



TWIGA AERO

AVIATION TRAINING & CONSULTING

AIRCRAFT GROUND DAMAGE REDUCTION STRATEGIES IN THE AGE OF COMPOSITE AIRCRAFT: White Paper

Maurizio Anichini | Brenda Aremo-Anichini
15th August, 2018

TABLE OF CONTENTS

TABLE OF CONTENTS 1

EXECUTIVE SUMMARY 2

INTRODUCTION 2

BACKGROUND/PROBLEM STATEMENT 2

SOLUTIONS 11

CONCLUSION 15

ADDITIONAL RESOURCES 16

FOR MORE INFORMATION 16





TWIGA AERO

AVIATION TRAINING & CONSULTING

EXECUTIVE SUMMARY

From operational risks to accidents and from aircraft damages to root cause analysis, this White Paper addresses the various operational deficiencies, costs and safety-related incidents introduced through the use of inconsistent procedures. Furthermore, we will analyse how a standard approach using AHM, the IATA Airport Handling Manual references, IGOM, the IATA Ground Operations Manual and ISAGO the IATA Safety Audit for Ground Operations can assist Airlines, Ground Service Providers (GSP), Airports and Civil Aviation Authorities (CAA) to achieve a higher level of compliance and conformance to established regulations and operational standards. Furthermore we will explore new and existing standards that will drive beneficial transformation and generate significant safety enhancements and savings whilst improving operational efficiency.

INTRODUCTION

Reportedly, 70% of all ground operations services are outsourced by airlines to GSPs globally. Knowledge transfer in ground operations continues to take place as GSPs gain more market share and outsourcing contracts. As such, airlines continue to distance themselves from ground operations activities and struggle to maintain control over GSPs through a variety of contractual clauses and SLAs (Service Level Agreements) that are put in place.

Each airline provides different operational procedures to their GSP for the same aircraft type.

This leads to safety-related incidents and accidents, operational inefficiencies, missed targets on SLAs and generates higher-severity safety-related risks driving higher costs.

BACKGROUND/PROBLEM STATEMENT

In our previous white paper *Solutions to the High Costs of Aircraft Ground Damage*, we discussed the \$12B annual cost and pain point the airlines are faced with today. That number will grow as composite aircraft come on line. Reducing risk exposures is not only key to reducing the high costs related to aircraft ground damage. It goes a long

2





TWIGA AERO

AVIATION TRAINING & CONSULTING

way to addressing the inconsistencies that drive sky-rocketing costs, deteriorating OTP (On Time Performance), increasing costs of injuries and related lost time, not to mention numerous other missed quality and safety-related targets. Let's consider the following questions:

- Why do differing operational standards exist to service the same aircraft type and for similar, standard services such as loading, push back, chocking, coning etc.?
- What can be done to address operational inefficiencies, injuries and numerous other missed targets?
- What strategic-level approach can airlines and GSPs use to improve performance, whilst reducing costs?
- How can regulatory authorities gain momentum to drive positive change, without introducing strict, prescriptive regulations, which may not achieve specific quality and safety-related targets the industry strives for?

Asking ourselves such questions as members of the community sheds light on the fact that, as an industry, we satisfy ourselves with knowing that regulatory bodies approve documentation in place. And so long as we achieve an *acceptable means of compliance*, 'all is well'. More questions arise:

- How do we train staff and what knowledge is retained by those trained?
- To how many different standards do we train staff who conduct the same function and tasks for the same aircraft type?
- How do we expect staff to retain the myriad of procedures?
- How is the Ground Support Equipment (GSE) maintained?
- How will the company manage the new IATA and ISAGO requirement to retrofit GSE with Safety Proximity Sensory Devices?



TWIGA AERO

AVIATION TRAINING & CONSULTING



As of June 2018, the IATA AHMs 910 and 913 detail the requirements. The ISAGO standards also include a provision to ensure GSE is retrofitted with Safety Proximity Sensory Devices to prevent aircraft ground damage. Lastly, the IATA Ground Operations Manual (IGOM) provides a standard for *no touch policy*.

Let's work on first things first.

In IGOM 3.1.3.2 **Basic Operating**

Requirements for GSE it is stated that:

"(h) A "No Touch" policy—meaning the GSE shall not touch the aircraft shall be employed for all GSE types with the exception of passenger loading devices. When positioning GSE, ensure that a clearance is maintained between the GSE and the aircraft to allow for vertical movement of the fuselage during the entire ground handling process."

AHM910 mentions the following:

“6. AIRCRAFT DAMAGE PREVENTION REQUIREMENTS
6.1 Whilst all GSE must protect personnel from the risk of injury, GSE that engages directly with aircraft MUST also be constructed using a design philosophy and materials that will prevent the GSE from damaging aircraft. With the exception of the specifically designed aircraft–GSE interface/contact points, (e.g. bridge canopies/service connections/towbar and towbarless interface points), manufacturers are required to identify opportunities to utilize technology and engineer out the risk of GSE being able to contact or damage aircraft.
6.2 A similar design philosophy shall also be applied to GSE that does not directly engage with aircraft but is likely or is known at times to have caused damage. This includes equipment such as baggage and cargo tugs, mobile GSE, dolly trains, toilet servicing equipment, de-icing truck, refueling vehicles etc.

4





TWIGA AERO

AVIATION TRAINING & CONSULTING

Note: The implementation of the above aircraft damage prevention requirements does not substitute for Standard Operations Procedures (SOPs) or any reduced skills, vigilance or training.”

Therefore, we still expect the human to maintain control of the machine in spite of the fact that it may be fitted with technology to assist in the prevention of aircraft damage.

AHM913 states:

3. INTRODUCTION

3.1 Considerable importance is attached to having equipment into **which the essential safety aspects have been incorporated as part of the basic design. It is particularly necessary when designing aircraft handling equipment to consider human factors (ergonomics and error) and the adverse conditions which frequently prevail in ramp areas, e.g. congested vehicle movement, exposure to weather, night operation, noise from aircraft and other vehicles and difficult communications.**

3.2 Ground Support Equipment (GSE) provided by employers is required, when properly used, to be safe, and without risks to the health and safety of employees, contractors, and other persons who may be affected by the equipment operation. Design safety standards place strict safety obligations on GSE designers, manufacturers, suppliers, and purchasers/users of this equipment (employers and employees). These obligations apply to all equipment used in the workplace, whether owned, rented or leased, its maintenance and ultimately its disposal.

IATA AHM913, section 6 AIRCRAFT DAMAGE PREVENTION REQUIREMENTS further states:

*“..GSE manufacturers shall continuously improve equipment design to achieve the goal of eliminating the possibility of aircraft being damaged by ground equipment. The recommendations in this chapter are based on the current state of the art. GSE manufacturers can propose alternative solutions provided analysis shows the same level of prevention or better. **All GSE manufactured after 1 July***

5





TWIGA AERO

AVIATION TRAINING & CONSULTING

2018 shall comply with the aircraft damage prevention requirements of AHM Chapter 9 and with specific focus on the following in order to reduce the risk of damage to aircraft:

6.1 Where enhancements exist, they should be fitted before these dates. Where economically viable, existing GSE shall be retrofitted with the objective of reducing aircraft damage, by complying with the appropriate AHM 900 series document by 1 Jan 2020.”

This goes a long way to facilitate the introduction of standards for GSE interfacing with the aircraft. They are to be fitted from the factory. Older GSE is to be retrofitted with safety devices such as proximity sensors and warning systems to limit the risk of ground damage, especially in respect of composite aircraft such as B787, A350, B737 Max etc.



TWIGA AERO

AVIATION TRAINING & CONSULTING



ISAGO Standards Manual

Effective February 2018



7th Edition

The new ISAGO standards also detail a provision to install safety proximity sensory devices on older GSE and to procure new GSE fitted with the devices from the manufacturer:

*“2.2 GSE Technical Requirements
ORM 2.2.1 The Provider should ensure newly acquired self-propelled GSEs is equipped with proximity sensing and warning devices that provide the capacity to sense the proximity of an aircraft and provide a visual and audible indication to the operator of the GSE's position, to reduce the risk of impact with the aircraft.”*

As we all know what is stated in the current edition of ISAGO as a **should** item, will become a **shall** items in the not-too-distant future. One of the problems faced by GSPs who seek to

retrofit older GSE is to locate the right sensory system that can be fitted to the equipment and that can provide a level of prevention in line with the intention of the IATA AHM and ISAGO standards. In fact, on many older GSE types, manufacturers face difficulties to act on the speed and braking action of the equipment to slow it down to under 1km/hr.¹ or *snail* speed and eventually stop it before the aircraft is impacted. That technology is available.

This raises yet another difficulty faced by many each GSE manufacturers developing their own unique system *in-house*, without a single standard and minimal consideration for the human interface. The ramp equipment operators will still face difficulties as they may be working with similar machines fitted with different types of systems in a single work day. For example, the belt loader fleet may be fitted with different sensory devices depending on the age of the machine, which will result in different parameters and characteristics for the operators to recognize, remember and interface with. This triggers some new questions.

¹ Aerospace Recommended Practice (ARP) 1558





TWIGA AERO

AVIATION TRAINING & CONSULTING

- Are we introducing new operational hazards and risks by not having a single standard human interface for safety sensory devices and the control panels?
- Are all the *bells and whistles too complicated* for operators to distinguish one from another?
- Are we expecting the operators working in an already complex, congested, loud environment under time pressure to perform additional controls and tasks, which may actually lead to damaging the aircraft as a result of the complexity and diversity of the devices, control panels etc. that are mounted on the equipment?

What if a technological solution to capture information that would help understand human behavior in GSE operations were available?

And what if the data could be captured and made available for analysis in line with Safety Management System (SMS) requirements?

Here is some *Food For Thought*.

We will not be able to engineer the human out of the equation, until we remove the human and introduce robotics on the ramp. Although this is being discussed and certainly being worked on in various circles within our industry, it is not yet visible on the ramp. Clearly automated factories, vehicles, warehouses etc. are in operation in other industries. Why not yet in ground operations? And how long do we think it will take for this transformation to take place?

During the 2017 IGHC (IATA Ground Handling Conference), Airbus highlighted the fact that daily about 40 aircrafts are AOG (on-the-ground) as a result of ground damage. Airbus further stated that in the coming years they expect this number to increase to up to 400 aircrafts AOG per day. As more and more aircrafts are built using composite fibres both the duration and costs of the AOGs are likely to increase exponentially due to the complexity of the repair work required. What does all this mean?

8





TWIGA AERO

AVIATION TRAINING & CONSULTING

Competent people using standard, simple operational practices and fit-for-purpose GSE fitted with proximity sensory devices will go a long way to control the damage rates and lower costs all around.

This said, we must understand the human element and related factors better and more must be done in ground operations to implement a true Human Factors program. This has been done in maintenance, flight and cabin operations. A Human Factors program that is based on a peer-to-peer approach, Ground Operations LOSA, (Line Operations Safety Audit), though developed and spelled out in the AHM² since well over a decade, has not made much headway in the Ground Operations arena. And technology is slow to be adopted.

The proximity sensory devices, though available on some GSE, have not yet made a fast entry into the market. A variety of systems using numerous types of technologies ranging from infrared cameras, to radar etc. may well get the job done. But as the variety of systems increase, so does the operator's complexity in interfacing with the systems. It appears no standard designs have yet been thought of or conceived, though the standards are already in place.

Are we as an industry putting the cart in front of the horse?

Let's take a deeper, introspective look and reality check.

- As a CEO or MD of your company, **what keeps you awake at night** in terms of safety risks and exposures relative to aircraft damages, injuries and accidents?
- **Do you know what the costs** associated with those risks are?
- And are you **comfortable with the level of risk mitigation** in place?
- **What kind of analysis does your company** conduct from the reports raised through the SMS?
- What do the **numbers** tell you?

² AHM616





TWIGA AERO

AVIATION TRAINING & CONSULTING

- Is a set of robust, uniform, yet **simple processes and procedures** in place?
- What do your **indicators tell you in terms of the procedural** complexities currently in place from the numerous airline clients a GSP has on their client list?
- Likewise, for airlines, **how successful are the control mechanisms in place** to manage your outsourced GSPs across the networks?
- How are the **human factors** managed within your company?

Most importantly perhaps is how the company can benefit in terms of operational performance, reputation and cost savings by driving **(r)evolutionary** changes and **implementing simple, robust processes, procedures, technology and enhance knowledge.**

Solutions highlighted in the information below have proven to achieve these points in companies ranging from GSPs to airlines and from airport to civil aviation authorities responsible for oversight across the globe.



TWIGA AERO

AVIATION TRAINING & CONSULTING

SOLUTIONS

Learning, Training, Knowledge sharing through Master Classes and specialized training sessions designed to meet specific requirements provides the competence levels to instil a company's *institutional knowledge*. Use the available tools and technology to raise awareness and implement the changes required to achieve the company's strategic goals and targets as relates to safe, reliable, efficient operations. Key points to achieve this are described below.

- **Simplification** is the single, most important driver to achieve excellent results.
- **Analysing** existing data from incoming hazard, near-miss, injury, incident and accident reports drives actionable knowledge

IGOM Implementation Workshop & Training

To address the problem of weak, complex, multiple-standards, processes and procedures, as opposed to robust, simple ones, we assist companies in the implementation of the core, industry process and procedures manual; the IATA Ground Operations Manual (IGOM). Improve operational performance and consistency while reducing safety-related risks.

We help companies conduct a Gap Analysis and lead the Implementation of robust, standard processes across your network.

Risk-Based Approach to Reduce Aircraft Ground Damage

The classic iceberg image shows that numerous near-miss events result in aircraft ground damage, incidents, accidents and serious injuries. This leads to lost time, increased operational and insurance cost and operational inefficiencies. Our *Triple A (Assess, Analyse, Ascend)* combined approach includes proper hazard identification, *risk assessment* and mitigation as well as *root cause analysis* is required to gain intelligence and drive change.

Our Triple A approach and methodology reduces costs, improves your bottom line and has proven to reduce aircraft ground damage by more than 90%.

11





TWIGA AERO

AVIATION TRAINING & CONSULTING

Operational Risk Assessment & Letter of Expertise & Endorsement (ORA LEE)

We conduct an independent risk assessment on the GSE at the point of manufacturing, based on ground operational expertise. In so doing, we simulate a live, operational environment or, if possible, we work directly airside, in a live environment *with the potential or actual GSE client*. We assess the interactions and interfaces between *Human, Machine and Aircraft*. Considering the standards in the AHM, IGOM and ISAGO for the specific GSE, anthropometrics, ergonomics, and many additional points, we render an expert opinion through a Letter of Expertise & Endorsement. A formal report is provided to the manufacturer, which contains all the aspects considered and an evaluation is rendered to identify the positive aspects and those points that can be improved. Only through an independent, expert opinion, can the manufacturer provide the potential clients more than just good pricing, reliability and longevity of the equipment.

Our independent “expert opinion” identifies the key points that distinguish the specific equipment from others and aligns these points to the Operational Risk Assessment & Letter of Expertise & Endorsement. A registered certificate is issued with each ORA LEE.





TWIGA AERO

AVIATION TRAINING & CONSULTING

Install Proximity Sensory and Warning Devices

Though manufacturers strive to achieve the best sensory devices to achieve the new IATA standards, some clearly stand above the rest. Such is the case for the TRILOGICAL Aircraft Damage Prevention System (ADPS). Besides the simplicity of the sensory devices and the option to mount the ADPS 'kit' to just about any existing GSE as a retrofit, the system is intelligent. Using a series of technological solutions tested and proven in harsh environments, some of which are so durable and reliable, they are used in military applications. The system actually captures data that can be translated into human behavioral patterns. This gives way to a new range of *analytical possibilities within the framework of the SMS and Just Culture* that can help drive the Safety Assurance program, lower costs of recurring accidents and costly aircraft damages. Possibly one of the best aspects of the TRILOGICAL ADPS is the fact that not only can it be mounted as a retrofit on older GSE with all of the functionalities of a similar system fitted to the newest GSE. It can also be installed from the manufacturer as an integral part of the original GSE. This feature gives way to a sensory device system that is harmonized across the GSE fleet, making it easier for the operators to transition from one piece of equipment to another given the standard human interface across different GSE types and brands.

Features



Full sensors kit mounted on GSE



Control GSE speed: Tortoise mode, snail mode and full stop



Indication panels for driver and GSE surroundings



Disable GSE after accident for supervision



Send accident alert by SMS/ email



Operator ID to operate GSE



Full accident report with Flight No, Operator, GSE, location, etc.



Record all accidents/ prevented accidents for training & analysis

Tri-Logical Technologies Ltd.
sales@trilogical.com | support@trilogical.com

www.trilogical.com

Snapshot of the TRILOGICAL ADPS No Touch Policy system features





TWIGA AERO

AVIATION TRAINING & CONSULTING

Implementing a Ground Operations Human Factors Program

Safety always has a cost. Either that cost is paid upfront in terms of prevention, or it is paid after the accidents, injuries and aircraft damages happen. The astronomical figures for aircraft ground damage stimulate reflection in search of *a cure*. Flight, Cabin crew and Aircraft Maintenance Engineers have long benefitted from Human Factors programs. Given the high costs associated with aircraft ground damage, is it not high-time to leapfrog ahead of the competition and run a different race? Implementing a Ground Operations Human Factors program (GOHF) is not only simple, it has proven to reduce costly aircraft damages by as much as 90%.

Though our proven methodology, we assist companies to implement GOHF programs as a way to reduce risk exposures and safety-related costs, increase operational efficiency and revenue by attracting client airlines to work with the safer GSPs.

Preparation & Implementation, New Model ISAGO

According to IATA statistics, companies that have undergone the ISAGO audit have an increased *voluntary reporting rate* for ground damages. This points to the healthy reporting culture in place in those companies.

Non-ISAGO registered companies show that 70% of the aircraft damages *are found as opposed to reported*, indicating a considerably lower level of Safety Just Culture is in place. Is the time not right to strive and achieve a higher level of control that enables the senior executives to ensure consistent, robust and reliable operations?

We collaborate with companies to implement the IATA Safety Audit for Ground Operations (ISAGO) using a methodology that has been proven time and again. GSPs that are ISAGO registered are better aligned with their airline clients, a majority of which undergo the IATA Operational Safety Audit (IOSA) program.



TWIGA AERO

AVIATION TRAINING & CONSULTING

CONCLUSION

With the rising \$12B cost of aircraft ground damage, injuries and accidents, the time is right to apply concrete solutions that deliver results against negative trends.

Although many initiatives are underway to address the problems, little or no work has been done to collect the required data that concerns all of ground operations. This includes collecting *human factors* data points in ground operations. In this regard, much work is yet to be done. *Understanding the human factors driving the accidents, will empower management decisions that are good for the GSPs, the airlines and equally so for the employees.*

Simplification is the single, most important driver to achieve excellent results. *Implementing the IGOM standards in an organization simplifies operations, reinforces conformance to procedures and standards while driving costs down and enhancing operational performance output.*

Implementing systems, SMS, QMS, RMS and GOHF remains a largely misunderstood dilemma, with many still considering the systems fully implemented once the documentation is completed and shelved. Our proven approach is radically different and focuses on practical implementation.

Convinced that the *solve-it-all* is an audit program, we must consider the implementation of standard processes and procedures to simplify and streamline operations and *verify the same through standard audit programs*, specifically developed for ground operations. *Checking those standards are in place is best done through the implementation of the ISAGO audit.*

All things considered, though perfection is unrealistic, without aiming for a high place, the industry will continue footing the increasing, annual costs of \$12B in aircraft ground damage and ancillary injuries and accidents.

15





TWIGA AERO

AVIATION TRAINING & CONSULTING

ADDITIONAL RESOURCES

If you would like to know more on our approaches to reducing aircraft ground damage, injuries and accidents, implementing systems, understanding human factors in ground operations, using ADPS and much more, please contact us:

www.twigaaero.com ,
Brenda.arem@twigaaero.com
+66 80 808 4836

Maurizio.anichini@twigaaero.com
+66 84 361 7311

FOR MORE INFORMATION

www.twigaaero.com ,

Contact:

Brenda.arem@twigaaero.com
Maurizio.anichini@twigaaero.com

© **Copyright Information** 2018, TWIGA AERO Ltd. All Rights Reserved

