Why Checklists?

Thomas Knauff

An experienced aerobatic pilot bails out of his crippled airplane, opens his parachute and falls to his death.

Before takeoff, he failed to fasten the leg straps.

The canopy opens at the beginning of a glider launch.

The pilot loses control of the glider as he struggles to close it.

A glider is seen very low in the landing pattern.

The result of failing to properly set the altimeter before launch.

These and countless other accidents would not have occurred had the pilot used a simple checklist before the flight.

Ever wonder when the first aviator checklist was developed and used?

There is a fascinating article about checklists in the Dec. 10, 2007 issue of *The New Yorker* magazine, written by Atul Gawande, a medical doctor. One might think checklists are as old as aviation, but they are not. Serious interest in checklists dates back only to 1935, and was spurred by a fatal accident of the first Boeing Model 299 bomber, which went on to become the legendary B-17. Dr. Gawande mentions this briefly in his article, but before moving on to that let's consider the aviation history in more detail.

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How the Pilot's Checklist Came About
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(Reprinted with permission)

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Wright Field, Dayton, Ohio

The final phase of aircraft evaluations under U.S. Army specification 98-201 (July 18, 1934) was to begin. Three manufactures had submitted aircraft for testing. Martin submitted their Model 146, Douglas submitted the DB-1, and Boeing submitted their Model 299.

Boeing, a producer of fighters for U.S. Navy aircraft carriers, had little success in commercial airliners or bombers for the U.S. Army Air Corps.

Boeing's entry had swept all the evaluations, figuratively flying circles around the competition.

Many considered these final evaluations mere formalities. Talk was of an order for between 185 and 220 aircraft. Boeing executives were excited — a major sale would save the company.

At the controls of the Model 299 this day were two Army pilots. Major Ployer P. Hill (his first time flying the 299) sat in the left seat with Lieutenant Donald Putt (the primary Army pilot for the previous evaluation flights) as the co-pilot. With them were Leslie Tower (the Boeing Chief Test Pilot), C.W. Benton (a Boeing mechanic), and Henry Igo, a representative of Pratt and Whitney, the engine manufacturer.

The aircraft made a normal taxi and takeoff. It began a smooth climb, but then suddenly stalled. The aircraft turned on one wing and fell, bursting into flames upon impact. Putt, Benton, and Igo, although seriously burned, were able to stagger out of the wreckage to the arriving safety crews. Hill and Tower were trapped in the wreckage but were rescued by First Lieutenant Robert Giovannoli, who made two trips into the burning aircraft to rescue both men

Both men later died of their injuries. Lt. Giovannoli was awarded the Cheney Medal for his heroism that day, but he died in an aircraft accident before receiving it. The investigation found "Pilot Error" as the cause. Hill, unfamiliar with the aircraft, had neglected to release the elevator lock prior to take off. Once airborne, Tower evidently realized what was happening and tried to reach the lock handle, but it was too late..

It appeared that the Model 299 was dead. Some newspapers had dubbed it as "too much plane for one man to fly." Most of the aircraft contracts went to the runner-up, the Douglas DB-1. Some serious pleading and politicking by Air Corps

officers gave Boeing a chance to keep the Model 299 project alive. Thirteen aircraft were ordered for "further testing." Douglas, however, received contracts for 133 aircraft for active squadron service. The DB-1 became the B-18.

Twelve of those Boeing aircraft were delivered to the 2nd Bombardment Group at Langley Field, Virginia, by August, 1937. The 2nd Group's operations were closely watched by Boeing, Congress, and the War Department.

Any further accidents or incidents with the Model 299 would end its career.

Commanders made this quite clear to all the crews. The pilots sat down and put their heads together. What was needed was some way of making sure that everything was done; that nothing was overlooked. What resulted was a pilot's checklist. Actually, four checklists were developed — Takeoff, Flight, Before Landing, and After Landing. The Model 299 was not 'too much airplane for one man to fly', it was simply too complex for any one man's memory.

These checklists for the pilot and co-pilot made sure nothing was forgotten. With the checklists, careful planning, and rigorous training, the twelve aircraft managed to fly 1.8 million miles without a serious accident.

The U.S. Army accepted the Model 299, and eventually ordered 12,731 of the aircraft they numbered the B-17. The idea of the pilot's checklist caught on. Checklists were developed for other aircraft in the Air Corps inventory.

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How important are checklists? As it turns out, they are very important. Taking the time to use simple checklists in our daily flying routines proves to be a life and death decision.

Here is the link to a fascinating article written by Dr. Atul Gawande — not about aviation checklists, but as used in medicine:

http://www.newyorker.com/reporting/2007/12/10/071210fa_fact_gawande

> The essence of the article is this:
>
> Because of infections, a simple checklist was proposed for doctors to use in a hospital Intensive Care Unit (ICU) for inserting ("setting") intravenous lines.
>
> The checklist includes: a total of five simple steps starting with the obvious ones of washing hands and cleaning wounds.
>
> Surprisingly, the use of the checklist was strongly resisted by doctors. But after one year, with the insistence and supervision of nurses, IV line infections fell from 11% to Zero!

At Johns Hopkins hospital, the average length of an ICU patient stay dropped by 50%.

Conclusion: the use of checklists for this one simple procedure prevented 43 infections, 8 deaths, and saved two million dollars — in a single hospital!

Reviewing recent glider accidents reveals several common, often repeated omissions to pilot responsibilities that are easily prevented by the use of simple checklists:

- Canopy Unlocked
- Dive Brakes Unlocked
- Tow Plane Running Out of Gas
- Altimeter Set Wrong
- Tail Dolly Still On
- Controls Not Connected
- Flaps in Wrong Position
- Flat Tire
- Knot in Tow Rope
- Seat Belts Undone
- Pitot Cover On
- Control Locks On
- CG Out of Limits

Glider pilots are encouraged to use checklists. There are several common checklists.

1. Assembly checklist
2. Critical Assembly Check
3. Preflight checklist
4. Pre-takeoff checklist
5. Pre-landing checklist

As indicated by Dr. Gawande, using checklists saves lives, and are simple to use.

Glider pilots need to be educated on the simple process of using checklists, and should encourage fellow pilots to take the time to perform the checklist before and during each flight.

Not all checklists are created equal. It is common to see checklists omitting important items, or are poorly organized.

Your glider probably has a manufacturer's written checklist in view of the pilot. This checklist may or may not be adequate. Here is an example of the entire pre-launch check from a popular training glider's official flight manual:

"Before every takeoff check canopy and airbrakes for complete locking."

Here is another, far more complete checklist:

Wing and tailplane connections checked?
Full and free movement of controls?
Parachute secured?
Straps tight and locked?
Brakes closed and locked?
Trim correctly adjusted?
Altimeter adjusted?
Canopy locked?
Cable on correct hook?

The second one is much more complete, isn't it? You would likely make some additions to this list.

Probably the most commonly used, memorized pre-takeoff checklist in the English language is the following, which has been modified over the years. It is suggested all glider pilots should memorize this or a similar one to use in the event you are flying a glider with an inadequate checklist.

C – Controls
B – Ballast (weight & balance)

S – Straps
W – Wind
I – Instruments
F – Flaps
T – Trim

C – Canopy
B – Brakes
E – Emergency plan

As an instructor, I often notice pilots who use the manufacturer's checklist, which only mentions the altimeter, fail to check other important instruments before takeoff. Also, I notice many glider pilots who were trained in gliders with the less common ABC checklist actually fail to commit it to memory, so it can be recalled for gliders without a posted checklist. .

In my case, I have added items I consider important and easily forgotten. "Remove wallet" is one of those items. Sitting on my wallet during a long flight can cause severe back pain. "Unzip fly" is another important preflight item, as it is difficult to accomplish during flight.

Computer systems are far more complex than the good-old-days. Without a checklist, it is easy to forget to enter crucial preflight information.

The checklist I use in my personal glider is a modestly lengthy one, and includes setting the flight computer, data logger, and other important items, any one of which might prevent a successful flight.

Nearly 20% of all fatal glider accidents occur during the launching phase of flight. Even more dramatic, is the fact that launching accidents usually occur during the first 20 seconds. Nearly all of these accidents would have been prevented with the simple use of checklists!

Each of us can help. We need to watch out for one-another. **Pay attention**. When you see someone assembling a glider without using a checklist, or failing to perform a critical assembly check, or hurrying through the pre-takeoff checklist, politely offer to help and suggest taking a few moments before the launch to ensure the glider is really prepared and safe for flight. It will have a big impact on glider safety. **It will save lives**.

In the hospital scenario, nurses interact with doctors and thereby help ensure the proper use of checklists. With this personal quality control method, hospitals and doctors are performing their duties to a higher standard, reducing accidents and preventing deaths.

The soaring community can use this model to good advantage to reduce glider accidents.

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