PUTTING WINGS ON

YOUR DREAMS

VOLUME XIV

ISSUE 12

T-CRAFT AERO CLUB

Editor Bert Osborn

Submitted by Jim Hudson
Membership and Safety Director

Year in Review

As this year came to a close, I like to go back through my logbook and review some of the special moments I've had flying, and think about what I want to accomplish in 2018. 2017 was a good year for me, I flew more than any other year in my flying career, close to 300 hours, mostly instructing. I was fortunate to fly with over 30 club members, and 20 plus non-club members. Two individuals earned their private pilot certificates, two more are close, and a couple just starting. I did quite a bit of backcountry, and several discovery flights. I feel fortunate, to be able to fly and help so many realize their flying dreams, as I remember earlier in my life that flying was always a dream for me. I also feel fortunate to be part of T-Craft with many like-minded pilots, who enjoy the freedom to fly, and are willing to help and participate toward our common goal. We have a great club, as witnessed by our membership that has been maxed out for over a year, and the wait list that has remained close to 15 all year long. General Aviation is strong at this time, and looks to stay that way in the near future.

Looking forward to 2018, I want to improve and learn some new things as a pilot and as an instructor. Understanding and teaching weather has always been a challenge for me, so I've signed up for some on-line courses to help in that area, I also plan to get instrument current again, and explore some new backcounty strips I've not been into yet.

I would encourage you to do something similar and think about and set some flying goals for 2018.

- What skills would you like to improve on? Are there some areas (for example: strong winds, stalls, spins, emergency situations) that make you nervous or a little afraid? Seek out some instruction to improve your skill level or help you over that fear.
- New skills - move up into a High Performance bird, or go after that tail- wheel endorsement. Maybe fly the backcountry.
- New Certificates/Ratings – Instrument, Commercial, or CFI

New Places to go – new landing strips to master?

One of the great things about our club is that we have a wide range of experience in our members and instructors who can help you achieve your goals. If you're not sure who to ask, you can ask me, or any of the instructors or board members who can help you achieve your flight dreams. I hope 2017 has been a good year for you and that 2018 will be even better.

Have fun, Fly safe and Don't do anything Stupid,
Jim

January 2018

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

Calendar of Events:

The next membership meeting will be January 30, 2018. Board meeting January 09, 2018.

01/09/2017 - Board Meeting
01/10/2017 – Accounts due
01/20/2017 - Accounts past due
01/30/2017 - Membership meeting

If you have any ideas for safety meeting presentations or would like to arrange a presentation, contact Membership/Safety Director Jim Hudson

Fuel Reimbursement
$4.17 per gallon.

Articles or Pictures
If you have any pictures or articles for the newsletter submit them to Jim Hudson or Bert Osborn.

Ratings:
15 Student Pilots
68 Private Pilots
01 Recreational Pilots
12 Commercial Pilots
09 Air Transport Pilots
31 Instrument Rated Pilots

Member Statistics:
38 Class I Members (36%)
67 Class II Members (64%)
07 Inactive (voluntary suspension)
15 Suspended (BFR/Med/Attend/Billing, Including 7 Inactive)
11 Social Members (non flying, not included in "Members")

BFR's
Jim Hudson

C182 Upgrade-Check Out
John Moen

New Ratings
Chad Hess - Private Pilot

Welcome New Members
Stephanie Harrison Class I
Stephan St. Maries Class I

Annual Meeting - Club Elections

From President - Ben Brandt

Annual Meeting and Elections are fast approaching. We will be meeting January 30th at 7:00pm.

The Annual meeting is a great opportunity to recap the year and get a view of what is in store for 2018. Also, this is your opportunity to serve on the T-Craft Board. Up for election this year are the offices of:
President - 1 Year term
Secretary - 2 Year term
Billing Director - 3 Year term
If you are interested in serving in any of these offices please email Gordon Hall at glh211@aol.com expressing your interest. Any member in good standing is eligible to serve.

Thanks, and we hope to see you there. Ben Brandt

HATS OFF

Thanks to Gordon Hall and Jim Hudson. The picture is on of Gordon Hall, stuck in the end of 89E. Gordon is chasing down and replacing the short in VOR coax. He saved the club over $800! Jim Hudson helped to push and pull the new cable from the front to the tail.

Do you see Gordon?

Scheduling Courtesy

A scheduling issue came up recently in which a member took out a plane that another member had scheduled for a given time block, depriving the member who scheduled it the use of the plane. The member who took the plane thought he scheduled it at that time, but he had actually scheduled it for the following day. It was an honest mistake that happens very rarely. However, it does bring up a couple of scheduling precautions. One should always re-check your schedule just prior to taking the plane, to check if there had been any changes or squawks, and to double check you have the correct plane scheduled. If for some reason you decide to take a different plane than you scheduled, make sure you change it on schedulemaster, and not just log out the plane. Be aware of when the plane is due back. Don't assume that you can take it longer than you have it schedule for if no one had it scheduled after you, someone could schedule behind you while you're flying. If for some reason you're going to be late on your schedule, let the next person know. If you're stuck somewhere because of weather or other issues you should contact those impacted, and also one of the board members.
Also, don't forget to cancel a schedule that you're not able to make. Failure to cancel a schedule or remaining portion of a schedule is the most frequent problem we see. We very rarely have scheduling problems, and for the most part, members are very courteous and respectful of other members.

December's Club Flying Stats

The top three flyers:		The top three aircraft flown:		The top billing aircraft:	
Chad Hess	9.8	13686	41.8	9989E	3,562
Lloyd Putnam	8.9	4464R	36.9	13686	3,051
Marjorie Wells	8.3	9989E	31.8	4464R	2,620

President's report on the state of the Hangar

We have made the down payment on the hangar and will be getting engineered drawings shortly. These drawings will be used to obtain our building permits. The hanger will have 5 bays and we will use one for our T-Craft plane. We already have 6 people on a waiting list of for the prospective hanger bays. All of the people on the waiting list are T-Craft members.

The search for the 8th Aircraft

T-Craft is not in a hurry to purchase aircraft number 8 immediately. Right now we don't have a place to park it and we will probably actively pursue a new aircraft in the late spring. After polling the membership, the aircraft search committee had recommended a 6 place aircraft. A Cessna 206 had been recommended as had a Cherokee 6. As we get closer to reviewing this, we'll take another poll of the membership.

1293F

All the documents for 93F are on the web page, except avionics. As was mentioned in the prior newsletter, a revised STC supplement was found at AirPlanes which removed the 2540 rpm continuous power restriction. 93F can be operated at 2700 rpm continuously. Jim could not get an answer for the change, the revision took place in 2012 and the latest is uploaded to our web page, as well as revised checklist. The checklists for the other 172's and 375 have been updated to include placing/ removing the pitot tube cover on/off, keeping transponder in ALT mode and a few other updates. Jim will update the C182's soon.

WINTER FLYING HOURS

5.4.3 "Use it or lose it" hour: In addition to monthly dues, members will be charged one of hour of 152 time at the scheduled rate if they don't fly the equivalent to that time during the month in any of the club planes. The “use it or lose it” hour is intended to encourage members to fly at least monthly to stay somewhat proficient.

5.6 Winter flying hours: During the months of December, January and February the monthly “use it or lose it” minimum flying charges may be combined in any of these three months. For example, if a member did not fly in December or January but flew the equivalent of three hours of 152 time in February, the December, January and February “use it or lose it” dollars would be applied to the February billing period. The same is true if the 3 hours were flown in any of the three winter months. If a member did not fly in any of the three winter months they will be charged for three hours of "use it or lose it" time in the February billing period.

WINTER HEATING RULES

Heaters & power cords are out. Next time you arrive at hanger to fly and you have layers of clothing to stay warm, please remember that your aircraft is also cold. There are two (2) power cords per aircraft. One power cord for oil sump heater & another for the small heater on chair. Please leave heater on chair. Usually takes a good 30 minutes to take some chill off engine & surroundings. Except for 64R, which has oil sump heater plug located in left nose air intake, the other aircraft have a plug located near oil dip stick tube. This should have been pointed out to new members during your walk-a-bout introduction to the aircraft/hanger and certainly during your aircraft checkout. If not please get with another member to help guide you. Taking care of an engine now will give us longer engine life. Please read "Cold Weather Operations", and a related article Why you're more likely to have an engine fire this fall on our web site in the site index.
Thanks. Safe enjoyable flying. DOM

HOURLY RATES

N67375
$60.00

N4464R
$71.00

N13686
$73.00

N1293F
$85.00

N1891X
$106.00

N9989E
$112.00

N7593S
$116.00

SQUAWKS

13686 - Two Garmin G5's have been installed. The defective G5 used as the directional gyro has been replaced and is functioning correctly.

9989E - 89E was having problems with its radios. Neither Nav radio would pick up a VOR. That problem was addressed and corrected by Gordon and Jim.

91X - Has been mothballed until February. 91X will be getting 2 Garmin G5's. One will be the attitude indicator and the other will be the directional gyro. When that happens we can remove the vacuum pump and reduce the gross weight of the aircraft. The 3 1/8 inch engine analyzer is being installed. The engine will be removed and rebuilt. The DOM checked with 4 different vendors to do the rebuild of 91X engine. He decided to go with Van Bortle. They will do a factory rebuild and with them the FAA will give the engine an additional 200 hours on the TBO. James reported that when he contacted them, they were back to him within 30 minutes. The replacement engine is now being built. Although Van Bortle doesn't want any money until the engine is ready, they will require a $14,000 core deposit. When the serial number of the core we ship matches the serial number of the one we supplied, the deposit will be returned. The engine won't be shipped until the check is received. The cost is $29,000 which is in line with the other quotes. There will be $1,000 for shipping from Mobile Alabama.

93S - 93S has an oil leak. We are not sure where the leak is, but we are looking at it.

64R - had its annual. The engine looks fine and the dual harnesses have been installed.

67375 - The radio in 375 appears to have suffered from a power spike. Although it is under warranty, if a power spike caused the problem, the club will have to pay. We won't know what the cost will be until the factory determines what has to be repaired. Gordon Hall recommended a master avionics switch like the ones in the other aircraft to attempt to avoid power surges on start up. The board accepted Gordon's recommendation and voted to install a master avionics switch in 375.

1293F - The Garmin GTX 335 had been ordered for and installed. By ordering before the first of the year we are saving $800.00. The ADF is being removed.

During November T-Craft kept Mike Metcalf busy with T-Craft airplanes. Mike did 3 - 100 hour inspections, an annual on 93F and the annual on 64R.

Remember to report squawks on schedule master. The old clip boards for reporting squawks have been retired.

CARE OF YOUR AIRCRAFT

Please remember that after landing club policy requires us to clean the leading edges and the windscreen of bugs and foreign debris. There should be no need for any such requirements As a matter of common courtesy we should leave an aircraft in a clean condition after we have flown it. We learned as early as first grade, if we create a mess, we clean it up. That's the grown up thing to do. PLEASE, after you land, clean the bugs off the leading edges and windscreen. Then use the furniture polish on the leading edges.

MEMBERSHIP DUES

Effective February 1, 2016 membership dues were established at $60.00 per month. At the Annual meeting in 2017 the membership approved continuing dues at the rate of $60.00 per month. That rate combined with the low hourly charges for the airplanes made available because of the well timed fuel purchases and the great maintenance under the watchful eye of Maintenance Director Jim Eyre makes T-Craft the leader in high quality, low cost flying. Upgrades will not impact the hourly cost of flying an aircraft.

PLEASE REMIT PAYMENT IN FULL BY THE 10TH OF THE MONTH.

Your account will be PAST DUE if not received by the 20th and there will be a $10.00 late fee. There will be a finance charge if your account is over 30 days past due and flying privileges will be suspended.

OFF FIELD FUEL REIMBURSEMENT

If you purchase fuel off site you will be reimbursed at the club rate per gallon, currently at $4.17 per gallon. In order to get the reimbursement, send your receipt(s) to the club mail address to the attention of Reggie Sellers, or scan a legible copy and email to Reggie Sellers. DO NOT put your receipt in the club pouch, these are for Nampa fuel receipts only and your personal receipt will probably get lost.

Remember. You use your credit card to purchase your fuel offsite. Submit the bill to Reggie and he will give you property credit.

Basic Med

What documents does T-Craft Need for Basic Med? We have several members who have obtained their Basic Medical.

1. We need the AOPA Basic Med Course Completion Certificate,
2. The Physician's Signature and Declaration page from the Comprehensive medical Examination Checklist,
3. Copy of your Driver's license showing the expiration date.

Note of Interest

The NDB north of Nampa has been decommissioned. That has created some changes in the IFR procedures. The departure procedure from both 29 and 11 used to include a hold at the NDB. There have been two new departure procedures created as a result of the decommissioning. We now have the ADEXE ONE ODP from runway 11 and the CADKI ONE ODP from runway 29.

BABY IT'S COLD OUTSIDE!

Time to beat this horse some more by Jim Eyre, DOM.

This has been around before. However, I wanted to present again to remind all about cold starts. With increase in number of club members some may not be that familiar with aircraft power plants and don't consider the need for preheat necessary since they usually don't preheat their automobile engine.

As you know it has been quite cold recently & starting an aircraft engine even after some preheating can result in a discharged battery and unnecessary engine wear. This situation stems from too short a preheat and/or not enough heat. Yes, we have said before that hooking up the heaters and oil sump heat while you do a good preflight (of at least 30 minutes) should suffice. However, when it is as cold as recently we may need to extend the time as our small heaters really don't put out that much heat in order to "heat soak" the engine internal parts. Why not use a separate heater for each opening in nose cowl. Perhaps one in cabin. Throw an extra blanket over cowling. All this of course is only good if each member is willing to take the extra time to ensure a good preheat. BTW 93F has heat to each cylinder when the sump heat is plugged in.

The damage that we do to an engine w/o preheat can occur in two common ways. The first is making lots of cold starts when the temps are in the teens or lower. Secondly a few cold starts when OATs are in the single digits can do lots of damage that may not be readily apparent until next summer when you have low oil pressure or low compression. While the engine may run ok after it is warmed up, damage will become apparent at some point and shorten engine life. The amount of engine wear that one cold start costs in engine life can be beyond belief – and it doesn't have to be below zero for this to occur.

Pistons scuff, rings can break in tight barrels, bearings undergo scuffing, cams and valves take a beating also. What's the magic temperature for preheating? We are talking about cold soaking here, not the temperature at midday. In other words, if it was 15 degrees or lower last night and it's 30/40 degrees midday, you shouldn't go without preheat. Your crank is still probably around 20/30 degrees at midday. While we can debate as to what temperature is correct to use preheat, being conservative will pay engine life dividends.

In no way does our use of multigrade oil constitute a mitigation of the potential engine damage, since the problem is one of dissimilar metal parts that heat at different rates. At cold temperatures, you can literally have aluminum to steel contact. No oil will protect against that situation, but the multigrade oil we use does make starting a bit easier.

Cold weather and moisture affect electrical systems, and battery power output (even when fully charged) is reduced dramatically. We use sealed batteries which provide extra capacity cranking. A significantly discharged battery will take hours to recharge in flight, a potentially exciting situation should the charging system fail. Let maintenance know ASAP about low battery power. Leaving a discharged battery remain in extreme cold conditions will result in the battery literally swelling & bursting at the seams. This did occur to one of our batteries in winter past.

Monitor alternator output (ammeter), especially after starting and during low rpm operations to verify that the system is being charged properly.

It is very important that when engines are started in cold weather, even after preheating, that they be operated at a low rpm for several minutes to allow for full oil flow to all critical parts of the engine internals. We encourage you to have oil temp needle move off bottom and better yet be touching the green before doing power run up. It is your asset you need to care for.

During run up operate a controllable pitch propeller several times at moderate rpm (1700-2000) to allow for oil to circulate in and out of the propeller and prop controls. It's not necessary to deeply cycle the prop to achieve this oil circulation, and it's hard on the engine.

If there ever is a time to have a potential fire from excess fuel by using throttle to force fuel into carb and/or over priming it's during cold weather. Be sure you have a good charged battery so you can suck any flames back into the engine by continuing to crank – and have a change of underwear available if you do have a fire.

During low temperature operations, particularly during starting and initial warm up it's important to have all the electronic equipment OFF to prevent voltage spikes from damaging avionics and allow full power to go to the starter. We recently had a power surge in 375 incapacitating the #1 radio which most likely was not in off position prior to crank. We are going to install an Avionics Master Switch in 375. Allow extra time for instruments to warm up. Some digital avionics displays go blank in cold weather and may require some heat to bring display into view. Warm air preheat of cabin will help.

Preparation for cold weather and winter operations definitely requires some proactive and modified procedures. Slow the pace of your preflight down so that something important is neither skipped nor missed with the discomfort of the cold. Winter is the time for extra care, but makes for some really enjoyable flying when Mother Nature cooperates.

Have fun, enjoy but please be safe. Your most friendly DOM

F-111 Aardvark
Part 1

Joe Bejsovec, T-Craft member

B-52 Revisited. In recognition of T-Craft pilot, Len Erickson who served as B-52 tailgunner, I have to mention that over Vietnam, two gunners shot down each a MIG-21, as witnessed by nearby B-52s (a MIG-21 is on display in Warhawk Museum). Hanoi insisted a third was also shot down, but it was un-verifiable. In 1991 the gun was removed from the BUF which seems an odd response for an effective device.

On airborne tankers. Owing to regular mid-airs between tankers and those to be refueled, tankers should be equipped with ejection seats. Statistics read 'all crew members lost' too many times.

Finally, the F-111. Born without a name, crew members calling attention to the long droopy radome, named it the Aardvark, and it stuck finally, solemnized by the Air Force. Like the F-35, the Aardvark is a serious science project, although many of its innovations were forgotten when new airplanes were designed. The F-111 was designed to be a fast, low level bomber and it excelled in that roll carrying four times the bombs an F-4 could carry. And when it came into its own made significant contributions to Vietnam and Libya.

The training at Nellis AFB, Las Vegas lasted five months: a review of all the equipment, the flying characteristics, the incidents and accidents that went before, the simulator and memorizing emergency procedures. It was during this time the first six F-111s were committed to Takhli, Thailand. Unfortunately three were lost right off. Blame was put on the horizontal stabilizer, called the slab, though there was no way to verify a combat loss. I suppose the slab could stop working if it were full of flack. So I was beginning to wonder if I made the right call. Then the day of first flight came up. We taxied to the end of the runway, put the brakes on, ran the engines up in full afterburner, and popped the brakes off. Wow! This what flying is all about. I'm sure my body left an impression in the seat back. But my flying career was short lived and my orders to war were cancelled because of the losses over Vietnam. The airplanes, all were sent back to General Dynamics to rebuild the slab. But Louie and I both destined to work in the new 430 TFS bomb-nav shop were sent to Takhli to see what had been done up to that point toward planning targets and identifying them. Getting tired of seeing us around Nellis, I got sent to University of Nebraska to finish up a degree in history. While there I found out about new squadrons being assembled for the UK and wasted no time signing up. I managed to fly a brand new airplane to RAF Upper Heyford, England. The F-111 nav computer was a platform device that leveled itself in 15 minutes, and it worked like a charm. The tanker navigator using stone-age stuff like the BUF asked me our position at regular intervals before he diverted to Thule. Now on to the F-111 equipment.

The crew capsule was a one-time shot, and seemed a good deal at the time. It was described as shirt-sleeve environment, but Squadron Commander elementary education major Mother Hubbard would not allow departure from the norm, like low quarter shoes or jungle boots. "Joe go get your right stuff." At ejection, the pyro-lining ropes would burn, then the rocket engine behind the seats would activate. If in flight, the rocket would limit the upward thrust just enough to clear the rudder, and have most of the thrust in the forward mode to move along with the airplane. If on the ground, the rocket would expend all its energy to lift the capsule straight up. A drag chute came out and pulled out two more main chutes. If the objective was to save lives, the capsule was a success. After ejection, attenuation balloons would fill underneath to cushion the landing, but were not effective in that regard, and crewmembers ended up with a crushed back and permanent grounding. The pilot stick could be pinned to the sump pump for bailing in a water landing. The capsule came equipped with windshield washers, though I never saw them used.

Instead of space age plastic the canopy was glass. If a big sea-bird came through the windscreen, the disruption and flying glass made further controlled flight impossible so an ejection ensued.

The most dramatic innovation was the variable geometry wing. Though there were many copiers, the F-111 was the only one to fold its wing into the fuselage, taking on a dart shape. The wings at 26 degrees were used for takeoffs and landings. For subsonic flight the wings were set at 45 degrees. For supersonic up to 2.5 mach the wings were at 72 degrees with much of the wing in the fuselage. The fastest I went was 1.92 mach.

The Aardvark came equipped with leading edge slats and flaps, both extended and retracted at the same time. They corroded in the wet English weather so had to be refurbished at MacClellan AFB in California. Since my Mother and stepdad George lived just off base, I volunteered to make the trip six or seven times. On one trip we were tasked with buying 1500 dollars worth of Mexican food so the 20 TFW could celebrate Cinco De Maya in style. What we hadn't taken into consideration was that the bombay was heated, so on the return trip to RAF Upper Heyford in a newly refurbished airplane, the food began to smell funny. Needless to say, I passed on it when it was served at the club.

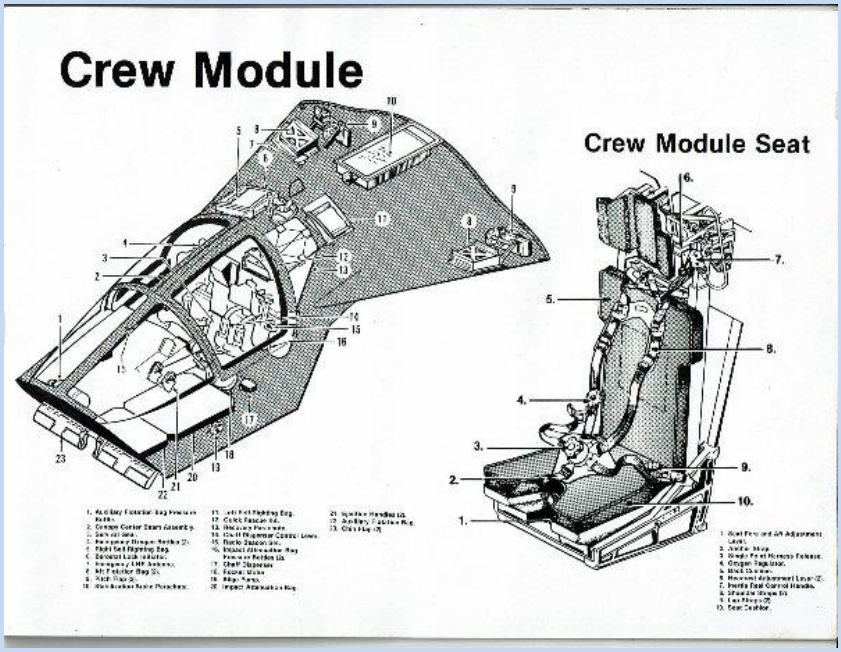
When we first arrived at RAF Upper Heyford in brand new airplanes in 1971, we treated them kindly enough to merit Jim Eyre's approval. Upon landing we held the nose off and let the big fuselage and wings slow the craft down, hardly using any brakes to exit the runway. Then the generals at USAFE got involved, saying, "We put those monster tires and twenty brake calipers on for a reason. When you touchdown, throw the nose down and get on the binders." Illogical, but we did as directed, and regularly had to deal with hot brakes and the fire department. The big tires were so we could fly from unimproved fields, which we never did, and part of the reason may be because the nose gear was normal size.

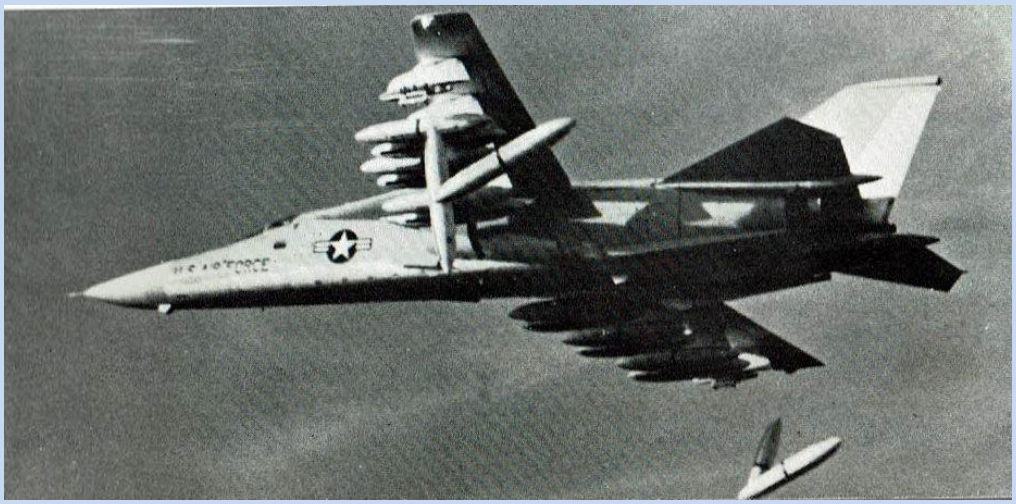
The Terrain Following Radar, was useful day or night in all weather. Some people didn't trust it. A crew took off from Mountain Home on a night visit to Saylor Creek Bombing Range. They turned the TFR off, and felt their way around until they went splat! Low level routes are designed to avoid population centers, airfields and big towers. I designed several for common use. One day Wally and I were at 500 feet on a low level in Germany. The visibilty owing to light rain was marginal. All of a sudden the plane pitched up a thousand feet, and as we passed over the top I managed to glance down and see the top of a thousand foot radio tower. The TFR read a narrow steel pole correctly and estimated the pull-up point and how much to climb to pass over the top with 500 foot clearance. It made me a believer. When we got home I marked all the German low level route maps then in use to ward off surprise by the follow-on troops.

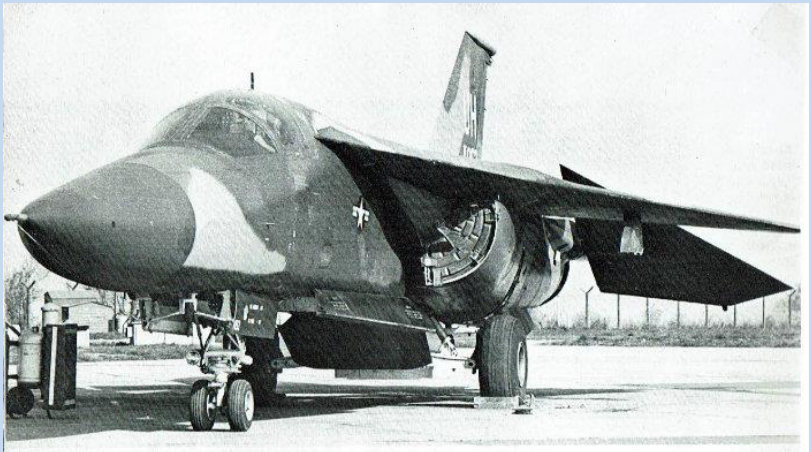
The pilot had a heads-up display that worked fine. His primary instruments were moveable tapes and included airspeed, and pressure altitude, but the glaring omission, since we spent so much time at low level was the radar altimeter readout. The radar altimeter was a small round gage in the middle of engine instruments and others, and I kept a close eye on it. Same for the standby air speed, which came in handy when the pilot's primary instruments quit.

The engines had six stages of afterburner whereas most airplanes had one. You could feel them kick in one at a time. With all six, the engines each generated 18,500 pounds of thrust, the F model 25,500.

This was an equipment review of a science project, and my next effort will be to tell about flying the Aardvark. Stay tuned. It was the eye opener fun stuff.







F-111E of the 20th TFW, RAF Upper Heyford, England. The revised intakes are clearly visible in this view. Their introduction removed flight restrictions above mach 2.2 and 60,000 feet. (USAF)

F-111E lifts off with afterburners cooking. The TF-30 engines, which have caused many of the F-111 development problems, were also the first jet engines qualified for supersonic flight at sea level. Their afterburners, unlike conventional turbojet afterburners, are capable of zonal settings. (USAF)

Why is lead needed during engine break-in?

BY BEN VISSER

In a past column I gave some background on what happens during break-in of a new or overhauled aircraft engine. Since then I have received numerous questions about why leaded fuel is needed during break-in.

Unfortunately, I do not know anyone who has a perfect answer for this. My opinion is based on lab tests and reports from field overhauls and manufacturer's reports.

An example of a lab test that we ran back in the late 1960s was one run in a 430 CID Buick engine. The engine was installed on a test stand and run for over 20,000 simulated miles at relatively high RPM and load. We monitored the valve stem height and, at the end of the test, there was no significant exhaust valve recession.

The test was repeated with a new tank and fuel lines, plus new heads that had never been run on a leaded fuel. (We found out that the original new engine had been run at the factory on a leaded fuel.)

Now after about 15,000 simulated miles, most of the exhaust valves had receded enough to take up the lash allowed by the hydraulic valve lifters.

As far as field data, about 20 years ago, a west coast oil company started to market an 80/87 unleaded avgas. This was perfectly legal since the ASTM D-910 spec for avgas specifies that the fuel only meet a maximum of 0.5 grams per gallon lead level. There is no minimum level.

A few months after the introduction of this fuel, I started to receive numerous valve recession complaints, but only from the west coast. Further investigation revealed that every failure occurred on aircraft that had operated on the unleaded fuel.

Subsequent to this I have heard numerous reports of valve recession on aircraft that have operated exclusively on unleaded mogas. Now it does not happen to every aircraft every time, but it does happen a significant part of the time.

So what is the mechanism here and what does the lead do to prevent exhaust valve recession?

This is one of those things that if you talk to 10 experts, you will probably get 20 to 25 different answers.

The most common ones are: Lead acts as a solid type lubricant to protect and cushion the valve and seat; another is that the lead alloys with the seat material; and still another is that it improves the heat transfer from the valve and heat tempers the seat.

In the Buick engine test, the low level of lead that was needed to protect the valves was due to the liquid cooling of these engines and the subsequent lower seat temperature compared to an air cooled aircraft engine.

When an engine is running, especially under high load, the exhaust valve is exposed to direct flame temperatures when it first opens. To keep the exhaust valve from getting too hot, engine manufacturers design a direct heat path up the valve stem to the guide, valve tip, and the oil flow.

But the most critical point is the valve tulip edge, and that is designed so that most of the heat is transferred to the valve seat during the time the valve is closed. There is not much time for the heat to be transferred, and the transfer depends on the difference in temperatures between the valve edge and the seat.

Since a liquid-cooled engine exhaust valve seat runs several hundred degrees cooler than that seen in an air-cooled engine, it is easy to see why aircraft engines are much more critical.

A Lycoming O-320-E2D

So what is the answer? I feel it is a combination of things.

First, in a new engine, the valves and seats are both ground. The surface of the valve and seat are not perfectly smooth. The micro ridges and valleys from grinding allow some leakage after the first startup, and provide a poor heat transfer path from the valve to the seat.

With a leaded fuel, the byproducts of combustion tend to coat the valve and seat, which yields improved sealing and a better heat transfer path. Over time, the seat does harden somewhat and the engine goes on to live a long productive life.

With an aircraft engine, it becomes much more critical, especially during break-in. After that a small amount of lead is required during the life of the engine to protect the valve and seat.

It is not a precise amount, but during break-in I would recommend running at least 25% 100LL for the first 50 hours. After that, a small amount every so often should keep all running well.

Does RNAV Always Mean GPS?

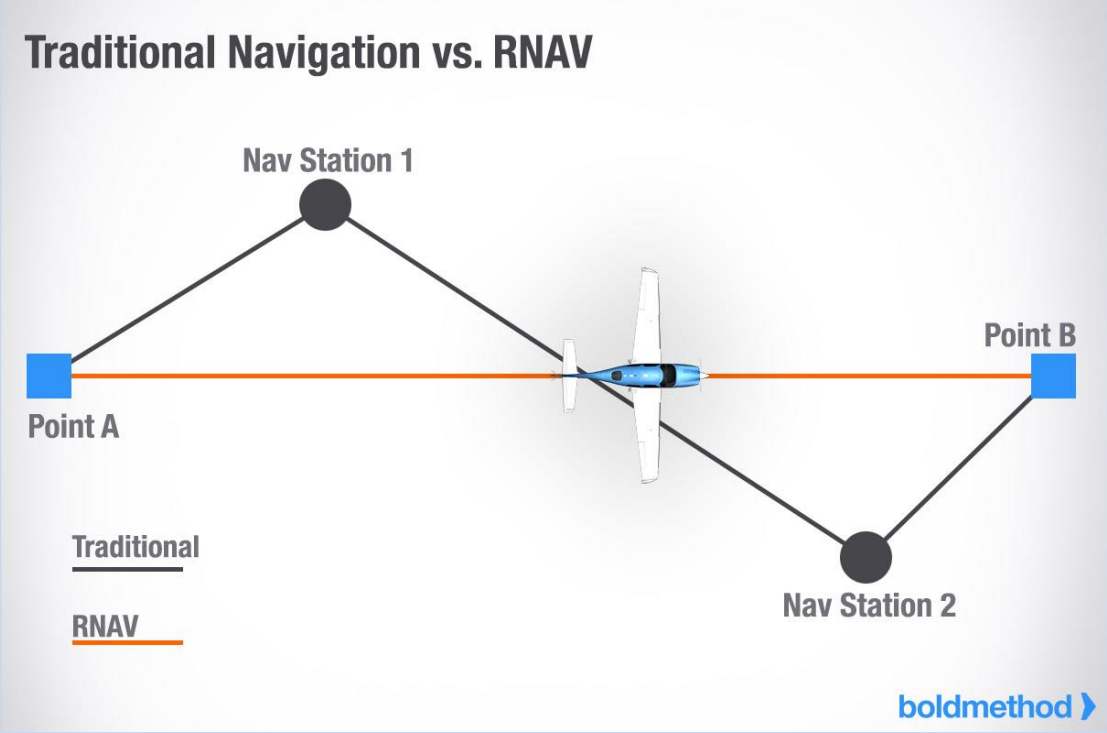
By Swayne Martin

Did you know that GPS isn't the only form of RNAV? While the two acronyms are often used interchangeably, there's a lot more to RNAV than you might think.

RNAV, Defined

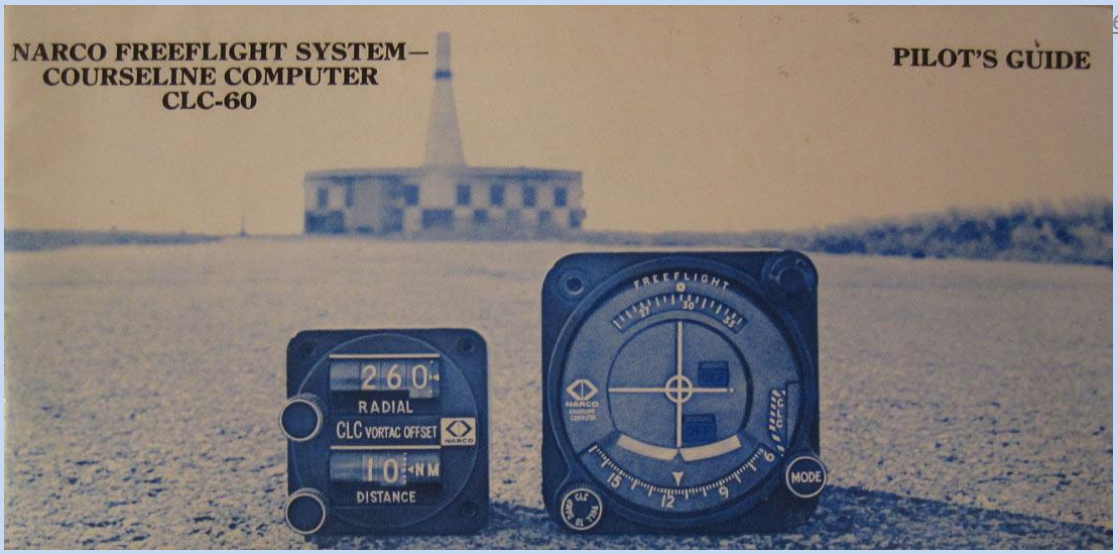
"Area Navigation" (RNAV) allows an aircraft to navigate between two points within the coverage zone of station-referenced navigation systems. Instead of having to go directly from one ground-based station to the next in a zig-zag pattern, RNAV allows aircraft to fly directly to any point within the coverage zone of the station being used. This "direct-to" capability often allows aircraft to bypass published routes, freeing up more airspace for traffic.

RNAV also allows aircraft to fly instrument approaches into airports that don't have any ground-based navigation stations, like a VOR or Localizer.



RNAV Routes Have Been Around Since The 1970s

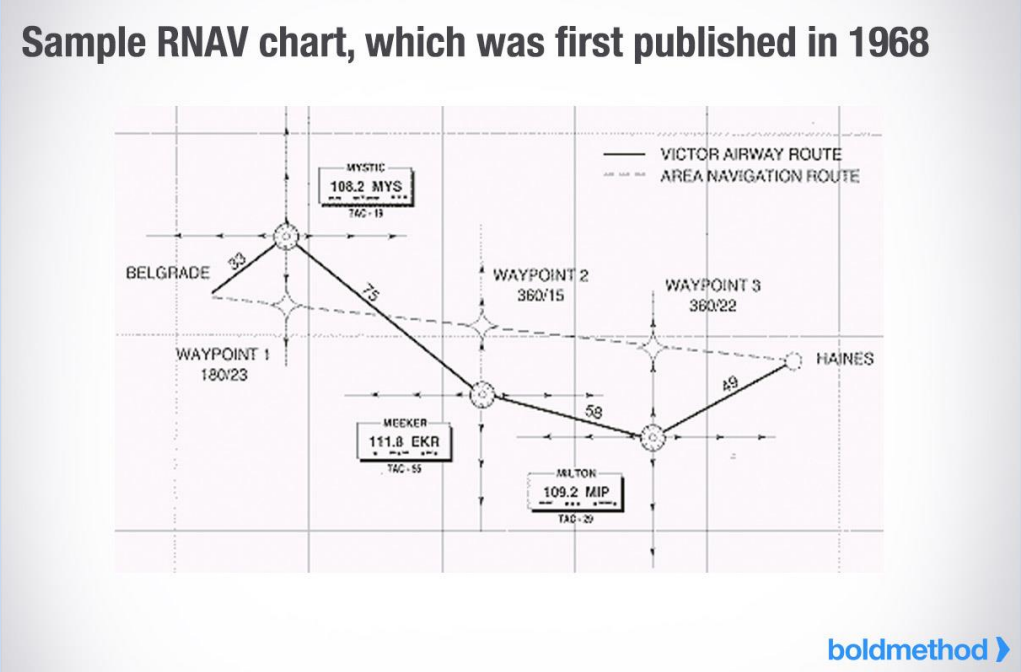
According to Jeppesen, the first RNAV en-route charts were published in 1968 when Narco introduced their CLC-60 RNAV computer to the market. This course-line-computer analyzed information from previously-installed VOR and DME receivers.
To use the CLC-60, two knobs controlled "radial" and "distance." If you wanted to "move" the VOR station 12 miles out on the 180 radial (this is just like creating a waypoint 12 miles to the South of a VOR), you'd set "180" in the radial window and "12" in the distance window. Unlike a standard VOR instrument, a full scale deflection on the CLC-60 was 2 miles, whether you were 1 mile from the station or 50 miles from the station.



eBay

An RNAV route could be utilized by inputting a series of VOR Radials and DMEs to make a navigable course. Each "waypoint" of the course had an associated radial and DME from the VOR being used.

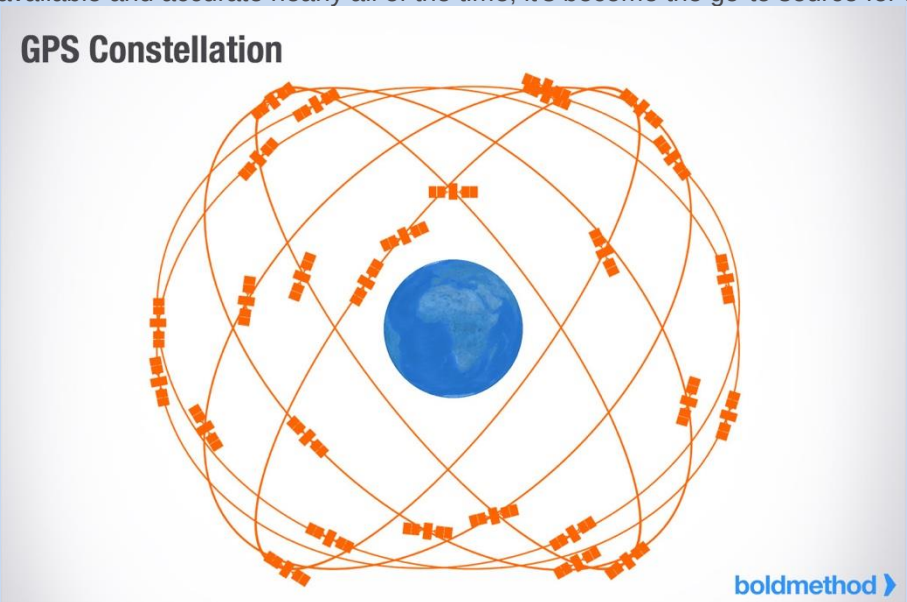
Creating a direct route could shave off substantial milage compared to victor airways, which rely on routes between NAVAIDs. For this to work, however, you needed to remain within the coverage limits of the VOR and DME.



Satellite Navigation Changed The Game

The first GPS satellite was launched in 1978 by the Department of Defense. Initially, GPS was only avialable for government and military use. But by 1993, a full 24-satellite constellation became operational and was opened to public use.

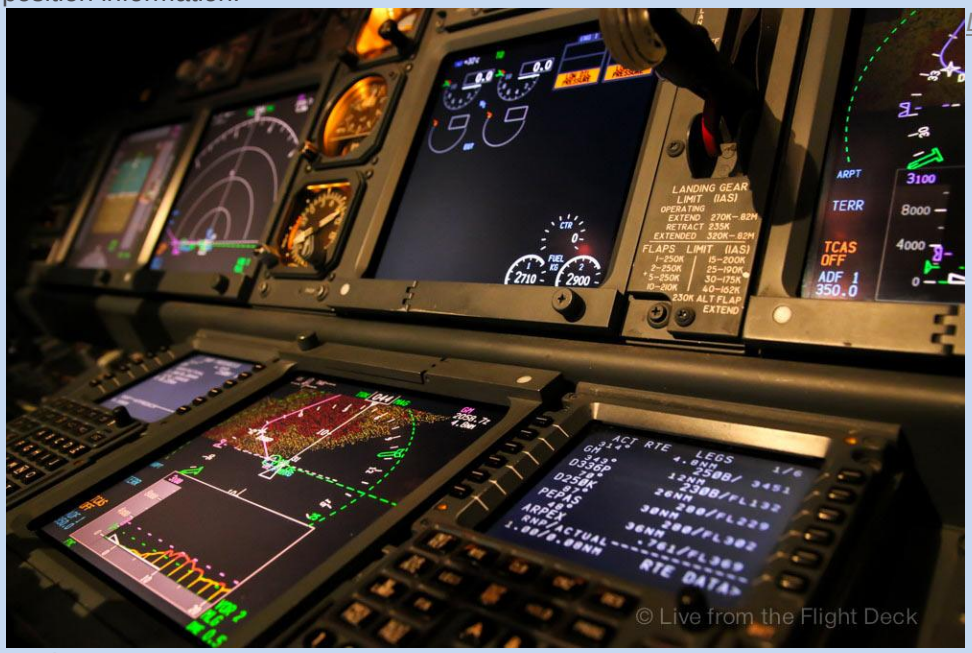
Using the same basic concept as VOR RNAV, as long as you're within the coverage range of GPS reception and your receiver is functioning properly, you can navigate point to point. For an aircraft to get a 3D location, the GPS receiver must get reliable signal from 4 satellites simultaneously. With GPS available and accurate nearly all of the time, it's become the go-to source for RNAV navigation.



An FMS Uses It All

Flight Management Systems (FMS), which are typically found on business and airline jets, allow you to enter a series of waypoints and instrument procedures that define a flight route. If waypoints and procedures are included in the navigation database, the computer calculates the distances and courses between all waypoints in the route. During flight, the FMS provides precise guidance between each pair of waypoints, along with real-time information about aircraft course, groundspeed, distance, estimated time between waypoints, fuel consumed, and fuel/flight time remaining. While most FMS systems use GPS, that's not their only source of information.

Many FMS systems in large aircraft are linked to an Inertial Navigation Unit (often times called an Inertial Reference System, or IRS), which is comprised of lasers and gyros that determine aircraft flight path, altitude, and attitude. And that's not the only extra source of information for an FMS. Most FMS systems combine GPS, IRS, VOR, LOC, and DME receivers to provided a hyper-sensitive "blended" location to the FMS. If one form of navigation becomes unreliable, backup navigation aids can be used for continual position information.



Live from the Flight Deck

Approved RNAV Systems, And When To Use Them

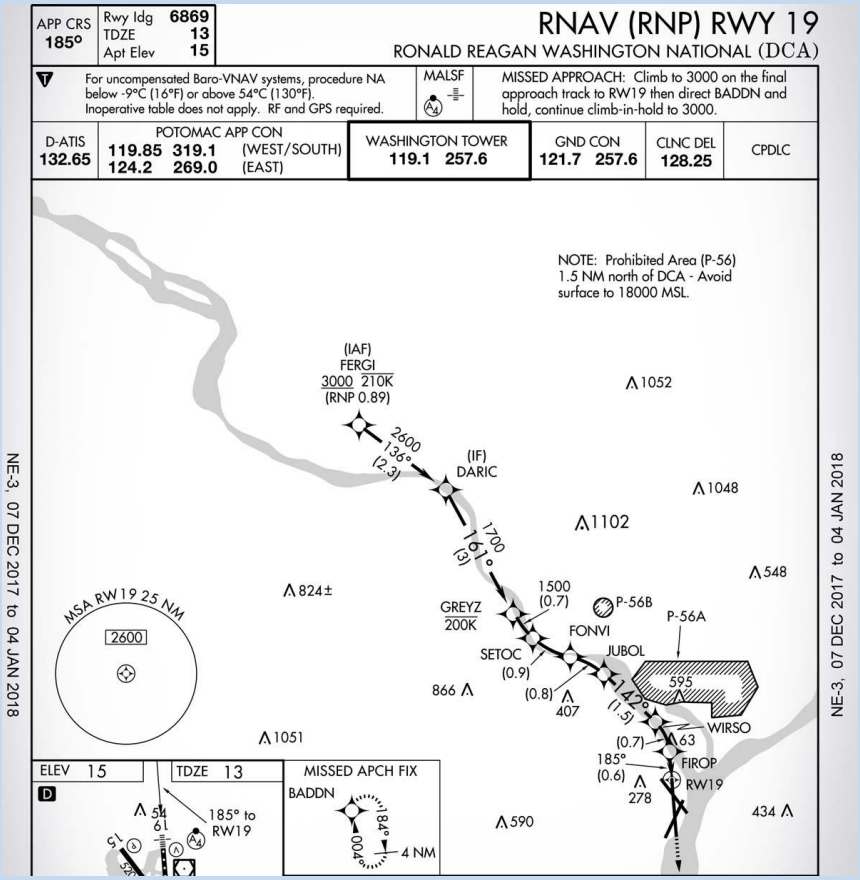
According to the AIM these are a few RNAV systems that can be approved. Keep in mind, the specific equipment and certification goes far beyond this list:

- Approved GPS Receivers
- Flight Management Systems Integrating Multiple Navigation Sensors
- RNAV System with DME/DME/IRU

DME/DME/IRU systems don't rely on GPS, and instead utilize multiple DME stations and an Inertial Reference Unit to get position information. While GPS may initially provide the IRU with location information for calibration, it does not rely on GPS for operation.

What About RNP?

Required Navigation Performance (RNP) is a form of navigation that allows an aircraft to fly directly between two 3D points in space. The fundamental difference between RNP and RNAV is that RNP requires on-board performance monitoring and alerting capability. Think of this as a computer system that's constantly self-assessing and ensuring the reliability of navigation signals and position information. According to GE Aviation, "RNP approaches with RNP values down to 0.1 allow aircraft to follow precise three-dimensional curved flight paths through congested airspace, around noise sensitive areas, or through difficult terrain." Specific testing and equipment is required to become RNP certified. Generally speaking, you won't fly RNP procedures until you're flying airline or corporate aircraft.



So, Does RNAV Always Mean GPS?

For most general aviation pilots today, yes. But that doesn't mean there aren't other forms of Area Navigation. In recent history, course line computers were the most basic form of RNAV. While GPS doesn't automatically equal RNAV, it's the most common system found in cockpits around the world, especially for piston aircraft.

Ash-spreading ceremony goes awry

The pilot was participating in an ash spreading ceremony and planned to do a low pass over the runway at the airport in Reidsville, N.C.

As the Aeronca 7BCM approached 50 feet above ground level and 70 knots, the pilot reported that the bag containing the ashes began to break and he “momentarily” let go of the flight controls.

Subsequently, the airplane descended, hit the runway, and bounced back into the air.

During the bounce, the pilot regained control and landed straight ahead, but the left main landing gear collapsed on the touchdown.

The airplane veered off the runway to the left and skidded to a stop.

A post-accident examination of the airframe revealed substantial damage to the firewall.

Probable cause: The pilot’s loss of pitch control while maneuvering at low altitude, which resulted in a collision with terrain, a left main landing gear collapse, and runway excursion.

NTSB Identification: GAA16CA082

This December 2015 accident report is provided by the National Transportation Safety Board. Published as an educational tool, it is intended to help pilots learn from the misfortunes of others.