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## Wake Vortices

Lift is generated by the creation of a pressure differential over the wing surface. This pressure differential triggers the roll up of the airflow aft of the wing resulting in swirling air masses trailing downstream of the wing tips. After the roll up is completed, the wake consists of two counter-rotating cylindrical vortices

### VORTEX STRENGTH

The strength of the vortex is governed by the weight, speed, and shape of the wing of the generating aircraft.

The greatest vortex strength occurs when the generating aircraft is HEAVY, CLEAN, and SLOW.

### STAY ALERT

Whether or not a warning or information has been relayed about vortices, the pilot is expected to adjust aircraft operations and flight path as necessary to preclude serious wake encounters. See the [AIM 7.3](#) for more on avoidance maneuvers.

## GPS – Outage and Performance Reporting

By: Al Secen, CFII

GPS has revolutionized the way we fly. No longer do we need to interpret CDI's or understand "reverse sensing". The promise of "highways in the sky" has been realized with avionics that depict aircraft position with remarkable accuracy.

As an overview, the Global Positioning System (GPS) is a U.S.-owned utility that provides users with positioning, navigation, and timing (PNT) services. This system consists of three segments: the space segment, the control segment, and the user segment.

The U.S. Air Force develops, maintains, and operates the space and control segments. The user segment is made up of all the equipment that companies provide for the use of the GPS signal, from aviation to zoology (animal tracking) – see what I did there? A to Z.

Civilians and military users both use the GPS satellites. The civilian

service is freely available to all users on a continuous, worldwide basis. The military service is available to U.S. and allied armed forces as well as approved Government agencies.

GPS augmentation is any system that aids GPS by providing accuracy, integrity, availability, or any other improvement to positioning, navigation, and timing that is not inherently part of GPS itself.

A wide range of augmentation systems have been developed by both the public and private sectors and includes Nationwide Differential GPS System, Wide-Area Augmentation System, Continuously Operating Reference Stations, Global Differential GPS, and International GNSS Service.

Recently, Tom Wilks mentioned that he had some anomalous GPS readings

(con't GPS P.2)

## Completing Your Flight

This topic has arisen at several meetings recently – it bears review by all of our pilots

So you've completed that flight today. Maybe a long cross country or just a few trips around the pattern. The engine is ticking away as it cools down and you're ready to head home.

It's best to remember that the flight isn't over until the airplane is tied down and secured properly. There are several things of importance to do, including recording your time on the Flight Log for accounting, inserting the gust lock, cleaning the airplane, and generally leaving it in good condition for the next pilot.

Like any good operator, CFC tries to help you remember this by providing a checklist of things to-do. Right at the bottom of the Flight Log is a list of the things you must do (not SHOULD do, MUST do) when securing the aircraft. Some of these items are based on courtesy, some on security, and some on safety. Regardless, they all need to be done by every pilot.

Our airplanes are an asset to the club and need to be cared for by all. Completing a proper post-flight checklist helps in that care.

when going to and returning from Cape May, NJ. The US government is interested to hear when events like that occur and have set up a website that allows you to see and report on GPS anomalies. Before flying, you may want to check out <https://www.gps.gov/support/user/> to review status and outage reports for GPS for your trips. Halfway down the page are links to check the operational status and find NOTAMS about known GPS service disruptions. You can also find a link to report outages yourself.

GPS is a man-made system, and like all man-made systems, it can fail or mislead when not operating perfectly. As pilots, we are expected to be prepared for our flights and know everything there is to know before we even start the engine (check out CFR 14 §91.103 if you are in doubt). That should include a review of any known outages of GPS, which are captured in NOTAMS and on the GPS page referenced above.

Of course, there are three segments to the GPS – if you are encountering difficulties, before reporting them to the government, make certain the user segment isn't at fault. Double check that you've entered the waypoints properly and that the avionics

are configured as you expected. Many manufacturers include options for personalizing the GPS that can cause chaos in a shared aircraft.

If you are a pilot that feels the need to modify preferences or options on the GPS receiver to fit your flying style, make sure you reset them to how you found them after your flight – you could save a fellow club pilot some grief with this common courtesy.

Once you are satisfied it's not the user segment leading to errors, let everyone else know you had problem by reporting it through the website. This could save lots of other pilots some grief, too.

Lastly, it may not be the space, ground, or user segment at all. It could be illegal interference.

When the FAA was first introducing RNAV approaches using GPS at Newark Airport in New Jersey, pilots regularly reported signal loss close to the runway. For months, the FAA and DoD investigated all of the segments. They could find no problems with the system. What they did find was more disturbing.

*(con't GPS P.4)*



## Aviation Safety: TAA

ASRS's award winning publication CALLBACK is a monthly safety newsletter, which includes de-identified ASRS report excerpts with supporting commentary in a popular "lessons learned" format. In addition, CALLBACK may contain features on ASRS research studies and related aviation safety information. Editorial use and reproduction of CALLBACK articles is encouraged.

The excerpt in italics to the right is reprinted from Issue 473 of NASA's CALLBACK website

*With a 300 foot ceiling and 6,000 RVR, a Super King Air 200 pilot intercepted the "glideslope" without crosschecking and correlating position and altitude. Several important lessons were subsequently learned.*

*The approach to Runway 17L was a bit rushed as traffic was heavy. I intercepted what I thought was the glideslope, but in the Pro Line 21 [Integrated Avionics] System, it was the VNAV bug. Both are green, but one is a snowflake; the other is a diamond. I thought the snowflake was the ILS glideslope and manually took over and flew down the course. I should have correlated altitude with position, but I was hurried and continued until I got the glideslope and a low altitude alert from Tower. I climbed out and subsequently made a normal ILS to landing. Lessons [were] learned on getting rid of the VNAV bug on ILS approaches, keeping situational awareness despite other factors, and initiating a go-around at the first sign of something not making sense. I spend more time in another aircraft that is also a Pro Line 21 aircraft, but the VNAV bug is magenta and is less likely to be confused. Basic airmanship needs to stay in the picture versus following the FMS to the wrong place.*

Technically Advanced Aircraft (TAA) are defined as aircraft with a minimum of an IFR-certified GPS navigation system with a moving map display and an integrated autopilot. Those are fun aircraft to fly!

However, there is a cost to the many features GPS receivers bring to us pilots. Our radio stacks are small and that means that the units must fit into small spaces. But, GPS and the computing technology in most receivers means they can do much more than just show where you are. Companies overcome this dichotomy (small space, big features) by "overloading".

Overloading is when a manufacturer or computer programmer uses one input pathway to do two things. The button on a GPS will act differently depending on which screen is being displayed when you press it (context sensitivity).

Similarly, there are only so many symbols that can be used on a display before the pilot suffers from saturation. Saturation occurs when the pilot's brain can no longer process all of the information being presented to it, and it copes by focusing on only one or two tasks to the detriment of all other tasks. Classic loss of situational awareness.

The pilot in this month's focus report was not

saturated, as much as he was confused. Each manufacturer has a different way to relay the complex information the unit is processing to the pilot. In this case, the pilot saw the symbology for what he thought was a glideslope but was actually the VNAV indicator.

The problem comes from the sensitivity differences in the VNAV versus glideslope.

A glideslope on an ILS transmits a beam that is 1.4 degrees wide (vertically). It narrows as you approach the runway. The width is about 1,500 feet at 10 NM from touchdown, narrowing to just a few feet at touchdown.

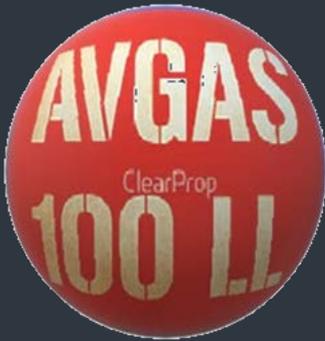
The LNAV/VNAV profile, however, is linear the entire way to the runway. The lowest an LNAV/VNAV approach can get you is 250' above touchdown as opposed to 200 feet for most ILS systems.

The King Air pilot was mistakenly treating the VNAV like a glideslope and could have flown into the ground in a classic Controlled Flight Into Terrain (CFIT) event if it weren't for the tower alerting him using (most likely) a ground based minimum safe altitude warning (MSAW) system in their ATC equipment.

(con't TAA P.4)

## AVGAS Update

According to the Federal Aviation Administration's (FAA) website, Aviation Gasoline, Avgas, is the last remaining lead-containing transportation fuel. Lead, a toxic, heavy metal, is used as an anti-knock agent in Avgas in the form of tetraethyl lead, TEL, (CH<sub>3</sub>CH<sub>2</sub>)<sub>4</sub>Pb. Lead is dispersed into the atmosphere during the combustion of Avgas. With the goal of reducing lead emissions, the United States' FAA and Environmental Protection Agency, EPA, are working together to eliminate these emissions from gasoline piston-engine aircraft.



## TAA *(con't from P.3)*

TAA equipment is delivering the promises of NextGen to GA pilots as well as the airlines. But the complexity of these new systems means we pilots must stay in front of the technology.

I suggest perusing the FAA produced [Advanced Avionics Handbook](#) that has great insights and advice for aircraft like ours.

It looks at advanced avionics from the perspective of navigation, automated flight control, and information systems. Along the way it discusses errors that may catch a pilot unawares and tries to provide guidance on avoiding those errors.

I also suggest thoroughly reading the manual for the equipment we have in our airplanes. The interfaces of the units differ from airplane to airplane and can cause confusion if your switch between them infrequently.

It's easy to get lost in the various screens and maps that the units display: learn how to get back to HOME quickly and reset any wanderings you may find yourself in.

Being familiar with the units and knowing its and your limitations can save a lot of trouble down the line.

## GPS *(con't from P.2)*

Interstate 95 runs right alongside the main runway in Newark. By that time, commercial trucking companies had already begun placing GPS trackers on their trucks. Many drivers considered this too intrusive and bought cheap GPS jammers off the internet to confound their bosses. Those jammers were strong enough to disrupt landing operations at the adjacent runway.

In response, the GPS community and the FCC began an education campaign to remind everyone that jamming devices (radio frequency transmitters that intentionally block, jam, or interfere with lawful communications) are illegal. That includes anything that intentionally jams cell phones, text messages, Wi-Fi networks and GPS.

One trucker caught using a jammer near Newark was fined \$32,000 in 2013.

### Preflight Responsibilities

The FAA has issued a NOTAM to operators of older ADS-B equipment (CFC's aircraft being WAAS enabled are not subject to the conditions) that requires a preflight inspection of GPS Performance Prediction. Should you not perform that task and your ADS-B reports an incorrect position, the operator will have been deemed to violate the ADS-B rule and sanctions may be levied.

While CFC is protected from this rule because we have advanced WAAS equipment, it still seems like a good idea to check the availability of GPS along your route of flight. It could save you a great headache when the moving map suddenly says you're somewhere you're not...or worse, says nothing at all.

### CFC has a Safety Officer!

IN JUNE OF 2019, AL SECEN (CFII) WAS NAMED AS THE CFC SAFETY OFFICER. ACCORDING TO THE DESCRIPTION OF THE ROLE, THE SO PLANS, IMPLEMENTS, AND COORDINATES SAFETY AND ENVIRONMENTAL PROGRAMS AND ENSURES COMPLIANCE WITH REQUIRED CLUB REGULATIONS, PROCEDURES AND POLICIES.

THE SO CONDUCTS SAFETY REVIEWS AFTER INCIDENTS/ACCIDENTS AND TRAINING TO ENSURE IMPLEMENTATION OF AND COMPLIANCE WITH CLUB SAFETY DIRECTIVES AND FAA REGULATIONS.

EXPECT SOME SHORT SAFETY BRIEFINGS TO COME TO A MEETING SOON!

## Editor's Note

Thank you to all who sent useful comments to me about the format of the newsletter.

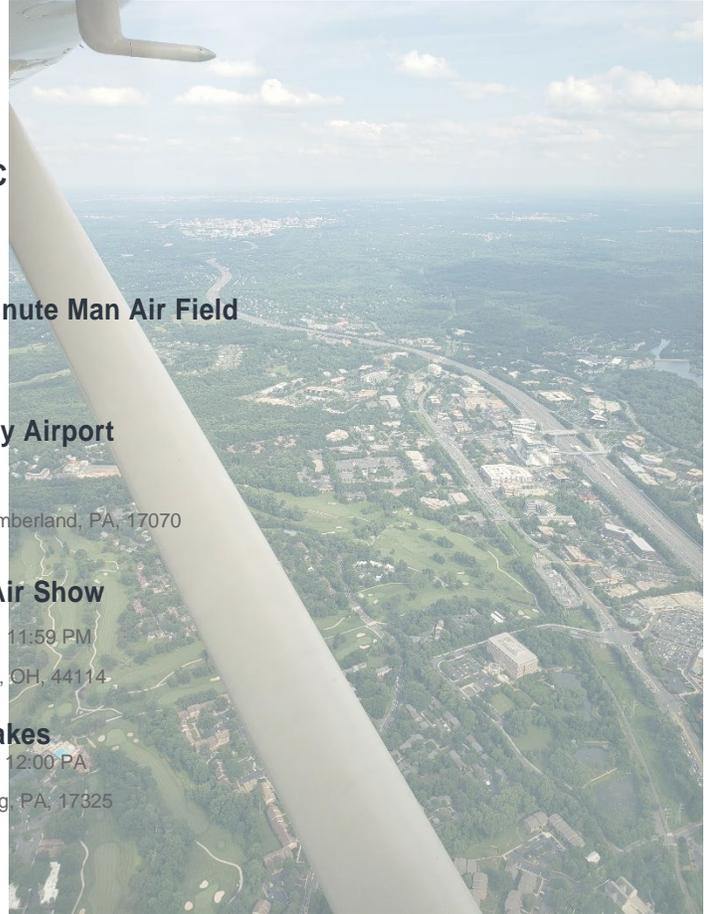
While I didn't get a chance to incorporate all the comments that I received, I am still planning to do so.

Please be patient as I establish a rhythm for researching, constructing, and distributing to the club.

Keep the suggestions coming and I hope you enjoy the current issue.

## Upcoming Events

- **Fifth Tuesday BBQ at CFC**  
July 30th 6:30 PM – 9:00 PM  
The CFC Trailer
- **Young Eagles Rally at Minute Man Air Field**  
Jul 13, 2019 9:00 AM - 12:00 PM
- **Rusty Pilots at Capital City Airport**  
Aug 3, 2019 9:00 AM - 12:00 PM  
200 Airport Road, Suite 100, New Cumberland, PA, 17070
- **2019 Cleveland National Air Show**  
Aug 31, 2019 12:00 AM - Sep 2, 2019 11:59 PM  
1501 North Marginal Road, Cleveland, OH, 44114
- **Wings, Wheels, and Pancakes**  
Sep 28, 2019 8:00 AM - Sep 29, 2019 12:00 PM  
1130 Chambersburg Road, Gettysburg, PA, 17325



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