

(R) Aircraft Damage Caused by Ground Support Equipment

RATIONALE

A complete revision to this report was made to remove detailed statistical information that was obsolete. The detailed information has been replaced with general statements concerning aircraft damage caused by ground support equipment.

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1. SCOPE

Only those incidents where a piece of ground support equipment directly associated with the "turnaround" servicing of an aircraft was involved are reviewed. Specifically excluded are those incidents that occurred during heavy maintenance, overhaul activity, or aircraft taxiing.

1.1 Purpose

This SAE Aerospace Information Report (AIR) summarizes aircraft damage, coupled with contributory factors, caused by GSE. It also offers recommendations in reducing exposure to aircraft damage.

2. REFERENCES

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 Applicable Documents

2.1.1 SAE Publications

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AIR1375	Minimum Safety Requirements for Special Purpose Airline Ground Support Equipment
ARP1247	General Requirements for Aerospace Ground Support Equipment, Motorized and Nonmotorized
ARP1287	SAE Standards for Use in the Design of Aerospace Vehicular Ground Equipment
AIR1558	Interface Protective Devices - Ground Equipment to Aircraft
ARP4084	Aircraft Ground Service Connections Locations and Type

2.1.2 IATA Publications

Available from International Air Transport Association, IATA, 800 Place Victoria, Montreal, Quebec, Canada H4Z 1M1

Airport Handling Manual

AHM 612	Recommendations for Airside Safety Performance Audits
AHM 630	Safe Operating Practices in Aircraft Handling
AHM 631	Safety Considerations for Aircraft Movement Operations
AHM 910	Basic Requirements for Aircraft Ground Support Equipment
AHM 913	Basic Safety Requirements for Aircraft Ground Support Equipment
AHM 914	Compatibility of Ground Support Equipment with Aircraft Types
AHM 997	Standard Operating Procedures for Ground Support Equipment

2.1.3 ISO Publications

Available from the American National Standards Institute (ANSI).

ISO16004:2000 Passenger Boarding Bridge or Transfer Vehicle – Requirements for Interface with Aircraft Doors.

ISO10842:2005 Aircraft Ground Service Connections – Locations and Types

3. GENERAL

The quantity of ground support equipment (GSE) required on the ramp to support air carrier operations continues to increase every year. The size and technical complexity of the aircraft and associated ground equipment also continues to increase. Additionally, in order to maximize the revenue potential for the air carriers, aircraft ground times are kept to a minimum.

The combination of these factors along with often overcrowded airport ramps contribute to serious safety concerns for the world's air carriers every day. Economic losses from aircraft damage caused by ground support equipment amount to millions of dollars annually.

Research by the IATA Airside Safety Group has determined that there is also a significant contributory factor in damage to aircraft resulting from the incompatibility of ground support equipment with aircraft.

Each aircraft type has specific areas on its structure which, by location, are particularly susceptible to damage by ground support equipment and, therefore, in order to avoid damage, must receive special consideration. These areas include wings, flap track fairings, nose gears, engine cowlings, doors, wing-to-body fairings, sensors, antennae, drain masts, etc.

In order to achieve maximum efficiency and cost-effectiveness, ground support equipment is generally cross-utilized over a variety of aircraft types, however, in so doing the equipment itself often becomes incompatible with the particular type of aircraft being serviced.

This universality of use poses significant hazards in aircraft/mobile ground support equipment interface.

4. SUMMARY OF AIRCRAFT DAMAGE AND CONTRIBUTORY FACTORS - BY TYPE OF GROUND SUPPORT EQUIPMENT

The order in which the equipment is listed is from that of the highest involvement in aircraft damage to that of the lowest involvement.

4.1 Baggage/Cargo Carts and Dollies

Damage occurs when baggage/cargo carts are pushed or towed into position at the cargo compartments and make contact with fairings, engine cowlings, and the fuselage. Unit load devices being transported on container/pallet dollies also come into contact with fairings and the fuselage when being positioned to the loaders at the aircraft. Of significance is the high number of incidents resulting from carts "running away". Contributory factors include:

- a. The height of covered carts and of dollies with ULDs in relation to fairings, engines, and fuselage appendages.
- b. The tracking and turning radius of these units when maneuvering around aircraft.
- c. Units having defective brakes being moved by wind or jet blast or being parked on a slope.

4.2 Container/Pallet Loaders

Nearly all the incidents occur as the units are positioned into or removed from the cargo compartments of the aircraft. Other damage is incurred when the aircraft doors are closed and make contact with the platform or railings of the loader. Contributory factors include:

- a. The size of the units in conjunction with the restricted maneuvering area in which they operate.
- b. Incorrectly configured "wings" or "extensions" utilized on the forward platform to enable the unit to mate with the sill of the aircraft.
- c. Position of guiderails and side safety rails that protrude into the arc of travel when opening/closing aircraft doors.
- d. Incorrect height of loader during closing and opening of aircraft doors.

4.3 Elevating Catering/Cleaning Trucks

The majority of accidents with this equipment occurs during final positioning at the aircraft with both the door and surrounding fuselage area being damaged. Other damage is caused when the units are backed away from the aircraft and the trailing edge of the wing is struck. Contributory factors include:

- a. Restricted visibility from the operator's position when approaching/departing the aircraft caused both by the height of the unit as well as extension platforms fitted over the operator's cab.
- b. Position of platform side safety rails that protrude into the arc of travel when opening/closing aircraft doors.

4.4 Ramp Tractors

This extremely mobile piece of equipment makes contact with various parts of the aircraft: engines, wings, and fuselage. It is worth noting that in general there is not an operational necessity for this equipment to get particularly close to the aircraft. Contributory factors include:

- a. Operators maneuvering the units too close to the aircraft.
- b. Vehicles being left unattended with the engine running, and either not having brakes set or the brakes having inadequate holding capability, allowing the vehicle to roll into the aircraft.

4.5 Passenger Loading Bridges

Aircraft doors suffered the most damage, however, devices on the fuselage, such as strakes, pitot tubes, etc., are also frequently damaged. Contributory factors include:

- a. Improper bridge operation (over 50% of the incidents fall in this category).
- b. Equipment malfunction with defective automatic levelling devices being most prevalent.
- c. Interference with sensors and probes located close to the aircraft door. Reference ISO 16004:2004

4.6 Belt Conveyors

Damage caused by this equipment occurs at all phases of the operation; i.e., positioning, loading/unloading, and removal. Contributory factors include:

- a. Operators misjudging the width of the boom in relation to the size of the aircraft door opening.
- b. Operators depressing the accelerator pedal instead of the brake pedal.
- c. Units positioned on an angle and turning when removed.
- d. The length of the side safety railing in relation to the curve of the aircraft fuselage.

4.7 Passenger Stairs/Steps

The final positioning of this equipment at an aircraft has particular problems, particularly on wide-body aircraft. As a result, damage is incurred to the doors and surrounding area. Damage is also caused when the equipment is driven in an elevated condition and contact is made with aircraft wings. Settling of aircraft onto the upper platform of the stairs is also a significant cause of damage. Contributory factors include:

- a. Restricted visibility from the operators position when approaching/departing the aircraft caused both by the height of the unit and the platform fitted over the operators cab.
- b. Position of platform side panels that protrude into the arc of travel when opening/closing aircraft doors.

4.8 Tow Tractors/Towbars

Most accidents with this equipment combination occur during the pushout phase of the operation as a result of tow bars or shear pins breaking and the tow bar striking the nose gear assembly or gear doors. Contributory factors include:

- a. Actions by the equipment operator
 1. Shifting into the wrong gear
 2. Applying too much gas during hook-up or start of pushout
 3. Foot slipping off the brake pedal
- b. Utilizing the inappropriate capacity tractor and / or towbar for the task to be performed.

4.9 Ground Power Units

Damage is generally confined to the aircraft connection points and the immediate surrounding area. Contributory factors include:

- a. The failure to remove cables from connection points before the units are moved away from the aircraft.
- b. The failure to perform a walkaround check of the unit.

4.10 Lavatory/Water Service Units

The general design of this equipment normally requires that they be reversed into the servicing position. Damage is incurred to areas adjacent to the servicing panel and under the fuselage on wide-body aircraft. Contributory factors include:

- a. The failure to utilize a guideperson when backing up to the servicing position on the aircraft.
- b. The failure to disconnect servicing hoses before moving the unit away from the aircraft.
- c. The failure to perform a walkaround check of the unit.

4.11 Fueling Units

The majority of incidents with this equipment occurred during the positioning of the units at the aircraft when contact was made with engines and wings. Vehicles moving during the fueling process or with elevated operator platforms not being lowered are other causes of damage. Contributory factors include:

- a. The size and height of the vehicles.
- b. The failure to disconnect servicing hoses before moving the unit away from the aircraft.
- c. The failure to perform a walkaround check of the unit.

4.12 Other

Just about all types of other GSE become involved in damage to aircraft but not at the same frequency as the GSE outlined above. A notable exception to this, however, are passenger coaches/buses and automobiles/vans which when put into a combined category make them the ninth highest pieces of GSE involved. Damage caused by this equipment is principally to aircraft wings and engines.

5. FINDINGS

An analysis of accident reports reveals a number of factors that are principal contributors to aircraft damage. These are:

- a. Operator training and qualifications
- b. Operating procedures
- c. Equipment design
- d. Maintenance condition/equipment malfunction
- e. Work/environmental conditions
- f. Aircraft design
- g. Management involvement