

SAFETY GRAM 4.0

May 2022



Air Force Aero Clubs,

Before you are able to take flight and every time after you land there is some type of ground handling task that all pilots or Aero Club staff must take part in. These include taxiing, starting, towing, pushing, parking, tying down, hangar-ing, and all ramp movements. These tasks need to have just as much attention and sound safety practices as when you are flying. I have attached two short articles one on Ground handling 101, and the other on Prevention of Hangar Rash. Hangar Rash is just a polished way of saying Aircraft Damage. Every Aero Club operation is different and has their own unique hazards when talking about ground handling. The articles do a decent job at identifying generalized hazards and mitigation strategies, but I would suggest each club take a closer look at their operation and identify club specific hazards and make sure there are proper risk mitigation strategies in place to prevent accidental damage to aircraft.

Fly Safely,

A handwritten signature in black ink, appearing to read "Jonathan Koch". The signature is fluid and cursive, with a large initial "J" and "K".

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Ground Handling 101

Before and after each flight, we taxi, push and pull the airplane. Doing it right means paying attention to detail and watching for the unexpected.

By **estaff** - **Published:** August 29, 2012 **Updated:** October 29, 2019



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Each flight of a land-based airplane begins and ends at the tiedown, or in the hangar. Even if you're flying a seaplane, glider or helicopter, some degree of preparation, care and feeding of your aircraft occurs on the ground/water, where it actually spends most of its time. How we operate an aircraft on the ground doesn't carry with it the same levels of risk as when we're airborne, but like anything involving aviation, there are right ways and wrong ways to do things.

When considering ground operations—which may or may not involve an operating engine—we always want to ensure the aircraft's safety and security, plus that of any persons and property around us. In our experience, many pilots have forgotten various practices and recommendations they should have picked up during their primary training. The results can increase the risk of being on an already-busy ramp or mean we can't use the airplane again soon.

Starting

We can't count the number of times we've seen someone pull their airplane out of a hangar for a short flight, forget to close the door and proceed to blow everything on the ramp into it when the engine catches at 2000 rpm. Even worse is starting an engine with people, vehicles and other airplanes close enough behind it to cause damage or injury. (And we won't even discuss parking large helicopters near light airplanes on a ramp.) Adhering to some simple procedures can enhance the safety of everyone and everything around you during engine starts.

The first thing we should do before even climbing in the airplane is ensure the area behind it is free of loose materials or anyone not necessary for the start and initial taxi operation. Of course, we're also going to check to see if any tiedown ropes remain attached, if any chocks are still in place and everything we need for the flight is aboard. Then we take a close look to ensure any towbars are disconnected, stowed and/or back in the hangar. This also is a good time to ensure all baggage, engine-access and other compartment doors are closed and secured. Only then should we get aboard and run the pre-start checklist.

A final word involves the actual starting of the engine. Most of us are flying a piston engine. When starting one, there's no need for the throttle to be anywhere near the full- or even half-open position. Only enough throttle for idling is necessary. Don't be one of the dweebs whose engine starts at cruise power. It's not good for the engine to be running at that high a power setting without being warmed up with plenty of circulating oil and won't endear you to anyone an otherwise safe distance behind you.

Taxiing

Many relatively inexperienced pilots look at taxi operations the same way they drive a car. Nothing could be further from reality. For one thing, the brakes we have on most airplanes aren't nearly as good as on the car we

drove to the airport. For another, we don't have wings sticking 20 or so feet out on either side. Finally, taxiways are bi-directional—someone easily can be coming from the other direction.

In 2006, the FAA was forced to issue an airworthiness directive, AD 2006-21-03, against Cirrus SR20 and SR22 airplane brake systems. The AD was issued after “several reports of airplanes experiencing brake fires and two airplanes losing directional control,” according to the FAA, and requires replacing O-ring seals or brake calipers along with trimming the wheel pants and installing temperature stickers.

One of the reasons the AD was necessary is pilots were taxiing too fast. In fact, online sister publication AVweb reported at the time “Cirrus Design argued that the best fix to avoid overheated brakes (or brake fires) is to taxi more slowly.” There's rarely a good reason to taxi at more than 20 knots (check your GPS-derived groundspeed...) and we'd argue even that's too fast. Some pilots seem to be in too big a hurry, or they forget they usually have a tailwind when taxiing to the active runway's departure end.

Instead, we should be using just enough power to keep things moving at a good pace, one allowing us to maintain control without riding the brakes. In airplanes like the Cirrus, which have a castering nosewheel instead of a steerable one, we may need a dab or two at the brakes to stay on the taxiway's centerline. The way you know you're taxiing too fast, with too much power? You need constant brake applications. Slow down. You'll save your brakes—for when you really need them—prolong your tires' lives and drastically reduce the chances of losing control. (You'll also be able to log more hours for the same trips!)

One occasion in which you're completely justified in using the brakes, of course, is after landing. Even so, you should be using them in a coordinated fashion to stop while maintaining straight-ahead directional control on the runway. Too often pilots come steaming off a runway as they try to make the first turnoff. Unable, to slow down enough to turn gracefully, they'll try initiating a sweeping turn even as they're still slowing down. Instead, we should be slowing down on the runway—or high-speed taxiway, if available—and not at the intersecting taxiway.

Another place where too much speed is both obvious and inappropriate is when entering a ramp parking area. There's no good reason to be cruising around a ramp at anything more than walking speed. Slowing down affords us better ability to stop quickly, more time to see and avoid hazards and gives the lineguy more time to get into position to marshal us to parking.

The bottom line? You're not driving; you're taxiing. Especially if you want to use the airplane again anytime soon, slow down.

Towing/pushing/Parking

Often, before we can taxi out for takeoff, we need to tow the airplane somewhere. It could be out of the hangar or across the ramp, sometimes even to the other side of the airport. Towing can be an art; it's always an operation in which we risk damaging the airplane due to a faulty towbar, failure to properly attach it to the airplane or exceeding the landing gear's limitations. In slippery conditions—rain, wind and/or snow and ice—the situation can get out of control quickly.

A lot of people have made a lot of money over the years developing and marketing towbars and related equipment to general aviation. The best solution to it all? Let the FBO do it for you. (Slip the line guy a \$20 bill to ensure he does it right.) In any event, using a towbar to pull or push your airplane demands three basic things.

First, the towbar has to be properly attached to the airplane. Each manufacturer has its own recommendations for how the towbar is attached and how the airplane should be towed. Learn them. Second is to ensure the towbar is properly removed and stowed—either in the airplane or on the tow vehicle—before you even think about starting the engine. Third is to not exceed any turning limitations many manufacturers impose for good reason. Such limitations usually are marked on the nosewheel strut with indices beyond which the nosewheel should not be turned. Of course, these marking need to be visible and in good condition if they're to be used.

Anytime we're towing or pushing an airplane, we need to ensure it's clear of any obstructions. Often, the only way to be sure is for someone with aircraft handling familiarity to be watching the space between the airplane and where we want it. Yes, that means towing or pushing is a two-person job, but a successful outcome is more likely. The only time when a second person may not be necessary is when pushing the airplane back into its own hangar, where we "know" it'll fit. Striping on the hangar floor and the ramp in front of it can be invaluable here. Presuming the striping is correct for your airplane, keep the nosewheel on the centerline and position the mains between the other two stripes and you should be good. Watch the back wall, though. Ideally, mounting a chock on the hangar floor or painting a "do not cross" stripe will prevent any damage when pushing the plane back into its hangar.

On The Ground

Ensuring proper ground handling of the airplane will help prevent any recurring mechanical issues—like worn or defective brakes—while ensuring safe and courteous start, taxi and shutdown operations. One of the keys is to simply take things slowly, especially when taxiing downwind. Crowded ramps, narrow taxiways and unfamiliar airports can be accidents waiting to happen unless we're constantly looking outside the airplane and paying attention to what we're doing. It's not fun, but it's a necessary part of getting into and down from the air.

[ramp-safety.pdf](#)

[goingwiththewind.pdf](#)

Prevent Hangar Rash

Ground-handling accidents usually result from inattentiveness and human factor issues. They can be costly but are easy to prevent. Heres how.

By **estaff** - **Published:** May 16, 2005 **Updated:** October 29, 2019



By Pat Veillette

I recently listened to an aviation insurance official cite a collection of claims for aircraft damaged during ground operations and dropped my jaw. The cost of even the smallest hangar rash can be quite expensive to your-or your insurance companys-checkbook.

Light materials like sheet and stamped aluminum or composites can carry amazing structural loads as long as the integrity of their shape is maintained. But, a small dent can seriously compromise the load-carrying capability of the structure. Repairs of more substantial damage-to a nosegear, a wingtip or a tail surface-can easily exceed the value of an older pride-and-joy, forcing you or the insurance company to total it. And the repair cost alone does not consider the expense of downtime. In the case of aircraft, its much cheaper and a lot less painful to prevent hangar rash in the first place than to pay for the damage afterwards.

Towing

The risk of damage during ground operations definitely goes highest when an aircraft is towed. There are many precautions that should be followed to reduce this risk.

For example, before moving the aircraft, you should thoroughly inspect all sides of its perimeter and the proposed path of movement, looking for obstructions anywhere close to the aircrafts wings and tail. You should also examine the pavements condition and drains to make certain the aircraft isnt towed over a suspect surface. When using a tug, its inspections should be current and proper braking action assured. It would be quite a disaster if the brakes on the tug were to give out during the towing operating.

In addition to ensuring the equipment is up to the task, its wise to have at least two wing walkers while moving the aircraft with a tug. The tug operator should maintain continuous visual contact with the wing walkers in case one spots a possible collision. If the tug operator loses sight of a wing walker, he or she should immediately stop.

Needless to say, if there is any doubt that sufficient clearance exists, a wing walker should command an immediate stop. It should go without saying that the aircraft should be towed at a slow walking speed. If the aircraft is going to be pushed into a spot or a hangar, a spotter should be positioned at the back of the aircraft with visual eye contact to the tug driver to prevent the aircraft from being pushed into an obstacle.

Ramp Movements

The damage risk is second highest when an aircraft is moved under its own power on a ramp. The list of ramp hazards that has caused aircraft damage is long.

For example, there are instances of aircraft taxiing over a drain grate, only to have it collapse. Often, narrow rows of aircraft are parked nearby, allowing too little room for a taxiing aircraft. Similarly, the parking spaces for aircraft are often too closely spaced. Sometimes, the ramps have a distinct slope, which is made worse during icy or snow-covered conditions. Prop and jet blast from other aircraft is always a hazard, especially when it blows loose items into nearby aircraft. Vehicles will always be hazard on a ramp.

Whenever taxiing onto a ramp, you should slow down and visually scan for any of these hazards. Use the FBOs Unicom to report your position and obtain directions or taxi-in assistance.

Some ramps have blind spots or sharp turns around corners of buildings that dont allow the pilot to see whats next-or whats coming. These are situations prone to ground collisions.

Sometimes ground marshallers are available. They can be helpful to avoid ground collisions, though nearly half of the aircraft damaged in the FAA's incident database were under the direction of ground marshallers at the time. If ground marshallers dont provide the correct hand signals at the start, you should probably be concerned that they havent been trained properly. Ground marshallers are not able to have complete 360-degree vision around your aircraft. If the ramp appears to be confined, ask the ground marshaller to have wing walkers. Only a wing walker standing in close proximity to your wing tips and tail can clearly observe the distance between your aircraft and a nearby obstacle.

Its still necessary for you to maintain awareness of your proximity to nearby obstacles. So how can you determine if your aircrafts wing tips are too close to a nearby obstacle? One technique that works well when the sun is high is comparing the shadows on the ground. When in doubt, enlist the help of a qualified person to check the distance. If no one is available, then shut down the engine (or have someone qualified hold the brakes), get out of the aircraft and see for yourself. If a ramps parking spot is really that tight, it wont hurt you to park further out and walk an additional few yards. And it will be cheaper than trying to squeeze into a tight parking spot and damaging your aircraft along with someone elses.

Often I see aircraft cutting across a ramp at a skewed angle, I guess to save a few precious seconds on the Hobbs meter. The best advice is to follow the yellow-brick road: Stay on the taxiway and ramp centerlines. This is especially true if your airplane has relatively little prop clearance. Ramps often have chocks laying around, and sometimes other equipment is left out also, particularly near parking spots.

Those centerlines were painted to keep an average aircrafts wingtips from striking parked aircraft. Besides being an additional guide, the chances of a stray chock laying in the middle of a taxi route are somewhat less. Prop strikes on pavement arent unheard of and even a minor prop strike is grounds for an extensive-and expensive-engine tear-down and inspection. Its imperative to taxi slowly and on an uncontaminated, smooth ramp if you fly something with little prop clearance.

While taxiing your aircraft, particularly in the ramp area, your attention should be solely outside of the aircraft. Checklists and other concurrent duties need to wait until you are out of the ramp area and either in the run-up area or on a long, straight, uncongested taxiway. A crowded ramp is no place to perform anything but extra vigilance outside of the aircraft.



Vehicles On The Ramp

The risk is third highest when ground-service equipment is moved around aircraft. Whether its a fuel truck rolling between aircraft, a tug towing an external power unit or a personal SUV hauling baggage out to an aircraft, vehicles moving around on ramps have damaged a lot of wingtips.

One large fuel provider now requires its personnel to place chocks on the back tires of its fueling trucks. When I heard of this policy, I assumed that main purpose was to prevent the vehicle from rolling into an aircraft, but that was only part of the reason for this procedure. The other intent was to force the vehicle operator to get out of the truck and walk around to the back and remove the chocks before attempting to drive away, thus forcing the lineman to visually inspect the rear area surrounding the service vehicle. Clever! Has it worked? So far, their rate of ramp damage incidents by service vehicles has shown a remarkable decline.

With the recent spotlight on the security of general aviation aircraft in the aftermath of 9/11, access to most ramps has been tightened. Hopefully this will cut down on the number of ground vehicles driving on aircraft ramps, which will hopefully drive down the number of ground incidents. A ramp with restricted vehicle access will tend to be a safer ramp.

Sometimes ramps have a slight slope, or sometimes brakes fail on a vehicle. When a vehicle stops on a ramp, it should be positioned so that it would roll away from aircraft. If a vehicle is parked on the ramp so that it could roll into an aircraft, this needs to be brought to the attention of the driver and the vehicle repositioned. When vehicles are left unattended on a ramp, the engines should be turned off, parking brakes set, and preferably a set of chocks placed under the tires to keep the vehicle from rolling.

Hangaring

The fourth riskiest event for ground damage occurs during hangar movements. Hangar doors need to be fully opened any time you are moving an aircraft into or out of a hangar. It hurts to look at pictures of nice aircraft whose wings and propellers struck hangar doors that werent fully open-if only the pilot had fully opened the doors! Hangar doors should also be secured to prevent inadvertent closure due to prop blast or winds.

Think, also, about what can happen inside the hangar once the aircraft is parked and the doors closed. For example, overlapping wings can be another source of aircraft damage if tires become deflated. I would have never considered this, but the industry official showed a series of pictures of an incident in this exact scenario happened. It would have been a non-event except that the wings overlapped other aircraft.

Floor markings guiding ground handlers when moving the aircraft and alert the crew to the best entry and exit positions are recommended. The limits should be clearly marked. This is particularly applicable when the aircraft is being pushed into a hangar since it is difficult for the tow operator to maintain an accurate perception of the rear area of the aircraft.

Human Factors

It shouldnt come as a surprise that being rushed was the leading factor in many ground-handling incidents. Its very clear that attempt to hurry while getting an aircraft moved dramatically increases the risk of ground damage.

When I flew air ambulance missions, we kept our aircraft in a hangar to protect it from the elements. When the red phone rang, there was a perception of time pressure to get the aircraft out of the hangar in a hurry and have the aircrafts engines ready to crank as soon as the hospital crew arrived. To guard against this mission-induced time pressure, I would have the aircraft fully preflighted at the beginning of the tour and have the tug already hooked up when the phone rang. The strategy worked because I was always waiting for the nurses to arrive.

Time pressure is the second leading overall factor that increases the chances of human error. When bad weather approaches, waiting until the last minute to get an aircraft into a hangar also increases risk. Its much wiser to perform such important tasks when you have the time and can take the proper precautions.

Conclusion

Factors associated with hangar rash are common to many ramps: Aircraft are often spaced too closely together, the ramp may be slick, and nighttime illumination may be poor. Obstructions are often present, and it can be difficult to hear a warning on the average noisy ramp.

Aviation safety is usually thought to involve the in-flight phases, but ramps and hangars can be just as hazardous. They demand the same level of care and attention.

Also With This Article

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-Pat Veillette is an aviation safety researcher who flies transports for a living.
