (i.e., role models good RRM) Motivating, patient, confident and assertive manner** Uses exercises and activities to maximise learning Recognises and responds to individual's needs Encourages mutual support, teamwork and sharing of individual learning experiences	Facilitation How to give constructive debriefing and feedback The difference between coaching and demonstration/instruction Group dynamics Group facilitation techniques
C1 Monitors	**Continuously monitors and responds to the flexibility of the**	Methods of tracking performance

and reviews progress	**training session** **Ensures objectives are achieved** Reviews progress with trainees against formal benchmarks	
C2 Assesses trainees performance	**Assists trainees to assess own individual and team performance against RRM standards** Sets new/additional learning objectives	Uses debriefing to facilitate learning Methods of assessing knowledge and skills
D1 Evaluates RRM training sessions	**Elicits feedback from trainees** Tracks training session processes against agreed criteria Elicits formal course evaluation from trainees Keeps appropriate records	Methods of assessing and improving session effectiveness Evaluation techniques
D2 Evaluates and develops own practice	**Regularly reviews own performance, strengths and development needs** **Collects feedback about performance from others** Keeps abreast of developments from Regulator, trade press, etc. Maintains a written development record against a development plan	Methods of assessing own performance Methods of improving own performance

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