CALLBACK
From NASA's Aviation Safety Reporting System
ASRS
Number 375 April 2011

MOTOR SKILLS: Getting Off to a Good START

A motor skill is a learned sequence of movements that combine to produce a smooth, efficient action. This month's *CALLBACK* looks into another type of motor skill– the skill required to produce a smooth, efficient (and safe) aircraft engine start.

Two of the following ASRS reports examine engine start anomalies on commercial jets. Three additional reports highlight the dangers inherent in hand-propping light aircraft. All of the incidents provide compelling lessons for anyone who wants to get off to a good start.

"Stop! Stop! Stop!"

An MD-90 Captain found that a crossbleed start during pushback could put the tug in a bad spot.

■ *…Because of an inoperative APU (Auxiliary Power Unit), we planned an engine start at the gate followed by a crossbleed start for the second engine, either on pushback or after the brakes were set.*

I [met] *with the tug driver and we talked about the need for a huffer cart for the engine start. He said we could only start the right engine at the gate. I asked if I could start the second engine during pushback and he agreed. I thought it would be safer to start with the push crew's eyes clearing behind and monitoring the second engine start.*

We started the right engine at the gate…. During pushback, I asked if I was clear to start the left engine and the tug driver agreed. I called for the "Crossbleed" checklist and I pushed up the right engine to 25 PSI minimum [pneumatic duct pressure] *according to the "Supplementary Procedures Checklist." The copilot was doing the checklist when we heard "Stop! Stop! Stop!" I stepped on the brakes.*

The tug driver said that the aircraft had pushed the tug [which was] *now at a 90-degree angle to the aircraft… and that the tug was in contact with the radome…. The copilot stated that the right engine* [had reached] *approximately 80% N2.*

We were towed back to the gate…where Maintenance found delamination [damage] *in the radome.*

"Tower Told Us We Had a Fire…"

The Captain of an air carrier jet experienced a very hot start when distractions and failure to follow normal flow patterns altered the engine start sequence.

(**Note:** This aircraft was configured with an ignition system that could activate the igniters on both engines simultaneously –Ed.)

■ *After the cabin door closed, the Before Start Checklist was run. I elected not to turn on ignition* [because] *I was attempting not to exceed the* [time] *limitations on the igniters. As we pushed, Ground cleared me to start the Number Two Engine. When I lifted the fuel lever the engine did not light off. I failed to turn off the fuel lever due to distractions from the Ground Crew telling to me to set the brakes. I was then cleared to start the Number One Engine. I switched on the ignition and engaged the* [Number One] *starter switch. A moment later a startled Ground Crew notified me that flames were coming out the back of the Number Two Engine. I released the start trigger for the Number One Engine and began motoring Number Two Engine in an attempt to clear the flames. Tower told us we had a fire and that they were sending the fire trucks. I did not initially notice an EGT rise in Number Two Engine. I continued motoring and asked Ramp if the flames were gone. They said that they thought so, but there was smoke. I observed EGT rapidly rising, then peg off the scale. I activated the T-handle and fired one squib into the Number Two Engine. The EGT began to drop and the fire trucks were on scene.*

I called for the Engine Fire Checklist. This was accomplished. It was at this time that I realized that I had left the Number Two Fuel Lever on. Once the list was complete, I instructed the Ramp Crew to take us back to the gate….

I failed to follow flow patterns that would have prevented this incident…. Never let yourself become distracted by outside events. I intend to never start an engine again until the push is complete and brakes are parked.

Unintentional UAV's

UAV's (Unmanned Aerial Vehicles) have been the subject of recent industry development and media attention. In the following reports, light aircraft are subject to some scary developments and unwanted attention when hand-propping mishaps result in "UUAV's" (Unintentionally Unmanned Aerial Vehicles).

Lesson One: What "Should Have" Been Done

Resorting to hand-propping due to a faulty battery could lead to the aircraft taxiing on its own for about 100 feet before being stopped by a collision.

■ *The aircraft was pulled from the tie-down spot and turned 90-degrees for starting and taxi to the hangar. Due to a weak battery the aircraft did not start. The wheels were chocked for hand-propping and the throttle was cracked open. When the engine started, it revved up to approximately 1,800 RPM and then the aircraft rolled over the chocks and proceeded ahead about100 feet where it contacted a parked aircraft. There was minor damage to both aircraft, but no injuries beyond a scraped knee when* [I] *scrambled from the rotating prop and fell under the wing. The chocks were insufficient to hold the airplane past a certain engine RPM.*

The brakes should have been set. The tail should have been secured as well. The throttle setting should have been lower. A second pilot in the cockpit holding the brakes and controlling the throttle would have been best.

Lesson Two: Know Your Crew

This pilot was familiar with the proper procedures for hand-propping, but despite a conscientious effort, one critical assumption led to a nose-to-nose encounter.

■ *I was going to fly a 65 HP taildragger with no electrical system and no starting system. It requires the pilot to hand-prop the engine and either requires the aircraft to be tied down or a person to hold the brakes….* [I] *instructed the passenger how to hold the brakes and how to pull the throttle to idle after engine start. Both holding the brakes and pulling the throttle to idle had been practiced. The passenger was in the rear seat, with the seatbelt fastened. After hand propping the engine, I noticed what sounded like an increase in engine rpm and the aircraft started to move forward rapidly. I got out of the way of the moving aircraft and around to the door. I was halfway inside the aircraft getting the engine to idle while telling the passenger to push the brakes when the aircraft struck a parked Cessna. The aircraft hit nose-to-nose…. The aircraft had traveled approximately 25 yards across the tarmac.* [There was] *prop and cowling damage…and both passenger and pilot were unhurt.*

I had incorrectly assumed that the passenger would be able to hold the brakes after engine start and I placed too much confidence in the abilities of a non-pilot….

The very act of hand-propping an aircraft is dangerous and I will never again pull the prop through without the aircraft being tied down…. Even 65 HP is enough to overpower the person starting the engine.

Lesson Three: Double Jeopardy

An engine that was idling too fast was just the beginning of a bad start for this Cessna 140 pilot. Things quickly went from bad to worse.

■ *I intended to start the engine and warm the oil prior to an oil change. The battery was low so I chocked both wheels and hand-propped the engine. Upon starting, the engine was idling too fast so I walked around the wing to the pilot's door to retard the throttle. I had my left hand on the door and as I reached for the throttle, I fell and the door separated from the airplane. The engine was making enough power that it jumped the right chock and began circling to the left. I attempted to re-enter the cockpit, but was knocked down again by the wing strut. The airplane continued to circle to the left and struck my truck which stopped the engine….*

Reflecting upon this incident, it is clear that my plane was not adequately restrained. One clear solution would have been to utilize another person at the controls during hand-propping….

While it is possible to find any number of published recommendations and checklists for solo hand-propping, it remains an extremely dangerous practice. The best procedure is to follow the Federal Aviation Administration's advice found in the Airplane Flying Handbook (FAA-H-8083-3) which states in part: "An engine should not be hand-propped unless two people, both familiar with the airplane and hand-propping techniques, are available to perform the procedure…. The procedure should never be attempted alone."

ASRS Alerts Issued in February 2011

Subject of Alert	No. of Alerts
Aircraft or aircraft equipment	7
ATC equipment or procedures	1
Airport facility or procedure	9
Maintenance procedure	3
Company policies	1
TOTAL	**21**

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A Monthly Safety Bulletin from

The NASA Aviation Safety Reporting System

P.O. Box 189, Moffett Field, CA 94035-0189

http://asrs.arc.nasa.gov

February 2011 Report Intake

Air Carrier/Air Taxi Pilots	2583
General Aviation Pilots	804
Controllers	652
Cabin	239
Mechanics	174
Dispatcher	41
Military/Other	26
TOTAL	**4519**