

MIFACE INVESTIGATION REPORT: #08MI169

SUBJECT: Air Museum Volunteer Died From Complications of a Head Injury Sustained After Falling From an Aircraft Tug

Summary

In the late summer of 2008, a 70-year-old male air museum volunteer died from complications of a head injury sustained when he fell from an aircraft tug. He was the crew leader of a three-person ramp crew. The tug was traveling westerly at below five miles per hour toward an airport taxiway. The tug had a front seat designed to accommodate two individuals. The decedent was positioned on the back of the tug in an area behind the front seat that was designed for equipment storage. He was in a squat position with his right side against the seat frame. He held on to the seat frame to maintain his position. The



Figure 1. Aircraft tug and squatting position of decedent on back of tug

decedent was wearing a baseball cap. It is postulated that a gust of wind began to blow the cap off of his head. In his attempt to keep his cap, the decedent released his hands from the seat frame, stood up and reached for it as it blew off. He lost his balance and fell to the tarmac on the driver's side of the tug. The tug stopped immediately and radioed for assistance. Emergency response personnel were on scene within one minute. They initiated treatment, and then the decedent was transported by helicopter to a nearby hospital. He died eight days later from complications of the head injury sustained at the time of the fall.

RECOMMENDATIONS

- Air museum staff should update the Ramp Crew Safety Manual to:
 - Adopt a “No Seat – No Rider” policy,
 - Comply with requirements of MIOSHA General Industry Safety and Health Standard, Powered Industrial Trucks, Part 21 and,
 - Include industry best practices.
- Volunteer organizations, such as this air museum, should develop and implement a safety and health program that includes a safety policy, safe work practices and procedures, hazard assessment, volunteer training, and checklists to assist all members in the safe performance of their duties.

INTRODUCTION

In the late summer of 2008, a 70-year-old male air museum volunteer died from complications of a head injury sustained when he fell from an aircraft tug. MIFACE was notified of this fatal incident by a newspaper clipping. On August 6, 2009, the MIFACE researcher interviewed the president of the air museum. During the course of writing this report, the police report, death certificate, and the medical examiner's death scene investigation report were reviewed. Pictures used in Figures 1 and 2 were taken by the MIFACE investigator at the time of the site visit. Pictures have been modified to remove identifiers.

The air museum was staffed by approximately 250 volunteers. The museum functioned by operational committees. Volunteers selected work tasks based upon their interests. The decedent had chosen to be a member of the ramp crew. The ramp crew functions include directing, moving and parking aircraft, helping to fuel the aircraft, helping the aircraft crew as necessary, and interacting with the public at museum events.

The decedent developed the museum's Ramp Crew Safety Manual that was revised in 2008. The manual included aircraft marshalling instructions, ground vehicle operations, pacing wingspans, aircraft signaling, ramp crew policies, evaluation forms, job description checklist, fire extinguisher and tow bar operation instructions. The manual did not include a prohibition of riding on the back of the aircraft tug.

At both the monthly general membership meetings and at museum staff meetings safety was not generally on the agenda. Operational committees discussed safety issues only when an issue arose. Most volunteers who worked with aircraft restoration were craftsmen and used the same knowledge and skills as volunteers as they did during the course of their paying jobs or when actively employed; therefore, the museum assumed that the workers knew how to work safely. Operational committees held orientation meetings for new volunteers. These orientation meetings did not regularly discuss safety issues unless relevant to the work being performed. Because of the importance of maintaining both the safety of the aircraft and the public, the ramp crew had an extensive orientation and training program that highlighted the importance of following Federal Aviation Administration (FAA) signaling, aircraft movement and towing procedures, emergency procedures, driving on airport grounds, etc.

The decedent had been a member of the ramp crew for approximately 20 years. He was designated as the ramp crew team leader due to his experience and demonstrated knowledge of ramp crew tasks and procedures. The team leader must demonstrate to the head manager of the ramp group that he/she can adequately perform ramp crew tasks, including knowing appropriate FAA rules and hand signals.

Each ramp crew trainee had a designated ramp crew training officer oversee his/her training. The trainee received extensive on-the-job training. The trainee must attend ramp safety classes, and must demonstrate, as recorded on an evaluation form, thorough knowledge and understanding of work procedures. After working at least six officially

approved events, the trainee may apply for qualification to work on the ramp crew. The ramp crew training officer observed the individual perform specific job tasks, including demonstrating proficiency working with all types of aircraft likely to be encountered during sanctioned events. The training officer completed a qualification checklist. If the individual successfully completed this segment of the testing, he/she must also apply for the airport's ramp pass as a requirement for "qualification." To receive an airport ramp pass, the airport required workers to pass a written test of FAA rules and regulations.

The ramp crew uniform consisted of a bright orange shirt embossed with RAMP CREW, khaki pants or shorts, a navy blue baseball cap with the air museum patch on the front and comfortable shoes.

Additional training had been provided to selected air museum personnel because they were members of the metropolitan disaster response and recovery team. They had meetings with a nearby airport for this task and participate in catastrophe exercises. All of the volunteer security individuals had First Aid, CPR and defibrillator training.

Remediation

Air museum personnel have spray painted the back of each tug with "No Riders on Back of Tugs."

Air museum personnel have brought this unsafe work practice (riding on the back of aircraft tugs) to the attention of volunteers working for other organizations when at sanctioned events.

INVESTIGATION

Many planning meetings had been held by the museum staff organizing the sanctioned event. The decedent had attended several of these meetings. He had taken a leave of absence from volunteering for personal reasons, and was becoming involved again in museum activities.

The aircraft tugs can either push or pull an aircraft to a designated area using a tow bar appropriate for the aircraft. The tug had a front seat designed for two passengers. At the back of the tug is an area for storage of equipment, such as wheel chocks and signaling wands, and the



Figure 2. Back of aircraft tug showing storage area and rider warning

attachment point for the tow bar. The tug did not have a suspension system or seat belts for the front seat passengers. The tug operated at a speed less than 5 mph.

The decedent arrived at work on the day of the incident at 7:00 a.m. The hours of the event were 9:00 a.m. to 5:00 p.m., but the ramp crew was required to stay until all aircraft were positioned for the evening. The incident occurred on the second day of the event. The decedent was assigned as the ramp crew leader. The ramp crew had three members. His ramp crew had completed towing aircraft from the ramp area, where both planes and spectators were positioned, to the taxiway. Once on the taxiway, aircraft were expected to taxi to the airport runway for take-off. If an aircraft turned back to the ramp, the pilot was indicating that there was a problem with the aircraft and that the aircraft required ramp crew assistance to tow the aircraft back to the ramp.

On the day of the incident, the ramp crew noted that an aircraft turned back toward the ramp. The decedent's ramp crew responded to assist the aircraft. Two individuals were seated in the front seat and the decedent was positioned on the back of the tug, squatting in the storage area. He was facing the driver's side; his right side was leaning against the back of the front seat. He held onto the seat frame for balance. The 10- to 11-foot tow bar was attached to the back of the tug.

The tug drove east at approximately two to three miles per hour from the ramp area toward the taxiway. At the junction of the ramp and the taxiway was a security checkpoint. The tug driver and crew checked in with security, coasting through the checkpoint. The driver then accelerated toward the aircraft.

The MIFACE researcher checked the weather conditions for the time of the incident. The weather conditions were noted for a 10-minute interval encompassing the actual time of the incident. Weather conditions were: West North West winds between 17.3 mph and 18.4 mph, with gusts between 23.3 mph and 27.6 mph. The temperature was approximately 67 degrees F.

It is postulated that while the tug was accelerating, a gust of wind caught the brim of the decedent's baseball cap and lifted the cap off his head. The decedent stood up from his squatting position in an attempt to grab his cap. He lost his balance and fell from the tug, and landed on the driver's side of the tug. He fell onto his side, then back, and struck the left side of his head on the pavement. The decedent was knocked unconscious from the impact. The tug stopped prior to reaching the end of the 10- to 11-foot tow bar.

A doctor, nurse, and ambulance were contracted to be on site for the event. Both the security personnel and ramp crew called for emergency assistance on the museum-issued radios. It took emergency response approximately one minute to arrive and begin emergency treatment. After on-site treatment, he was flown by helicopter to a nearby hospital. The decedent died eight days later from the injuries sustained.

Police investigation found no defects of the taxiway pavement or on the handle on the tug defective. The decedent's tennis shoes were in good condition.

CAUSE OF DEATH

The cause of death as listed on the death certificate was craniocerebral trauma. No toxicological tests were performed at the time of autopsy.

RECOMMENDATIONS/DISCUSSION

- Air museum staff should update the Ramp Crew Safety Manual to:
 - Adopt a “No Seat – No Rider” policy,
 - Comply with requirements of MIOSHA General Industry Safety Standard, Powered Industrial Trucks, Part 21 and
 - Include industry best practices.

The front seat provided space for two passengers. The manual does not contain a statement prohibiting more than two passengers (riders) on the tug (No Seat – No Rider policy). The work practice observation evaluation form also did not address a trainer observing more than two individuals riding on the tug.

MIOSHA General Industry Safety Standard, Powered Industrial Trucks, Part 21 provides safety rules for the care and use of powered industrial trucks and operator safety. The aircraft tug is considered to be an “industrial tractor” by MIOSHA. An industrial tractor is a “truck designed primarily to draw one or more non-powered trucks, trailers or other mobile loads.” Part 21’s Appendix A, Figure 5, and reproduced as Drawing 1 illustrates the type of vehicle included in this definition.

The current manual extensively covers some, but not all of the MIOSHA Part 21 requirements. The Manual includes: employee responsibilities (Rules 2171-2182), operator training (Rule 2152), operator testing (Rule 2153), moving trucks (Rules 2183-2192), and loading safety, such as attaching tow bars (Rule 2193). The manual does not include MIOSHA’s minimum requirements for operator selection (Rule 2151) and operator permits (Rule 2154).

MIFACE recommends that the Ramp Crew operational division review the MIOSHA Powered Industrial Truck standard and update the Ramp Crew safety manual, including the observational checklists to include the missing MIOSHA requirements.

As an additional resource for the Ramp Crew operational division, the Flight Safety Foundation (FSF) in 2003 launched a Ground Accident Prevention (GAP) program for commercial operations. The goals of the GAP program was to develop information and

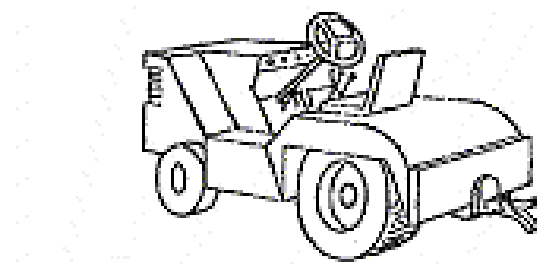


Fig. 5 –Industrial Tractor

Drawing 1. Industrial Tractor,
MIOSHA Part 21, Appendix A,
Figure 5

products — e-tools — to eliminate accidents and incidents that: (a) occur on airport ramps (aprons) and adjacent taxiways, (b) during the movement of aircraft into and out of hangars, and (c) directly affect airport operations and/or result in personnel injuries or damage to serviceable aircraft, facilities or ground-support equipment.

The GAP e-tool includes three videos, a Ramp Operational Safety Procedures – A Template for Ramp Supervisors, and Tip Sheets. The three videos are titled: Best Practices for the Safe Use of Aircraft-Tow Vehicles, Best Practices for Safely Towing Aircraft, and Best Practices for General Ramp Safety. The GAP e-tool can be found at: <http://www.flightsafety.org/gap.html>

Another resource for the Ramp Crew operational division is the National Business Aviation Association (NBAA). The NBAA Safety Committee developed a PowerPoint presentation *Ground Damage Prevention* <http://www.nbaa.org/ops/safety/hangar/aircraft-ground-damage-prevention.ppt>. The PowerPoint identifies risks and exposures to aircraft and personnel and how to manage and prevent the exposures.

- Volunteer organizations, such as this air museum, should develop and implement a safety and health program that includes a safety policy, safe work practices and procedures, hazard assessment, volunteer training, and checklists to assist all members in the safe performance of their duties.

As the MIFACE researcher accompanied the air museum on a tour of the museum, many work tasks were observed, such as welding and cutting, wood working, painting, metal cleaning, etc. The air museum staff relies on the pre-existing safety knowledge of its volunteers, especially those volunteers performing in a “skilled trade” type task. The difficulty in relying on the experience a worker brings to a task is that experienced workers could have developed unsafe work practices, become comfortable or complacent, or be using their work skills in a new setting and be unfamiliar with new hazards. Chemical safety, personal protective equipment, machine safety, electrical safety, compressed gas safety, ladder safety; all were safety issues observed during the MIFACE site visit which could be addressed in a safety and health program. MIFACE recommends that the organization develop a comprehensive safety and health program, or safety management system, that addresses management leadership and employee involvement and conduct a workplace analysis including hazard assessment. The hazard assessment will provide information to develop hazard prevention and control strategies and volunteer (and paid staff if indicated) safety and health training and education.

Like the Ramp Crew group, each air museum operational working group should develop safe work practices and procedures to reflect the nature of their working environment and job tasks. The operational group leaders, with the assistance of their volunteers, should evaluate tasks performed, identify all potential hazards, and then develop, implement, and enforce safe work procedures, conduct necessary training, and periodically evaluate the effectiveness of the hazard mitigation addressed by the procedures.

Air museum staff should include safety as a standing item on the staff and general membership meeting agendas. Including safety topics at both staff and general membership meetings will show the museum's commitment to providing a safe workplace for the volunteers, as well as provide an opportunity for input from volunteers on issues that impact their safety. Minutes should be maintained that document the discussion and follow-up action(s) to be taken to address the safety issue.

MIOSHA health and safety standards as well as best industry practices can be utilized to support this effort. MIOSHA Consultation, Education and Training Division has many resources for an organization to use and adapt to their needs. The Non-Profit Risk Management Center has an online tutorial and an online safety and health toolkit to assist non-profit organizations in the development and implementation of a health and safety program.

REFERENCES

MIOSHA standards cited in this report may be found at and downloaded from the MIOSHA, Michigan Department of Energy, Labor & Economic Growth (DELEG) website at: www.michigan.gov/mioshastandards. MIOSHA standards are available for a fee by writing to: Michigan Department of Energy, Labor & Economic Growth, MIOSHA Standards Section, P.O. Box 30643, Lansing, Michigan 48909-8143 or calling (517) 322-1845.

- MIOSHA General Industry Safety and Health Division, Powered Industrial Trucks, Part 21
- Flight Safety Foundation, Ground Accident Prevention e-tool. <http://www.flightsafety.org/gap.html>
- National Business Aviation Association (NBAA) Ground Damage Prevention. <http://www.nbaa.org/ops/safety/hangar/aircraft-ground-damage-prevention.ppt>
- Non-Profit Risk Management Center. Workplace Safety Is No Accident, An Employer's Online Toolkit to Protect Employees and Volunteers. <http://nonprofitrisk.org/tools/workplace-safety/workplace-safety.shtml>
- Vintage Flying Museum Safety Management System. <http://groups.google.com/group/ftwasp/web/vintage-flying-museum-safety-management-system>
- Weather underground history for incident day <http://www.wunderground.com/>

Key Words: Aircraft tug, Industrial tractor, Volunteer, Fall

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To improve the quality of the MIFACE program and our investigation reports, we would like to ask you a few questions about this report:

What was your general impression of this MIFACE investigation report?

Excellent 1	Good 2	Fair 3	Poor 4		
		Excellent	Good	Fair	Poor
Was the report...		1	2	3	4
Objective?		1	2	3	4
Clearly written?		1	2	3	4
Useful?		1	2	3	4
Were the recommendations ...		Excellent	Good	Fair	Poor
Clearly written?		1	2	3	4
Practical?		1	2	3	4
Useful?		1	2	3	4

How will you use this report? (Check all that apply)

- Distribute to employees/family members
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Thank You!

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