

Teamwork in Motion



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Flight crews play a pivotal role in safety during business jet towing and parking.

BY WAYNE ROSENKRANS

Aircraft damage that delays or cancels flights prompted Dassault Falcon Customer Service in France to investigate causal links between aircraft towing and ramp accidents. The company's data analysis in early 2007 confirmed that such events are a major cause of flight schedule disruptions.

"Most events are preventable: Systematic precautions, patience and careful handling may avoid personnel injury and expensive repairs," Dassault said in a service advisory.¹ "These best practices are applicable to any personnel using a vehicle in the vicinity of an aircraft such as a tug, truck, limousine, airport vehicle, etc."

Events from the first quarter of 2000 through the first quarter of 2007 were used to develop the advisory and to help raise industrywide awareness. "The 68 events studied are the number of occurrences for which we had a sufficiently detailed description of the event for our analysis," says Pascale Heitz, Falcon 900-series support program manager. The importance of avoiding such events was emphasized by the fact that 44 events (65 percent) occurred away from the operators' home bases, where the consequences are more difficult to handle.

An internal alerting system sounded the alarm when delayed/cancelled flights for the Falcon fleet increased after 2003 to an overall

rate of about 10 towing/parking events per year. "In the last 12 months, towing incidents have been the number one cause of delayed/canceled flights on the Falcon 900EX EASy aircraft, with three occurrences out of the approximately 70 aircraft in service," Heitz said.

Heitz believes that the problems should receive wider attention for several reasons. "The trend most probably is similar for other business jets, as most events occur outside home base — that is, generally involving a tow vehicle not maneuvered by the Falcon operator — and the number of towing incidents involving two aircraft was significant," she said.

When towing/parking events occur, immediate consequences can include the need for extensive repairs in an urgent aircraft-on-ground scenario, plus a sudden requirement for alternate transportation. "For Falcon aircraft, a substitute airplane costs about US\$4,000 per flight hour, so it is a big expense for the operator if the aircraft takes some time to be repaired," Heitz said.

Injuries, while rare, also have been a significant consequence — especially injuries to ground service personnel or bystanders. "We may have to report the event to our airworthiness authorities and follow up to review if we could improve something in our documentation, communication, design or training," she said.

Flight crews add a line of defense against towing mishaps if they not only observe FBO personnel but check their equipment and familiarity with aircraft-specific procedures.

Causal Categories

Company analysts assigned the following causal categories:

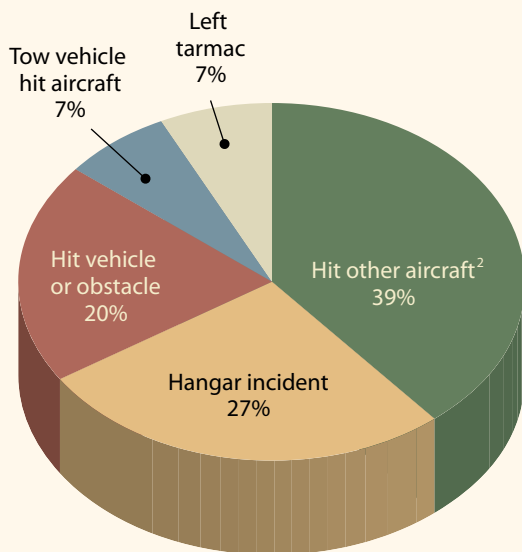
- The most common example of 24 *maneuvering error* events was a towed aircraft striking a parked aircraft (Figure 1) — often inside a hangar. Variations included the towed aircraft striking the hangar door or a parked vehicle or the tow vehicle striking the towed aircraft, or the tow vehicle operator moving the towed aircraft off the tarmac.
- When the 22 *torque-link connected* events occurred, the nose

landing gear leg or the nose-wheel steering system typically was damaged because of failure to disconnect the nose landing gear torque link prior to towing. Falcon aircraft require this step because the turn radius of the gear will be exceeded if the torque link remains connected.

- When the eight *incorrect towbar installation* events occurred, the aircraft typically struck the tow vehicle. In one example, the towbar was not secured to the tow vehicle, so it dropped out of position when towing began.

- When the four *broken towbar* events occurred, the issue typically was failure to carefully inspect the towbar condition prior to using it. In one example, the towbar broke into two pieces, and the aircraft then struck the tow vehicle.
- When the four *parking brake left on* events occurred, the aircraft parking brake was not released, and usually the parking brake was damaged.
- When the two *turn radius exceeded* events occurred, the nose landing gear leg or nosewheel steering typically was damaged because on the Falcon 900EX EASy, when the nose gear torque link is not connected, the turn radius is limited to 100 degrees.
- When the one *chocks removed too early* event occurred, the aircraft rolled into another aircraft after the chocks were removed before towing began.
- When the one *improper tug* event occurred, the aircraft rolled into the tug because the tow vehicle selected had insufficient power, causing its towbar shear-pin to break and disconnect from the aircraft.
- When the one *tow vehicle left with brake off* event occurred, the tug rolled away from its initial position with the aircraft still connected, and the towed aircraft struck another aircraft.
- When the one *towbar hit aircraft* event occurred, the tow vehicle operator inadvertently struck the aircraft with the towbar while connecting to the aircraft.

Maneuvering Errors During Towing¹



Notes

1. Maneuvering errors that occurred during towing of Dassault Falcon aircraft were identified in the manufacturer's worldwide report database from first quarter 2000 through first quarter 2007. A total of 68 towing/parking events in the database were deemed to have sufficient detail for categorization and safety analysis.
2. Assigned subcategories of maneuvering error were: *hit other aircraft*, which means the towed aircraft struck another aircraft that was parked, and damaged parts often were the wing tips, but sometimes were the horizontal stabilizer tip, gear door, etc.; *hangar incident*, which means all events occurring in a hangar, including striking another aircraft, and in most cases, the aircraft struck the hangar door or struck another part of the hangar itself; *hit vehicle or obstacle*, which means that the aircraft struck a vehicle such as a car or fuel truck or an obstacle such as a fence; *tow vehicle hit aircraft*, which means any event in which this was the type of contact; and *left tarmac*, which means that the towed aircraft departed from the tarmac because of error by ground personnel.

Source: Dassault Falcon Customer Service

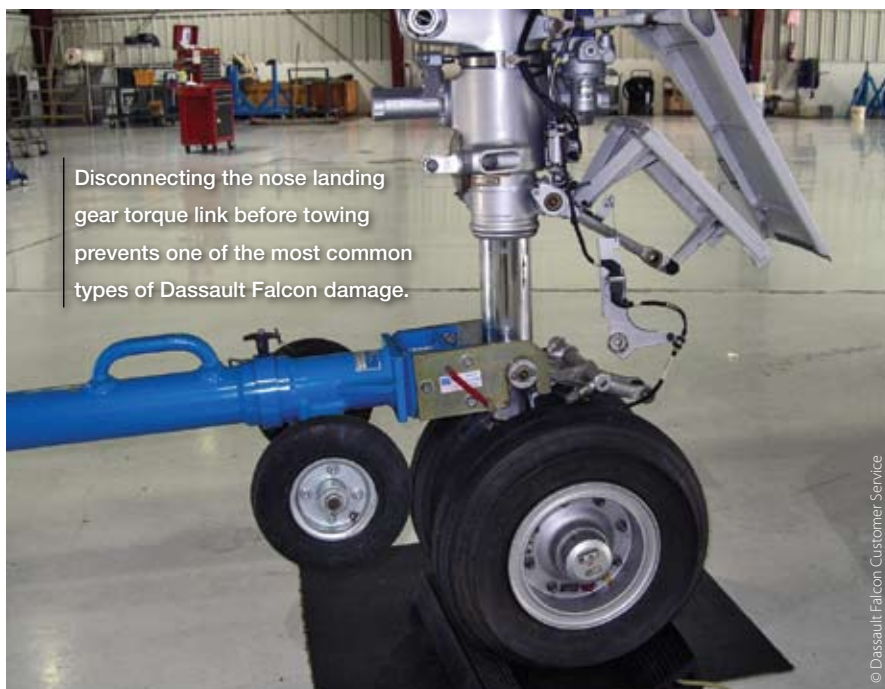
Figure 1

Typical Examples

In developing the advisory, the analysts considered these case studies among others:

- “According to the customer, as the aircraft was being pushed back, the aircraft disconnected from the towbar (the towbar head pin had not been installed). The disconnect happened when the tug’s brakes were applied to stop the aircraft. Upon disconnect, the customer’s aircraft continued to roll toward another parked aircraft. The tug driver jumped off the tug and put a chock under the Falcon’s tire path; this stopped the Falcon. Unfortunately, the tug continued to roll toward the Falcon. Seeing this, the tug driver tried to stop the tug but was unable to. The tug rolled into the nose gear doors on the Falcon.”
- “The aircraft was towed with the steering connected. A very sharp turn was made to turn the aircraft around when a ‘loud pop’ was heard from the nose gear.” The operator was reminded to comply with the *Dassault Falcon Ground Servicing Manual* during towing operations and a maintenance procedure to check for any damage following an accident/incident.²
- “The aircraft needed to be moved on the ramp. The [flight] crew was not around at the time, and the main entrance door was locked. [The aircraft] was towed approximately 50 yd (46 m) with the parking brake set.”

The aircraft crewmember’s close involvement is critical in reducing towing/parking events, Dassault believes. “Close



involvement” means that the flight crew takes time to check the equipment used by the fixed base operator (FBO), verifies that the FBO’s personnel are familiar with the specific towing/parking procedures for the aircraft type, and remains in the vicinity of the aircraft until it has been stopped and chocked on the parking stand. The parking brake may remain released while a Falcon’s wheels are chocked, especially for overnight parking. Another recommendation is to verify that safety cones with high-visibility color and retroreflective tape have been placed immediately after parking to attract ramp vehicle drivers’ attention.

“A copy of the *Ground Servicing Manual* should always be kept on board the aircraft,” the advisory said. Heitz added, “The goal is to reduce the risk by ensuring that the towing personnel are aware of the Falcon towing procedure, providing them with a manual if necessary.”

Manuals provide the aircraft-specific towing procedures for use of a shear pin-fitted towbar or a towbar-less aircraft tow vehicle.³ Operators,

FBOs and handling agents are strongly discouraged from using practices other than these.

Mismatched Equipment

Operators, FBO personnel and handling agents must use only tow vehicles, towbars and shear pins approved by the aircraft manufacturer.⁴ “Pins of a lesser strength may shear during normal towing loads,” the advisory said. “Use of a stronger pin may cause excessive loads to be applied on the nose gear, and could result in damage.” Scheduled maintenance inspections may enable early detection and timely replacement of the unserviceable equipment.

Dassault also recommends carefully inspecting the condition of each towbar and/or shear pin — looking for nicks, bends and other signs of damage — immediately before each towing/parking operation, and avoiding the use of damaged parts. “A damaged pin may fail and cause premature separation of the towbar from the aircraft if subjected to excessive loads,” the advisory said.

Correctly matching the tow vehicle to the specific aircraft type and local towing conditions similarly reduces risks. “Check that the tug is powerful enough to maneuver the aircraft at the maximum ramp weight, including factoring in the slope of the tarmac,” the advisory said.⁵ “If the tug is underrated, the shear pin may break and lead to aircraft damage.”

After procedures and equipment serviceability are addressed, the next step is to “clear the towing area of all safety and ground support equipment such as flight line fire bottles, servicing carts, maintenance vehicles, etc.,” the advisory said. Depending on the manufacturer’s specifications, pre-towing steps may include confirming that the nose landing gear torque link has been disconnected — if applicable — the parking brake has been released and the towbar has been connected properly.

Falcon-specific reminders that may have counterparts for other business jets are:

- Before beginning the towing operation, close the aircraft main entrance door to avoid damaging it by contact with an uneven surface;
- To prevent damage to the nose gear torque link, called the *scissor link* on some other types, do not step on the nosewheel to turn it; instead, “rotate the towbar or pull gently on the lower torque link for alignment”;
- To prevent damage to the nose gear tire, ensure that the torque link lower arm does not contact the tire.

Dassault’s most widely applicable safety advice includes the following points:

- “Ensure clear communication between cockpit and towing personnel to avoid contradictory actions;
- “Keep qualified personnel in the cockpit during towing to apply the parking brake in case of emergency;
- “Never leave the cockpit while the aircraft is unchocked;
- “Slow down; most towing/parking events are due to rushing, so patience is your best asset for safe towing. Use gradual turns and drive at a slow walking speed. When in doubt, stop;
- “In a cramped area such as a hangar, always assign wing walkers to watch the wing tips. Wing walkers with whistles can help to alert the driver;
- “Take special care inside the hangar when moving aircraft, tow vehicles, limousines and apron service vehicles because a relatively large number of events occur upon hangar door closure, while towing another aircraft inside the hangar, while driving a car inside the hangar, etc.;
- “In rain, snow or fog conditions, visibility is lower and stopping distances are increased. Make gradual turns and steer smoothly in these weather conditions and at night. Use tire chains for the tug as appropriate for snow and ice.”

Sharing Best Practices

To address past constraints on communication channels, limited to customers and authorized service centers, a new method for free digital distribution of

procedures and checklists is in development. “Today we have a private Internet portal, which is limited to our operators, so we are currently looking into a public address to see if we could provide the *Ground Servicing Manual* on our Web site without a password,” Heitz said.

For both general and type-specific safety guidance about towing/parking business jets, Dassault Falcon Customer Service also recommends the U.S. National Air Transportation Association Safety 1st Professional Line Service Training Program <www.natasafety1st.org/plst.htm> and the Flight Safety Foundation Ground Accident Prevention program <www.flightsafety.org/gap_home.html>, which includes free online videos and other instructional materials. ●

Notes

1. Dassault Falcon Customer Service. “Precautions for Safe Aircraft Towing/Parking.” *Falcon Service Advisory* no. FSA900EX-EASy-09-10-02. May 21, 2007.
2. *Dassault Aircraft Maintenance Manual* (AMM) MP 09-101 contains the airworthiness checks applicable after a towing/parking event.
3. Operators, ground service personnel and handling agents towing/parking Falcons were referred to Section 5 of the *Dassault Falcon Ground Servicing Manual* and AMM MP 09-100/MP 09-102.
4. The advisory specifies replacement shear pin part no. TMY20-09-105005 for towbar-equipped vehicles and APM2466-2 for towbarless vehicles. Towbarless towing also requires interface tool part no. APM2466 to prevent nose landing gear damage.
5. For example, to tow a Falcon 900EX on level ground, the tow vehicle must have a rated capacity not less than the aircraft maximum ramp weight of 48,500 lb (22,000 kg).