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GROUND HANDLING AND FLIGHT SAFETY

BASICS, BEST PRACTICES AND AWARENESS-RAISING

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GROUND HANDLING AND FLIGHT SAFETY

BASICS, BEST PRACTICES AND AWARENESS-RAISING

Technical Guide

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This French DGAC document is a courtesy translation of guidance material which makes references to practices and regulations applicable in France. It is intended to be useful to foreign companies operating in France, however it should be noted that the practices promoted in this guide may not be directly applicable in other countries.

SUMMARY

INTRODUCTION

Ground handling activities keep commercial flight operations running smoothly, but they also contribute very directly to flight safety. This guide reviews the recognised procedures, while also highlighting things that go unsaid, innovations and best practices that aim to improve flight safety. Since this document focuses on this particular aspect, practices related to occupational safety are not addressed.

The employees of ground handling companies are in the front line of aircraft safety. They are the first to intervene on the aircraft when it arrives at an airport, they prepare the aircraft for its flight and they are the last to observe the aircraft from the outside before it takes off. So they must have the right reflexes, the necessary knowledge and an appropriate attitude. While some of these qualities come with experience, they are mainly acquired through adapted communications, training, awareness-raising and actions taken by management on the subject of incident handling.

The authors of this document consulted ground handling companies, airports and airlines operating in France. Their contributions enriched this guide and helped to identify the risks specific to ground handling, common practices and innovative means of coping with these risks.

This guide proposes practices that the different operators can then chose to adopt, depending on the context and their own specific constraints. These practices are presented in the most generic way possible, but the demands specific to each airline and airport, or changes in the regulations, must always take precedence. This guide has no regulatory standing and cannot be used as an official reference document in audits, examinations or inspections by the competent authorities.

Special attention has been given to illustrating and justifying the proposed practices through explanations and concrete examples, which can be very useful for ground handlers internal communications.

READER'S GUIDE

This guide is divided up into three sections.

01 **The safety management principles** constitute an essential core for the effective implementation of the practices presented in the following two sections.

02 **The common practices** cover the themes that apply to most ground handling agents and activities.

03 **The task specific practices** describe how each activity can affect flight safety and the rules that can reduce these risks.

In each section, each theme is structured around **basics** that are known by all and must imperatively be followed to guarantee flight safety. Their presentation is sufficiently generic to be consistent with the different operators' practices.

To take things further, "management" and "behavioural" **best practices** are highlighted in special text boxes:

MANAGEMENT BP

These best practices are intended for managers. They generally consist of innovative procedures implemented in different ground handling companies that can be replicated at little cost in order to improve flight safety.

BEHAVIOURAL BP

These best practices are intended for front-line agents. They underline points demanding attention and the right behaviour to adopt in the execution of their tasks, without impacting the procedures they must follow.

Finally, these basics and best practices are illustrated and justified using concrete examples of incidents and accidents that help us to better address the risks incurred by the different ground handling activities. These examples are intended to be used in training and in awareness-raising campaigns about the impact of ground handling activities on flight safety.

The identified risks are ranked according to their impact on flight safety and are measured by combining their probability of occurrence and their possible consequences. The level of risk is represented by the following symbols:

1. SAFETY MANAGEMENT PRINCIPLES

1.1. SAFETY CULTURE AND JUST CULTURE

SAFETY CULTURE

The safety culture reflects the way safety is perceived and prioritised within an organisation and the engagement of employees at every level of seniority. Safety culture is made up of common convictions, practices and attitudes that are driven and maintained directly by the words and actions of management.

MANAGEMENT BP

Management must understand that mistakes are and will be made. Therefore, it is necessary to anticipate the attitude of front-line agents by whetting their appetite for the detection of errors and the means of avoiding them.

MANAGEMENT BP

Holding safety meetings several times a year, where all the employees – from management to the front-line agents – can talk openly and highlight safety points to be improved, is a constructive step.

Numerous factors help to create an atmosphere favourable to the safety culture. Acting on these factors is the responsibility of management, which must be aware of the fact that organisational and human factors are essential to the safety of operations.

MANAGEMENT BP

The training of front-line agents must go beyond simply learning technical skills. Initial and further training must also include issues related to human factors, such as anticipation, communication and teamwork.

It is difficult to measure to what extent the safety culture is disseminated within the company. But the quantity and quality of occurrence reports from ground operations can reveal the general state of play.

MANAGEMENT BP

The adoption of a safety culture can be significantly encouraged through incentives that reward the escalation of relevant information. Some companies have introduced awards or a form of internal recognition to reward agents who contribute to the improvement of safety.

"We learn from our mistakes. You can report them in confidence! These reports are beneficial to flight safety and your own safety, and you are the main witnesses!"

RELATED OCCURRENCES

1 ▶ DEPRESSURISATION FURTHER TO AN UNREPORTED IMPACT ON THE GROUND

2005, Seattle: shortly after the take-off of an MD-83, a dull explosion was heard. The cabin pressure dropped, the oxygen masks were released and the crew started an emergency descent. On arrival, a hole measuring approximately 30 x 15 cm was visible on the right-hand side of the aircraft. Just before the departure, a baggage handler had "scraped" the aircraft with his tractor as he moved clear. After a quick check, he could not see any damage and did not report the incident.

JUST CULTURE

A "just culture" has been defined as "a culture in which front-line operators and others are not punished for actions, omissions or decisions taken by them which are commensurate with their experience and training, but where gross negligence, wilful violations and destructive acts are not tolerated" *(James Reason)*.

"Just culture" is based on the "non-punitive" treatment of human errors, but it still punishes certain infringements, defined in Article 16*(10)* of Regulation *(EU)* No 376/2014. Front-line agents need to be reminded of this aspect of "just culture", which is sometimes overlooked.

MANAGEMENT BP

From an organisational perspective, the teams that have access to the notified incidents must be clearly independent from both the teams that take administrative sanctions and from human resources. The front-line agents must be made perfectly aware of this fact, if a healthy and trusting climate is to be established. Agents must also have the option to declare an incident anonymously.

This principle of a "just culture" is essential to the effective implementation of a safety culture. It must nurture a climate of trust between the management and employees to encourage the latter to provide essential information about the incidents they observe. The goal is to improve the system, not to inflict punishment blindly.

"The goal is to correct the mistake, not its perpetrator!"

Managers need to send these messages, while insisting on the absence of disciplinary measures taken as a result of these reports. These reports are only used to improve safety and, ultimately, to turn unwanted situations into opportunities to learn and do better.

EUROPEAN REGULATION 376/2014
Art. 16: Protection of the information source

[States] shall refrain from instituting proceedings in respect of unpremeditated or inadvertent infringements of the law which come to their attention only because they have been reported.

If disciplinary or administrative proceedings are instituted under national law, information contained in occurrence reports shall not be used against the reporters or the persons mentioned in occurrence reports.

Employees and contracted personnel who report or are mentioned in occurrence reports [...] shall not be subject to any prejudice by their employer or by the organisation for which the services are provided on the basis of the information supplied by the reporter.

Except:

- in cases of wilful misconduct;
- where there has been a manifest, severe and serious disregard of an obvious risk and profound failure of professional responsibility to take such care as is evidently required in the circumstances, causing foreseeable damage to a person or property, or which seriously compromises the level of aviation safety.

2 ▶ RISK OF AN ACCIDENT IF AN ANOMALY IS NOT NOTIFIED

2006, Prague: following de-icing, an ATR is at the holding point, ready for take-off. In the meantime, the agent who performed the de-icing operation noticed that the levels of de-icing fluid and of water in his tanker truck were incoherent. He immediately reported the anomaly. The aircraft's crew were informed in time and returned to the de-icing area, where it was observed that the de-icing operations had been ineffective and that ice had formed on the wings.

An effective safety culture, from the front-line operators to management, helps prevent serious accidents.

1.2. OCCURENCE REPORTING

"Learn from the mistakes of others.
You don't have time to make them all yourself."

(Anna Eleanor Roosevelt)

Experience has shown that accidents are often preceded by similar safety-related incidents. So reporting these incidents is a precious resource to determine the precursors of accidents or potential dangers.

Notifying management of the occurrences observed in the field is the essential link in the efficient escalation of information. Occurrence reports must also be sent to the DGAC, depending on the relevance of the information received and the regulatory requirements. Moreover, sharing this information with airlines and airport operators allows them to analyse the occurrences for safety purposes. Since the different players have differing visibility in terms of the quantity and the sources of information, the analyses they make complement one another and help to identify different risks.

The European Regulation *(EU)* 376/2014 on the reporting, analysis and follow-up of occurrences in civil aviation came into effect on 15 November 2015. It is supplemented by the Implementing Regulation *(EU)* 2015/1018, which lays down a list classifying safety-related occurrences in civil aviation to be mandatorily reported.

MANAGEMENT BP

These European regulations define a minimal framework for the reporting of occurrences. But they also promote voluntary notification, by asking the assistants to set up an internal system that facilitates the collection of voluntary reports. This type of notification helps us to "see further ahead", inasmuch as they allow new risks or risks specific to certain conditions to be identified by operators and, on a broader scale, by the DGAC, which also receives them. All the escalated information is analysed with the same level of attention as incidents that must imperatively be reported.

MANAGEMENT BP

The content of the reports is crucial to the performance of the system. The tools used to manage reports must allow different forms of content, such as photos, videos and documents, to be recorded and kept for long periods.

BEHAVIOURAL BP

To allow for a proper analysis, it is essential to always collect as much information as possible about the context of the occurrence. Photographs are often very useful, provided they can be taken in safety.

Voluntary reporting systems must be set up that, like for the compulsory notifications, are readily accessible and confidential.

MANAGEMENT BP

Measures can be taken to facilitate reporting, such as self-service terminals in rest areas, forms on an intranet site or hard copy forms that can easily be deposited in a letterbox, etc.

1.3. FEEDBACK ANALYSIS

The safety culture, the just culture and occurrence reporting take on their full meaning in the analysis of the information collected. This integration of feedback must lead to targeted and appropriate safety measures.

The first level of feedback integration consists of the **individual analysis** of each of the reports. The priority goal of this process is the identification of technical, organisational or human faults, not to place blame.

The analysis of occurrence reports must be part of a logical process, in which as much information as possible is collected *(the context, photos, procedures, interviews, supporting documents, skills, etc.)*. In this way, the causes of, and the factors contributing to, incidents can be determined as precisely as possible, and corrective actions and recommendations can be formulated.

MANAGEMENT BP

Escalated occurrences must be studied regularly and periodically, and not only after a serious incident or in preparation for an audit.

The depth of the analysis is proportional to the level of risk associated with the occurrence. This analysis became compulsory with the entry into force of European Regulation *(EU)* 376/2014 in November 2015. In addition to occurrences that are deemed to be especially significant – which must be analysed individually – theme-based analyses are also strongly recommended and preferred, based on groups of occurrences that share the same aspect of safety.

MANAGEMENT BP

Certain risk factors can be easily attenuated – the shortcomings of a procedure, unsuitable equipment, etc. – but the real problem is identifying them. It is necessary to look beyond the basic interpretation that “the agent is to blame”. Pertinent identification can be made easier by cross-referencing and comparing several reported incidents.

The grouping of incidents represents a second essential level of analysis, because it helps to identify risk factors that cannot be detected by analysing occurrences individually. It also reveals trends to the operator and can be used to target preventive actions.

Grouping similar occurrences together is made much easier by categorising occurrences using a well-adapted taxonomy.

MANAGEMENT BP

In addition to the ADREP taxonomy used in the ECCAIRS software, operators can define their own occurrence categories according to their activities and the specific identified risks. More refined categorisation makes for more precise comparisons and analyses and, consequently, more appropriate corrective actions. But incidents must always be reported to the authorities according to the ADREP taxonomy.

If suitably summarised, these groups allow the company's safety issues to be approached globally and enable safety topics that demand special attention to be detected.

There are a multitude of possible drivers and opportunities for improvement. Action can be taken on procedures, the working environment, equipment, human factors, etc. Every option must be considered and, as far as is possible, this work should be carried out with the front-line agents.

MANAGEMENT BP

Management must bear in mind the fact that institutional and organisational factors, under-staffing, insufficient materials or unsuitable training are all easier to manage and control than distractions, forgetfulness or absent-mindedness.

There are numerous risk management methods that can clearly be applied to ground handling operations. There is a wealth of documents about risk analysis, and the managers of ground handling service providers can draw inspiration from them. Examples include the common risk analysis methods, such as Preliminary Risk Assessment *(PRA)*, Failure Mode and Effects Analysis *(FMEA)*, the HAZOP method *(HAZard OPerability)* and the bow-tie diagram method.

MANAGEMENT BP

The implementation of a Safety Management System (SMS) formally defines the necessary elements, such as safety culture, occurences reporting and their integration.

1.4. TRAINING AND AWARENESS-RAISING

The training of front-line agents is essential, because it defines the right behaviours and attitudes to be adopted. This field of activity, more so than others, demands greater complementarity between theoretical and practical training. Efforts to raise awareness of the safety of operations and its impact on flight safety must be made at all times.

All the training courses that agents attend must be recorded in the staff management system, with the dates of the courses, the name of the instructor, the date of the next refresher training, etc.

MANAGEMENT BP

Every front-line agent must have a job description that clearly defines his/her field of competence and, therefore, field of activity. This job description can be very precise, for example right down to the type of equipment that the agent can use. This job description, which must be sent to the agent whenever it is updated, guarantees a scope of action in which the agent has been trained.

In addition to initial training, the maintenance of skills and levels of training must not be neglected. Simple tools can help to maintain the levels of knowledge and vigilance of front-line agents.

MANAGEMENT BP

During every morning briefing (or at every shift change), introduce a review of a safety topic, with questions on the risks, precautions, procedural points, etc.

MANAGEMENT BP

Send mini-questionnaires or memos to the front-line agents in the form of a “read and sign” to make sure the information has been properly transmitted.

Access to information at all times is another important factor in the correct execution of ground operations. The procedures, manuals and guides, both common and applicable to a particular airline, must be readily accessible.

MANAGEMENT BP

Management can also use memos to give instructions specific to a type of aircraft, airline, aircraft stand, etc.

MANAGEMENT BP

Use pictograms to send general messages! Their meaning is more immediately obvious and universally understandable than a sentence that has to be read, and they are easier to remember.

2. COMMON PRACTICES

2.1. WALKING AIRSIDE

Ground handling personnel on foot work in an environment where serious risks with a multitude of causes threaten both their own safety and flight safety.

Operators on foot in the Aircraft Stand Restricted Area *(ASRA)* are best placed to detect impacts on the aircraft, leaks, etc., because they are the closest to the aircraft and they are the last agents remaining in the vicinity of the aircraft before it departs.

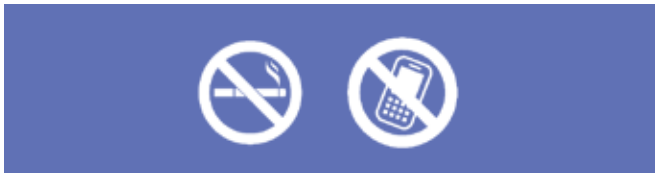
Operators working on the apron, and more particularly in restricted zones, must always remain attentive to the risks around them. The concurrent activities around the aircraft result in a noisy environment that can conceal certain dangers.

BEHAVIOURAL BP

It is necessary to remain permanently aware of all the operations taking place and not to rely simply on noise.

As a general rule, only the operators playing a role in the aircraft touchdown are allowed into ASRA. The use of personal protective equipment *(PPE)*, and of high-visibility clothing in particular, is essential in these zones. Depending on the airport, special pedestrian pathways are marked out and must be followed.

Similarly, operators must never smoke or use their mobile phones. Not only due to the risk of fire, but also because they will necessarily become less vigilant.



Working on foot in the immediate vicinity of the aircraft demands the utmost vigilance, especially with regard to the various sensors and antennas on the fuselage, which are very fragile. The slightest impact or scratch on the aircraft can have a direct effect on flight safety and must be reported.

Aircraft engines also represent a serious source of danger in ASRAs for the safety of both the personnel and of the flight. By way of example, engines can ingest or expel FOD *(Foreign Object Debris)*, which can clearly compromise their proper working order or damage the aircraft. Operators must permanently keep these types of dangers in mind and never approach the aircraft when the anti-collision lights are on, in which case access to the ASRA is barred. ▶ OCCURRENCE 1

All the employees working around the aircraft may come across FOD in the ASRA.

BEHAVIOURAL BP

It is easier to detect and collect FOD when on foot. Therefore, agents should stay on the lookout.

They must also be very wary of turboprop aircraft. When rotating, the propellers are less visible and not necessarily very noisy. Agents must never approach or touch the propellers, even when they are at a standstill. ▶ OCCURRENCE 2

RELATED OCCURRENCES

1 ▶ MAINTENANCE OPERATOR SUCKED INTO A JET ENGINE

2006, El Paso (United States)**: shortly after the boarding operations of a Boeing 737, a line maintenance agent was pulled into one of the aircraft's jet engines. He was fatally injured, despite the quick reactions of the captain, who immediately stopped the engine.**

The zones in front of and behind the engines are particularly dangerous, especially when the engines are running.

2 ▶ GROUND OPERATOR STRUCK BY A PROPELLER

When an ATR was 1 metre from its final position on the stand, a marshalling assistant passed under the right-hand wing, from the rear, close to a rotating propeller. The propeller struck his head, causing fatal injuries. The agent completed his marshalling training one year before. On the evening of the accident, he replaced another operator who was absent. He usually worked in another team, for another airline, which uses jet aircraft.

In cases like this, the importance of regular preventive actions becomes quite clear. The fact that agents are used to working on aircraft with certain characteristics must be taken into consideration in further training.

3 ▶ USE OF MOBILE PHONES CLOSE TO THE AIRCRAFT

Every year, numerous notifications of ground staff and crews using their mobiles inside the ASRA, and even inside the fire safety perimeter during refuelling operations *(see section 2.5. Refuelling in progress)***, are received. The risks are high: fire, distraction when using electronic devices or interference with the aircraft's systems.**

2.2. VEHICLE AND EQUIPMENT DRIVING

The use of vehicles and GSE plays a significant role in flight safety, whether they are used inside or outside the ASRA. They are close to the aircraft and, consequently, must be in perfect working order and be used properly.

Every vehicle or machine must be inspected before use. It must be in perfect working order and none of the parts must be susceptible to becoming detached during use. This inspection must be conducted before use. Moreover, more thorough inspections must be made on a periodic basis.

MANAGEMENT BP

Provide a vehicle inspection checklist for the start of each daily turn of duty. Once the operator has signed off the checklist, he/she is authorised to use the vehicle if it is in an acceptable condition.

MANAGEMENT BP

In the operational procedures, also include a checklist for an inspection when the vehicle or machinery is returned at the end of the shift.

If a vehicle is found to be faulty or in an unacceptable condition, it must be clearly identified as such and the maintenance department must be informed.

Front-line agents must always obey the simple rules when they take charge of a vehicle or machine:

- Vehicles and machines must only be used by specially trained personnel.
- They must only be used for the intended purposes.
- The number of persons on board is strictly limited to the number of seats *("no seat, no ride" rule)*. In particular, it is forbidden to transport anyone on a part of the vehicle – flat bed, trailer, etc. – that is not intended for this purpose.
- All transported objects must be properly stowed so that they will not fall off and cause danger to the operations and flight safety. ▶ OCCURRENCE 1

Similarly, some basic rules apply to all movements of vehicles and machines:

- The handbrake must be applied when stationed.
- The engine must never be left running when the vehicle is unattended, even for a short moment. ▶ OCCURRENCE 3
- They must never pass under the fuselage or the wings, apart from in exceptional specific cases that airlines may introduce for certain types of aircraft.
- They must never reverse in the vicinity of the aircraft, unless assisted by another operator on the ground *(reversing cameras can sometimes do away with the need for these markings)*.
- Vehicles, machines and equipment can be blown over or ingested by jet engines. Therefore, they must never be positioned close to the front or the rear of a jet engine. ▶ OCCURRENCE 2

BEHAVIOURAL BP

When pulling dollies with a tractor, the driver must always remember that the dollies do not follow exactly the same line as the tractor. They have a tendency to cut corners. This means that the driver must not turn immediately after passing an obstacle, but must leave enough room for the carriages.

The movements of vehicles on a platform often obey local rules that must be learned. The following applies in all cases:

- Moving aircraft always have right of way.
- Vehicles must not enter a ASRA when the aircraft is moving or its anti-collision lights are on.

- Vehicles or machines must never park, even for a short time, in front of fire fighting equipment or the fuel hydrant emergency stop. They must be readily accessible and visible at all times.
- No vehicles must cross or park on vacant aircraft stands. This guarantees that the ASRA is empty when it is attributed to an aircraft and also avoids soiling the ground with FOD or oil.
- Access to the manoeuvring area is strictly limited to agents wearing badges that include the "MAN" functional sector *(according to security regulation applicable on French airports)*, vehicles equipped with a radio connection and is subject to systematic authorisation from the control tower. An additional clearance must be obtained before crossing a runway.

MANAGEMENT BP

The handler in charge of the turnaround can appoint a designated agent who systematically authorises each vehicle to enter the ASRA and accompanies it until it comes to a standstill.

After completing the aircraft handling, the vehicles and equipment must be parked in the areas provided. They must never clutter the ASRA or hinder access to the fire fighting equipment. They must be chocked or the brakes applied to prevent movement in the event of engine blast.

Poor weather conditions *(section 2.6)***: refer to practices 3, 7, 12, 16 and 17.**

RELATED OCCURRENCES

1 ▶ POOR STOWAGE OF BAGGAGE ON DOLLIES

All the transported objects *(baggage, containers, etc.)* **must be properly stowed. An item of baggage that falls off a dolly can easily be blown away, projected by an aircraft or sucked in by a jet engine.**

2 ▶ BLASTING AND INGESTION OF A CONTAINER

1999, Dallas: a departing aircraft blasts an empty ULD into the right-hand engine of another aircraft behind it. The pilots had not noticed the "FOD" before stopping in the aircraft stand.

On an apron, any equipment or objects that are not immobilised represent a danger for the operations and persons. The blast from a jet engine can move or tip over loads weighing several tens of kilogrammes.

3 ▶ VEHICLE MAINTENANCE AND ENGINE LEFT RUNNING WHEN UNATTENDED

2012, France: shortly after starting a pushback, the driver noticed that there was a problem with the tractor and decided to isolate it for maintenance. The machine then became uncontrollable and collided with another vehicle. The driver then left the tractor, with the engine still running, to help the driver of the other vehicle, before realising that the pushback tractor had started to accelerate backwards. It finally came to a halt by colliding with another vehicle. The consequences were essentially material, but they could have been much worse.

SEE ALSO THE OCCURRENCE IN SECTION *2.5 REFUELLING IN PROGRESS* THAT DESCRIBES THE IMPORTANCE OF READY ACCESS TO THE FUEL HYDRANT EMERGENCY STOP AND FIRE FIGHTING EQUIPMENT AT ALL TIMES.

2.3. EQUIPMENT IN CONTACT WITH THE AIRCRAFT

While the recommendations in the preceding section must also be followed for the use and maintenance of the equipment and machines that come into direct contact with the aircraft, some specific practices also apply. These systems include passenger boarding stairs, belt loaders, container loaders and elevator trucks *(catering, maintenance, passengers with reduced mobility, etc.)*.

Like for all the other vehicles, the equipment in contact with the aircraft must be inspected before use, and in particular, any parts that could cause damage to the aircraft.

These vehicles must only be operated by specially trained personnel, who have been made aware of the specific risks.

MANAGEMENT BP

The use of this type of vehicle by untrained operators can be avoided by explicitly recording their training and/or authorisations in their job description or skills record. By clearly establishing authorisations to use this type of vehicle, agents are explicitly informed.

Equipment that comes into contact with the aircraft must not be started before the aircraft comes to a complete halt, is chocked, the engines stopped and the anti-collision lights switched off.

RELATED OCCURRENCES

1 ▶ COLLISION BETWEEN AN A380 AND A CATERING TRUCK

April 2015: a catering truck collided with the leading edge of the wing of an A380 when approaching the aircraft. While the damage was minor, the aircraft was grounded for repairs for two days. This incident did not compromise flight safety, because the collision was reported. But, if this type of damage is not notified, it may not be detected before take-off and can have direct consequences on the flight.

BEHAVIOURAL BP

Bring the vehicle to a complete standstill, in order to test the brakes, before entering the ASRA. Faulty brakes detected in the immediate vicinity of the aircraft could result in damage to the latter. While this rule applies to all types of vehicles, it is essential for vehicles that come into contact with the aircraft.

When in the immediate vicinity of the aircraft, the vehicles must be used at reduced speed and must never come into direct contact with the aircraft, including the protective rubber parts. A margin of a few centimetres must also be allowed.

The equipment's safety handrails and canopies must be fully retracted when manoeuvring, then deployed for use. No equipment with an elevator platform must be put in the raised configuration while moving. ▶ OCCURRENCE 2

BEHAVIOURAL BP

When needed, an operator on the ground should be asked to guide the vehicle into position safely. This person must always be clearly visible to the operator of the equipment. The driver must stop immediately if visual contact is lost.

This practice can be applied systematically to wide-body aircraft, on which upward visibility is limited by their dimensions. ▶ OCCURRENCE 1

Special attention must be paid to the aircraft's sensors during the approach phases as they can be easily damaged. It is also advisable to pay close attention to wing roots located close to the doors, like on a Boeing 747.

RELATED OCCURRENCES

2 ▶ HANDRAILS NOT RETRACTED WHEN APPROACHING THE AIRCRAFT, RESULTING IN A COLLISION

In recent years in France, numerous cases of damage to aircraft by lift truck handrails have been reported. When approaching the aircraft and raising the platform, it is essential that there are no protruding parts, and that the rubber protections are in good condition.

3 ▶ NON-STABILISED CATERING TRUCK - TIPPING WHEN UNLOADING

2000, Rio de Janeiro *(Brazil)***: an operator was tasked with installing the catering trolleys on board an A340. After loading some of the trolleys, the truck fell against the wing of the aircraft. The truck's stabilisers had not been deployed before raising the platform. Since he was used to working on smaller aircraft, the operator had never experienced this type of problem.**

Lift platforms *(catering trucks, PRM, maintenance, etc.)* **must always be properly positioned and stabilised, for all types of aircraft.**

BEHAVIOURAL BP

When approaching and withdrawing the equipment, check the general condition of the doors and nearby parts of fuselage. The door must be closed, so that the fuselage can be effectively and completely inspected. The slightest anomaly must be reported, even when in doubt. These inspections are essential for flight safety.

Once the vehicle has been positioned in contact with the aircraft, it must be properly immobilised using all the available means *(chocks, stabilisers, etc.)* ▶ OCCURRENCE 3

When positioning the vehicles, operators need to remember that the aircraft may rise or descend by tens of centimetres when unloading or loading. Therefore, a suitable margin must be allowed and all the available equipment must be used *(auto-leveller, proximity sensors, etc.)*.

The cabin and cargo doors must only be operated by suitably trained personnel. Operators must remember that, depending on the curve of the fuselage, the cargo doors can have a long range of movement.

Finally, complying with some simple rules will allow the equipment to be moved clear in complete safety.

Operators must never lower a platform or move a vehicle clear if the aircraft door is not closed, in order to check that it is securely closed and to visually inspect its surroundings satisfactorily.

MANAGEMENT BP

When moving a vehicle in contact with the aircraft away from the aircraft, any accidental forward movement can be avoided by first removing the rear chocks, reversing the vehicle by a few metres, then removing the front chocks, before leaving the ASRA in complete safety.

Poor weather conditions *(section 2.6)***: refer to practices 4 and 12.**

2.4. FOD

FOD, or Foreign Object Debris, can be defined as any object present within the movement area which has no operational or aeronautical function.

FOD that is frequently found on aprons includes pieces of metal, baggage tags or even parts of baggage. Certain FOD is more difficult to identify, because it is often used during handling operations and can be found on the ground due to the wind, jet blast or poor stowage *(tarpaulins, chocks, cones, etc.)*.

The presence of FOD on aprons and their surroundings is dangerous. It can be ingested by an aircraft engine, displaced by jet blast, come into collision with another aircraft or vehicle, and even puncture tyres.

When debris is sucked in by a jet engine, the damage may be limited to a few broken blades that can be replaced if they are detected quickly. But in more serious cases, the blades can break and cause the the engine to explode immediately, or a few cycles after the initial damage.

The ASRA must be inspected before the arrival of the aircraft, before every movement of the aircraft and after the departure of the aircraft. These inspections must be systematic and form an integral part of the procedures. FOD inspections can be performed in teams, so that the entire zone is properly checked.

The areas adjacent to the stand can also be a source of danger for the aircraft and the personnel. If any FOD is visible in unoccupied adjacent areas, then it should be removed. ▶ OCCURRENCE 1

All the activities around the aircraft are potential sources of FOD. Agents should be informed that the FOD must be removed, no matter where it comes from. It is not the person who produces the FOD who is responsible: it is the person who fails to remove it!

BEHAVIOURAL BP

In addition to these inspections of the ASRA, every operator must remain vigilant and remove any identified FOD that should then be placed in a bin intended for this purpose.

BEHAVIOURAL BP

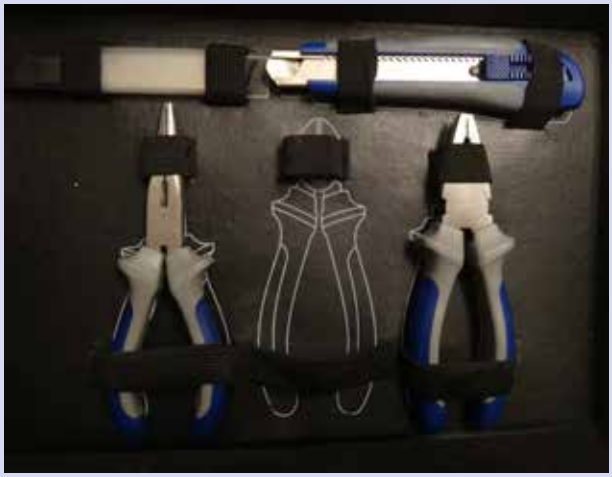
It is useful to consider the possible origin of the FOD, which may be the aircraft itself.

BEHAVIOURAL BP

At the end of each operation, the operator must check that the work zone is free of FOD and that none of the equipment used has been forgotten. This is the “clean as you go” principle.

MANAGEMENT BP

When tools are used, they must be packaged so that the risk of forgetting them on the platform is reduced (shadow board, barcode, etc.).



RELATED OCCURRENCES

1 ▶ BLASTED FOD: DESTRUCTION OF A BUS DOOR

2009, France: when the passengers were leaving a bus to board an aircraft on a remote stand, the rear door of the bus was destroyed by a projectile blasted by a long-haul aircraft that was entering a nearby stand. There were no injuries, but the consequences could have been quite dramatic.

FOD can quickly represent a serious danger to the operators in the vicinity. If the FOD is projected against an aircraft that is taxiing prior to take-off, the impact can have serious consequences that will not be detected before take-off.

BEHAVIOURAL BP

If the FOD cannot be picked up (crushed food, gravel, sand, etc.), it must never be ignored and the information must be escalated so that it can be cleaned up properly.

The vehicles and equipment used in ground handling activities can be the direct cause of FOD. Therefore, when inspecting these vehicles, it is necessary to check for any parts that could become detached, or objects that could fall to the ground.

MANAGEMENT BP

If the airport infrastructures are deemed to be insufficient, FOD bins that can be closed may be installed in each vehicle and clearly identified.

SEE ALSO THE OCCURRENCE "BLASTING AND INGESTION OF A CONTAINER", SECTION *2.2 VEHICLE AND EQUIPMENT DRIVING.*

RELATED OCCURRENCES

2 ▶ PERSONAL BELONGINGS LEFT ON LANDING GEAR

2013, France: a pouch containing documents and a bank card was found beside the runway. The owner, a ground operator, had hooked it on the landing gear of an aircraft during the turnaround, and forgot to retrieve it before departure from the stand.

All ground operators are responsible for the belongings and tools they carry about their person, and they must not forget anything. Anything left on the stand is considered to be FOD and can have serious consequences on the aircraft's operations. This example clearly illustrates how such objects can quickly be displaced to zones where they represent a greater danger.

2.5. REFUELLING IN PROGRESS

Refuelling is a critical operation in the ground handling process because the risk of fire is very high and permanent. Fires may be caused by the refuellers, but also by the ground operators, who must remain especially vigilant during these operations.

In the refuelling procedure, the refuelling truck is always positioned in the right direction to move clear of the aircraft quickly in an emergency. Other vehicles must never park on the escape route facing the refuelling truck, even for a short time. ▶ OCCURRENCE 2

Similarly, the fire fighting equipment and the fuel hydrant emergency stop must always be free of any obstacles and visible to all. ▶ OCCURRENCE 1

In France, a Fire Safety Perimeter is defined, inside which:

- smoking is forbidden
- camera flash lights are forbidden
- mobile phones cannot be used *(even in sleep mode)*
- the use of any electronic devices is forbidden
- access to the Fire Safety Perimeter must be limited to essential vehicles

RELATED OCCURRENCES

1 ▶ CLUTTERED RESTRICTED ZONE: FUEL HYDRANT EMERGENCY STOP AND FIRE FIGHTING EQUIPMENT ARE NOT READILY ACCESSIBLE

As shown in the photo opposite, too many cases of obstructions to the fire fighting systems are reported every year. If a fire breaks out, this equipment must imperatively be immediately accessible.

Find the fuel hydrant emergency stop button on this photo ➔

- ground power units *(GPU)* are forbidden, apart from units intended for use in explosive atmospheres. However, these units must be kept sufficiently clear of the fuel tank vents under the aircraft's wings.

The Fire Safety Perimeter represents a 3-metre zone around the fuel tanks, the fuel pipes and the aboveground storage tanks.

Some particularly dangerous zones have been defined within this perimeter. They include the zones located less than three metres from the aircraft fuel caps, the fuel tank vents, the fuel hydrant connections, the pipes and the refuelling vehicles.

It is important to insist on the fact that no vehicles must park under the extremities of the wings *(fuel tank vents)*.

Moreover, during refuelling operations, the GPUs, ACUs and ASUs must not be connected, disconnected or started. The same applies to the use of the 400 Hz cable.

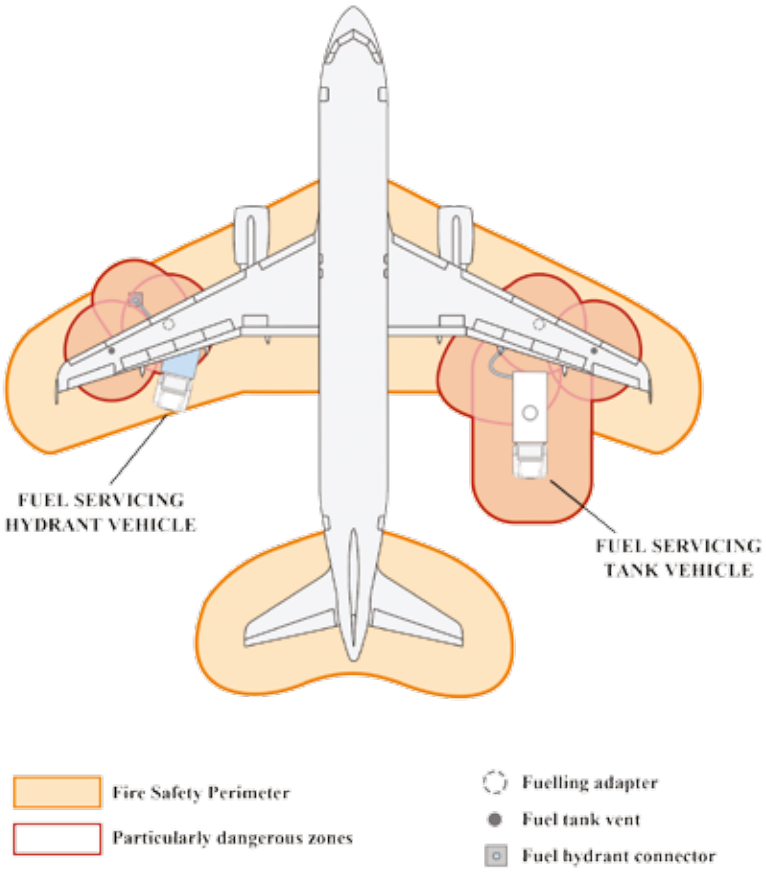
Before starting the refuelling operations, it is also strongly recommended to advise the crew, personnel and passengers.

BEHAVIOURAL BP

It is not always easy to know exactly when the refuelling operation starts. When in doubt, as soon as a refuelling truck is connected to the aircraft, every agent should consider that refuelling is in progress and, therefore, follow the appropriate safety instructions.

MANAGEMENT BP

An agent can be specifically assigned to the supervision of safety during refuelling. This agent can be a ramp operator or a member of the technical crew, depending on the airline. In this case, the agent must remain close to the aircraft throughout the refuelling operation, so that he/she can intervene in the event of an emergency.



RELATED OCCURRENCES

2 ▶ EXIT PATH OF THE REFUELLING TRUCK OBSTRUCTED

In the event of a fire, it must be possible for the refuelling vehicle to move clear of the aircraft and ground handling equipment as quickly as possible. This applies in particular to fuel tankers, which contain several tonnes of kerosene. Therefore, no vehicles must ever park, even for a short time, on the exit route of the tanker truck. The truck in this photo would find it very difficult to drive clear of the aircraft in the event of a fire.

2.6. ADVERSE WEATHER CONDITIONS

The weather conditions can quickly compromise flight safety if appropriate measures are not taken. Strong wind, very high or very low temperatures or storms can diminish the physical capacities of the operators, the grip of vehicles and visibility at the airport. Therefore, it is essential to know how and when to react to these situations.

This section presents practices that apply to all the operators working on the aprons, and includes recommendations for specific activities. In section 3 "task specific practices", references to these recommendations are made using the ☂ symbol.

Anticipation plays an essential role in taking the changing weather conditions at the airport into consideration. Handlers must be familiar with the sources of weather information and forecasts at their disposal, and be capable of understanding the immediate operational consequences.

Information on weather conditions can be obtained from the aerodrome operator, the airlines, the air navigation services, a weather services provider or by taking direct measurements in the field.

Action plans must be clearly established for every possible meteorological situation. These plans include both the procedures for operations and the immediate actions to be taken by every operator on the apron. Local procedures may also be imposed by the airport operator, and the action plans of the ground handler must be in line with these procedures.

The second major factor is the means provided by the ground handler to warn its employees and subcontractors that unfavourable weather conditions are on their way. Various means of alert – daily briefings, radio messages, visual messages, messages from the information system, etc. – are essential.

STRONG WINDS

A number of precautions must be taken to prevent equipment from colliding with an aircraft due to the wind, or to make sure that the structural strength of the aircraft is not exceeded, especially when operating the doors. These recommendations can be adapted according to the wind thresholds defined by the airlines and the airport operators.

MANAGEMENT BP

If there are differences between the thresholds of the handled airlines, the ground handler can decide to apply only the most restrictive threshold in order to facilitate the application of the corresponding procedures by the front-line agents. More restrictive local requirements always take precedence over the thresholds defined by the airlines.

1 The aircraft must be chocked more securely. The cabin and hold doors and the service panels must be handled with care, or even closed and locked.

2 The proper chocking and/or braking of vehicles and equipment must be adapted and checked.

BEHAVIOURAL BP

3 Non-powered equipment can be secured by attaching it to a properly immobilised towing vehicle.

4 Any equipment with an elevator platform must be fully lowered, because they are particularly sensitive to wind. Any equipment in contact with the aircraft must be moved out of the ASRA, and in particular the passenger boarding stairs and passenger boarding bridges.

5 Pushback operations must be halted.

6 De-icing and anti-icing operations must be halted.

BEHAVIOURAL BP

7

- Move the containers well clear of the aircraft.
- Make sure that the containers are securely closed and locked on the dollies. Empty containers are more sensitive to wind and demand special attention.
- Always take great care when loading empty containers in high winds.

BEHAVIOURAL BP

8 Wind can continually blow new FOD into the ASRA. Therefore, even greater care must be taken throughout the turnaround, and not just before the arrival and the departure of the aircraft.

SEE ALSO SECTION 2.3 EQUIPMENT IN CONTACT WITH THE AIRCRAFT “NON-STABILISED CATERING TRUCK: TIPPING WHEN UNLOADING”.

Lift platforms must imperatively be chocked and stabilised to prevent any movement or tipping, especially in high winds. In the event of high winds, the activity must be interrupted without delay and the platform lowered.

STORMS

Storms a few kilometres away from an airport can incur a real risk of lightning impacts that must be taken into consideration. While the source of lightning is always in storm clouds, it can strike several kilometres away from the clouds. As a general rule, if lightning is visible or thunder can be heard at the airport, then the risk must already be taken into consideration.

9 In this case, refuelling operations must be interrupted without delay and headset connections must be disconnected. The interruption of all other operations may be necessary, depending on how the situation evolves.

BEHAVIOURAL BP

10 In the event of strong precipitation, the cabin doors must not be left open for too long to prevent too much water from entering the cabin and creating the risk of a short circuit. ▶ OCCURRENCE 2

EXTREME TEMPERATURES

Very high or low temperatures directly affect the powers of concentration and the physical endurance of the ground staff.

MANAGEMENT BP

Protective equipment must be provided, shift hours must be adapted, or staff must be allowed to take more breaks in order to reduce their exposure to difficult conditions that can increase the risk of making a mistake.

MANAGEMENT BP

Personnel should be given access to water in hot weather.

WINTER CONDITIONS

BEHAVIOURAL BP

11 Before the aircraft arrives, the marshaller must check that the snow and ice on the aircraft stand has been sufficiently removed to allow for proper and safe manoeuvres.

The marshaller must only allow an aircraft to enter a stand if the conditions allow the handling operations to be performed in complete safety, both for the aircraft and all the operators. By doing so, the marshaller engages the liability of the ground handler.

BEHAVIOURAL BP

12 Snow and ice should be removed from the vehicles and equipment that service the aircraft, as they could contaminate the apron. Windscreens must be completely free of snow, ice and mist in order to guarantee good visibility.

Grip may be seriously reduced in certain places, so the speed of the vehicles must be adapted to the conditions, especially in the vicinity of the aircraft.

BEHAVIOURAL BP

13 The operators responsible for the water supply and the lavatory services must make sure that no liquid is split on the ground, because it could freeze.

BEHAVIOURAL BP

14 Utmost care must be taken during pushback or towing operations on slippery surfaces. It is strongly advisable to avoid suddenly changing direction, accelerating or braking. ▶ OCCURRENCE 1

BEHAVIOURAL BP

15 On slippery surfaces, make sure that engines are not started before the end of the pushback, because both the tractor and the aircraft might skid.

POOR VISIBILITY

BEHAVIOURAL BP

16 Only the equipment that is essential to service the aircraft must enter the ASRA in order to reduce the risk of collision. All vehicles and equipment must keep their lights on.

BEHAVIOURAL BP

17 Always drive at reduced speed in poor visibility, especially when close to the aircraft.

RELATED OCCURRENCES

1 ▶ BRAKING ON BLACK ICE WHEN TOWING, COLLISION WITH THE AIRCRAFT

2007, United States: when towing a DC-9, the tractor braked sharply on a sheet of black ice. The truck skidded and turned through almost 180°, while the aircraft continued and passed over the tractor *(the engines mounted at the rear of this type of aircraft make it particularly susceptible to tipping when empty)*.

The aircraft and the tractor are both very heavy, with very high inertia. Therefore, it is crucial to make all movements at low speed and to avoid any sudden manoeuvres, especially if there is a risk of ice on the ground.

2 ▶ OPEN DOOR IN A STORM: DAMAGE TO THE AIRCRAFT'S SYSTEMS

2014, France: passengers were boarding a Boeing 737, when a storm broke out. The rain entered the aircraft and damaged the electronic equipment under the floor. The necessary repairs delayed the flight by about 20 hours.

In heavy rain, and if no means of protection are available, the aircraft's doors must be closed in conjunction with the crew.

2.7. DANGEROUS GOODS

Dangerous goods are materials or objects that represent a risk to health, the environment, the safety of the personnel or flight safety. They are listed in the documentation of ICAO and IATA. All hazardous material is associated with a code according to its nature, special characteristics and dangerousness.

By their very nature, dangerous goods demand greater vigilance than ordinary freight.

The first step in guaranteeing the safe transportation of dangerous goods consists of packaging them properly. The specific procedures must be strictly followed when palletising, accepting, loading and delivering these goods.

Always check dangerous goods for leaks or visible damage before loading them into an aircraft or a container. As a general rule, it is wise to check all types of goods. Certain goods are not identified as being dangerous, but they can become dangerous in the event of a leak. This is true of seafood, which can leak corrosive salt water.

BEHAVIOURAL BP

Operators must use their senses to detect possible defects in the packaging of hazardous materials.

BEHAVIOURAL BP

Observed or suspected damage must be reported immediately and the emergency instructions must be followed according to the class of the dangerous goods.

Also, check that the tag on the load that identifies the goods is present. This tag serves as an essential reminder to anyone working with dangerous goods and allows them to take any necessary precautions.

BEHAVIOURAL BP

All tags must be legible and compliant with the hazardous materials identified in the loading instruction report. It is preferable to keep a set of spare tags, so that the tags can be replaced if necessary.

MANAGEMENT BP

It is preferable to have tags readily accessible, so that the tags can be replaced if necessary.

BEHAVIOURAL BP

If possible, the tags must be positioned so that they are easy to read, preferably at eye level.

In the event of a leak, the products from these goods can cause a dangerous reaction if they are mixed together. Therefore, it is imperative to obey the compatibility rules when drawing up and executing the loading instructions.

When drawing up the loading instruction report, the nature of the freight must always obey the rules defined by the transporters. This point must always be checked. Certain hazardous materials cannot be carried on certain types of aircraft or are subject to specific restrictions *(maximum quantity, position in the aircraft, packaging, etc.)*.

Certain loads cannot be carried at the same time as passengers, but only in cargo aircraft. They are tagged as being for “Cargo Aircraft Only” *(CAO)*.

RELATED OCCURRENCES

1 ▶ UNDECLARED DANGEROUS GOODS, FIRE AFTER UNLOADING

2014, France: a parcel caught fire on a sorting conveyor after being unloaded from the aircraft. It contained several undeclared lithium batteries.

In-flight fires are one of the most feared risks in the industry. They can quickly cause serious damage to the structure or the control systems of the aircraft and incapacitate the crew.

All dangerous goods must be loaded so that they do not move at all during the flight. The package orientation must be respected *(↑↑)*. Other nearby goods must also be loaded with care to avoid damaging the dangerous goods during the flight *(falling, crushing)*.

The crew must always be informed when dangerous goods are present on board. This allows them to know what kind of materials are present in the aircraft and where they are located, so that they can react accordingly, for example in the event of a fire. In this case, the ground handler gives a NOTOC *(Notification to Captain)* to the crew that specifies the nature and the position of the dangerous goods on board. If the goods are moved to another position, a new NOTOC must be raised and given to the crew.

RELATED OCCURRENCES

2 ▶ BAGGAGE CATCHES FIRE WHEN LOADING THE HOLD

France: when loading a Boeing 737, as the passengers were boarding and the plane was being refuelled, an item of baggage in the hold exploded. The agent immediately informed the crew and asked for the refuelling operations to be interrupted. The passengers were evacuated and the fire was extinguished by the ground staff and then the fire brigade. The fire was started by a maritime flare contained in the baggage of one of the passengers. This type of device is listed as dangerous goods and should never have been allowed on board.

The agents in charge of passenger check-in are supposed to prevent dangerous goods from being left in baggage. But since this can never be fully guaranteed, vigilance is required during handling, and the agents need to know how to react in the event of an incident.

3 ▶ FIVE CONTAINERS OF FLAMMABLE LIQUID LEFT UNLASHED

2014, France: during loading operations, the ground crew noticed that five RFL-coded containers had been left unlashed in the bulk freight hold. After inspecting the containers, several impacts were found, but fortunately there were no leaks.

In this example, there were no consequences for the flight, but if one of the containers had been pierced, causing a leak, flight safety would clearly have been compromised. Dangerous goods must be systematically stowed, in accordance with the procedures.

4 ▶ CRASHES FOLLOWING A FIRE ON BOARD

A Fedex DC10 (1996)**, a UPS DC8** (2006, see photos opposite)**, a UPS Boeing 747** (2010) **and an Asiana Boeing 747** (2011) **were all destroyed by fires on board, followed by an emergency landing in the first two cases and a crash in the more recent incidents. The wreckage of the aircraft did not allow the causes of the accidents to be formally established, but the corresponding reports systematically pointed out the presence of dangerous goods on board.**

When preparing the loadsheet, the rules applying to the transportation and separation of dangerous goods must always be obeyed. The aircraft must always be loaded strictly according to the instructions.

SEE ALSO OCCURRENCE 2 IN SECTION *3.16 PASSENGER CHECK-IN AND BOARDING*: "UNDECLARED AND POORLY PACKAGED DANGEROUS GOODS, FIRE IN THE HOLD WHILE PREPARING FOR DEPARTURE".

2.8. COMMUNICATION AND TEAM MANAGEMENT

No matter how perfected the procedures given to the agents are, their safe and effective implementation depends largely on good communications within the teams: clear instructions, trust and confidence between team members and the capacity to call oneself into question are just some of the keys to optimal operations. On the other hand, a lack of communication or a misunderstanding can quickly contribute to accidents.

TEAM MANAGEMENT

Team coordinators or leaders play an essential role in the transmission of information.

The proper execution of the instructions given by the team leader depends to a great extent on the manner in which they are given. This is even more the case in the noisy and stressful environment of ground operations. Before issuing an instruction, it is necessary to make sure that the recipient is listening, or even ready to write it down, if the information is complex. ▶ OCCURRENCE 1

BEHAVIOURAL BP

All instructions must be:
1. Concise
2. Clear
3. Not open to interpretation.

RELATED OCCURRENCES

1 ▶ MISUNDERSTANDING DURING LOADING: 30 ITEMS OF BAGGAGE MISSING

2011, France: a Boeing 737 is loaded and takes off. 30 items of baggage in the loadsheet had not been loaded in the hold, due to a misunderstanding between the traffic agent and the ground crew. As a consequence, the load is almost half a tonne lighter than expected.

Instructions must be transmitted for operations such as loading, de-icing, pushback, etc. It is essential that the instructions are well communicated and understood to avoid mistakes that can compromise flight safety. Refer to the occurrences in section *3.6 Loading and unloading* for the risks that can be incurred by incorrect loading.

BEHAVIOURAL BP

Ideally, always ask for confirmation that the instructions have been fully understood by getting the recipient to repeat them.

Example: *"The baggage on the first dolly and 20 items of baggage from the second dolly must be loaded in compartment 41, and the rest of the second dolly in compartment 52. Is that clear? Can you confirm?" - "Yes. The first dolly and 20 items from the second in 41 and the rest in 52".*

COMMUNICATIONS WITHIN A TEAM

The ease of communication within a team is essential in order to freely:
- ask questions when in doubt or in the event of misunderstanding,
- ask for help,
- ask someone to check the work carried out.

This communication is even more important for operations performed in pairs, such as de-icing, where cooperation between the person in the basket and the person in the cabin is crucial.

MANAGEMENT BP

Communication can be made easier by taking the languages spoken and different cultures, or even affinities, into consideration.

If possible, it is useful for the agents performing certain operations, such as refuelling, to inform the others when they start and when they have finished. This enables the other agents to be more aware of their environment and the operations in progress.

3. TASK SPECIFIC PRACTICES

3.1. LOAD PLANNING

Preparing the loadsheet and the loading instruction report *(LIR)* is an essential step before every flight. These documents demand the utmost rigour, inasmuch as the slightest error can directly compromise flight safety.

The pilots will enter parameters in their on-board computers for take-off on the basis of the information in the loadsheet. The catastrophic consequences of an incorrect loadsheet are very easy to imagine.

In the calculation of the loadsheet, it is essential that:

- The planned weight of the aircraft and its load does not exceed the structural limits set by the manufacturer and the airline.
- The centre of gravity of the aircraft remains within the limits provided by the manufacturer and the airline.

If any dangerous goods are included, their distribution in the loading instruction report must strictly obey the compatibility rules.

RELATED OCCURRENCES

1 ▶ FAILURE TO TAKE ACCOUNT OF ATYPICAL GROUPS OF PASSENGERS: CENTRE OF GRAVITY TOO FAR FORWARD

2009, France: an ATR 42 takes off with a full team of rugby players on board. When rotating, the combined action of the captain and the copilot, who both pull the stick full back, is not enough to raise the nose of the aircraft. Take-off is interrupted at high speed. A weight in excess of that usually used had been applied when preparing the loadsheet, but it was still lower that the actual weight of most of the passengers. After checking the actual weights, it was found that the centre of gravity was beyond the forward limit.

When carrying sports teams, the club should be invited to provide the actual weight of the passengers and the seating should be prepared in advance in order to guarantee the proper distribution of weight in the cabin and a reliable centre of gravity.

The crew must be informed of the presence and position of any dangerous goods or special loads on board before departure. This notification takes the form of a NOTOC. This will enable the captain to take appropriate action in the event of an emergency during the flight and to give precise information to the authorities, if necessary.

BEHAVIOURAL BP

Groups of passengers made up only of children or larger-than-average persons influence aircraft balance and must be taken into consideration.

The loadsheet must reflect the actual weight of the aircraft before departure.

BEHAVIOURAL BP

If possible, the final version of the loadsheet should only be sent to the captain once all the hold doors have been closed.

Any changes that are made after the captain has been informed of the load must absolutely be notified and added to the loadsheet. These last-minute changes *(LMC)* include changes in the number of baggage items, changes to the freight, changes in the number of passengers and where they are seated in the aircraft, etc.

MANAGEMENT BP

The procedure can include a checklist that is filled in as the preparations for loading are completed. This will make sure that no steps or checks are forgotten in the preparation and execution of the loading operations (see the example of a checklist to supervise loading operations in section 3.6 “Loading and unloading”).

MANAGEMENT BP

A systematic cross-check of the loadsheet is recommended.

MANAGEMENT BP

For some airlines, loadsheets are prepared manually. This is increasingly infrequent, so agents should be regularly trained in the manual preparation of load and balance sheets (e.g., once a month).

The loading plans must also take account of the risk of the aircraft tipping, particularly for stopovers where partial loading/unloading takes place.

MANAGEMENT BP

The loading instruction report can be supplemented by an unloading plan to make sure that operations are performed in complete safety at the destination.

Finally, it is important to remember that the loadsheet is not an end in itself. Even when it is prepared with the utmost care, poor communications with the ground staff can result in incorrect loading. The proper transmission of this information must be made beyond any doubt. In this respect, refer to section 2.8 “Communication and team management”.

SEE ALSO THE OCCURRENCES IN SECTION *3.6 LOADING AND UNLOADING* FOR THE CONSEQUENCES OF A CENTRE OF GRAVITY THAT IS TOO FORWARD OR AFT.

3.2. PRE-FLIGHT DOCUMENTATION

The flight documentation provides the crew with all the necessary information for the flight. It must be handed over sufficiently in advance of the departure to allow for an unhurried analysis.

Depending on the agreements with the airline, the flight dossier may contain the following documents:

- weather information *(SIGWX and WINTEM charts, METAR/TAF reports, etc.)*
- aeronautical information *(NOTAM, approach charts, etc.)*
- Operational and/or ATC flight plan

The flight documentation is specific to a given flight: flight number, registration number and type of aircraft, provenance and destination, alternate airports, etc.

BEHAVIOURAL BP

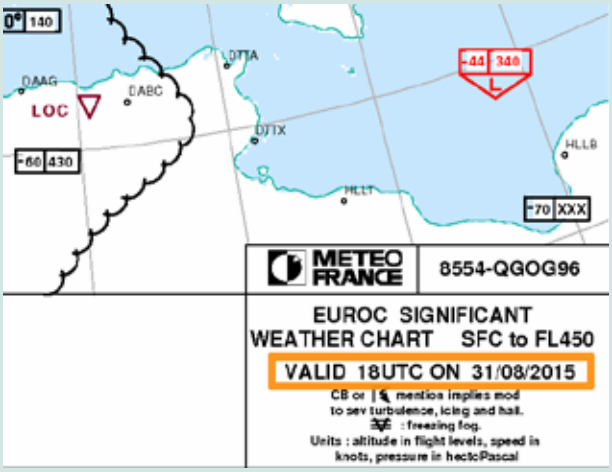
Do not print out a flight documentation on paper that has already been used on one side, because this can cause confusion for the crew.

Information given to the crew by ground handling service providers must be:

- comprehensive about all the planned geographical zones ▶ OCCURRENCE 2
- valid at the corresponding times.

BEHAVIOURAL BP

Check the date and time of validity of the information provided, and of the weather data in particular.



RELATED OCCURRENCES

1 ▶ DELAYED HANDOVER OF THE FLIGHT DOSSIER: "HURRY-UP SYNDROME"

2011, France: the crew of an Airbus A320 asked for their flight dossier 70 minutes before departure. It did not arrive and they had to ask for it again 30 minutes later. The crew then started to prepare the flight, without the flight documentation, but with the tools at their disposal, before asking again 17 minutes before take-off. The complete flight file eventually arrived two minutes before the scheduled departure time. The crew then decided to delay the departure in order to prepare the flight completely and calmly.

Documents must be provided as early as possible to allow the crew to take everything into consideration and to cope with any unforeseen events before the departure, while under time pressure that can be high.

RELATED OCCURRENCES

2 ▶ INCOMPLETE FLIGHT DOSSIER

2014, France: the crew of an Airbus A330 received their flight dossier, which mentioned that there was no NOTAMs on the departure airport. They checked the information themselves and discovered two pages of NOTAMs, indicating that a number of taxiways were closed.

The absence of certain information can cause the crew to take the wrong decision, incurring significant risks to safety.

3.3. AIRCRAFT ARRIVAL HANDLING

Arrivals must be approached with as much vigilance as departures. Even if take-off is not imminent, every operation can have consequences on the safety of the upcoming flight. The aircraft is moving in a restricted and potentially cluttered space.

PREPARING FOR ARRIVAL

All the equipment for the aircraft must be available before its arrival: sufficient numbers of chocks and cones, headset for intercom connections, marshalling bats, gloves or illuminated wands for visual signalling purposes.

If the ground markings allow the GPU to be pre-positioned inside the ASRA, then it can be put in place, provided that it is strictly inside this zone, chocked or with the brakes applied, and that the exhaust is not pointing towards the fuselage.

The operator in charge of the arrival must check that the ASRA is "clean", i.e., free of equipment, vehicles and FOD. These items could damage the aircraft, or be ingested, blown away or moved by the engines.

The operator must also make sure that:

- All the passenger boarding bridges are folded back
- The lead-in and stop markings for the aircraft are clearly visible
- The emergency systems *(emergency stop, extinguishers, etc.)* are present and readily accessible
- The full team is present and everyone knows what they have to do

BEHAVIOURAL BP

It is also wise to check the areas adjacent to the ASRA for objects and obstacles.

The marshaller must be present before the aircraft arrives to prevent the pilot from having to park the aircraft on his/her own. If a stand guidance system is used, it must be checked before the aircraft arrives.

As a general rule, anyone who is not involved in the arrival operations must not enter the ASRA.

MARSHALLING

The marshaller's role consists of guiding the aircraft along the ground markings as far as the stop marking corresponding to the aircraft type. There must be only one marshaller, who is clearly identified by wearing a reflective jacket and is ready to guide the aircraft as soon as it arrives. ▶ OCCURRENCE 1

The marshaller must be positioned so as to establish permanent visual contact with the crew. It is advisable to stand in the axis of the aircraft in order to have a better view of its alignment.

SEE ALSO THE OCCURRENCE IN SECTION *2.4 FOD*: "BLASTED FOD: DESTRUCTION OF A BUS DOOR", WHICH DESCRIBES THE POSSIBLE CONSEQUENCES OF A FLIGHT ARRIVAL WHEN THERE IS FOD ON THE AIRCRAFT STAND OR NEARBY.

SEE ALSO THE OCCURRENCE IN SECTION *3.4 MOBILE STAIRS AND BOARDING BRIDGES*: "AIRBRIDGE NOT RETRACTED, COLLISION ON ARRIVAL".

MANAGEMENT BP

To avoid stopping the aircraft on the wrong ground marking, especially when visibility is poor (darkness or bright sunlight), chocks or cones can be placed in axis of the correct stop marking.

This practice is not permitted by ISAGO, which requires that the ASRA must be completely empty when the aircraft arrives.

Another variant consists of placing an agent outside the ASRA, but in the axis of the marking, in order to help the marshaller.

Before guiding, and throughout the procedure, the marshaller constantly checks that the path of the aircraft is free of any objects or obstacles that could pierce the tyres, cause a collision or be moved due to jet blast. In this case, the marshaller must stop the aircraft immediately.

Similarly, the procedure must be stopped if there is any doubt or immediate danger. If in doubt about the wing tip clearance, the marshaller must ask for the presence of wing walkers.

RELATED OCCURRENCES

1 ▶ INCORRECT POSITIONING: NEAR MISS WITH THE AIRBRIDGE

2015, France: an A380 arrived on a stand under the supervision of a marshaller, who failed to respect the standard progressive movement used to indicate that the aircraft should stop. The pilot braked as sharply as possible without incurring any risks for the passengers. The aircraft eventually stopped beyond the stop marking, less than two metres from an airbridge. A tractor was called in to correctly position the aircraft before the passengers could disembark.

Incorrect marshalling incurs the risk of a collision with equipment or with another aircraft. Moreover, it can also prevent the proper use of the ground handling infrastructures, such as the hydrant and the boarding bridges *(see the occurrence "Incorrect positioning: disconnection of a fuel hose, fire" in section 3.7 Refuelling)***. Aircraft have high inertia, especially long-haul models. They must be guided progressively, while anticipating their movements.**

MANAGEMENT BP

Wing walkers can be used systematically if the configuration of the aircraft stand so requires.

At night, in poor visibility conditions, if the zone is poorly lit or if the airport authorities so demand, illuminated wands must be used to avoid any ambiguity in the instructions given to the crew.

When the aircraft stand is equipped with a stand guidance system, an operator must check that it is in proper working order before the aircraft arrives. It is possible that the system will fail to detect an abnormal situation, so the operator must be ready to interrupt the guiding procedure at all times. ▶ OCCURRENCE 2

RELATED OCCURRENCES

2 ▶ DOCKING GUIDANCE SYSTEM FAILURE: COLLISION WITH THE AIRBRIDGE

2015, Portugal: an A320 arrived using an automatic docking guidance system. While the pilot strictly followed the system's instructions, the left-hand engine came into collision with the airbridge. The airbridge was properly retracted, but the guidance system failed to recognise the type of aircraft and issued incorrect instructions.

The inquiry into this occurrence is still open. To avoid this type of occurrence, an agent must systematically be on hand to actuate the emergency stop, if an abnormal situation is detected.

ARRIVAL COMPLETION

No-one must approach the aircraft until the engines have stopped and the anti-collision lights have been switched off. The aircraft must then be immobilised using chocks and marked off with safety cones, in accordance with the airline's procedures. The cones mark out a "safe" working area that protects the aircraft. They must not be moved for as long as the aircraft remains docked.

MANAGEMENT BP

Demand headset communication with the crew as soon as the nose wheel chocks are in position, to request confirmation that the engines have stopped. The marshaller then authorises the agents to move around by giving the "thumbs up".
▶ OCCURRENCE 3

BEHAVIOURAL BP

If in doubt about the working order of the anti-collision lights, wait for the marshaller's or the team leader's OK before approaching the aircraft.

BEHAVIOURAL BP

Do not use chocks that are damaged or have sharp edges.

Particular care must be taken with turboprop aircraft because the propellers are not always visible when moving.

MANAGEMENT BP

Before the other agents approach the aircraft, it is possible to visually inspect the general appearance of the aircraft for impacts, damage or leaks. It is possible that they were not detected on departure or occurred in flight (collisions with birds, hail, etc.).

Poor weather conditions *(section 2.6)*: **refer to practices 1, 2, 8, 9 and 11.**

RELATED OCCURRENCES

3 ▶ THUMBS UP: PERSONNEL BLASTED BY A JET ENGINE

2012, France: an Embraer 190 arrives at its stand. Once chocked and the anti-collision lights off, the aircraft zone supervisor invites the ground staff to start the ground operations. When walking behind an engine, one operator is violently blown over, because the crew had mistakenly failed to stop the engines. While ground handling is not directly responsible for this incident, the arrivals procedure has been changed accordingly.

3.4. PASSENGER STAIRS AND BOARDING BRIDGES

The use of telescopic passenger boarding bridges and stairs carries significant risks for personnel, passengers and for flight safety. Passenger boarding bridges are used from the airport terminal, while stairs are installed on the apron.

Before using bridges or stairs, always check that they are in good working order, according to the recommendations in sections *2.2 Vehicle and equipment driving* and *2.3 Equipment in contact with the aircraft*. The equipment, and fixed-height stairs in particular, must be adapted to the type of aircraft. An unsuitable size increases the risk of impacts with the aircraft, inasmuch as the usual visual references and the information from the proximity sensors may be altered.

On departure and on arrival, all the boarding bridges must be fully retracted and stairs must be in the spaces provided, outside the ASRA. ▶ OCCURRENCE 1

When the aircraft arrives, the equipment must only approach it once the engines have been stopped, the anti-collision lights have been switched off and the aircraft has been chocked. Always approach the aircraft slowly. When close to the aircraft, make a halt in order to precisely adjust the position without hitting the fuselage or the sensors. Ask a member of the ground staff to help to guide the equipment into the optimal position.

This is particularly helpful when positioning powered passenger bridges and stairs.

All embarkation and disembarkation equipment that is not in contact with the aircraft must be placed sufficiently clear of the aircraft to allow the escape slides to be deployed if necessary.

BEHAVIOURAL BP

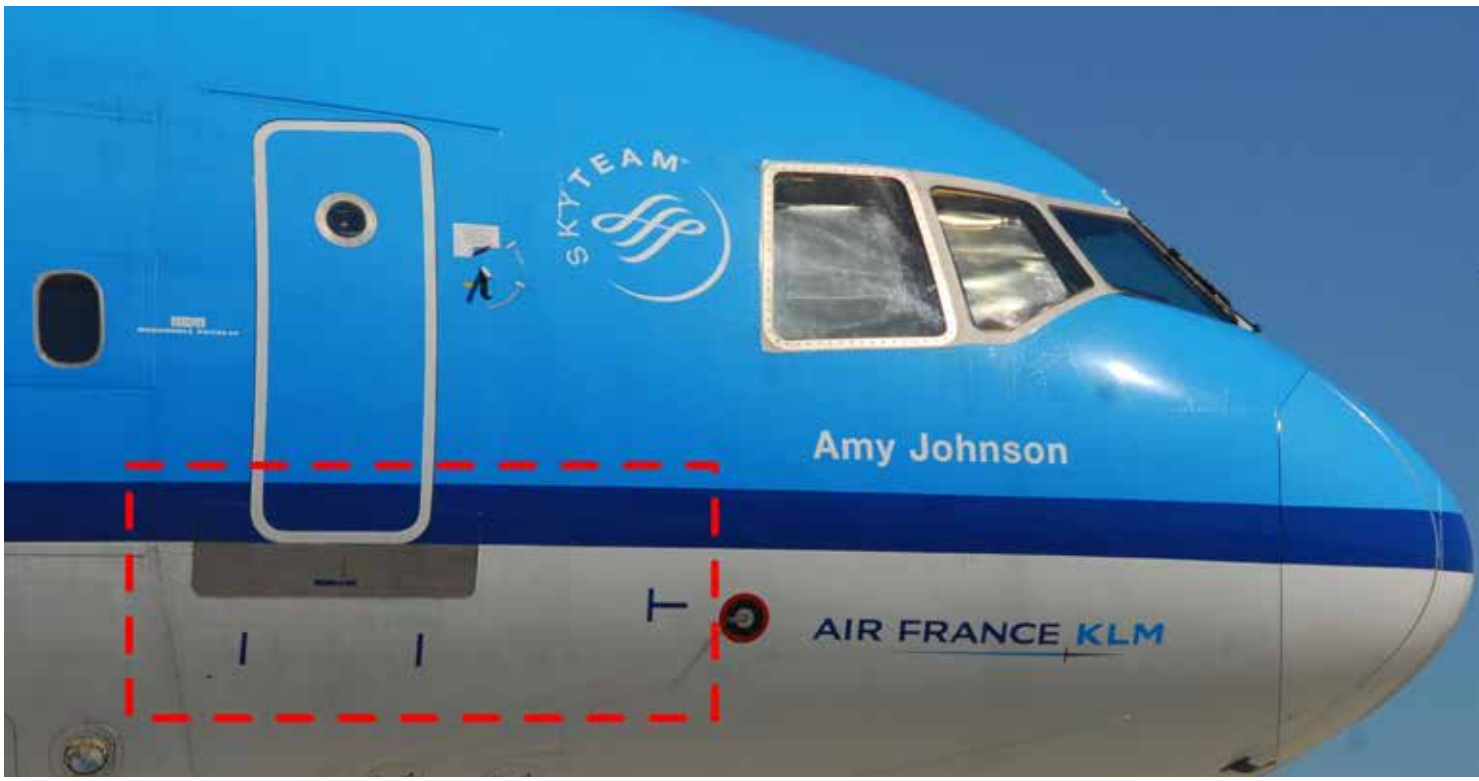
When positioning towable stairs, it is advisable to disconnect the tractor before manually bringing the stairs into contact with the aircraft.

BEHAVIOURAL BP

Only the operator tasked with positioning a telescopic bridge must be present inside the airbridge when it is being positioned.

When positioning embarkation or disembarkation equipment, all the available aids must be used: the proximity sensors of the equipment, the markings by the aircraft's doors, etc.

Markings are sometimes placed on the aircraft's fuselage to help to precisely position equipment by the doors. *(see photo below)*



The embarkation and disembarkation equipment must always be positioned with a margin above the door sills that allows for the fact that the aircraft will descend as it is loaded.

When available, auto-levellers must always be used. Before using the auto-levellers, always check that they are in good working order. Front-line agents must never forget that an incorrectly positioned device may not function correctly.

MANAGEMENT BP

If no auto-levellers are available, an operator must man the controls of the passenger boarding bridge or stairs for as long as they are in use. In this way, the operator can monitor the descent of the aircraft during loading and adapt the height of the airbridge accordingly.

On some aircraft, the second door may be located close to the wing root. This is the case on the A380, certain Boeing 767s and Airbus A321s with two main doors on the left-hand side. In this case, when positioning the embarkation equipment, it is imperative to take special care not to hit the engine or the wing root.

Once each piece of equipment is in position, it must be suitably immobilised *(stabilisers, chocks, etc.)*. Safety devices, such as hand rails or protective barriers, must only be deployed once the door is open, to avoid causing damage to the door if the vehicle are not correctly positioned.

BEHAVIOURAL BP

Whenever possible, the equipment's control system must be protected against unintentional or malicious use by way of covers, control locks, barred access, etc.

Once the aircraft doors have been closed, moving the equipment clear demands just as much care as putting it in position.

BEHAVIOURAL BP

When removing equipment, visually check the general appearance of the zone that was in contact, paying special attention to the sensors.

Special care must be taken before retracting boarding bridges equipped with a 400 Hz cable or air conditioning hose, because the cables must imperatively be disconnected from the aircraft first to prevent them from being wrenched out.

BEHAVIOURAL BP

Before retracting the bridge, ask for confirmation that the 400 Hz and air conditioning (where appropriate) cables have been disconnected and stowed, for example by asking the ground operations team leader.

MANAGEMENT BP

Install a clearly visible safeguard on every airbridge key to make sure that the 400 Hz cable is always disconnected before retracting the airbridge. One example is a large, bulky flag.

When the aircraft is unattended *(long-term docking, night stops, etc.)*, all the means of boarding must be removed when the aircraft is not being serviced.

Poor weather conditions *(section 2.6)*: **refer to practices 4 and 10.**

RELATED OCCURRENCES

1 ▶ AIRBRIDGE NOT RETRACTED, COLLISION ON ARRIVAL

2011, France: as an A320 arrived at its stand, the left wing hit the boarding bridge, without the crew even noticing. The airbridge had not been correctly retracted and was inside the ASRA. Since the airbridge was usually in the right place, the marshaller did not check its position.

Passenger boarding bridges that are not fully retracted may encroach on the ASRA. This can result in collisions when the aircraft arrives or departs. The positions of the pilot and the marshaller do not allow them to fully assess distances from the wing tips, as this incident demonstrates, because the crew could see the airbridge after the aircraft had stopped, but they did not notice the collision. If an incident like this goes unnoticed on departure, the potential consequences are very serious.

SEE ALSO THE OCCURRENCE IN SECTION *3.5 GPU AND 400 HZ CABLE*: "GPU CABLE WRENCHED OUT".

SEE ALSO THE OCCURRENCE IN SECTION *2.3 EQUIPMENT IN CONTACT WITH THE AIRCRAFT*: "HANDRAILS NOT RETRACTED WHEN APPROACHING THE AIRCRAFT, RESULTING IN A COLLISION"

3.5. GPU AND 400 HZ CABLE

During ground handling, aircraft need electricity for their on-board systems, lighting, etc. This energy can be supplied by the Ground Power Unit *(GPU)* **or from converted mains power provided by the airport** *(400 Hz cable)* **that takes over from the aircraft's Auxiliary Power Unit** *(APU)*.

The handling and positioning of the GPU are potential sources of danger on aprons. Just like any other item of equipment, the GPU must be inspected before use and repaired or replaced whenever necessary.

Whenever possible, and depending on the configuration of the aircraft stands, the GPU must not be pre-positioned in the ASRA. Certain airlines and local rules may authorise this practice, but the GPU should preferably be placed outside the ASRA before the aircraft arrives, whenever possible.

Once in position, the GPU must be immobilised in every direction using chocks or a parking brake.

BEHAVIOURAL BP

The GPU must be positioned in the ASRA so that its exhaust does not point directly at the fuselage.

BEHAVIOURAL BP

The GPU must be positioned as far as possible from the aircraft's fuel vents to avoid any risk of fire.

BEHAVIOURAL BP

Before connecting a GPU to an aircraft, always check that the power switch is set to "OFF".

The GPU can only be started, switched off and disconnected on the orders of the crew. The same applies to the connection and disconnection of the 400 Hz cable.

As a general rule, the GPU or the 400 Hz cable must not be connected or disconnected during refuelling. However, they can be connected *(and the GPU can be started)* in advance.

At the end of the operations, never apply undue force when disconnecting the GPU or the 400 Hz cable. Always check that the cable has been disconnected before retracting the airbridge or moving the GPU clear.
▶ OCCURRENCE 1

RELATED OCCURRENCES

1 ▶ GPU CABLE WRENCHED OUT

2015, France: before the departure, the agent responsible for removing the GPU started his tractor, thinking that one of his colleagues had disconnected the cable, which was not the case. The connector was wrenched out and damaged, as were the flap and the connector on the aircraft. Maintenance was called in to check the damage.

Occurrences of this type, in which the 400 Hz cables are torn out when the boarding bridge is retracted, are also regularly reported. There is a real risk of damaging the aircraft.

3.6. LOADING AND UNLOADING

Loading and unloading an aircraft demand the utmost vigilance on the part of the operators before, during and at the end of the procedures. If the aircraft is not loaded according to the instructions, the manoeuvrability of the aircraft will be directly affected. The crew will only discover this fact in the critical flight phases of take-off and landing.

BEFORE LOADING

The loading of an aircraft can have a serious impact on flight safety. This impact can easily be reduced by following some simple best practices right from the preparation and reception of the baggage or the freight to be transported.

To allow the loading instructions to be correctly followed, the person who prepared them must ensure that they are transmitted properly to the operators handling the baggage and goods. When the instructions are given, the agent supervising the loading operations must be certain that they have been fully understood. If in the slightest doubt, the agent must contact the person giving the instructions for confirmation. The instructions can then be transmitted to the agents who will load the aircraft, making sure that they too have fully understood them. In this respect, refer to section *2.8 Communication and team management*.

Firstly, damaged containers or equipment must never be used. By way of example, containers that cannot be closed must not be used.

Moreover, the condition of the load must be checked before bringing it to the aircraft and operators must make sure that the tags match the flight in question.

BEHAVIOURAL BP

The integrity of the goods must be checked again when they arrive in the ASRA. The goods or baggage may have been damaged during transportation. Any damage must be immediately notified. If the damaged load is still in an acceptable condition to make the flight, then a note must be added to the loading instruction report. Otherwise, it must be repacked.

AIRCRAFT ARRIVAL

For all types of arrivals, at the final destination or in transit, all the holds must be inspected. If any equipment is damaged or faulty, the station manager must be informed. It is also wise to notify a load that has collapsed or is inadequately loaded, even if it is not damaged.

BEHAVIOURAL BP

When the aircraft arrives, also check that the load matches the loading information received from the preceding ground handling operations. Unfortunately, differences are frequently found. Informing the departure station directly improves flight safety, because the necessary corrective measures can then be taken.

BEHAVIOURAL BP

If a leaking load is detected on arrival, it must be notified immediately. It may no longer be detectable a few hours later for another flight.

Once these inspections have been made, the aircraft can be unloaded, usually starting from the rear, to avoid any risk of tipping.

LOADING PROCESS

Before starting the aircraft loading phase, the holds must always be inspected: the locking systems must be in working order and the walls and doors must be free of damage. Any forgotten objects must be removed.

The slightest anomaly must be reported, and the loading operations interrupted. This directly affects flight safety.

BEHAVIOURAL BP

Wait for the team leader's OK before starting to load.

It is fundamental to follow the order in which the goods and baggage are loaded. Usually, the front of the aircraft is loaded first, to prevent it from tipping. ▶ OCCURRENCE 1

The prepared loading instruction report guarantees that the aircraft is properly balanced and that the compatibility rules of the goods are obeyed. Therefore, the instructions must be followed to the letter. ▶ OCCURRENCES 2 and 3

For example, the front-line agents must never forget that two containers of the same size cannot be interchanged, because their weights are different.

If the loading instruction report cannot be strictly followed for any reason whatsoever, the operators must not take any individual initiatives, and must inform their supervisor immediately.

MANAGEMENT BP

Use a checklist as the loading procedure progresses and ask the loading supervisor to sign it. This tool will make sure that all the steps and key checks are completed and that the instructions are followed.

Loading supervision checklist

Flight: ZY123 Reg.: F-ZYXW Destination: ABC

Task	ETD	Done
Loading instructions received	-90	10:00
...		
ULD and pallets condition checked	-60	10:23
...		
NOTOC given to captain	-30	N/A
...		
Loading complete	-10	11:15
Nets properly secured	-10	11:15
...		
Departure or pushback	0 11:30	11:24

Comments: nothing to report.

Name: Jean DUPONT Signature:

Example of a checklist used to supervise loading operations.

RELATED OCCURRENCES

1 ▶ FAILURE TO RESPECT THE UNLOADING ORDER

2002, Sydney *(Australia)*: shortly after the arrival of an MD-11 cargo plane, a 4x4 vehicle is unloaded from the front. The aircraft tips onto its tail. The car ends up on the runway and the 11 crew members are rescued using a cherry picker.

Baggage handling also demands the utmost vigilance on the part of the operators. The baggage tags must be checked and the number of items of baggage must be counted systematically.

BEHAVIOURAL BP

When checking the baggage tags, it is advisable to check both the destination and the flight number, because two aircraft docked side by side may share the same destination. In addition to sending it to the wrong destination, inverting the baggage can also result in incorrect weight and balance, thereby compromising flight safety.

PRECAUTIONS WHEN LOADING

The aircraft descends during the loading procedure, so it is important to keep an eye on the height of the loader relative to the door.

The goods must be positioned to avoid damaging the aircraft hold *(all the weight in one corner for example)*.

It is also useful to bear in mind that seemingly safe goods can affect flight safety.

BEHAVIOURAL BP

When left out in the rain, pallets covered with plastic film can collect water, which must be removed (risk of excess weight and damage to the aircraft's systems).

BEHAVIOURAL BP

Removing protective films from fruit and vegetables (pineapples, etc.) before loading prevents condensation from forming and inadvertently triggering the fire alarm during the flight.

RELATED OCCURRENCES

2 ▶ FAILURE TO RESPECT THE LOADING INSTRUCTION REPORT: CENTRE OF GRAVITY TOO FAR FORWARD

2004, France: an ATR 42 takes off on a relatively short runway. When rotating, the captain pulls on the stick full back, but nothing happens. The combined action of the copilot has no effect either. The take-off is rejected at high speed and the aircraft comes to a halt near the end of the runway. After checking, it was found that all the baggage was in the front hold, while the loading instruction report stated that one quarter was to be put in the rear hold.

With a centre of gravity too far forward, the pilot has difficulty in manoeuvring the aircraft. Sometimes, fully actuating the controls is not enough to take off, and there is a danger that the aircraft will overrun the runway.

BEHAVIOURAL BP

When loading electric mobility aids, the loading supervisor or the operator must make sure that the wheelchair's electric circuit has been properly isolated, for example by trying to operate it by pressing the joystick.

It is imperative and fundamental to stow and secure the loaded goods for the sake of safety.

- Stowing must always be checked *(including the tension of ropes and nets)*, even for empty containers. ▶ OCCURRENCE 4
- Goods must never be lashed to anchor points in the hold that are not intended for this purpose.

- Cargo compartment nets must be correctly installed and secured, even if the compartment is empty.
- Cargo loading heights must be strictly respected.

BEHAVIOURAL BP

When loading, confirm that the locks have been immobilised by entering a note in the loading instruction report for every container, pallet, etc.

MANAGEMENT BP

Whenever possible, the load should be checked by a person who did not take part in the loading operations.

MANAGEMENT BP

The loading procedure may require a photograph (particularly of bulk goods) to be taken at the end. In this case, the operator understands that his/her work can easily be inspected in the event of a problem.

At the end of the loading process, it is quite frequent for the doors to be locked incorrectly. It is important to insist on the fact that the doors can only be operated by qualified and authorised personnel.

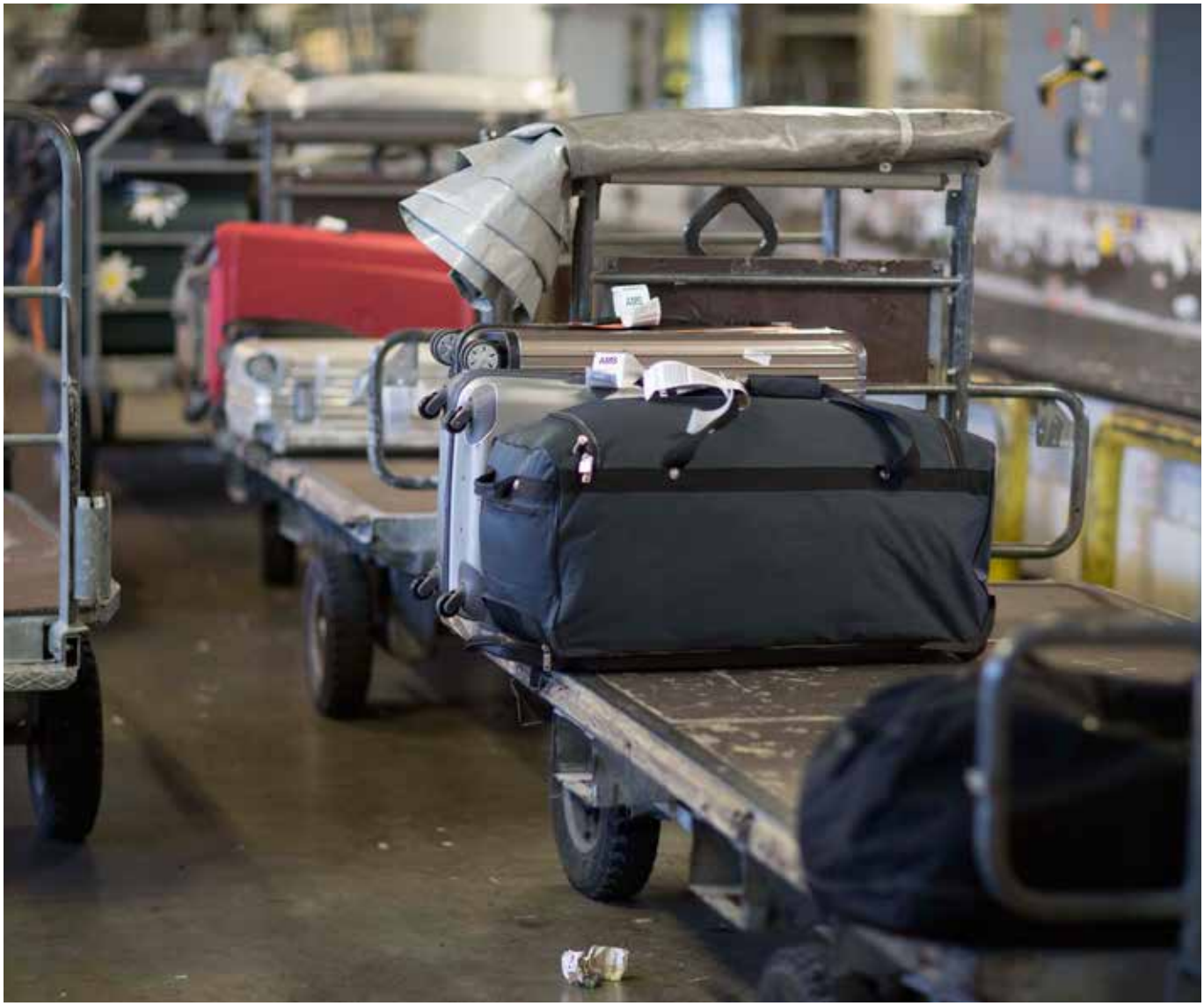
Poor weather conditions *(section 2.6)*: **refer to practice 7.**

RELATED OCCURRENCES

3 ▶ FAILURE TO RESPECT THE LOADING INSTRUCTION REPORT: CENTRE OF GRAVITY TOO FAR REARWARD

- **1950, United Kingdom: an aircraft with 83 people on board crashed on landing, in the final approach. The aircraft's centre of gravity was too far back, making it uncontrollable in this critical phase.**
- **In 1999, a Fokker F-27 crashed in final approach in Guernsey under the same circumstances. ➔**
- **1998, Bastia** *(France)*: **during a stopover, part of the baggage on board an A320 is unloaded. During take-off, when rotating, the aircraft took a sudden nose-high attitude. The crew aborted the take-off and the aircraft fell back down onto its front landing gear. All the remaining 1,600 kg of baggage had mistakenly been loaded in the most rearward hold at the original departure station, instead of in the front hold. The agent who raised the new loading report did not check the position of this baggage in transit.**

When the centre of gravity is too aft, the aircraft overreacts to commands, potentially to the extent of becoming uncontrollable. This situation is particularly critical on take-off and landing, when the travel of the controls that is usually required to raise the nose of the aircraft by a few degrees can cause it to adopt an overly raised attitude *(in the first two accidents, the aircraft ended up almost vertical)*, **causing it to stall.**



RELATED OCCURRENCES

4 ▶ CONTAINERS INCORRECTLY LOCKED OR UNLOCKED

2014, France: when an A320 started its descent, several thuds could be heard from the cockpit and the cabin. On arrival, an unlocked container was found in a position different from the one indicated in the loading instruction report.

This type of incident is reported dozens of times every year. Locking containers and stowing the freight prevents them from moving in flight. Just like in the event of incorrect loading, they can cause the centre of gravity to be too far forward or aft. Moreover, if they come into collision with the cargo partitions, they can cause serious structural damage.

SEE ALSO THE OCCURRENCE IN SECTION *2.7 DANGEROUS GOODS*: "FIVE CONTAINERS OF FLAMMABLE LIQUID LEFT UNLASHED"

SEE ALSO THE OCCURRENCE IN SECTION *3.16 PASSENGER CHECK-IN AND BOARDING*: "INCORRECT HANDLING OF AN ELECTRIC WHEELCHAIR THAT CAUGHT FIRE DURING UNLOADING", WHICH HIGHLIGHTS THE IMPORTANCE OF OBEYING THE INSTRUCTIONS FOR THE TRANSPORTATION OF CERTAIN GOODS AND THE POSSIBLE CONSEQUENCES OF POORLY STOWED LOADS IN THE HOLD.

3.7. REFUELLING

Refuelling is a high-risk activity for both the ground operators and for flight safety. This section concentrates mainly on the risks and the best practices related to activities specific to the refueller. The best practices for all the operators present on the apron during refuelling are described in section 2.5.

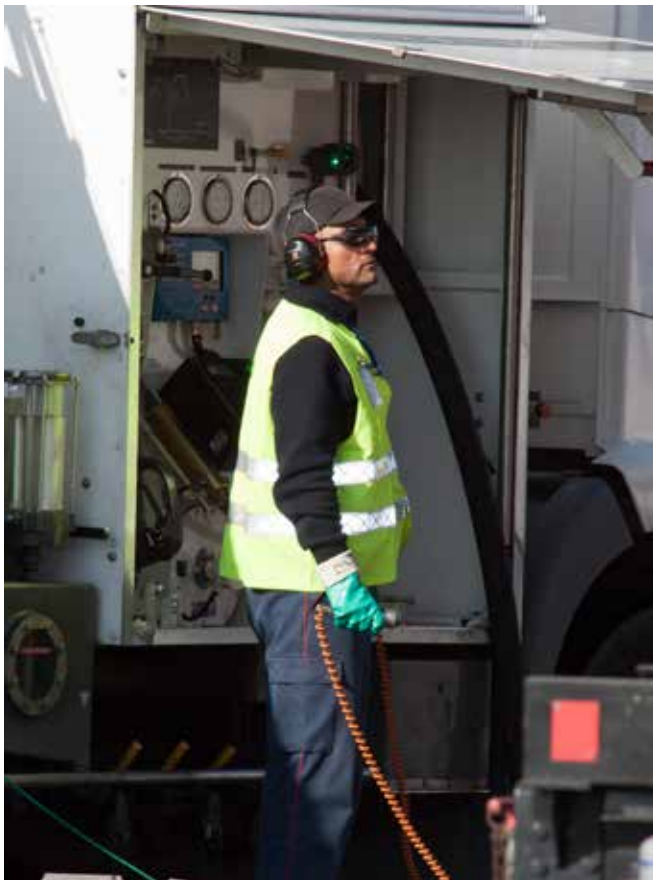
The refuelling vehicle must approach its aimed position on the stand at low speed and in the forward direction. The refueller must park the vehicle so that it can drive away from the aircraft in the forward direction.

BEHAVIOURAL BP

If the refuelling truck cannot approach the aircraft in the forward direction, then it is strongly recommended for it to be guided by another operator.

BEHAVIOURAL BP

The final position of the refuelling truck must be chosen so that minimal loads are applied to the refuelling hose and the aircraft coupling.



Towed tanks or towed hydrant pump must remain coupled to their tractor.

Before starting to refuel, the operator must check that:

- The engines are stopped
- The aircraft is chocked
- The APU is switched off
- The fuel gauge is reset to zero

BEHAVIOURAL BP

Before starting the refuelling operation, also check that the fire extinguisher and the fuel hydrant emergency stop are readily accessible.

BEHAVIOURAL BP

The aircraft may descend by tens of centimetres during loading (baggage, freight, passengers). Therefore, it is essential to allow a sufficient margin when positioning equipment (truck, step ladders, baskets, etc.) and to check this space before starting to refuel.

If the refueller or a member of the ground staff notices that the temperature of a part of the aircraft is abnormally high, then it is preferable to wait until suitable conditions are restored before refuelling.

The operator must connect the ground cable*(s)*. If any of the ground cables becomes disconnected, refuelling must be interrupted immediately.

Refuelling must only start once the supervisor on the ground or the technical crew has given the OK, depending on the airline's procedures.

The refueller must stay outside the vehicle to supervise the operation *(even in the winter)* and must be in a position to interrupt the operation at all times *(deadman's control)*.

The rules applicable to the various operators during refuelling, and in particular the rules applying to the fire safety perimeter, are described in section *2.5 Refuelling in progress*. They are obviously also applicable to the refueller. ▶ OCCURRENCE 2

BEHAVIOURAL BP

During the refuelling operation, remain attentive to the other activities in the vicinity in order to detect any possible sources of fire (mobile phones, sparks, etc.) and to stop the refuelling operation, if necessary. In this way, the operator can also spot vehicles or equipment placed in front of the tanker or hindering access to the fire fighting systems.

At the end of refuelling, the agent in charge of the operation must make a final inspection, including a complete walkaround of the refuelling vehicle, to check the integrity of the aircraft, that the fuel plugs are closed and locked and that all items used have been stowed away.

MANAGEMENT BP

Formally record the checks made at the start and at the end of the operation in a document to be completed as the operation progresses, then signed by the refueller.

Poor weather conditions *(section 2.6)*: **refer to practice 9.**

RELATED OCCURRENCES

1 ▶ INCORRECT POSITIONING, DISCONNECTION OF A HOSE, FIRE

2001, Denver *(United States)*: **a Boeing 777 is being refuelled when the fuel hose becomes disconnected from the wing and sprays kerosene all over the place. A fire breaks out and the refueller suffers serious burns, from which he later dies, and the aircraft is damaged. The refuelling truck was incorrectly positioned, applying abnormal stress to the hose, which became detached from the wing.**

The correct positioning of the truck and the constant vigilance of the refueller are essential during refuelling operations.

2 ▶ USE OF PERSONAL ELECTRONIC DEVICES DURING REFUELLING

Third-party operators' agents are regularly seen using electronic devices, such as mobile phones, inside the fire safety perimeter during refuelling. These devices contain components that can become very hot, such as the batteries, and they are also capable of producing sparks. In the presence of fuel vapour, the risk of fire or an explosion is then very high. Refuellers must remain vigilant at all times, for their own safety and for that of the people and the equipment nearby. The refueller must obviously obey this rule too.

SEE ALSO THE OCCURRENCE IN SECTION *2.5 REFUELLING IN PROGRESS*: "EXIT PATH OF THE REFUELLING TRUCK OBSTRUCTED"

3.8. LINE MAINTENANCE

Line maintenance consists of the operations performed before the aircraft leaves in order to make sure that it meets the conditions of airworthiness required to make the planned flight. Aircraft line maintenance is performed in its operating environment, i.e., usually on the apron.

Line maintenance activities are precisely defined by the European Regulation 1321/2014, and in particular by Appendix III: Part-145. With regard to flight safety, it seems appropriate to emphasise the following points.

Failing to pick up tools, objects or replaced parts can quickly have a serious impact on the smooth running of the flight. Especially since this type of omission is difficult to detect before the aircraft's departure. Therefore, it is important to make sure that nothing is left on the spot.

MANAGEMENT BP

Verification procedures should be introduced to avoid forgetting tools during line maintenance operations. The most common procedures consist of using holders with markings cut or drawn around the shape of the tools (shadow board, shadow box).

RELATED OCCURRENCES

1 ▶ PAPER RAG LEFT IN THE FLIGHT DECK, DAMAGED CONTROLS

2013, Auckland *(New Zealand)*: during maintenance work, the stabiliser trim cable of a Boeing 737, its guide and several pulleys were found to be seriously damaged.

The investigation revealed that the damage had been caused by a paper rag found nearby, which had been left in the flight deck after a maintenance operation or cleaning.

Irrespective of their size, objects that are left in the aircraft can move around and cause damage to the systems.

2 ▶ INTERRUPTED TASK: AIRCRAFT TAKES OFF WITH THE LANDING GEAR SAFETY PIN

2008, Australia: a mechanic explains: "While performing a walk-around on the aircraft, I noticed that the nose strut appeared lower than normal on extension. I decided to install the aircraft nose gear down-lock pin for an added safety precaution. After completion of strut service, I began to stow the equipment. In the process, a catering employee asked me if I could apply ground power to another aircraft parked at another gate. In turn, I completely forgot about removing the gear down-lock pin. It was not until the aircraft departed and then radioed in that he was unable to retract the aircraft nose gear. The aircraft returned to the gate. The gear pin was discovered to be installed in the nose gear."

(Credits: An overview of human factors in aviation maintenance, Australian Transport Safety Bureau)

This example illustrates the importance of not interrupting maintenance tasks, and of not being interrupted by another person.

SEE ALSO THE OCCURRENCE IN SECTION 2.4 FOD: "BLASTED FOD: DESTRUCTION OF A BUS DOOR", WHICH DESCRIBES THE POSSIBLE CONSEQUENCES OF A FLIGHT ARRIVAL WHEN THERE IS FOD ON THE AIRCRAFT STAND OR NEARBY.

MANAGEMENT BP

An efficient system to reference the tools (e.g., barcodes) also helps to keep them in good condition and regularly calibrated.

It is essential not to interrupt maintenance operations or to let people interrupt you. Distractions can result in operators inadvertently failing to completely execute every step of the procedure.

BEHAVIOURAL BP

If a maintenance task is interrupted, one best practice consists of checking that all the steps of the procedure have been completed. Using the written version of the procedure is essential.

As a general rule, line maintenance operations are performed outdoors, in conditions that can be made difficult by noise, heat, precipitation, time pressure, etc. Every one of these constraints can increase the risk of making a mistake or forgetting something. Consequently, everyone is responsible for taking the suitable precautions, but also for refraining from starting a task if the conditions prevent it from being executed without compromising flight safety.

3.9. POTABLE WATER AND TOILET SERVICING

While activities related to the drinking water supply and lavatory servicing may initially seem insignificant, they can in fact have a real impact on flight safety, in particular because they involve the use of liquid and corrosive products, directly in contact with the aircraft fuselage.

Usually, the toilet servicing procedure consists of three stages:

1. **Emptying**
2. **Rinsing**
3. **Pre-charging with disinfectant**

The liquids used in the toilets are corrosive and can cause damage to the structure of the aircraft. Even very small leaks must be reported immediately. Most products are blue and can be easily detected. In all other cases extra vigilance is necessary.

Checks for leaks or traces of corrosive products must be made before and after servicing the toilets.

When refilling with potable water, any slippages on the aircraft must be wiped away and dried. Spilt water can turn into ice.

To prevent overflows in the cabin that could cause a short circuit, it is essential to:

- Strictly respect the recommended quantities of pre-charge liquid or water.
- Never fill without first emptying.
- Only perform these operations when the aircraft is electrically powered up *(GPU, 400 Hz or APU)* to make sure that the overflow valves are working.

Poor weather conditions *(section 2.6)***: refer to practice 13.**

RELATED OCCURRENCES

1 ▶ OVERFLOWING TOILET LIQUID IN THE CABIN

2013, France: passengers noticed that the carpet in the aisle at the rear of the aircraft was wet. Because too much toilet liquid was charged, it overflowed onto the floor of the cabin.

When servicing the toilets, it is essential to respect the recommended quantities to avoid overflows that can cause a short circuit. For the same reason, never fill the systems without emptying them first.

3.10. AIRCRAFT OUTSIDE CLEANING

Cleaning the exterior of an aircraft consists of removing deposits from the fuselage, the landing gear and the flight deck windshield. Regularly cleaning the fuselage helps the aircraft to maintain its aerodynamic properties, while a clean windshield guarantees good visibility for the pilot, which is essential to the safety of every flight. Clean landing gear is easier to inspect and keep in proper working order.

CLEANING THE WINDSHIELD

Cleaning agents must be used in strict accordance with the airline's or the manufacturer's recommendations. Using the wrong product can significantly reduce the pilot's visibility under certain conditions of brightness that cannot be detected before the aircraft takes off.

MANAGEMENT BP

When the windshield cleaning is in the scope of services contracted to the ground handler, it is essential to always have the right equipment to access the windshield from the exterior, so that the crew is not tempted to take off with reduced visibility. ▶ OCCURRENCE 1

When using this type of equipment, it is important to remain vigilant in the vicinity of the aircraft to avoid causing any damage, in particular to the numerous sensors located around the windshield.

CLEANING THE FUSELAGE AND LANDING GEAR

When cleaning the fuselage, the manufacturer's recommendations must be followed to the letter, especially regarding the protection of sensors and sensitive zones, such as the radome.

MANAGEMENT BP

Unless recommended otherwise, the technique consisting of protecting the sensors by applying adhesive tape should be avoided, due to the risk of forgetting to remove it at the end of the operation.

The manufacturer's recommended products must always be used in all cleaning operations.

The landing gear must be free of mud, tarmac or any other substance that could interfere with its operation.

BEHAVIOURAL BP

Never hesitate to report the slightest anomaly (leaks, cracks, corrosion, etc.) when cleaning an aircraft, or even when simply in doubt.

BEHAVIOURAL BP

Once the cleaning operations have been completed, the agent in charge must systematically check that none of the equipment and materials used have been forgotten.

RELATED OCCURRENCES

1 ▶ REDUCED VISIBILITY CAUSED BY A DIRTY WINDSHIELD

2011, France: on departure, the crew of an Airbus 320 asked the assistant to clean the windshield, which was covered with insects. They did not receive a positive response and, due to time pressure, decided to take-off with the dirty windshield.

Just like in a car, visibility is reduced by a dirty windshield, especially when flying into the sun. But aircraft do not have built-in windshield wipers, which is why it is so important to be able to provide the adequate cleaning, especially in the summer, when there are more insects and birds.

3.11. CLEANING THE CABIN

Cleaning the interior of the aircraft is mainly to allow passengers to travel in comfortable and clean conditions but it can impact flight safety too. Extra precautions must be taken when cleaning the flight deck.

As a general rule, the equipment used to clean the cabin must not obstruct the emergency exits.

Standard cleaning products must be used, in the recommended conditions and quantities. They are intended for a particular use that must be respected. Inappropriate use can lead to the release of toxic substances or even start a fire during the flight.

MANAGEMENT BP

Using pictograms on the various products is a good way of illustrating the uses that are permitted and forbidden.

The use of non-flammable products should always be preferred, wherever possible. The cabin must be sufficiently ventilated when using flammable products.

A representative of the airline must supervise the cleaning of the flight deck.

BEHAVIOURAL BP

Any accidental contact with the equipment in the cockpit must be reported, and operators must never attempt to return the controls to their initial position themselves.

If a cleaning agent, or even water, is spilt onto the floor of the cabin or the hold, it must be reported. It could cause short circuits during the flight and render certain equipment inoperative, and in the longer term, could damage the structure of the aircraft by corrosion.

BEHAVIOURAL BP

The agent in charge of the cleaning operations must always check that nothing has been left in the aircraft. A simple cloth can affect flight safety.

SEE ALSO THE OCCURRENCE IN SECTION *3.8 LINE MAINTENANCE*: "PAPER RAG LEFT IN THE FLIGHT DECK, DAMAGED CONTROLS".

3.12. AIRCRAFT DEPARTURE

The departure of an aircraft from its stand is a fundamental phase in the safety of the forthcoming flight. It is the last opportunity to observe and notify an incident, an impact on the aircraft or any other anomalies that could compromise a smooth flight. This is also the point where time pressure is at its highest, a fact that can lead to last-minute mistakes that are difficult to detect, because no-one else can see the exterior of the aircraft between the moment it leaves the stand and take-off.

In the departure phases, the ground personnel must always remember that the crew cannot see what is going on under the aircraft. So safety depends directly on the ground handling personnel. Following the procedures and good communications are essential and must not be affected by the time pressure. No compromises must be made between safety and punctuality. A delay is always preferable to committing negligence in order to leave on time.

If an ASU is used, it must be in perfect working order *(handling and movement close to the engines)* and it must be correctly positioned. Pressurisation can only start on the crew's orders.

The GPU, ACU and ASU are only disconnected once the crew has given the go-ahead. They must then be positioned well clear of the aircraft's path and the path of the tug, in the event of pushback.

The agent in charge of the departure operations must make sure that:

- The aircraft stand and path of the aircraft are free of FOD.
- The ASRA is sufficiently clear of any contaminants, such as snow or ice, for the aircraft to move in complete safety.
- All the ground equipment has been moved out of the ASRA and the path of the aircraft, apart from the equipment used in the departure operations, which must also be positioned outside the aircraft's path. All the equipment used in passenger boarding operations has been removed or retracted.
- The fire fighting systems are readily accessible.
- Anyone who does not take part in the departure procedure is outside the ASRA, and stays there.

In addition to the crew walkaround, the ground handling staff must also inspect the aircraft to check that it is really ready to depart:

- all the service flaps and panels are closed and locked
- the cabin and hold doors are free of damage and are properly closed *(plus the nearby sensors)*
- there are no signs of leaks or damage

The aircraft inspection must be very thorough, because it has a direct impact on flight safety. The crew must be informed of the slightest anomaly.

BEHAVIOURAL BP

When starting the engines, the ground personnel must pay close attention to the outlets of the engine nozzles. If they see flames, the crew must be informed immediately. The aircraft's systems cannot detect this type of fire.

If no pushback is required, headset communication with the crew must only be cut with the crew's authorisation.

BEHAVIOURAL BP

If the intercom connection between the ground staff and the crew is interrupted, the ground agent in charge of communications must remain visible to the crew until communications are restored.

Poor weather conditions *(section 2.6)*: **refer to practices 8 and 9.**

RELATED OCCURRENCES

1 ▶ DAMAGE CAUSED TO AN AIRCRAFT BEFORE TAKE-OFF DETECTED AFTER LANDING

2007: during pushback, the crew of a Boeing 747 felt a violent shock. The agent in radio contact inspected the aircraft and the tractor and reported that no damage had been caused. The take-off procedure was resumed. When the aircraft arrived at its destination, a rectangular hole measuring 6 cm in width by 50 cm in length was found under an engine, along with traces of paint from the vehicles used by the ground handler before departure. After closer analysis, the aircraft was unable to depart and was towed to a maintenance workshop to be repaired on the spot.

The damage had been caused during or before pushback, but went undetected in the inspection of the aircraft and during the additional check during pushback. The crew cannot see what happens under the aircraft, which is the reason why the vigilance of the ground staff and a thorough inspection of the aircraft are so important.

SEE ALSO THE OCCURRENCE IN SECTION *2.4 FOD*: "BLASTED FOD: DESTRUCTION OF A BUS DOOR", WHICH DESCRIBES THE POSSIBLE CONSEQUENCES OF A FLIGHT ARRIVAL WHEN THERE IS FOD ON THE AIRCRAFT STAND OR NEARBY.

SEE ALSO THE OCCURRENCE IN SECTION *3.13 PUSHBACK*: "LANDING GEAR SAFETY PIN NOT REMOVED BEFORE TAKE-OFF".

3.13. PUSHBACK

Pushback is a key phase of an aircraft's departure, in which it is pushed backwards from its stand towards the taxiway. Heavy loads are applied to the aircraft's landing gear and tyres in this phase.

There are three types of pushback: conventional with a towbar, towbarless and by Power Push Unit *(PPU)*.

Communication must be established between the ground and the flight deck throughout the departure procedure, preferably using headsets, otherwise by using the conventional signals. Precise communications between the ground operations will guarantee optimal safety.

A briefing must be held between the crew and the agent in charge of the departure before the pushback. The specifics of a departure to be mentioned include the direction of movement, the final position and the signals used.

BEHAVIOURAL BP

In the pre-departure briefing with the crew, it is advisable to:

- repeat the information provided by the captain to make sure they have been fully understood;
- agree on the emergency signals that may be used;
- never hesitate to request confirmation of information when in doubt.

MANAGEMENT BP

The agent wearing the headset must have a good command of English in order to avoid any misunderstanding.

When positioning the tractor, it is important to make sure that:

- the towbar is well adapted to the type of aircraft
- the landing gear is chocked according to the airline's procedures and the type of pushback
- the aircraft's parking brake is on
- the safety pin is no longer present ▶ OCCURRENCE 2
- the nose landing gear bypass pin is in place *(except for PPU pushbacks)* ▶ OCCURRENCE 1

BEHAVIOURAL BP

When positioning the pushback tractor prior to departure, a guide agent positioned close to the landing gear assists and secures the manoeuvre.

The following conditions must be checked before removing the chocks from under the wheels of the main landing gear:

- The pushback tractor is connected to the aircraft and its parking brake is on
- The aircraft's parking brake is on

BEHAVIOURAL BP

For towbarless pushback, the nose landing gear must never be lifted until all equipment is disconnected from the aircraft.

After confirmation that the aircraft's parking brake has been released, the pushback can start.

During the pushback, all the operators involved in this phase must remain well clear:

- of the aircraft's landing gear
- of the paths of the aircraft and the tractor
- of the danger zones near the engines

The manoeuvres must be made at low speed, smoothly and in a manner that allows them to be stopped immediately.

BEHAVIOURAL BP

The oversteer and overtorque alarms must always be operational on towbarless tractors.

Depending on the airline, if visual markings indicate the maximum permitted steering angles, they must be respected in order to limit the stress applied to the nose landing gear. The operator must keep a close eye on the steering angle markings at all times, even if the pushback tractor is equipped with oversteer and overtorque alarms. *(see photo opposite)*

BEHAVIOURAL BP

If the maximum steering angles are exceeded in the pushback, the crew must imperatively be informed, and the aircraft inspected.

Once the pushback has been completed and the crew confirms that the brakes have been applied, the towbar can be detached. The bypass pin must then be removed.

With the crew's permission, headset communications can be cut and the ground personnel gives the "all clear" thumbs up while showing the bypass pin, if any.

Poor weather conditions *(section 2.6)***: refer to practices 5, 14 and 15.**

RELATED OCCURRENCES

1 ▶ FORGOTTEN BYPASS PIN: AIRCRAFT IMMOBILISED ON THE TAXIWAY

2015, France: the overtorque alarm went off as a Boeing 777 was being pushed back. The pushback was interrupted to allow the maintenance staff to intervene, but the aircraft was about 20 metres onto the taxiway. The ground operator had forgotten to install the bypass pin, which had not been checked by the pushback driver.

Without the bypass pin, the pushback tractor cannot turn the aircraft and damage may be caused to both the tractor and the aircraft.

2 ▶ LANDING GEAR SAFETY PIN NOT REMOVED BEFORE TAKE-OFF

2013, Cape Town *(South Africa)***: a Boeing 777 took off and then interrupted its climb at 3,000 m, because it could not raise the nose landing gear. 50 tonnes of kerosene had to be jettisoned in flight to lighten the aircraft, before returning to land in Cape Town. The safety pin had been left in place in the nose gear. The pin was removed and the aircraft refuelled before taking off again.**

This pin secures the landing gear during lengthy stopovers and when being towed, and it must always be removed before take-off. During the pre-departure aircraft walkaround and before pushback, operators must always check that the pin has been removed.

SEE ALSO THE OCCURRENCE IN SECTION *2.6 POOR WEATHER CONDITIONS*: "BRAKING ON BLACK ICE WHEN TOWING, COLLISION WITH THE AIRCRAFT".

SEE ALSO SECTION *3.14 TOWING*: "TOWING AN A380: COLLISION WITH A HANGAR".

3.14. TOWING

Towing usually consists of taking an aircraft from a stand to a maintenance area or to another stand. This operation is commonly performed with an empty aircraft and in the absence of the crew.

Aircraft are towed by conventional tractors or by towbarless tractors.

Towing operations require at least two agents:

- an agent who drives the tractor
- a brake operator seated in the aircraft flight deck

The brake operator communicates using a radio headset.

Before proceeding with the towing operation, always check that:

- the landing gear safety pins are in place
- the aircraft's brakes are operational
- the parking brakes are released and the anti-collision lights are on, before the aircraft moves
- the brake operator gives the OK before starting the manoeuvre
- air traffic control has given its clearance.

BEHAVIOURAL BP

A briefing must be held between the agent driving the tractor and the agent in the aircraft's flight deck before the towing operation. The specifics of the manoeuvre must be specified and fully understood. Any emergency signals must also be coordinated.

BEHAVIOURAL BP

Irrespective of the type of tractor, a guide must be positioned close to the nose landing gear to position the tractor precisely and to reduce the risk of damage.

During the towing operation:

- the start and the end of the towing operation must be performed in a straight line in order to limit the loads on the landing gear. At the end of the towing operation, the nose landing gear must be parallel to the axis of the aircraft.
- the manoeuvre must be made at low speed, smoothly and in a manner that allows it to be stopped immediately
- the ground markings must always be followed to stay well clear of the obstacles to the sides of the aprons

BEHAVIOURAL BP

When moving towards or in hangars, wing walkers are often necessary, in addition to a guide, because the risk of collision is high. ▶ OCCURRENCE 1

BEHAVIOURAL BP

Since the towing operations can be performed without any technical personnel from the airline, it is essential to report any anomalies regarding damage, defects, failures, leaks, etc. that are observed on the aircraft, even when in doubt.

Poor weather conditions *(section 2.6)*: **refer to practices 14 and 15.**

RELATED OCCURRENCES

1 ▶ TOWING AN A380: COLLISION WITH A HANGAR

2011, Le Bourget: an Airbus A380 was being towed when its right wing hit a hangar beside the taxiway.

The aircraft was not supposed to take this route. Wing walkers could have prevented this collision from happening.

SEE ALSO THE OCCURRENCE IN SECTION *2.6 POOR WEATHER CONDITIONS*: "BRAKING ON BLACK ICE WHEN TOWING, COLLISION WITH THE AIRCRAFT".

3.15. DE-ICING AND ANTI-ICING

The purpose of de-icing and anti-icing is to protect the critical surfaces of the aircraft until take-off, at which point the aircraft's own systems take over.

De-icing consists of removing frost, snow, slush or ice, while anti-icing is a preventive precaution against the formation or the accumulation of these contaminants. De-icing and anti-icing are usually performed successively on the aircraft stand or in a dedicated area.

An aircraft with the slightest deposit of frost or ice must never be allowed to take off, because this can compromise flight safety.

There are three phases to the de-icing and anti-icing process.

1. **Trigger**
2. **Execution**
3. **Inspection**

The operation is **triggered** on the basis of the conditions observed or forecast by the crew, by the airline operatives or by the ground handler under the conditions defined by the airline.

BEHAVIOURAL BP

Wherever possible, de-icing and anti-icing operations should be performed after all the other departure operations in order to minimise the interval before take-off. In particular, ask if the aircraft has already been refuelled and, if not, proceed with the de-icing and anti-icing after refuelling.

When the truck comes into action, the quality of the content of each tank must be checked using a refractometer, and visually, according to the expected colour, in order to be sure that the treatment will work effectively under the prevailing conditions. ▶ OCCURRENCE 3

The **execution** of the de-icing/anti-icing operations must always be symmetrical and cover the entire surface of the wing, the vertical stabiliser and rudder, the horizontal stabiliser and the elevators, on both sides of the aircraft.

As far as is possible, the treatment must be applied continuously. If the operation has to be interrupted, it is preferable to start again, in order to guarantee a treatment that is uniform, complete and symmetrical.

BEHAVIOURAL BP

In the event of significant accumulations of contaminants on a T-tail aircraft, the de-icing should start from the tail. If the wings are de-iced first, the aircraft could tip backwards due to the difference in weight.

Precautions must be taken in de-icing and anti-icing operations in order to avoid the so-called "no-spray" zones, such as:

- the engine inlets and outlets
- the APU inlets and outlets
- the brakes and tyres
- the flight deck windshield
- the cabin windows
- the aircraft sensors
- all other zones prohibited by the aircraft manufacturer.

BEHAVIOURAL BP

Never spray the product below the level of the cabin windows in order to protect the aircraft's sensors.

The de-icing operations continue until the agent considers that the contaminant has been completely removed.

BEHAVIOURAL BP

When two-man de-icing systems are used (a driver and an operator in the basket), the driver can have a better view of the state of the surfaces, or, at the very least, a view that complements that of the operator in the basket. The assessment of the situation can be improved by continuous communication between the two operators.

The effectiveness of the de-icing/anti-icing operations is influenced by the temperature and the flow rate of the liquid. The maximum values set by the manufacturer must be respected to avoid damage to the structure of the aircraft, and in particular composite surfaces.

MANAGEMENT BP

Clearly identify the various de-icing fluid hoses using colours, for example. Doing so will prevent the wrong de-icing or anti-icing product from being used.

In forced air de-icing operations, special attention must be paid when working close to the ground, where debris can be projected and damage the aircraft.

Similarly, always make sure that the contaminants are not moved to inappropriate zones *(gaps between flight controls, engine inlets, etc.)*.

The **inspection** is always made at the end of the operation in order to make sure that all the contaminants have been removed. In this case, the aircraft is said to be "clean" or the "Clean Aircraft Concept" applies.

The crew must be informed of the start time of the operation and of the product used *(type, concentration and complete name)*.

BEHAVIOURAL BP

The holdover time is determined by the time at which the treatment starts. Therefore, this time must be precisely recorded at the start of the operation.

MANAGEMENT BP

Before each winter, it is advisable for the agents who perform the de-icing/anti-icing operations to follow theoretical and practical refresher training.

Poor weather conditions *(section 2.6)*: **refer to practice 6.**

RELATED OCCURRENCES

1 ▶ INCOMPLETE DE-ICING, POOR CHECKS

1991, Stockholm *(Sweden)*: the engines of an MD-81 stopped a few seconds after take-off and the aircraft crashed into a field. The engines had sucked in some pieces of ice from the wings, which had not been sufficiently de-iced. The 129 people on board survived the emergency landing.

The presence of contaminants on the critical surfaces of an aircraft, even in small quantities, can result in a total and sudden loss of control after take-off.

On aircraft with engines at the rear of the fuselage *(MD-80, Boeing 717 and CRJ)*, sucking in ice can also cause the engines to lose power. Consequently, it is essential to check that the aircraft has been properly de-iced.

2 ▶ "OVERLY COMPREHENSIVE" DE-ICING

2009, Sweden: an A320 is de-iced without the green light of the crew and without respecting the zones to be avoided. Fluid entered the cabin air conditioning circuit. The aircraft had to be ventilated, then de-iced again before take-off. During the flight, the crew's eyes started itching, they had difficulty breathing and had to put on oxygen masks. Even after ventilating the aircraft just before take-off, traces of the de-icing fluid had been left in the air conditioning circuit.

This examples illustrates the consequences of failing to respect the no-spray zones. In more serious cases, sensors can be obstructed or blocked, directly affecting the crew's ability to pilot the aircraft.

AEA – No-spray areas, A320 ➔

3 ▶ USE OF AN INAPPROPRIATE FLUID

2006, Prague: an ATR 42 was de-iced with a mixture of water and glycol in the wrong proportions, following an unnoticed failure of the de-icing truck. The problem was only detected after the operation, when the aircraft was already at a standstill waiting to take off. An inspection revealed that ice had re-formed on the treated surfaces. The aircraft had to be de-iced again before taking off.

The duration of the protection can be affected by using an unsuitable fluid, in which case ice is susceptible to form on the surfaces again, without the crew necessarily noticing.

3.16. PASSENGER CHECK-IN AND BOARDING

Passenger check-in takes place far away from the ground operations and the aircraft. But some simple best practices can directly contribute to flight safety. The same applies to passenger boarding.

CHECK-IN

The agents responsible for passenger check-in can directly influence flight safety, even if they may be unaware of this fact. The coherence of the planned load and the obedience of the rules applying to the transportation of dangerous goods depend on their vigilance.

They must pay close attention to groups of passengers such as rugby teams or school children. Their total weight, compared with a group of varied passengers, can differ significantly, and the centre of gravity of the aircraft could be affected, if this is not taken into consideration. High numbers of excess baggage items can also affect aircraft balance.

BEHAVIOURAL BP

Groups of passengers with characteristics that can change the centre of gravity of the aircraft must always be signaled so that they are taken into consideration when seating the passengers and in the aircraft's loading documents.

The placing of the passengers in the aircraft during check-in is also important. Passengers sitting in rows next to an emergency exit must be capable of opening them and understanding the information given on board by the crew, in accordance with the airline's rules.

The ground handling agent plays a crucial role: passengers are not necessarily aware of the fact that a battery, a portable gas stove, or even a cigarette lighter, even in the hold, can impact flight safety.

BEHAVIOURAL BP

Always question every passenger about the presence of dangerous goods in their baggage (cabin and hold baggage) and double-check, if necessary.

MANAGEMENT BP

An up-to-date manual on the carriage of dangerous goods must always be available to the personnel. A quick reference guide can help to raise awareness of this issue and enable the personnel to make double-checks more easily.

Notices of forbidden dangerous goods must be present and readily accessible at the check-in desk and when boarding.

MANAGEMENT BP

When receiving passengers with reduced mobility and their electric mobility aids, the data they provide about the characteristics of these devices must be checked, especially with regard to:

- the weight and dimensions of wheelchairs: this precise information must be forwarded to the staff preparing the flight in order to guarantee the proper centre of gravity of the aircraft and to make sure that the limits of the hold are not exceeded
- batteries: in order to understand the specifics of each model in terms of the isolation of the electric circuits and control systems.

In 2015, the International Civil Aviation Organisation *(ICAO)* recommended that electronic cigarettes should only be transported in the cabin. They have been banned from the hold by most airlines, due to several incidents in which electronic cigarettes were accidentally switched on and caused fumes or fire.

BEHAVIOURAL BP

Always mention electronic cigarettes when checking-in baggage. The general public is unaware of this recent ban. The same applies to lithium batteries. ▶ OCCURRENCE 2

Special attention must be paid to certain categories of atypical passengers, such as campers or hunters, who often have cooking appliances or other dangerous goods in their baggage.

MANAGEMENT BP

Inform the personnel in advance of particular events that could result in the arrival of more “risky” passengers (holiday season, pilgrimages, carnivals, etc.).

The transportation of electric mobility aids for passengers with reduced mobility also demands special attention. Numerous cases of poor handling are regularly reported.

A database containing the different procedures for different models is available in the Air Transport Advice section of the British Healthcare Trades Association website. Electric mobility aids must be refused if they are too large to fit in the hold or if there is no procedure to prevent them from starting accidentally.

BOARDING

During boarding, cabin baggage is sometimes transferred to the hold. In this case, the personnel must question the passenger about the possible presence of dangerous goods in the cabin baggage. Certain items that are allowed in the cabin are prohibited in the hold. These changes must also be entered in the loadsheet or a last-minute change *(LMC)*.

BEHAVIOURAL BP

If a passenger’s cabin baggage is transferred to the hold during boarding, question the passenger about the presence of any dangerous goods in their baggage (lithium batteries, electronic cigarettes, etc.).

Passenger boarding operations demand particular attention when they take place on foot *(by bus or directly from the terminal)*. The paths must be clearly identified or indicated, the passengers must be supervised by ground handling personnel and they must be informed that smoking and the use of mobile phones are prohibited. Particular vigilance is required when boarding on foot during refuelling. ▶ OCCURRENCE 1

RELATED OCCURRENCES

1 ▶ PASSENGER SMOKING ON THE APRON DURING REFUELLING

2015, France: an airline invites its passengers to board the aircraft during refuelling. A passenger is caught smoking at the foot of the aircraft stairs, in the immediate vicinity of the fire safety perimeter.

This type of incident is still reported all too frequently. The agents in charge of boarding must remind passengers that smoking is forbidden and make sure that they obey.

2 ▶ UNDECLARED AND POORLY PACKAGED DANGEROUS GOODS, FIRE IN THE HOLD WHILE PREPARING FOR DEPARTURE

2014, Melbourne *(Australia)*: when loading the baggage in a Boeing 737, thick smoke started coming out of the rear hold. The hold extinguishers are switched on and the aircraft is evacuated. One passenger was found to have more than 20 lithium batteries for remote controlled aircraft, some of which had caught fire due to a short circuit.

The check-in agents are responsible for detecting any dangerous items in the baggage that is carried in the aircraft. They must pay even closer attention to new threats, such as electronic cigarettes, lithium batteries, which are used in laptops, mobiles phones or remote-controlled devices, etc.

3 ▶ INCORRECT HANDLING OF AN ELECTRIC WHEELCHAIR THAT CAUGHT FIRE DURING UNLOADING

2008, Manchester: when unloading a Boeing 757, sparks were seen coming from an electric wheelchair. The wheelchair was taken out of the hold and caught fire on the belt loader. An investigation revealed that the wheelchair's electric circuit had not been correctly isolated in order to prevent it from starting accidentally. Movement of baggage in the hold could have started a fire by continuously leaning on the wheelchair's control joystick.

This incident, which is far from being an isolated case, could have been much more serious if the fire had started in flight, it illustrates the need to follow the instructions applying to electric mobility aids.

SEE ALSO SECTION *2.7 DANGEROUS GOODS*: "BAGGAGE CATCHES FIRE WHEN LOADING THE HOLD".

SEE ALSO SECTION *3.1 LOADING PLANS*: "FAILURE TO TAKE ACCOUNT OF ATYPICAL GROUPS OF PASSENGERS: CENTRE OF GRAVITY TOO FAR FORWARD".

GLOSSARY

ACU	Air Conditioning Unit
ADREP	Accident/Incident Data Reporting System and Taxonomy *(ICAO)*
AEA	Association of European Airlines
APU	Auxiliary Power Unit
ASRA	Aircraft Stand Restricted Area *(in French: ZEC, Zone d'Evolution Contrôlée, used to describe the area on an aircraft stand delimited by a red marking)*
ASU	Air Start Unit
BP	Best Practice
CAO	Cargo Aircraft Only
DGAC	Direction Générale de l'Aviation Civile *(French Civil Aviation Authority)*
ECCAIRS	European Coordination Centre for Accident and Incident Reporting Systems
EU	European Union
FOD	Foreign Object Debris
GPU	Ground Power Unit
GSE	Ground Support Equipment
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
ISAGO	IATA Safety Audit for Ground Operations
LMC	Last-Minute Change
NOTAM	Notice to Airmen
NOTOC	Notification to Captain
PPE	Personal Protective Equipment
PPU	Power Push Unit
PRM	Passengers with Reduced Mobility
PSI	Fire safety perimeter
SMS	Safety Management System
ULD	Unit Load Device

REFERENCES

Airport Handling Manual,
35th edition, IATA, 2015

IATA Ground Operations Manual (IGOM),
IATA, 2015

ISAGO Standards Manual,
4th edition, IATA, 2015

Severe Weather Safety Guidelines for Ramp Operations,
SG 906, A4A, 2015

La coactivité autour des avions en escale, (Co-activity during a scheduled turn-around of an aircraft)
INRS, 2014

Regulation (EU) No 376/2014 of the European Parliament and of the Council of 3 April 2014 on the reporting, analysis and follow-up of occurrences in civil aviation

An International Standard for Business Aircraft Handling,
IBAC, 2014

Recommendations for De-icing / Anti-icing Aeroplanes on the Ground,
29th edition, AEA, 2014

Aircraft Ground Handling and Human Factors,
NLR, 2010

Just culture and human factors training in ground service providers,
NLR, 2010

Airside Safety Handbook,
4th edition, ACI, 2010

Guidance on organisational structures,
ECAST, 2009

Safety culture framework for the ECQST SMS-WG,
ECAST 2009

Ramp Operational Safety Procedures,
Flight Safety Foundation, 2007

CAP 642: Airside Safety Management,
CAA UK, 2005

Doc 9284: Technical Instructions for the Safe Transport of Dangerous Goods by Air,
ICAO

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PHOTO CREDITS

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Richard Metzger / *STAC* – **Véronique Paul** / *STAC*

2.2. VEHICLES AND EQUIPMENT DRIVING
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2.3. EQUIPMENT IN CONTACT WITH THE AIRCRAFT
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2.4. FOD
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2.5. REFUELLING IN PROGRESS
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2.6. ADVERSE WEATHER CONDITIONS
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2.7. DANGEROUS GOODS
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2.8. COMMUNICATION AND TEAM MANAGEMENT
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3.1. LOADING PLANNING
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3.2. PRE-FLIGHT DOCUMENTATION
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3.3. AIRCRAFT ARRIVAL HANDLING
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RAPTRAD IMAGINE

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3.8. LINE MAINTENANCE
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3.14. TOWING
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