NLR Air Transport Safety Institute
Research & Consultancy

Executive summary

JUST CULTURE AND HUMAN FACTORS TRAINING IN GROUND SERVICE PROVIDERS

Problem area
The concepts of just culture and human factors have been identified by the European Commercial Aviation Safety Team as a ground safety issue for which safety enhancement action plans have to be developed.

The objective of this study is to investigate what elements are required to establish and maintain a just culture, and what elements are required to establish a human factors training programme, creating proper awareness of human factors to relevant personnel of ground service providers.

This document describes the results of the study, performed by the Air Transport Safety Institute of the National Aerospace Laboratory NLR in cooperation with the Civil Aviation Authority of the Netherlands.

Description of work
The study has been performed by conducting a literature study on just culture and human factors, and by applying existing research to ground service providers. The results of the research on just culture have been tested by means of a practical application of a just culture self-audit at six ground service providers in the Netherlands.

Results and conclusions
The results of the study are elements required to establish and maintain a just culture and human factors training programme, specific recommendations to the participating ground service providers to improve their just culture, a just culture audit template to be used by ground service providers and auditing organisations, recommendations for further research on just culture, an application of

Report no.
NLR-TR-2010-431

Author(s)
A.D. Balk
S.H. Stroeve
J.W. Bossenbroek

Report classification
UNCLASSIFIED

Date
May 2011

Knowledge area(s)
Vliegveiligheid (safety & security)

Descriptor(s)
Human factors
Safety culture
Ground handling

existing human factors research to the ground handling process and recommendations to address specific human factors in training of management and ramp personnel of ground service providers.

Applicability

The results of the just culture study are considered applicable to all European ground service providers.

NLR Air Transport Safety Institute

Anthony Fokkerweg 2, 1059 CM Amsterdam,
P.O. Box 90502, 1006 BM Amsterdam, The Netherlands
Telephone +31 20 511 35 00, Fax +31 20 511 32 10, Web site: http://www.nlr-atsi.nl

NLR Air Transport Safety Institute
Research & Consultancy

NLR-TR-2010-431

JUST CULTURE AND HUMAN FACTORS TRAINING IN GROUND SERVICE PROVIDERS

A.D. Balk
S.H. Stroeve
J.W. Bossenbroek[1]

[1] CAA-NL

Customer	Directorate General of Civil Aviation of the Netherlands
Contract number	- - - -
Owner	NLR
Division	Air Transport
Distribution	Limited
Classification of title	Unclassified May 2011

Approved by:

Author	Reviewer	Managing department
31-05-'11	31-05-'11	

SUMMARY

The Ground Safety Working Group of the European Commercial Aviation Safety Team has the overall objective to encourage implementation of action plans developed by existing ground safety initiatives when addressing European ground safety issues and to develop new safety enhancement action plans when action plans have not yet been developed. The topic of human factors has been addressed as one of the ground safety issues for which safety enhancement plans have to be developed.

The study of [Balk & Bossenbroek, 2010] on aircraft ground handling and human factors highlighted the establishment of a just culture and attention for specific human factors as improvement areas for ground service providers.

This document describes further research on just culture and human factors in ground handling, performed under the authority of the European Commercial Aviation Safety Team by the Air Transport Safety Institute of the National Aerospace Laboratory NLR, in cooperation with the Civil Aviation Authority of the Netherlands.

The objective of this study is to provide appropriate analysis methods and improvement options with regard to just culture and human factors for ground service providers. The results provide a basis for recommendations to the participating ground service providers and the European aviation industry.

Research performed on just culture resulted in:

- Elements required to establish and maintain a just culture;
- A just culture self-audit template to be used by ground service providers internally;
- Specific recommendations derived from the self-audit results, particularly aimed at confidentiality, independence, culpability and training with regard to safety reporting systems;
- A just culture audit template to be used by auditing organisations;
- Recommendations for further research on just culture.

Research on human factors and human factors training resulted in:

- Elements required to establish a human factors training programme;
- An application of existing human factors research to the ground handling process;
- Recommendations to address specific human factors in training.

ABBREVIATIONS

ASC-IT	Aviation Safety Culture Inquiry Tool
ATSI	Air Transport Safety Institute
CAA-NL	Civil Aviation Authority of the Netherlands
CAP	Civil Aviation Publication
CRM	Crew Resource Management
ECAST	European Commercial Aviation Safety Team
GAIN	Global Aviation Information Network
GSP	Ground Service Provider
GSTWG	Ground Safety Training Working Group
GSWG	Ground Safety Working Group
HS&E	Health, Safety & Environment
MRM	Maintenance Resource Management
NLR	National Aerospace Laboratory
RRM	Ramp Resource Management
SRC	Safety Regulatory Commission
TRM	Team Resource Management

CONTENTS

1 INTRODUCTION

1.1 BACKGROUND

In February 2009, the European Commercial Aviation Safety Team (ECAST) Ground Safety Working Group (GSWG) was established. One of the objectives of the ECAST GSWG was to research the effects of human factors involved in ramp safety, which was conducted by the Air Transport Safety Institute (ATSI) of the National Aerospace Laboratory (NLR) in cooperation with the Civil Aviation Authorities of the Netherlands (CAA-NL).

This research resulted in a final report [Balk & Bossenbroek, 2010[1]], which links safety culture and human factors by stating that in a mature safety culture, the presence and effects of human factors in the ground handling process are acknowledged, training is provided to manage human factors that may surface during the task performance and the risks they may introduce are mitigated as much as possible. Vice versa, effective human factors training aims to manage human errors and promote safe behaviour. It is therefore a valuable tool to improve the safety culture of individual organisations.

With regard to safety culture, [Balk & Bossenbroek, 2010] concluded that the development and maintenance of a just culture, and its dissemination to ramp personnel, is a point of attention for most Ground Service Providers (GSP). Additionally, an overview of human factors was provided, ordered by their frequency of occurrence in the ground handling process.

1.2 OBJECTIVE

The study described in this report continues the research on safety culture and human factors in ground handling by focusing on the creation and maintenance of a just culture, and the establishment of human factors training. The objectives of this study are:

- Provide guidelines to develop and maintain a just culture;
- Provide a way to audit just culture;
- Provide guidelines to develop human factors training;
- Apply existing human factors research to ground handling.

[1] http://www.easa.eu.int/essi/documents/HFreportfinal_000.pdf

By pursuing these objectives, this study ultimately aims to improve the safety of ramp personnel and to prevent incidents and accidents.

Initiatives in the areas of just culture and human factors do not stand alone or complement already existing safety initiatives or programmes. Ideally, they are fully incorporated to form an integral part of the organisation's safety culture.

The guidance provided in this report for the establishment of a just culture and human factors training for ground service providers needs to be tailored to the size, needs, local circumstances and resources available.

1.3 SCOPE

To define the scope of the research, the following IATA definition of ground handling is used [IATA]:
'Ground Handling covers the complex series of processes required to separate an aircraft from its load (passengers, baggage, cargo and mail) on arrival and combine it with its load prior to departure'.

Since previous research has shown that the risk of aircraft damage is highest at the ramp when the aircraft is parked [Balk, 2007], the scope has been further specified to include ramp handling only, so only the ground handling activities that take place around the aircraft during a turnaround are taken into account.

1.4 DOCUMENT SETUP

Chapter 2 describes guidelines for ground service providers to establish and maintain a just culture. Chapter 3 provides guidelines for the establishment of human factors training and its contents. Both chapters are concluded with several recommendations.

2 JUST CULTURE IN GROUND HANDLING

2.1 BACKGROUND

In a study on safety culture at GSPs in the Netherlands [Balk & Bossenbroek, 2010], relative low ratings were found for the safety culture characteristics *Justness*. As a result of this study it was recommended to pursue more detailed research on just culture for GSPs, leading to appropriate analysis methods and improvement options for these organisations. The results of research on just culture are expected to support the development of methods for evaluating and attaining a just culture at GSPs at a European scale, such as pursued by the ECAST GSWG.

The research presented in this chapter follows this recommendation by focusing on the following objectives:

I. Identify the current situation at GSPs for the organisation of safety reporting and the consequences of such occurrences for personnel involved and for the organisation;
II. Evaluate the current situation: what works well and what might be improved;
III. Identify ways to improve sub-optimal aspects;
IV. Identify ways to audit the level of just culture.

In this research these objectives have been pursued by the following steps:

- A review of literature on key aspects of just culture and ways to achieve a just culture;
- The development of a questionnaire for the evaluation of just culture at GSPs on the basis of main results of the literature review;
- The evaluation of just culture at GSPs in the Netherlands using the developed questionnaire, including the identification of options for improvement.

Section 2.2 provides the results of the literature review. Section 2.3 describes the questionnaire and its application at GSPs in the Netherlands, including the identification of opportunities to improve the just culture. Section 2.4 provides a general discussion of the research and recommendations are included in section 2.5.

2.2 JUST CULTURE LITERATURE REVIEW

2.2.1 DEFINITION OF JUST CULTURE

Guidelines on establishing just culture in aviation [GAIN, 2004] and air traffic management [SRC, 2006] refer to the seminal work of James Reason [Reason, 1997] for its definition. Reason refers to just culture as "an atmosphere of trust in which people are encouraged, even rewarded, for providing essential safety-related information, but in which they are also clear about where the line must be drawn between acceptable and unacceptable behaviour." This is also reflected by the definition provided by the European Commission, in which: 'Just culture' means a culture in which front line operators or others are not punished for actions, omissions or decisions taken by them that are commensurate with their experience and training, but where gross negligence, wilful violations and destructive acts are not tolerated [EC No 691/2010].

Reason argues that a no-blame culture is neither feasible nor desirable, as some unsafe acts are egregious and warrant sanctions. In a just culture the culpability line is drawn clearly. A just culture is closely linked to a reporting culture, i.e. an organisational climate in which people are prepared to report their errors and near-misses. In particular, an effective reporting culture depends on the way an organisation handles blame and punishment. A reporting culture supports an informed culture in which the managers and operators have good knowledge of all factors that determine the level of safety. Other relevant parts in the safety culture framework of Reason are a flexible culture, i.e. the ability to reconfigure in the face of high-tempo operations or certain kinds of danger, and a learning culture, i.e. the willingness and competence to draw right conclusions from its safety information system and the will to implement major reforms when needed. All these contributing parts interact and the overall safety culture is more than the sum of its parts [Reason, 1997].

[Balk & Bossenbroek, 2010] used the NLR Aviation Safety Culture Inquiry Tool (ASC-IT) for assessing the safety culture of seven GSPs in the Netherlands. The way that just culture is addressed in ASC-IT [Montijn & Balk, 2010] is discussed in Section 2.3.1.

2.2.2 DRAWING THE CULPABILITY LINE

As a basis for achieving a just culture, there should be ways to distinguish between acceptable and unacceptable behaviour. As an aid to such a judgement references [GAIN, 2004] and [SRC, 2006] refer to a decision tree for determining

the culpability of unsafe acts (Figure 1), which was devised by James Reason [Reason, 1997]. It includes the following leading questions in five stages for judging an unsafe act:

- Intention of the actions and consequences?
- The involvement of unauthorized substances like alcohol or drugs?
- Deliberate violation of rules and are these rules workable or have violations become a part of the working practice?
- Substitution test: Could another person with similar competences and qualifications have made the same error under similar circumstances?
- Repetitiveness of the unsafe acts?

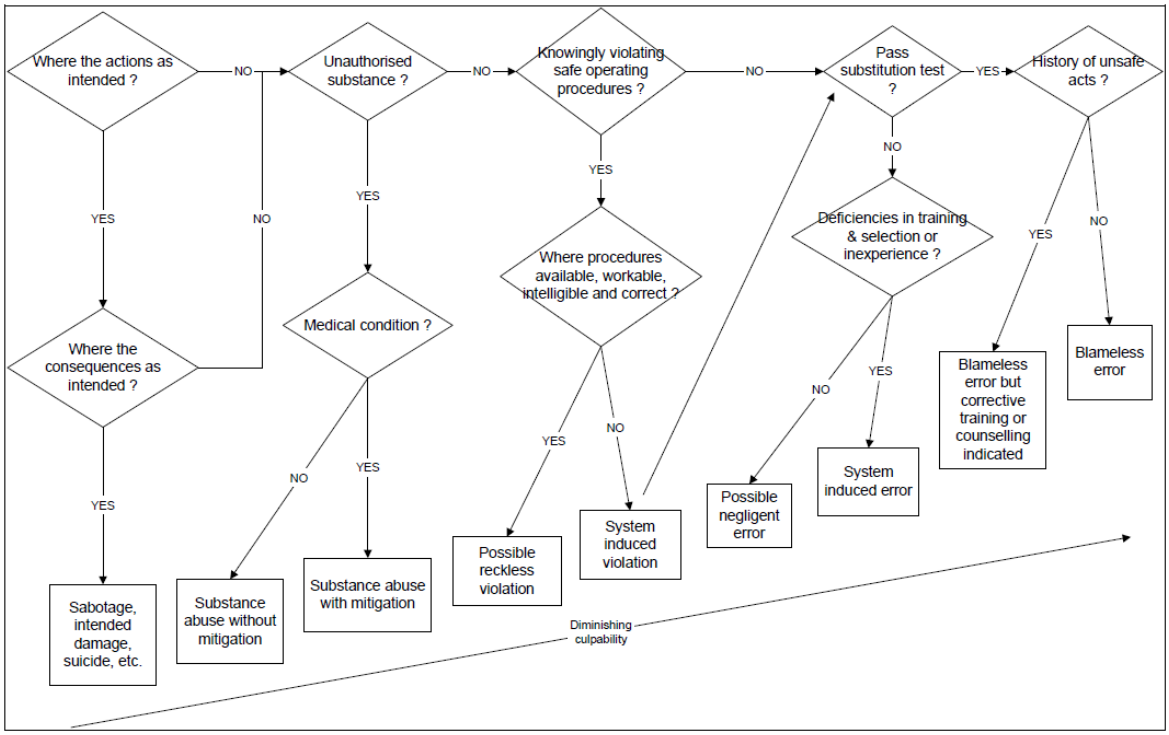

Figure 1: Decision tree for determining the culpability of unsafe acts [SRC, 2006] based on [Reason, 1997].

Reason suggests the following ranges for drawing the culpability line based on the categorisation of Figure 1:

- Unacceptable behaviour deserving strong sanctions: 'Sabotage, intended damage, suicide, etc.' and 'Substance abuse without mitigation';
- Grey area in which careful judgement must be exercised: 'Substance abuse with mitigation' and 'Possible negligent error';
- Blameless behaviour, unless they involve other aggravating factors: 'System induced error' and 'Blameless error'.

Figure 2 shows a more detailed diagram for ways to deal with unsafe acts at various layers in the organisation as developed in the Hearts and Minds project [Shell, 2004], [Hudson, 2007].

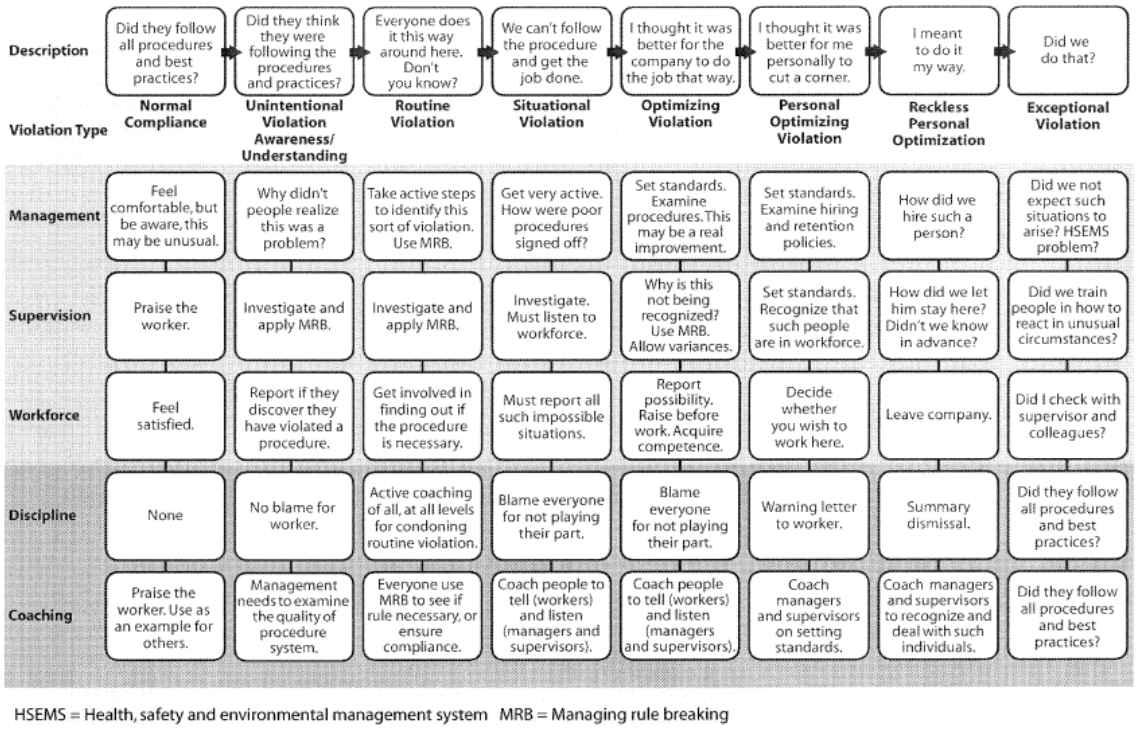

Figure 2: Hudson's just culture model [GAIN, 2004] based on [Shell, 2004].

2.2.3 Implementing a just culture

A range of methods and issues to be considered in implementation of a mature safety culture is discussed for the various sub-cultures by Reason [Reason, 1997]. A number of so-called micro-tools, which support people working in the organisation in improving particular aspects of safety culture, was developed in the Hearts and Minds project for oil and gas multi-national Shell [Hudson, 2007].

The Flight Operations/Air Traffic Control Operations Safety Information Sharing Working Group of the Global Aviation Information Network (GAIN) developed guidelines for attaining, implementing and maintaining a just culture [GAIN, 2004]. These guidelines are based on a number of sources, including [Reason, 1997]. The GAIN guidelines were worked upon by the Eurocontrol Safety Regulatory Commission for Eurocontrol just culture guidelines [SRC, 2006]. Based on these guidelines, a just culture includes the following elements that can be assessed for their presence and maturity:

- Reporting policy and procedures;
- Assignment of roles, responsibilities and tasks;
- Indemnity against legal proceedings except in cases of wilful misconduct or reckless behaviour;
- Methods for reporting and assessment of safety reports;
- Reporting form;
- Feedback to reporters;
- Measures to increase the awareness of the safety reporting system;
- Measures to develop and maintain a just culture.

These elements are described by eight main steps, which are provided below. Appendix A provides for each step detailed guidelines and suggestions, which may be used as points of interest in the establishment of a just culture.

Step 1: Develop reporting policy and procedures

Management commitment is the primary requirement for establishing and maintaining a just culture. Similarly, management commitment is the basis for developing a reporting policy and related procedures. When management commitment is not obtained to establish a safety reporting system in which ramp personnel report errors and incidents without fear of disciplinary actions, no resources will be made available and corrective actions will not substantiate.

When developing a reporting policy and procedures, it is important to consider whether reports may be issued anonymously and whether the person(s) receiving and assessing the reports have an independent function within the organisation. This avoids interference between reported human errors and career prospects.

Step 2: Determine roles, responsibilities and tasks

A number of different people needs to be involved in the development, implementation and maintenance of the safety reporting system. A person has to be appointed who is responsible for the development, implementation, promotion and management of the safety reporting system. This person ensures confidentiality of reporting and reports directly to the board of directors to highlight (potential) safety issues and trends. At management level, a person has to be assigned the responsibility to decide if disciplinary actions have to be taken after errors, incidents or accidents.

To support the safety reporting system, personnel have to be appointed to perform the activities of collecting, assessing, analysing and monitoring of safety reports and trends, and circulating safety information in the organisation.

Step 3: Reduce legal barriers

In order to reduce the legal barriers to reporting and assessment of safety occurrences and trends, the two most important issues are: indemnity against disciplinary proceedings and a legal framework that supports reporting and investigation of incidents. Without these aspects firmly established in the organisation, ramp personnel may not report errors and incidents because of fear of legal proceedings.

Step 4: Establish methods of reporting and assessment

After a reporting policy and procedures have been developed, the infrastructure for reporting of safety occurrences has to be established. Reporting of safety issues should be a clearly described and easy process, safety reports should be professionally assessed and managed, and feedback should be rapid, useful, accessible and intelligible to all personnel.

Step 5: Develop reporting form

Although safety issues could be reported verbally, it is beneficial to also develop a reporting form that encourages accurate and complete reporting (e.g. questions that are understandable) and is easy to fill in; otherwise reporters may provide erroneous or misleading responses. The objective of the safety reporting system has to be carefully considered when deciding on what information is required to reach this objective.

Step 6: Develop template for feedback to potential users

It is important that reporters and other ramp personnel know as soon as possible that an occurrence has been investigated and that the root cause is solved. Feedback may be given on individual reports, but also in a combined form by means of regular safety letters or memos.

Step 7: Develop plan for educating users and implementing the system

Potential reporters have to be informed about the safety reporting system and know how to submit their information. This may include induction courses and periodic awareness sessions to remind ramp personnel of the importance of reporting and to ensure that all ramp personnel are familiar with the reporting procedures.

Step 8: Develop and maintain a just culture

A number of additional issues concerning the ‘cultural’ aspects of reporting are necessary in order to maintain motivation to report, such as trust between the reporters and their supervisors, and between the supervisors and their

managers. This is a precondition for the safety reporting system to function. The main objectives are to develop an open culture in which people feel able to trust the system and to develop new ways to motivate people to use the system.

Continuous management commitment has to be ensured. To maintain and improve management commitment to safety, management has to be continuously involved in the reporting process to show visibly that they believe in and are willing to promote the just culture. Simultaneously, commitment to safety of ramp personnel has to be ensured by actively involving them in the assessment of safety issues and development of corrective actions.

Observations to the just culture implementation steps
Although above steps are based upon the GAIN roadmap to a just culture [GAIN, 2004], it is clear that they have interactions with a variety of safety culture aspects. In particular, a large number of these steps are related to what Reason calls 'engineering a reporting culture' [Reason, 1997].

2.3 Evaluation of just culture at GSPs in the Netherlands

2.3.1 Just culture in ASC-IT

ASC-IT has been used to assess the safety culture of seven GSPs in the Netherlands [Balk & Bossenbroek, 2010]. The ASC-IT safety culture framework is based on a synthesis of various studies in this field, and a number of these studies have in turn been partially based or inspired on the work of James Reason. Therefore, there are a number of similarities between the Reason components and the safety culture characteristics presented by ASC-IT. In addition, the present framework consists of a number of characteristics that are not – or not explicitly covered by the Reason components because they have more recently been identified as important elements of safety culture.

Early adopters of the concept of safety culture have often been using the safety culture model proposed by James Reason. Hence, they are accustomed to the safety culture components introduced by Reason in his model, and may even have conducted surveys that constitute a benchmark reference for their future safety culture assessments based on these components. For those organisations it may be useful to be able to relate the Reason components to the characteristics of the safety culture framework of ASC-IT.

The table below shows how Reason's safety culture components relate to the characteristics of the safety culture framework on which ASC-IT has been developed [Piers, Montijn & Balk, 2009]. An explanation of the six ASC-IT safety culture characteristics is provided in Appendix B.

Table 1: Relation between Reason's safety culture components and ASC-IT safety culture characteristics [Piers, Montijn & Balk, 2009].

		ASC-IT safety culture framework					
		Commitment	Justness	Information	Awareness	Adaptability	Behaviour
Reason	Just		X				
	Reporting			X			
	Learning			X		X	
	Flexible					X	

2.3.2 ASC-IT RESULTS FOR SAFETY CULTURE

[Balk and Bossenbroek, 2010] analysed the safety culture of seven GSPs in the Netherlands. Figure 3 shows the mean ratings attained for the safety culture characteristics averaged over the seven participating GSPs. It follows that management rated the statements consistently more positively than the operational personnel. Lowest ratings were attained for the characteristic *Justness*, a medium range for the characteristics *Information*, *Adaptability* and *Behaviour*, and highest ratings for the characteristics *Commitment* and *Awareness*. An explanation of the levels of safety culture (1 to 5) is provided in Appendix D.

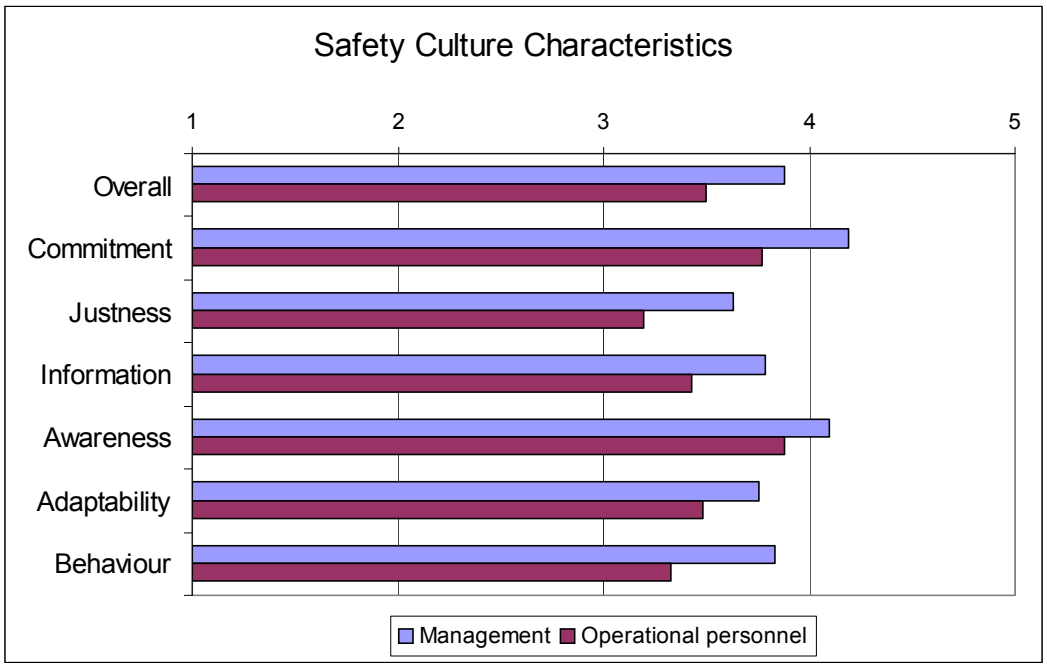

Figure 3: Mean ratings of the safety culture characteristics for the GSPs.

The safety culture characteristics are composed of a number of safety culture indicators in ASC-IT [Montijn & Balk, 2010]. Figure 4 to Figure 9 present the mean ratings of the safety culture indicators associated with the safety culture characteristics of Figure 3, which are averaged over the seven participating GSPs. A detailed explanation of the safety culture indicators is provided in Appendix C.

Figure 4: Mean ratings of the safety culture indicators for the characteristic Commitment.

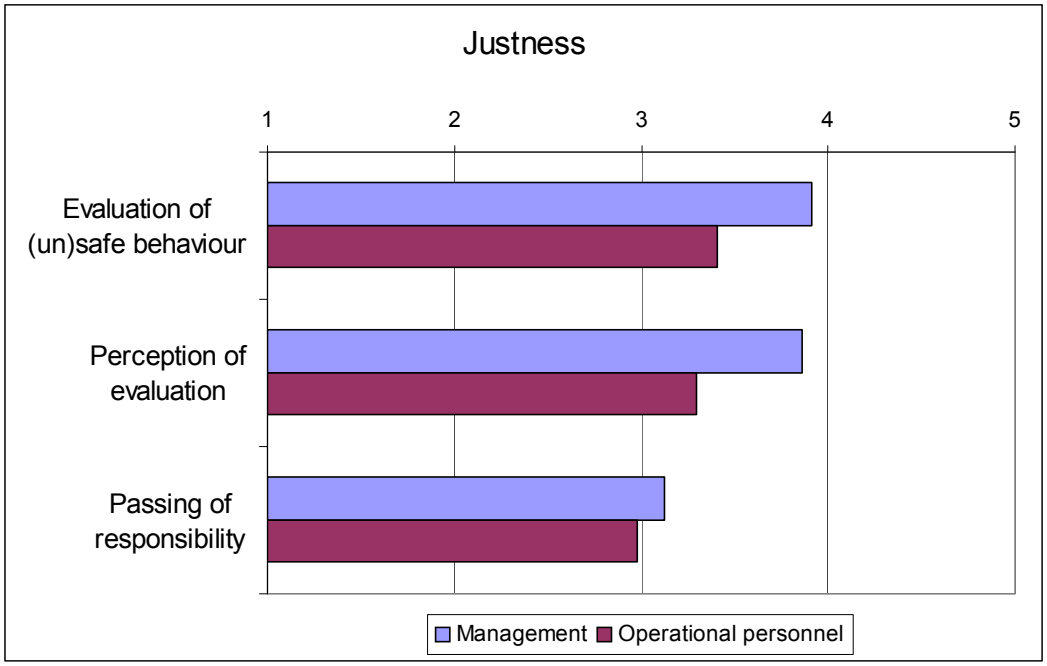

Figure 5: Mean ratings of the safety culture indicators for the characteristic Justness.

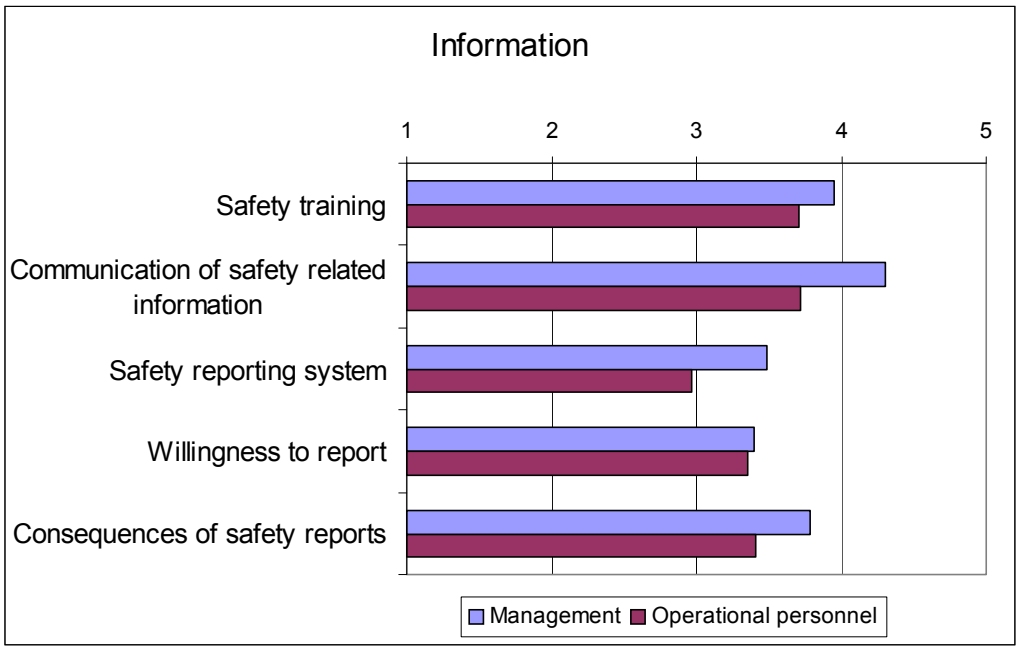

Figure 6: Mean ratings of the safety culture indicators for the characteristic Information.

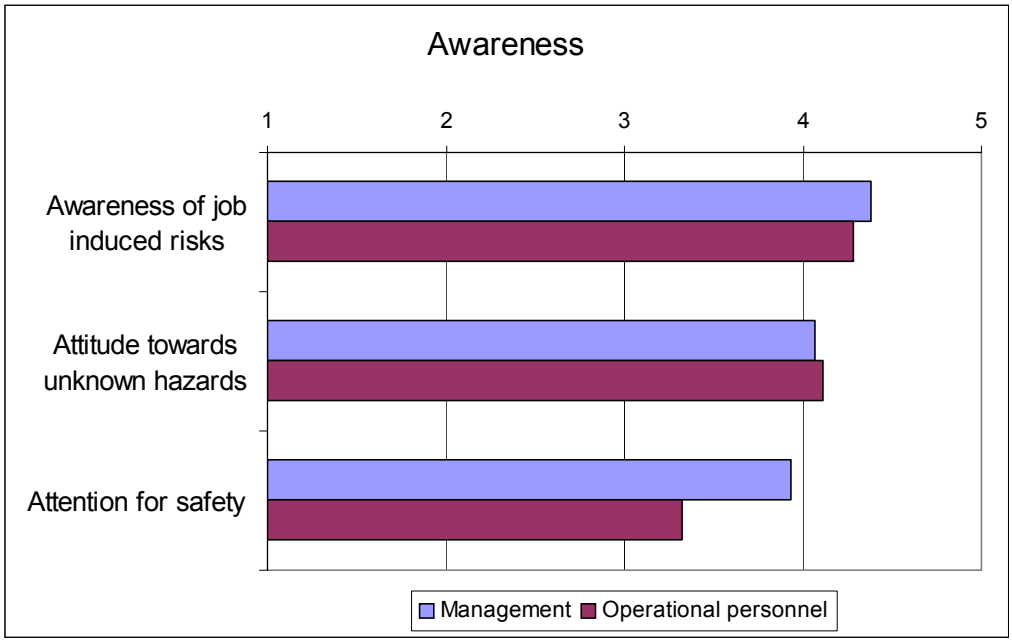

Figure 7: Mean ratings of the safety culture indicators for the characteristic Awareness.

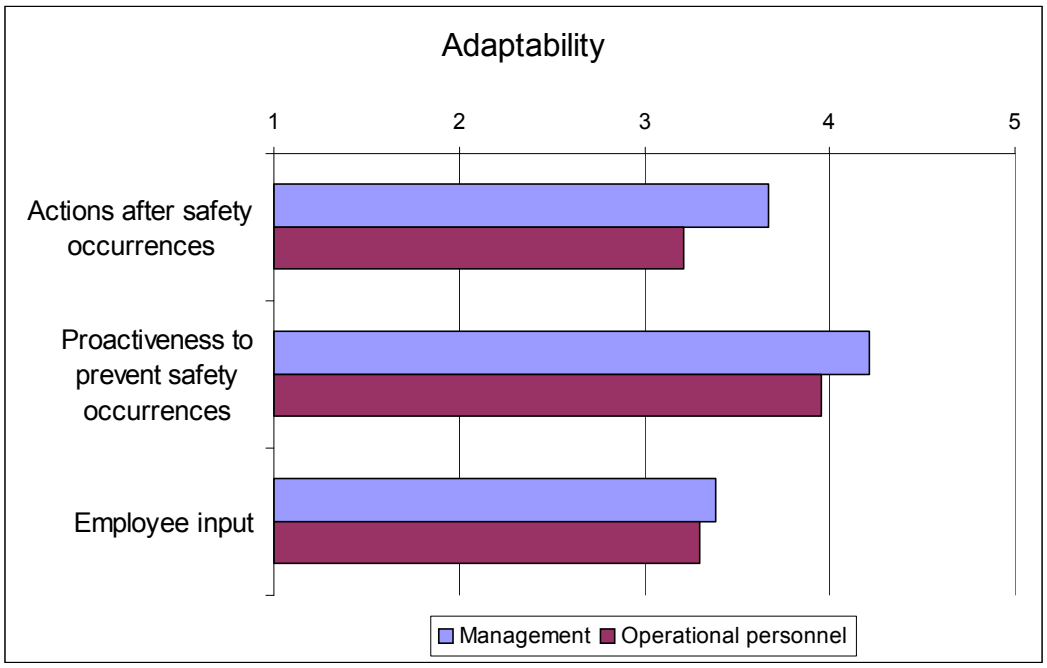

Figure 8: Mean ratings of the safety culture indicators for the characteristic Adaptability.

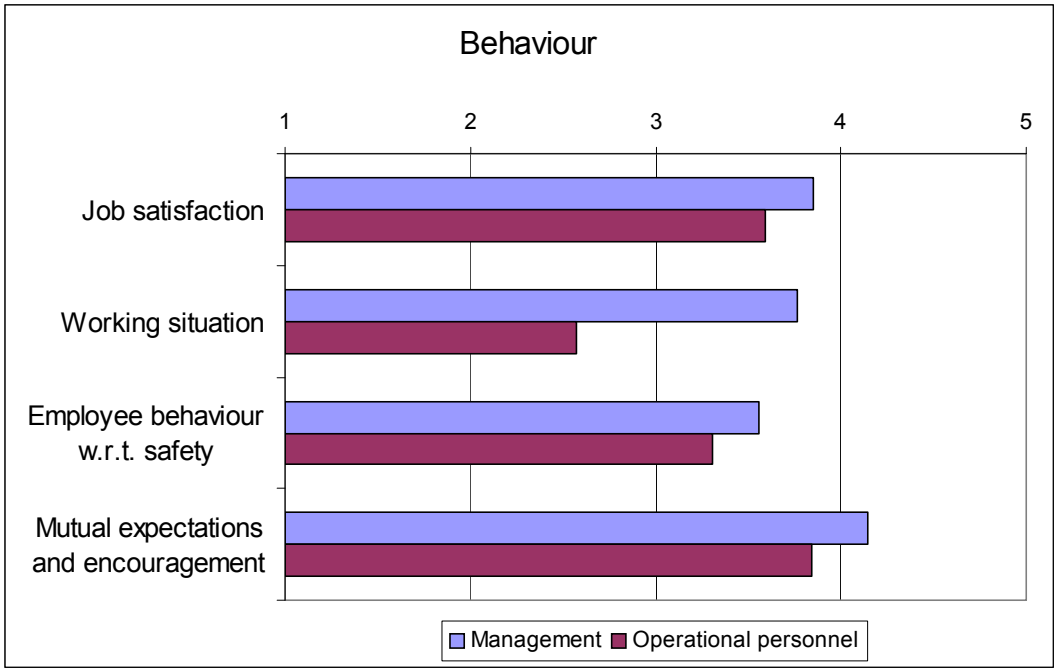

Figure 9: Mean ratings of the safety culture indicators for the characteristic Behaviour.

As indicated by the GAIN roadmap to a just culture, close relations exist between a just culture and a reporting culture: (1) reported safety occurrences are the inputs for evaluating potential consequences (e.g. improvement of systems or

procedures, coaching, disciplinary action); (2) an effective reporting culture, in turn, depends on the way in which blame is handled in the organisation.

For the status of just culture in relation with reporting of safety occurrences the following ASC-IT safety culture indicators are of special interest:

- Evaluation of (un)safe behaviour (Justness);
- Perception of evaluation (Justness);
- Passing of responsibility (Justness);
- Communication of safety related information (Information);
- Safety reporting system (Information);
- Willingness to report (Information);
- Consequences of safety reports (Information);
- Actions after safety occurrences (Adaptability).

It follows from Figure 4 to Figure 9 that the ratings of these safety culture indicators are below the overall average for operational personnel, except for the indicator *Communication of safety related information*. For management, below average ratings are obtained for these indicators, except for the indicators *Evaluation of (un)safe behaviour* and *Communication of safety related information*.

2.3.3 JUST CULTURE QUESTIONNAIRE STUDY

In order to pursue the objectives of the current study, listed in Section 1.2, a questionnaire was designed on the basis of the just culture-related aspects presented in Section 2.2.3. The questions are presented in Appendix E. Whereas Appendix E provides the questions to be used internally as a self-audit for GSPs, Appendix F provides an abridged version to be used by auditing organisations. The just culture internal audit questionnaire has been evaluated by GSPs. The abridged version, however, has not yet been evaluated.

A Dutch version of the just culture internal audit questionnaire was provided to seven GSPs in the Netherlands. Six out of seven of these organisations returned a completed version of the questionnaire. All main GSPs in the Netherlands participated in the study. Due to the comparable ground handling processes and organisational structures, the just culture study is considered to be representative for all European GSPs. A summary of the main results is provided next.

Legal framework

Most interviewees of the GSPs recognise that in principle ramp personnel in their organisations are at risk of legal actions as a result of an error or contribution to an incident or accident during their work. It is often indicated that legal actions are only to be expected in cases of intended damage or gross negligence. In some answers a distinction was made between prosecution by the Public Prosecutor and civil lawsuits dealing with liability. It is recognised that the organisation has no control over the actions of the Public Prosecutor. The possibility of passing information about incidents by the Civil Aviation Authority to the Public Prosecutor is considered as a hindrance to a just culture, although the organisations do not indicate any negative experiences to this respect. There would be support and protection for ramp personnel in the case of legal actions by the companies' insurances and/or lawyers. This support may be limited in the case of intended damage or gross negligence. As a negative effect of the current legal framework it is indicated that ramp personnel are sometimes afraid to report events that may be used against them.

Reporting of safety-related issues

Reporting of safety-related occurrences is mandatory in five out of six GSPs and it is voluntary in one. In two GSPs anonymous reporting is possible, in three GSPs this is not possible and the interviewee of one GSP did not clarify this aspect. In the two GSPs that indicated that anonymous reporting is possible, the reports are only accessible to a safety-related group of people, such as incident investigators and occupational health and environment advisors. Notwithstanding this level of confidentiality, the interviewee of one of these GSPs indicated that by other channels the management is often informed about the occurrences. In the four other GSPs a broader set of people has access to the incident reports, such as a supervisor and the management. The interviewees of two GSPs indicated that their safety reporting system might be improved by allowing the possibility to report anonymously, thus stimulating an increase in the number of reports. In contrast, the interviewee of another GSP without anonymous reporting clearly indicated that anonymous reporting is not needed, resulting from an open reporting culture for incidents; moreover, this GSP uses penalties for not reporting of occurrences.

Reporting format

At the GSPs, reporting is done by means of a paper or electronic form, or verbally. Typically, the paper or electronic forms are available in a single format and they are not somehow adapted to the user. As the forms are seen as simple, this is mostly not considered to be a problem. An interviewee indicated that the

team leader may assist in describing the occurrence and especially in acquiring causal factors and potential mitigating measures. In general the forms require information about the safety-related occurrence, related behaviour of people involved, related procedures, related material, contextual conditions and suggestions for mitigating measures. The durations indicated for completing a safety report vary from 'a few minutes' to '20 minutes to 2 hours' and are on average some 15 minutes.

Procedures & training

The procedures for reporting of safety-related occurrences are typically included in general or safety-specific manuals. In addition to these procedures for the reactive reporting, the interviewees mostly indicate that proactive reporting of safety-relevant situations is also being stimulated in their organisations. Procedures for the safety management of such proactive reports are not clear from the just culture questionnaires. The levels of training on the use of the safety reporting system differ. It has been indicated in some GSPs that there is little or no training, and this is considered either as no problem since the safety reporting system should be simple to use without training, or either as a point for improvement. In other GSPs the training is part of a recurrent safety awareness training programme or it is verbally and on-the-job. The levels of continuous stimulation for effective use of the safety reporting system by the management or HS&E employees differ between the organisations. Some interviewees indicated a good level of continuous stimulation by the management, while other recognised that it might well be improved.

Investigation

Decisions about the investigation of safety issues is made by the supervisors, managers or airlines in three GSPs and by a combination of the management and an investigator, or manager of the safety department, in the other three GSPs. In two organisations there are procedures in support of this decision making. The investigation of the safety issues is done by supervisors, managers or airlines in three GSPs, by a combination of managers and safety employees in one GSP and by the safety department in two GSPs. Thus only in two cases the investigation is performed completely by employees with an independent role in the organisation. The interviewees indicated that in four of the GSPs there are some kinds of procedures for the investigation process and the types of results that it should deliver.

Feedback

Based on the insights obtained in the investigation, potential mitigating measures with regard to procedures and systems are derived in the organisations. The identification of mitigating measures is performed by people such as safety experts, training experts, management and ramp personnel involved. Feedback on the safety insights and mitigating measures is shared within the organisations by means of newsletters, meetings and bulletin boards. Most interviewees consider the feedback to be effective; one interviewee welcomes the transition towards a more personal system for safety messages than the current bulletin board.

Culpability

The GSPs have not developed procedures for determining the level of culpability of the behaviour of ramp personnel involved in safety occurrences. The interviewees refer to generic employment agreements, to deviations from standard operating procedures or in general to intentional misconduct, but their answers indicate a lack of specific procedures for determining a culpability line. Decisions about culpability are made by supervisors and management in four GSPs and they are made by managers in combination with people from the safety department in two GSPs. Follow-up actions, such as disciplinary actions, retraining, etc., are made by the same people. There are no clear procedures to determine such follow-up actions.

2.3.4 Observations about just culture at the GSPs

It is recognised that the conducted questionnaire-based just culture evaluation has several limitations, such that no final conclusions about the level of the just culture at the GSPs can yet be reached. These limitations are discussed in Section 2.4. Notwithstanding these limitations, several interesting observations can be made about just culture aspects at the GSPs:

- At several GSPs anonymous reporting of occurrences is not possible and the safety reports are accessible by a large group of people, such as supervisors and managers. As also indicated by some interviewees, this lack of confidentiality may restrict the willingness of employees to report occurrences;
- At several GSPs the investigation of occurrences is not done completely by personnel with independent roles, but rather involves supervisors and managers. This lack of independence may lead to the view of employees that occurrences are not evaluated in a fair and just way, e.g. because they think that particular irrelevant work-related issues are mingled in the investigation;

- At some GSPs there seems to be limited training and stimulus for use of the safety reporting system;
- The GSPs do not seem to have developed clear procedures for drawing the culpability line between acceptable and unacceptable behaviour of employees, or for determining follow-up actions. Due to the lack of clear procedures for deciding on culpability and follow-up actions, the risk of arbitrariness exists in such decision-making, which may result in a perception of ramp personnel of arbitrariness and unjustness.

2.4 DISCUSSION OF THE JUST CULTURE QUESTIONNAIRES

The obtained questionnaire results provide insight in the organisation of safety reporting and the ways in which incidents reports are being handled, and responded to, by the GSPs. This forms a basis for the just culture in these organisations. It is manifest that the obtained questionnaire results do not provide a complete overview of the just culture in the organisations. Limitations in the results include the following points.

- The questionnaires were answered by single individuals in the organisations. As such, the answers reflect their views and may not in all respects be representative for the views of others in the organisations. In particular, it was observed in the ASC-IT results (Section 2.3.2) that the safety culture ratings provided by management are considerably higher than those indicated by operational personnel. Operational personnel did not have the opportunity to provide input to the just culture questionnaire;
- The questionnaires were completed in writing. The answers were not subsequently discussed to assure that all questions were properly understood or to provide the opportunity to sketch more in detail the context of the issues raised;
- The questionnaires handed out were a first version based on the literature described in Section 2.2. It may be that different ways of asking in potential follow-up questionnaires provide another view on the just culture issues at the GSPs considered;
- The questionnaires do not lead to a direct evaluation of the level of just culture at the organisations. Rather the questionnaire results provide a basis for comparison of just culture related aspects between organisations for a range of issues that have been identified to be important in order to achieve a just culture.

2.5 RECOMMENDATIONS

The primary recommendation for GSPs to establish and maintain a just culture is to establish the following elements that can be assessed for their presence and maturity:

- Reporting policy and procedures;
- Assignment of roles, responsibilities and tasks;
- Indemnity against legal and/or disciplinary proceedings except in cases of wilful misconduct or reckless behaviour;
- Methods for reporting and assessment of safety reports;
- Reporting form;
- Feedback to reporters;
- Measures to increase the awareness of the safety reporting system;
- Measures to develop and maintain a just culture.

Added to this, following the observations on the questionnaire-based just culture results presented in Section 2.3.4, in general a range of improvement options can be formulated for the GSPs:

- Introduction of procedures for a sufficient level of confidentiality of safety reports;
- Introduction of procedures for a sufficient level of independence of the investigation of occurrences;
- Introduction of procedures for drawing the culpability line and determining follow-up actions;
- Clear communication in the organisation about the procedures for confidentiality, independence of investigation and decision-making about culpability and follow-up actions;
- Sufficient training and the introduction of persons promoting all safety culture aspects;
- Active involvement of (senior) management.

The relevance of these options for the specific GSPs depends on the current arrangements and conditions at these GSPs. Furthermore, the improvement options can be tailored towards the specific situation at the GSPs.

In recognition of the limitations of the just culture questionnaires presented in Section 2.4, the following recommendations for just culture research are posed:

- The development of just culture questionnaires towards different roles in the organisation;
- The development and application of formats to discuss the results of just culture questionnaires with individuals or groups in order to provide a

broader perspective on details of the organisational context and specific just culture improvement options;

- The evaluation of the developed just culture questionnaire by discussing its merits and results with interviewees and auditors;
- Consideration of introducing scales for just culture aspects in order to more directly evaluate just culture in organisations;
- Evaluation of the developed just culture questionnaire by other GSPs in Europe.

3 HUMAN FACTORS TRAINING IN GROUND HANDLING

3.1 BACKGROUND

In the process of aircraft ground handling, the performance of ramp personnel plays a crucial role in ensuring a safe operational environment for themselves, fellow ramp workers, the aircraft and its occupants. It is therefore important to consider human factors and their effects on performance and work efficiency. The need for human factors training in ground handling has also been addressed by the ECAST Ground Safety Training Working Group (GSTWG), which proposed to include human factors in the training programmes for various job functions in ground handling [ECAST GSTWG, 2009][2].

GSPs may significantly benefit from relevant human factors training provided to all ramp personnel and management. Effective human factors training aims to:

- Increase the awareness of the effects and potential risks of human factors (e.g. damage, injury, etc.);
- Develop mitigation measures to decrease or eliminate the effects and potential risks of human factors;
- Promote a just and reporting culture;
- Improve human performance;
- Ensure a safe and efficient ground handling process.

Human factors training brings safety issues close to the individual and ultimately aims to change the attitudes and behaviour of ramp personnel and management towards safety. Consequently, it influences the perceptions of ramp personnel and management of the safety culture within their team and organisation. By attending human factors training, management shows their commitment to safety to ramp personnel.

Next to improvement of safety culture, human factors training may also increase the GSPs' competiveness when (potential) customers are informed that human factors training is incorporated in the training structure to increase the level of safety and efficiency of the services provided.

[2] http://www.easa.eu.int/essi/documents/ECASTGSTWGProposalforaGroundHandlingTrainingGuideline.pdf

To increase the awareness of human factors, knowledge has to be gained about which human factors are encountered by ramp personnel during their daily activities. This knowledge will significantly benefit from the establishment of a just culture, as elaborated in the previous chapter, in which potential safety issues and their causes are openly reported. With this knowledge, measures can be focused to mitigate or eliminate potential risks as much as possible. Vice versa, human factors training stipulates the importance of operational feedback to improve safety, which promotes the establishment of a just and reporting culture.

Since human factors training aims to capture and reduce human errors to increase safety, it may be embedded in existing safety programmes or initiatives and ideally is fully incorporated in already existing training programmes. Each GSP should fit the human factors training to their size, needs, local circumstances and resources available.

This chapter provides initial steps to set up a human factors training programme, together with its proposed contents. The proposed contents have been based on the findings of [Balk & Bossenbroek, 2010] and described by applying existing human factors knowledge to the ground handling process. Section 3.2 describes general guidelines for establishing a human factors training programme. Section 3.3 provides several suggestions for the human factors training contents. Recommendations with regard to human factors training and its contents are provided in Section 3.4.

3.2 GUIDELINES FOR ESTABLISHING A HUMAN FACTORS TRAINING PROGRAMME

Civil Aviation Publication (CAP) 716 identifies several stages of implementation of human factors training for aviation maintenance organisations. [CAP 716] has been used as a starting point to develop the following steps for implementation of human factors training in GSPs:

1) Redefine safety policies (e.g. disciplinary policy), procedures, roles and responsibilities;
2) Educate and train personnel responsible for the establishment and provision of human factors training;
3) Establish a human factors training programme, including:
    a. Training objectives;
    b. Definition of target groups;
    c. Training schedules (initial/recurrent);
    d. Measurement of competence;

   e. Means of evaluation;
   f. Supporting structure (e.g. safety reporting system);
   g. Training needs analysis;
4) Decide if training is provided by the GSP, or by an external training organisation;
5) Develop training material;
6) Provide initial and recurrent training or maintain awareness of human factors;
7) Evaluate training contents and instructors;
8) Update and improve the human factors training by:
   a. Using the evaluation forms;
   b. Incorporating reported safety occurrences;
   c. Keeping instructors up-to-date with human factors information.

The success of human factors training depends on its relevance to the day-to-day activities of those receiving the training. Therefore, human factors training has to be tailored to various target groups in the organisation. Next to relevance, [CAP 716] suggests that interaction between the instructors and training participants is extremely important to transfer the human factors knowledge. This way, the opportunity is created to discuss operational examples during the training.

An element of a just culture is the recognition that the origin of errors or incidents may be attributed to organisational factors or management decisions. Therefore, tailored human factors training should also be provided to management, which creates awareness of human factors that ramp personnel experience in their day-to-day activities, and how management decisions may adversely affect the working situation on the ramp. For ramp personnel, human factors awareness training may be complemented with training about how to cope with specific human factors.

In order to tailor human factors training to various target groups within GSPs, it is of vital importance to carefully conduct a training needs analysis at various levels of the organisation. The following steps are proposed to include in the training needs analysis:
1) Establish organisational objectives;
2) Identify potential problems in performance;
3) Identify specific concerns about current performance;
4) Identify training needs;
5) Analyse training needs;
6) Set training objectives;
7) Complete training programme.

Due to organisational differences, GSPs should decide on the training contents and the intended level of competence for the various target groups. One of the challenges GSPs face in developing human factors training is to tailor the training to various levels of education, employment (permanent/temporary), interest and motivation.

3.3 SUGGESTIONS FOR HUMAN FACTORS TRAINING CONTENTS

In the training needs analysis, it is considered worthwhile to give attention to the frequency of occurrence of specific human factors in the ground handling process. Some human factors may occur frequently, which would require appropriate attention in training, whereas other human factors are seldom, or never, encountered.

The study performed by [Balk & Bossenbroek, 2010] identifies personal factors and communication as the most frequently reported human factors involved in incidents and accidents related to the ground handling process. The collective term of personal factors is further specified in the following human factors, in decreasing order of reported frequency:

- Time pressure;
- Stress;
- Fatigue;
- Peer pressure;
- Motivation;
- Complacency;
- Workplace distractions/interruptions;
- Personal event;
- Physical health;
- Body size/strength;
- Memory lapse.

These human factors, as well as communication and several other human factors considered relevant to the ground handling process, are described according the structure provided by [ICAO Doc 9806].

[ICAO Doc 9806] groups the common factors affecting human performance and work efficiency as follows:

- Human factors deriving from the individual;
- Human factors affecting individuals' interactions with others;
- Human factors relating to the workplace.

In making this distinction between various human factors, measures to mitigate the effects of human factors in the operational environment can be focused.

3.3.1 HUMAN FACTORS DERIVING FROM THE INDIVIDUAL

Irrespective of the nature of the activities to be conducted, human performance differs by individual and may be affected by the following list of human factors, which is based on [ICAO Doc 9806] and complemented where necessary with human factors addressed in [Balk & Bossenbroek, 2010].

- Physical characteristics;
- Physical fitness;
- Automated behaviour
- Complacency;
- Alertness;
- Stress;
- Body rhythm disturbance;
- Sleep;
- Fatigue;
- Motivation;
- Personal events;
- Personality and attitudes;

All ramp personnel have to deal with these human factors to some extent during their ground handling activities. A further explanation of each human factor is provided below.

Physical characteristics

Physical characteristics like body size, length, reach, strength, eyesight, and hearing are important factors to consider in the process of ground handling. Body size, length and reach may help or hinder ramp personnel when working in the confined spaces of the aircraft belly or cargo holds. Especially ramp personnel involved in loading and unloading of baggage or cargo benefit from physical strength due to the repetitive physical exertions they have to deliver.

Eyesight and hearing form a means of communication on the ramp and may be of lifesaving importance. Visual and aural signals have to be adequately seen and heard to communicate and avoid dangerous situations. Additionally, eyesight, in particular estimation of distance, is important when moving equipment on the ramp and connecting moving equipment to the aircraft.

Physical fitness

Ramp personnel with adequate physical characteristics to perform their activities will still benefit when they arrive physically fit at work. Improved fitness reduces tension and anxiety and it is considered that it increases the resistance to fatigue, which is an important human factor to consider in the ground handling process [Balk & Bossenbroek, 2010], especially during shift work.

Automated behaviour

When certain tasks are repeated frequently, performance of these tasks may easily become an automated routine for which less or no attention is required. Most of the tasks performed by ramp personnel are repetitive tasks (e.g loading and unloading of baggage) and therefore prone to become automated behaviour. However, ramp personnel have to deal with different aircraft types, different aircraft configurations, different airline procedures and different equipment. This increases the risk that automated behaviour is incorrectly applied, with potential hazardous conditions as a result.

Next to risks associated with the development of automated behaviour, risks are also introduced when behaviour has to be changed. When ramp personnel move from one GSP to another or when GSPs merge, previous learnt procedures have to be adapted and re-learnt. The newly-learnt procedures likely become automated behaviour in the course of the employment. However, under stress and time pressure, there is an increased risk that ramp personnel fall back on previous learnt procedures, thereby applying them incorrectly to the situation at hand, again resulting in potential hazardous situations. Since time pressure and stress are the most frequently reported human factors by ramp personnel [Balk & Bossenbroek, 2010], attention for automated behaviour must not be neglected.

Complacency

Automated behaviour may also relate to complacency. When ramp personnel are over-confident that they are perfectly able to perform a certain task, their alertness may decease and the actual performance of the task may become an automated process. Especially in the masculine culture of ramp personnel, characteristics like overconfidence and arrogance could lead to complacency.

Alertness

Although automated behaviour may speed up the ground handling process, it also creates a risk when deviations from the routine processes are introduced. Deviations or new risks may not be detected since tasks are performed automatically. It therefore decreases the alertness to deviations from the routine

or to new risks. Boredom has a similar effect on the alertness of personnel, for example when ramp personnel have to wait for equipment or the next aircraft to arrive.

Closely related to alertness is the ability to detect and perceive input from the five senses. This ability decreases with a rising level of stress, noise, time pressure, boredom and fatigue, most of which are ever present in the process of ground handling.

A reduction in alertness may lead to memory lapses, which, in turn, may result in omissions of certain procedures or process steps. There are examples in which ramp personnel forget to disconnect the external power connection before driving away, forget to retract protection rails while attaching loading equipment, forget to close doors and panels after servicing, etc.

Stress

Stress may have positive or negative effects on human performance. Positive effects are beneficial for the operations, since it speeds up the ground handling process, but negative effects may create risks to ramp personnel and to the aircraft and its occupants. Negative effects are caused by various stressors which are experienced during the ground handling process; the most important being time pressure [Balk & Bossenbroek, 2010]. Other stressors are for example staff shortage, weather conditions, noise and temperature. Training and experience may help to effectively deal with these stressors.

Each individual ramp worker may also be negatively affected by personal stressors. Potential personal stressors are, among others, fatigue, workload or conflicts. The supervisor or team leader, as well as fellow team members, should be attentive to the existence of such stressors in individual ramp workers.

Body rhythm disturbance

In the ground handling process, shift work introduces disturbances of the body rhythm of all ramp personnel. Despite the similarity that all ramp personnel are affected to some extent, the way shift work is organised differs from GSP to GSP. Some GSP apply morning, day and evening shifts, whereas other GSP maintain a 24/7 operation. Additionally, the rotation of shifts over time may differ, depending on the concept that has been adopted: an advanced (afternoon-morning-night) or delayed (morning-afternoon-night) rotation. Either way, the body rhythm is continuously forced to adapt itself to the new working schedule 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 not the same as during the day. The arousal level is lower during the night, which may temporarily be increased by the use 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.

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. However, the masculine culture of ramp personnel may form a barrier for complaining about shift work.

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.

Sleep

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, again, may temporarily be increased by the use of stimulating substances. However, these substances have a negative effect on the ability to receive adequate (both in quantity and quality) sleep in between shifts.
When the loss of sleep quality and quantity is not compensated by adequate sleep, permanent and severe disturbance of the sleep pattern may result. Moreover, it may cause chronic fatigue and behavioural changes, like persistent anxiety or depression.

Fatigue

Fatigue can be divided into acute, chronic and mental fatigue. Acute fatigue manifests after performing a series of heavy or demanding tasks, like loading of loose baggage. Acute fatigue results in chronic fatigue when consistently insufficient rest is taken between the demanding tasks. Mental fatigue results from emotional stress. When these kinds of fatigue are not recognised and no corrective measures are taken, they may result in a decrease in human

performance and work efficiency. Similar as stress, fatigue is aggravated by time pressure, insufficient staff and weather conditions.

In aircraft ground handling, ramp personnel, especially temporary staff, sometimes have a job next to their employment at the GSP 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. It is important for GSP to be aware of such conditions and take appropriate actions when necessary.

Motivation

In order to get the best performance of ramp personnel, they have to be motivated to perform the job in a safe and efficient manner. The primary means to increase the motivation of ramp personnel is management continuously propagating their commitment to safety. This can be accomplished by e.g. regular visits to the ramp during aircraft turnarounds or to the staff canteens.

An improved motivation may also be obtained by rewarding ramp personnel for good performance. Rewards may take the form of promotions, awards, mentioning the best performing team, etc. On the other hand, motivation may decrease due to e.g. consistent boredom, disciplinary actions or the perception that ramp personnel are treated unfair or unequal in the organisation.

Personal events

Personal events have a small or greater influence on the performance of ramp personnel. For example, the death of a family member, martial difficulties or worries about one's health may have a severe impact on physical fitness, alertness, stress perception, sleep, fatigue and motivation.

Personality and attitudes

Ramp personnel are comprised of individuals from different cultural and ethnic backgrounds, with different personalities and attitudes. Instead of other human factors, these individual traits are more or less stable and may be accounted for by fellow ramp workers. However, personal traits may also be resistant to change when needed to improve for example work performance or behaviour.

Next to the fact that all ramp personnel have to deal with personal traits of themselves and fellow ramp workers, permanent staff is working together with temporary staff, who may have different attitudes with regard to the work and

the organisation. Effort is needed from supervisors to make them perform as a team in which these differences do not create a risk to themselves or to the flight operations. In order to adequately cope with different personalities and attitudes, interpersonal factors have to be considered.

3.3.2 INTERPERSONAL FACTORS

Due to the various activities that have to be performed during the turnaround in a confined space and short time frame, teamwork is essential for a safe and efficient ground handling of aircraft. Ground handling is a process in which individual ramp workers of different specialism, 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.). Therefore, adequate attention for interpersonal factors is beneficial to increase work efficiency, to operate as a team, and thereby to increase the level of safety in ground handling. Few GSPs, however, employ teams[3] that consist out of a fixed composition of ramp personnel.

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

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

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

[3] In the context of this report the definition of a team is: a group of ramp personnel composed for e.g. the duration of a shift or a turnaround, who collectively perform ground handling activities.

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 ground handling process. Holding a team responsible for their performance rather than individual ramp workers is an important motivator for all team members. Their effort to perform safely and efficiently will increase their 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 the safety of ground handling.

[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 ground handling process is important.

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, since they will promote safe behaviour 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 ground 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 ground 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 ground 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.

Training provision in GSPs provides several challenges that have to be considered carefully when developing training programmes for ramp personnel. A good balance has to be sought between classroom training to learn about equipment and procedures, and on-the-job training to develop manual skills. The pace of training may also be varied, taking into account the different nationalities and levels of education.

Teaching is considered to be a skill on its own. Therefore instructors should be carefully selected and not only be appointed on the basis of experience. Experience in aircraft ground handling will increase their credibility when teaching, but teaching skills ensure that the information is correctly passed on to trainees. Since on-the-job instructors have to provide training and perform their job simultaneously, they especially should be trained to pass on the required amount of information to trainees in a structural way. To ensure that close supervision is maintained during times of high workload, on-the-job trainees should be scheduled supplementary to the normal amount of ramp personnel.
Especially when different procedures have to be learnt, or ramp personnel from other organisations are employed, instructors and supervisors should be alert that newly learnt procedures may interfere with previous learnt procedures. Especially during stressful situations, ramp personnel may fall back to previous learnt procedures.

The effectiveness of the training, the training programme (both classroom and on-the-job) and the instructors should be adequately evaluated in order to detect opportunities for improvement.

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 ground handling process, supervisors should verify if task assignments are correctly understood and have an open attitude to receive and answer clarifying questions.

In the ground 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. Therefore, 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 ground 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 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 ground 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 ground 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 which 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. 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 ground 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 timeframe available.

Ramp Resource Management

As stated before, ramp personnel operate as a team with connected (e.g. cargo loading) or seemingly disjointed (e.g. placing cones) tasks. However, they are also part of a larger team that consists of several teams from various organisations (e.g. pushback). Therefore, adequate training in teamwork and team performance is required for a safe and efficient ground handling of aircraft.

Crew Resource Management (CRM) for flight crew has a long and proven history in aviation [ICAO 9683]. The CRM concept has evolved into Team Resource Management (TRM) for Air Navigation Service Providers [ICAO 9683] and Maintenance Resource Management (MRM) for Maintenance Providers [ICAO 9806], which is applied as a training countermeasure to human error. Since aircraft ground handling is a team effort of individual ramp workers or various teams from different organisations, the TRM concept may also be applied to ground handling, establishing the concept of Ramp Resource Management.

The objective of RRM is the effective functioning of ramp personnel through the timely and proficient use of all available resources aimed at the safe and efficient ground handling of aircraft. Envisioned benefits of RRM are:

- Recognition of how human factors can affect performance;
- Enhanced safety barrier against human error;
- Less operational disruptions;
- Enhanced efficiency;
- Enhanced continuity and stability of team work;
- Enhanced sense of working as a part of a larger and more efficient team;
- Improved use of resources, which results in;
  - An adequate distribution of workload;
  - Improved working schedules;
  - Improved shift handovers;
- Increased job satisfaction.

The establishment of RRM relates to the establishment of an organisational safety culture. In a just and mature safety culture, time and effort is spent to increase the safety of ramp operations and proper attention is given to human factors issues. This includes a safety reporting system that provides operational feedback from ramp personnel concerning safety issues and human factors encountered in their day-to-day activities. This feedback should be incorporated in training for ramp personnel to increase the awareness of human factors and their effect on safety and efficiency, and to increase the relevance of human factors training.

RRM training should not be provided as complementary to the normal training provided by GSP, but as an integral part of the training programme, which constitutes a powerful tool to enhance the organisation's safety culture. In order to gain the full advantage of RRM and teamwork, it is suggested to train teams instead of individual ramp workers. This, however, may not always be accomplished since GSPs may operate either firm or flexible teams. Moreover, a

disadvantage of operating firm teams is that it reduces the flexibility of manpower schedules.

With regard to team work and team roles in GSPs, specific attention should be given to working with ramp personnel with different ethnic backgrounds. RRM training may overcome the negative effects which may be associated with working with personnel from different ethnic backgrounds. For example, a code of conduct may be developed and applied, that states that fellow team members are treated with respect and how they should communicate.

Success of RRM training largely depends on its relevance to the day-to-day activities of ramp personnel. To increase the relevance of RRM, genuine examples should be used to explain the effects of team performance on the safety and efficiency of ground handling. These examples should also be updated regularly to provide for different examples for recurrent training and to incorporate possible changes in the ground handling process.

After establishing RRM training it should constantly be evaluated to improve the training, to increase its relevance to ramp personnel, to increase the instructors' teaching skills and to justify the expenses to management. Relevance of RRM to ramp personnel can be increased by letting course participants provide operational examples prior to/for the succeeding training. Operational feedback and feedback about the course contents from ramp personnel increases their motivation to attend the training and increases the instructors' motivation to train ramp personnel.

3.3.3 WORKPLACE FACTORS

The workplace and working conditions of ramp personnel may also introduce several human factors that create risks to the safety of ramp personnel or flight safety.

The following aspects, based on [ICAO 9806] have to be considered when addressing factors related to the workplace:

- Workplace distractions and interruptions;
- Workload;
- Workstation design.

Workplace distractions and interruptions

Workplace distractions and interruptions may cause a loss of awareness of what is happening at the ramp, or may cause a shift or loss of alertness. This, in turn, may cause ramp personnel to forget to perform certain procedures or process steps. Even worse, distractions during ground handling may result in severe damages or injuries.

Workload

Due to the focus on the scheduled departure time of aircraft, there is always time pressure involved in aircraft ground handling. The required activities have to be performed within a limited timeframe and any disruption in the process increases the workload that is experienced. Ramp personnel have to take care that their capacity is not exceeded. Should this occur, unsafe conditions are potentially ignored or shortcuts are taken.

One of the challenges in aircraft ground handling is to spread the workload over the duration of the shift. Since scheduling of ground handling primarily depends on aircraft on-time-arrivals, an adequate spread of the workload over time can only fully be attained when aircraft arrive at their scheduled time of arrival. However, most operational disruptions relate to delays of incoming flights [Balk & Bossenbroek, 2010], resulting in extreme variations in workload during shifts. Therefore, scheduling of ramp personnel should be sufficiently flexible to decrease the workload during peak hours and to compensate for times when no ground handling activities can be performed. Otherwise, risks of boredom, fatigue and loss of motivation are introduced. It is noticed that this describes an ideal situation in which sufficient resources are available. As a practical measure to manage workload, manpower schedules may be developed proactively, taking into account historical data of actual aircraft arrival times. This way, standard delays are incorporated in the schedules, making them more efficient.

Workstation design

As stated before, ramp personnel have to deal with different equipment, different types of the same equipment, different airline procedures, different aircraft configurations, and different systems in aircraft of the same configuration. Therefore, ramp personnel should adequately be trained to be alert on the differences that may be encountered. Procedures and equipment should be standardised as much as possible to decrease the risk of errors in operating the equipment or aircraft systems. Ideally, procedures, systems and equipment should be designed taking into account human factors principles.

3.4 RECOMMENDATIONS

Based on the suggestions for human factors training contents as provided in Sections 3.3, GSPs should consider the following recommendations with regard to human factors training, depending on their size, needs, local circumstances and resources available:

- Establish a human factors training programme tailored to the various target groups;
- Incorporate human factors training in already established safety initiatives and training programmes;
- Establish regular medical checks for physical fitness (in particular eyesight and hearing);
- Aim at standardisation of procedures, equipment and communication;
- Appoint a trusted representative with whom personal events effecting work may be shared;
- Introduce human factors aspects in scheduling of ramp personnel;
- Establish a rewarding system for good and safe team performance;
- Establish a standardised way to regularly communicate work-related issues;
- Provide sufficient time/overlap for shift handovers;
- Include team aspects (e.g. group decision making, interpersonal skills) in human factors training;
- Establish a standardised means of communication (e.g. phraseology, verifying if assignments are correctly understood);
- Establish a mature safety culture which disseminates to the teams;
- Provide leadership courses to supervisors;
- Establish a code of conduct to respectfully approach colleagues of different cultural or ethnic backgrounds;
- Verify to what extent the concept of Ramp Resource Management can be applied in GSPs;
- Use historical data (e.g. actual aircraft arrival times) in scheduling of ramp personnel.

4 REFERENCES

Balk, 2007	Balk AD. Safety of ground handling. National Aerospace Laboratory NLR, report NLR-CR-2007-961, 2007
Balk & Bossenbroek, 2010	Balk AD, Bossenbroek JW. Aircraft ground handling and human factors. National Aerospace Laboratory NLR, report NLR-CR-2010-125, April 2010
CAP 716	Civil Aviation Authority Safety Regulation Group. Civil Aviation Publication 716 Aviation Maintenance Human Factors (EASA/JAR145 Approved Organisations). Second edition, 2003
ECAST GSTWG, 2009	ECAST Ground Safety Training Working Group. Proposal for a Ground Handling Training Guideline. First edition, 2009
Eurocontrol, 1996	European Organisation for the Safety of Air Navigation. Guidelines for Developing and Implementing Team Resource Management, HUM.ET1.ST10.1000-GUI-01. First edition 1996
Eurocontrol, 1999	European Organisation for the Safety of Air Navigation. Team Resource Management Test and Evaluation, HUM.ET1.ST10.2000-REP-01. First edition 1999
EC No 691/2010	Commission Regulation (EU) No 691/2010 of 29 July 2010
GAIN, 2004	GAIN Working Group E. A roadmap to a just culture: enhancing the safety environment. First edition, September 2004
H&M	Hearts and Minds website: http://www.eimicrosites.org/heartsandminds/index.php
Hudson, 2007	Hudson P. Implementing a safety culture in a major multi-national. Safety Science 45:697-722, 2007
IATA AHM	International Air Transport Association. Airport Handling Manual. 31st edition, 2011
IATA ISAGO	International Air Transport Association. IATA Safety Audit of Ground Operations Standards Manual. Second edition, 2010
ICAO Doc 9806	International Civil Aviation Organization. Human Factors Guidelines for Safety Audits Manual. First edition, 2002
ICAO Doc 9683	International Civil Aviation Organization. Human Factors Training Manual. First edition, 1998

Montijn & Balk, 2010	Montijn C, Balk AD. ASC-IT – An Aviation Safety Culture Inquiry Tool. National Aerospace Laboratory NLR, report NLR-CR-2009-241, January 2010
Piers, Montijn & Balk, 2009	Piers M, Montijn C, Balk AD. Safety culture framework for the European Commercial Aviation Safety Team Safety Management System and Safety Culture Working Group. http://www.easa.europa.eu/essi/documents/WP1-ECASTSMSWG-SafetyCultureframework.pdf
Reason, 1997	Reason J. Managing the risk of organizational accidents. Ashgate, Aldershot, UK, 1997
Shell, 2004	Shell. Hearts and Minds project. 2004
SRC, 2006	Eurocontrol Safety Regulation Commission. Establishment of 'just culture' principles in ATM safety data reporting and assessment. Version 1.0, 31 March 2006
Wise, Hopkin & Garland, 2010	Wise JA, Hopkin VD, Garland DJ. Handbook of Aviation Human Factors. Second edition, 2010

Appendix A JUST CULTURE GUIDELINES

Step 1: Develop reporting policy and procedures

It is important that the following issues are considered with regard to the underlying reporting structure and company commitment:

(a) Confidentiality or de-identification of reports;
(b) Separation of the agency/department collecting and analysing the reports from those bodies with the authority to institute disciplinary proceedings and impose sanctions;
(c) Company commitment to safety;
(d) Some degree of independence must be granted to the managers of the safety reporting system.

Step 2: Determine roles, responsibilities and tasks

For such a system to thrive, a number of different people needs to be involved in the implementation and maintenance of the system. A sufficiently experienced person will be needed to promote the system and act as guarantor to ensure that the assurances of anonymity are preserved in the face of external or managerial pressures. Decide and select people to:

(a) Promote the system;
(b) Educate users and implement the system;
(c) Collect and analyse the reports;
(d) Feedback the information (develop a newsletter, or other means of dissemination);
(e) Develop and maintain the data collection system;
(f) Decide which department will be involved in the disciplinary (decision making) process.

Step 3: Reduce legal barriers

In order to reduce the legal impediments to reporting and assessment of safety occurrences, the two most important issues are: indemnity against disciplinary proceedings and a legal framework that supports reporting and investigation of incidents.

The first steps in changing the legal aspects could be to:

(a) Substantiate the current legal situation; does it need to be changed?;
(b) Discuss possibilities of change with company lawyers/legal advisors. If change is unlikely, or difficult, then alternative solutions should be sought, such as company protection;

(c) Discuss with operational personnel what changes in the legal policy they think would improve incident reporting.

Step 4: Establish methods of reporting and assessment

It is important that the following issues are considered with regard to the method by which reports will be collected, assessed and analysed:

- Ease of making the report or easy access to the responsible officer in case of a verbal report - voluntary reporting should not be perceived as an extra task;
- Clear and unambiguous directions for reporting and accessibility to reporting means;
- Professional and consistent assessment of safety reports;
- Data collection for trend analysis;
- Professional handling of investigation and lesson dissemination;
- Rapid, useful, accessible and intelligible feedback to the reporting community.

Steps to develop a 'Just Culture' safety reporting system could be:

(a) Decide on whether it should be a mandatory or a voluntary safety reporting system;
(b) Decide on whether it should be an anonymous, a confidential or an open safety reporting system;
(c) Decide on how and by whom safety reports will be assessed and analysed;
(d) Develop procedures to ensure a consistent assessment of safety reports;
(e) Decide if and how the reports will be further investigated (what will be the focus of the investigation; will face-to-face interviews be required, etc.);
(f) Decide which reports will be investigated further (e.g. those which are most severe, or, those with the most learning potential);
(g) Decide who will investigate the reports;
(h) Develop procedures for determining culpability and for the necessary follow-up action (type of discipline or coaching);
(i) Decide who shall decide culpability (e.g. team consisting of safety, operations, management, human resources, etc.);
(j) Draft a plan and discuss it with a small selection of operational personnel.

Step 5: Develop reporting form

It is important to have a reporting form that encourages accurate and complete reporting (e.g. questions that are understandable) and is easy to fill in; otherwise reporters may provide erroneous or misleading responses. Determine:

(a) What information is required (e.g. only information that will improve learning in the organisation);

(b) What the information will be used for (e.g. case studies or summary data) as this will determine what information needs to be collected;
(c) What format the information should be collected in (e.g. electronic, paper, verbally, or a combination thereof);
(d) What resources are required to develop the system (people, costs);
(e) Whether (and how) the reporting form should be integrated with the current safety reporting system.

Step 6: Develop template for feedback to potential users

It is important that reporters and staff know as soon as possible that an occurrence has been investigated and that the problem is solved. In this step the organisations should determine:

(a) What type of information it wants to disseminate (e.g. summary, case studies, "hotspots", human factors data, etc.);
(b) How to disseminate the information (e.g. feed-back form, newsletter, website etc.);
(c) Who will be involved (in managing, writing, editing, will senior management endorsement of the action plan be needed);
(d) How often will the feedback be disseminated and when;
(e) Template style of the newsletter/webpage, title, etc.

Step 7: Develop plan for educating users and implementing the system

Potential reporters must know about the reporting scheme and know how to submit a report. This will include induction courses; periodic awareness to remind staff of the importance of reporting and ensuring that all staff are provided with access to reporting forms. The following are some suggested initial steps for implementing the system:

(a) Develop brochures to explain the changes in the legal system;
(b) Present the changes to all staff;
(c) Train a person (or a team) to be the main focus for the system;
(d) Explain to users how this new system will fit into any existing system;
(e) Have a "Safety Week" campaign to promote the safety reporting system;
(f) Include a section on the safety reporting system in safety induction courses;
(g) Use email and internet to communicate, to announce new information and congratulate participants;
(h) Design posters to describe the safety reporting system process pictorially.

Step 8: Develop and maintain a just culture

A number of additional issues concerning the 'cultural' aspects of reporting are necessary in order to maintain motivation to report, such as trust between the

reporters and their supervisors, and between the supervisors and their managers. This must genuinely exist for the safety reporting system to work. The main aims are to develop an open culture in which people feel able to trust the system and to develop new ways to motivate people to use the system. Ways to achieve this include the following:

(a) Management commitment - Raise awareness of management's commitment to safety, with a "hands on approach". Have management involved in the reporting process to show visibly that they believe in and are willing to promote the just culture;

(b) Develop 'marketing strategies' for enhancing safety culture - i) Customer centred: focusing the marketing strategy to suit the audience (e.g. management focus will be different from that of operations personnel); ii) Link safety values to the core business: show tangible evidence for safety value impact, such as how safety can enhance production, efficiency, communication and even cost benefits; iii) Reward and recognition: develop positive reinforcement for reporting incidents so that reporters feel that their action in reporting has a benefit on safety;

(c) Employee involvement - Ensure employee involvement so that they are committed to the need to be actively involved in decision making and the problem solving process;

(d) System visibility - Potential contributors must be made aware of the procedures and mechanisms that support the safety reporting system;

(e) Maintaining the employees' voice - The system must ensure that the reports are used to voice the employee's views and not used to suit existing management priorities;

(f) Publicised participation. The contribution rate from different parts of the organisation should be published to show that others have trust in the system (but care must be taken to ensure that this does not have the opposite effect, such as asking for certain quotas of reports per month);

(g) Change attitudes and behaviours - Focus on the immediate, certain and positive consequences of reporting incidents and publicise the "pay-offs" of reporting incidents.

Appendix B SAFETY CULTURE CHARACTERISTICS

This appendix describes the six safety culture characteristics.

Commitment:
Reflects the extent to which every level of the organisation has a positive attitude towards safety and recognises its importance.

Justness:
Reflects the extent to which safe behaviour and reporting of safety issues are encouraged or even rewarded, and unsafe behaviour is discouraged.

Information:
Reflects the extent to which safety related information is distributed to the right people in the organisation.

Awareness:
Reflects the extent to which employees and management are aware of the risks the organisation's operations imply for themselves and for others.

Adaptability:
Reflects the extent to which employees and management are willing to learn from past experiences and are able to take whatever action is necessary in order to enhance the level of safety within the organisation.

Behaviour:
Reflects the extent to which every level of the organisation behaves such as to maintain and improve the level of safety.

Appendix C SAFETY CULTURE INDICATORS

This appendix describes in detail the indicators belonging to each of the six safety culture characteristics.

C.1 INDICATORS RELATING TO COMMITMENT

The characteristic *Commitment* reflects the extent to which every level of the organisation has a positive attitude towards safety and recognises its importance. Top management should be genuinely committed to keeping a high level of safety and give employees motivation and means to do so as well. The following indicators for commitment have been identified:

I1_1. *Management concern*

A good safety culture starts with management being genuinely concerned with safety. Therefore, one of the most important goals of (top-) management should, apart from making profit, be to keep a high level of safety, for the operations, for the customers, and for their employees. The concern for safety expresses itself in management being willing to release job pressure if safety is at stake, and also in management accepting setbacks and human errors as inevitable, putting everything into place to minimize the chance of such errors occurring. Management concern for safety should furthermore be projected onto the employees, who, in a good safety culture, have confidence in the management doing everything possible to keep high safety records.

I1_2. *Personal concern*

Management concern for safety will reflect on the personal concern for safety of the other members of the organisation. Like management, (operational) staff should consider safety as a core value, and be aware that a high level of safety is essential for the continuity of the operations. This means that safety should always been given priority above efficiency and profit, and safety issues, however small, should be considered seriously.

I1_3. *Investment in safety*

The prioritisation of safety discussed above is reflected, among others, by the amount of money and effort that is invested over the entire organisation in order to maintain and improve the level of safety. The existence of a safety department ensures that safety issues are taken seriously, safety requirements and

procedures are installed, and that an intermediary regarding safety issues between management and employees exists. Obviously, such a safety department should function in reality and emanate the authority necessary to be taken seriously. Finally, in case an incident or accident has occurred, the organisation should put all possible means at the disposal of a solution.

C.2 INDICATORS RELATING TO JUSTNESS

The characteristic *Justness* reflects the extent to which safe behaviour and reporting of safety issues are encouraged or even rewarded, and unsafe behaviour is discouraged.

I2_1. *Evaluation of safety related behaviours*
Safety related behaviour should be evaluated in a consistent and just manner. Safe behaviour should be rewarded and occasional mistakes should not lead to grave punishments. In contrast, reckless behaviour should imply negative consequences for the person concerned, and actions should be taken against violations of safety procedures or rules. Also, no negative consequence should be attached to the usage of the safety reporting system.

I2_2. *Perception of evaluation*
The evaluation system should be perceived as just by those evaluated. Employees should not be concerned with the evaluation when reporting occasional mistakes. The evaluation should be clear in when employees can be expected to be rewarded, punished, or not undergo any consequence from their actions.

I2_3. *Passing of responsibility*
Management should acknowledge that the causes of accidents or incidents often originate from management decisions, rather than actions undertaken on the shop floor. Of course, the final responsibility could be put at the front line employees, but management needs to realise that the cause of failure of safe behaviour on the shop floor has to be sought for in management decisions.

C.3 INDICATORS RELATING TO INFORMATION

The characteristic *Information* reflects the extent to which information is distributed to the right people in the organisation. Employees should be encouraged to report safety concerns, therefore demanding the existence of a safety reporting system. Work related information has to be communicated in the

right way to the right people in order to avoid miscommunications that could lead to hazardous situations.

I3_1. *Safety training*

Employees should be given training in order to carry out their job in a safe manner. Training in adequate behaviour and communication in case of emergency situations should also be given to everyone in the organisation. Training in safe behaviour and emergency situations should be given at regular intervals

I3_2. *Communication of safety related information*

Safety reports should be communicated to the right people, and safety issues should be communicated to all employees in order to keep them informed with known hazards. When changes are implemented that anyhow affect safety, management should inform the employees concerned by those changes. Talking about safety issues amongst employees, amongst management and between employees and management should be viewed as normal and desirable. Events involving safety issues should be reviewed by management and employees.

I3_3. *Safety reporting system*

An important ingredient to assure safety of operations is to install a system to report safety issues. Such a system should enable reporting safety concerns regarding technical systems, procedures, and safety related behaviour. It should be ensured that all employees know about the existence of the safety reporting system and are familiar with its usage.

I3_4. *Willingness to report*

The safety reporting system can only reach its aim, namely to make management knowledgeable of safety issues, if employees are willing to use it. Not only should they be willing to report accidents, but also minor incidents as well as near misses[4]. Indeed such near misses could, if recurring, lead to graver incidents or accidents. Usage of the safety reporting system should be encouraged. The willingness of using the safety reporting system is enhanced by making it possible to report safety issues anonymously.

[4] A near miss in this context is a happening that could have led to an incident or an accident but did not thanks to some lucky circumstances.

I3_5. *Consequences of safety reports*

The safety reporting system should be used to genuinely and rapidly take action to reduce the safety concerns. Moreover, the usage of the safety reporting system should by no means imply negative consequences for those using it. It should be possible to report anonymously, but employees should feel be confident to identify themselves when reporting.

C.4 INDICATORS RELATING TO AWARENESS

The characteristic *Awareness* reflects the extent to which employees and management are aware of the risks the organisation's operations imply for themselves and for others. Employees and management should be constantly maintaining a high degree of vigilance with respect to safety issues.

I4_1. *Awareness of job induced risk*

Management and employees should be aware of the risk the organisation's operations induces not only to themselves, but also to other people, e.g. people living in the surroundings of the organisation and people using the organisation's products (typically aircraft passengers in the case of air transport). Management and employees should never think that they have achieved the highest possible level of safety, and always be looking for ways to improve their safety records. Management and employees should always be aware that safety can be improved and look for ways to do so.

I4_2. *Attitude towards unknown hazards*

A good safety culture is a means to obtain a high level of safety. However, a high level of safety can also lead to the belief that all safety issues are taken care of, and hence it could release the pressure upon performing safely. A high level of safety thus represents a danger to maintaining a high level of safety. Therefore, employees should always be aware of known hazards, and also constantly be on the look-out for new ones.

I4_3. *Concern for safety*

High safety awareness is reflected in a continuous attention for safety issues. This means that even in the absence of safety occurrences the organisation's members are concerned with safety. They are aware of the importance of safety for the continuity of the operations and act accordingly.

C.5 INDICATORS RELATING TO ADAPTABILITY

The characteristic *Adaptability* reflects the extent to which employees and management are willing to learn from past experiences and be able to take whatever action is necessary in order to enhance the level of safety within the organisation.

I5_1. *Actions with respect to safety occurrences*
When faced with safety concerns, incidents or accidents, management and employees should take immediate action to prevent such negative happenings to recur. Near misses should also be taken into account by management and employees, and their causes should be looked for in order for them not to recur with possibly graver consequences. Installed improvements should be followed up in order to check whether they are indeed effective, and do not imply other unforeseen safety concerns.

I5_2. *Proactiveness to prevent safety occurrences*
Reaction upon safety issues, incidents or accidents is not sufficient for a high level of safety to be reached. Indeed, rather than being reactive, the organisation's management and employees should be proactive in solving safety problems. Improvements should be looked for and implemented before negative happenings occur, and employees should be encouraged to look autonomously for ways to improve safety on the shop floor.

I5_3. *Employee input*
In an organisation with a good safety culture, it is highly appreciated that employees communicate their knowledge and experience. Employees should be enabled to suggest improvements with respect to their or others' job. When facing problems, management should not hesitate to assign the right persons, even if they are front-line employees, to solve those problems. When facing problems or safety issues, employees should be enabled, if necessary, to interfere even if these problems or issues are beyond their work area. In this case, they should not be treated as meddlers, but their proactiveness should on the contrary be appreciated.

C.6 INDICATORS RELATING TO BEHAVIOUR

The characteristic *Behaviour* reflects the extent to which every level of the organisation behaves such as to maintain and improve the level of safety. From the management side, the importance of safety is recognized and everything to

maintain and enhance safety records is put in place. Employees should be empowered to keep high safety levels, not only through reporting but also through decision making.

I6_1. *Job satisfaction*

Job satisfaction is an important requirement to carry out safe operations. Indeed, it promotes concentrated behaviour at work, and thereby safe behaviour. It includes a good physical and mental state during normal working periods, a good contact with colleagues, and an adequate job pressure, which is, amongst others, assured by a sufficient size of the staff. Work should be appreciated in an adequate manner by the employees' foreman/supervisor as well as by the colleagues. This will promote the job satisfaction, hence safe operations.

I6_2. *Working situation*

The employees should be able to have access to the equipment necessary to perform their job in a safe manner. The equipment should be in a good condition, and adequate training to use the equipment should be given. Also, safety equipment (e.g. fire extinguishers) should be available at all times.

I6_3. *Employee behaviour with respect to safety*

A necessary ingredient to safe operations is the willingness of employees to behave and execute their job in safe manner. They should be aware that risk taking, whether unnecessary or driven by profit or performance concerns, could potentially be very harmful and that it should therefore be reduced to a zero rate. Employees should furthermore be enabled to prevent the occurrence of accidents or incidents, by taking responsibility and undertaking action when needed.

I6_4. *Mutual expectations and encouragement*

Safe behaviour should be mutually expected and encouraged amongst employees, and should result in the acquirement of colleagues' respect. When faced with unsafe operations, employees should be encouraged to stop and report those. Violations of procedures and regulations should be effectively discouraged.

Appendix D LEVELS OF SAFETY CULTURE

This appendix describes the levels of safety culture used by NLR-ATSI.

Level 1 (pathological)
In a pathological safety culture, safety is considered as unimportant and even senseless. Safety plays no role in any layer of the organisation, from top management to frontline personnel. Action is taken only after severe safety occurrences, and only consists of identifying and punishing the directly responsible person(s) without further noticing, let alone investigating, the organisational factors that are likely to have played a role. If safety already is a subject of communication, it is only after severe safety occurrences and for only a short period of time. If there is already any awareness of existing safety risks, there is in general no willingness to do something about them. Employees raising safety concerns are not appreciated, in particular when (other) interests (e.g. profit, efficiency, quality or environment) are at stake. Safety considerations do not play an important role in the behaviour of frontline personnel. Unsafe behaviour in the benefit of (other) interests is rewarded.

Level 2 (reactive)
In a reactive safety culture, safety is generally regarded as a burden that is imposed from the Authorities. Safety is taken into account to meet the requirements imposed by the regulations. Action is taken only to satisfy the law, or after a safety occurrence, in which case it mainly consists of identifying and punishing the directly responsible person(s). Only if the safety occurrence is severe it becomes object of communication and measures are taken to prevent recurrence. There is only willingness to take action against an existing safety risk when it is too late. Behaviour is barely influenced by safety considerations. Unsafe behaviour in the benefit of (other) interests is allowed.

Level 3 (calculative)
In a calculative safety culture, safety is considered as a factor that has to be accounted for. Safety is taken into account in management's decision making, but in itself safety is not a core value. Action is only taken after a safety occurrence, and next to identifying directly responsible person(s), it also aims at investigating the organisational processes that might have played a role. A safety reporting system is installed to meet legal requirements, and is only used for gathering information in the aftermath of safety problems. There is a general

awareness of the safety risks induced by the operation, and one is willing to take measures if these become too large. The behaviour of frontline employees is influenced, amongst others, by safety considerations. There are situations in which unsafe behaviour in the benefit of other interests is allowed, but in general there is a mutual expectation of safe behaviour.

Level 4 (proactive)
In a proactive safety culture, safety is considered as a prerequisite. Safety is a core value of the organisation and plays an important role in decision making at management level as well as in day-to-day operations. The safety reporting system is not only used for detecting severe safety issues, but also for issues with less or no impact. Safety reports only have consequences for the directly responsible person(s) if there appear to be intentional actions or negligence. The operations are regularly assessed on their safety, and safety measures are thoroughly evaluated after implementation. After a safety occurrence, the first concern of management is to prevent recurrence. After that the directly responsible person(s) often are still pointed out and punished, but responsibility is also assigned to organisational factors. There is a general awareness of the safety risks induced by the operation, and action is taken to reduce them as much as possible.

Level 5 (generative)
In a generative safety culture, safety is the core value of the organisation and is recognised as essential for the continuity of the operations. There is a clear line between acceptable and unacceptable behaviour. As long as safety occurrences are not the result of negligence or intention there are no consequences for the directly responsible person(s). In this atmosphere of trust the safety reporting system is widely used and the measures resulting from safety reports are fed back to the involved parties. One is aware of the existence of unidentified safety risks, aware of the fact that the next accident is just around the corner, and keeps a constant level of vigilance with respect to these unidentified risks. Safety is decisive for the behaviour of front line personnel, and unsafe behaviour is never tolerated.

Appendix E JUST CULTURE INTERNAL AUDIT

E.1 JUST CULTURE QUESTIONNNAIRE

Close relations exist between a just culture and a reporting culture. On the one hand, reported safety occurrences are the inputs for evaluating potential consequences (e.g. disciplinary action, coaching, and improvement of systems or procedures). On the other hand, an effective reporting culture depends on the way that blame is handled in the organisation.

The assessment and improvement of just culture at ground service providers has the following objectives:

1) Identify the current situation at the ground service provider for the organisation of safety reporting and the consequences of such occurrences for involved personnel and for the organisation.
2) Evaluate the current situation: what works well and what might be improved?
3) Identify ways to improve sub-optimal aspects at the ground service provider.
4) Identify ways for the auditor to audit the level of just culture in the ground service provider.

These steps are addressed in detail by the following audit questions. These questions consider the just culture and the reporting culture in your organisation. Consider the **current** situation at your organisation while answering the questions.

The questionnaire is organised as follows:

- Legal framework;
- Policy and procedures for reporting of safety-related issues;
- Confidentiality;
- Safety reporting system;
- Feedback;
- Investigation;
- Culpability;
- Other remarks.

E.2 LEGAL FRAMEWORK

1. Are employees in your organisation at risk for legal actions as result of an error made during their work or a contribution made to the occurrence of an incident?

2. Are employees protected by your organisation against prosecution? In what way?

3. Does the existing legal framework have positive or negative effects on the reporting, assessment and learning of safety occurrences in your organisation? What kinds of effects?

4. What kind of changes in the legal framework would promote the reporting and investigation of safety occurrences?

E.3 POLICY AND PROCEDURES FOR REPORTING OF SAFETY–RELATED ISSUES

5. Has your organisation developed a policy for proactive reporting of safety-relevant situations and/or procedures? What is this policy?

6. Has your organisation developed a policy for reactive reporting of safety-relevant situations? What is this policy?

7. How is this policy supported by the management?

8. Is the reporting of safety-related issues being stimulated?

9. In what ways can employees report safety-related issues?

10. Are there procedures for the reporting of safety issues. Please explain them.

11. Are the procedures accessible for employees? In what ways?

E.4 CONFIDENTIALITY

12. (a) Is the current safety reporting system anonymous?
(b) Is the current safety reporting system confidential? Who has access to the reports?

13. Does the level of confidentiality have positive or negative effects on the reporting, assessment and learning of safety occurrences in your organisation? What kinds of effects?

14. Should this aspect of the safety reporting system be changed in your opinion? In what way?

E.5 SAFETY REPORTING SYSTEM

Voluntary / mandatory reporting

15. Is the current safety reporting system mandatory or voluntary?

16. Does this have positive or negative effects on the reporting, assessment and learning of safety occurrences in your organisation? What kinds of effects?

17. Should this aspect of the safety reporting system be changed in your opinion?

Hardware

18. What is the current reporting format (if available): paper / electronic?

19. Is the way of reporting adjusted to the user (education, nationality, etc.)?

20. Should the reporting format be changed in your opinion? In what way?

Information

21. What types of information should be provided verbally or in the current format?

22. Is the information asked for sufficient for organisational learning?

23. How long does it take to complete a form?

24. Does the current form have positive or negative effects on the reporting, assessment and learning of safety occurrences in your organisation? What kinds of effects?

25. Should this aspect be changed in your opinion? In what way?

Training

26. How are people trained to use the safety reporting system?

27. How are people being constantly stimulated to use the safety reporting system?

28. Have people been appointed to promote the use of the safety reporting system?

29. Does the current education have positive or negative effects on the reporting, assessment and learning of safety occurrences in your organisation? What kinds of effects?

30. Should this aspect be changed in your opinion? In what way?

E.6 FEEDBACK

31. (a) How is information on safety-related issues distributed in the organisation?
(b) Who receives this information?

32. (a) In what ways are lessons learnt from reported safety issues?
(b) Who are involved in determining lessons learnt?

33. How is information on lessons learnt from safety issues distributed in the organisation?

34. Does the current feedback have positive or negative effects on the reporting, assessment and learning of safety issues in your organisation? What kinds of effects?

35. Should this aspect be changed in your opinion? In what way?

E.7 INVESTIGATION

36. Who decides if and how safety issues are further investigated?

37. (a) Are there procedures for deciding which safety issues will be further investigated?
(b) What are these procedures?
(c) Are these procedures being adhered to?

38. Who investigates reported safety issues?

39. Hold the people investigating safety issues an independent position in the organisation?

40. (a) Are there procedures for the way that the investigation should be done and for the results that should be attained?
(b) What are these procedures?
(c) Are these procedures being adhered to?

41. Does the organisation of the investigation of safety issues have positive or negative effects on the reporting, assessment and learning of safety occurrences in your organisation? What kinds of effects?

42. Should this aspect of the safety reporting system be changed in your opinion? In what way?

E.8 CULPABILITY

As a basis for achieving a just culture, there should be a clear culpability line, which distinguishes acceptable and unacceptable behaviour in the context of an occurrence.

43. Who decides about the acceptability of the behaviour of employees in the context of a safety occurrence?

44. (a) Are there procedures for determining the acceptability of the behaviour in the context of a safety occurrence?
(b) What are these procedures?
(c) Are these procedures being adhered to?

45. Who decides on follow-up action (training, discipline, coaching, etc.)?

46. (a) Are there procedures for determining follow-up action?
(b) What are these procedures?
(c) Are these procedures being adhered to?

47. Does the decision-making on the culpability have positive or negative effects on the reporting, assessment and learning of safety occurrences in your organisation? What kinds of effects?

48. Should this aspect be changed in your opinion? In what way?

E.9 OTHER REMARKS

49. Do you have any other comments or suggestions for the development of just culture?

Appendix F JUST CULTURE EXTERNAL AUDIT

F.1 JUST CULTURE QUESTIONNNAIRE

Close relations exist between a just culture and a reporting culture. On the one hand, reported safety occurrences are the inputs for evaluating potential consequences (e.g. disciplinary action, coaching, and improvement of systems or procedures). On the other hand, an effective reporting culture depends on the way that blame is handled in the organisation.

The assessment of just culture at ground service providers has the following objectives:

1) Identify the current situation at the ground service providers for the organisation of safety reporting and the consequences of such occurrences for involved personnel and for the organisation.
2) Evaluate the current situation: what works well and what might be improved?
3) Identify sub-optimal aspects at the ground service providers.

These steps are addressed in detail by the following audit questions and consider the just culture and the reporting culture of the audited ground service provider. The audit questions mainly serve as guidance during regular audits. For this reason these questions shall not strictly be used one after another during an interview, but preferably be used to develop a dialogue between the auditor and the auditee. During the post-audit analysis, besides the interview answers, also notes from the interview may be complemented by expert knowledge or impressions of the interviewers. All this information will be analysed to produce a final picture about the status of the strengths and weaknesses of the organisation's just culture.

The questionnaire is organised as follows:

- Policy and procedures for reporting of safety-related issues;
- Confidentiality;
- Safety reporting system;
- Feedback;
- Investigation;
- Culpability.

F.2 Policy and procedures for reporting of safety–related issues

1. Has the organisation developed a policy for reporting of safety-relevant situations and/or procedures? What is this policy?

2. How is this policy supported by the management?

3. Is the reporting of safety-related issues being stimulated?

4. In what ways can employees report safety-related issues?

5. Are there procedures for the reporting of safety issues. Please explain them.

6. Are the procedures accessible for employees? In what ways?

F.3 Confidentiality

7. Is the current safety reporting system anonymous and confidential? Who has access to the reports?

F.4 Safety reporting system

Voluntary / mandatory reporting

8. Is the current safety reporting system mandatory or voluntary?

Hardware

9. Is the way of reporting adjusted to the user (education, nationality, etc.)?

Information

10. What types of information should be provided when reporting safety issues?

11. Is the information asked for sufficient for organisational learning?

Training

12. How are people trained to use the safety reporting system?

F.5 Feedback

13. How is information on safety-related issues distributed in the organisation?

14. In what ways are lessons learnt from reported safety issues?

15. How is information on lessons learnt from safety issues distributed in the organisation?

F.6 Investigation

16. Are there procedures for deciding which safety issues will be further investigated? What are these procedures?

17. Who investigates reported safety issues? Do they have an independent position in the organisation?

18. Are there procedures for the way that the investigation should be done and for the results that should be attained? What are these procedures?

F.7 Culpability

As a basis for achieving a just culture, there should be a clear culpability line, which distinguishes acceptable and unacceptable behaviour in the context of an occurrence.

19. Who decides about the acceptability of the behaviour of employees in the context of a safety occurrence?

20. Are there procedures for determining the acceptability of the behaviour in the context of a safety occurrence? What are these procedures?

21. Who decides on follow-up action (training, discipline, coaching, etc.)?

22. Are there procedures for determining follow-up action? What are these procedures?