Skywriter

Monthly Newsletter of the Calgary Ultralight Flying Club

June 1999

Across the Wing

by Wilf Stark

The June 10th meeting will be the last before summer break. Some lucky person will also walk away with one of the latest and greatest Icom portable transceivers when we draw the winning ticket.

Kathy Lubitz (UPAC) e-mailed me last week, to remind us that the June 14th CARAC meeting will be the last one before recommendations go before government. Issues that affect us deal with passenger-carrying privileges by ultralight pilots. Rather than trying to paraphrase her, I've included portions of her e-mail , so we can discuss them at our next meeting, and if appropriate, forward our position and comments to CARAC:

"Our position (UPAC) has always been to leave the status quo for those that do not want to be involved with passengers. That will be the pilots who own 80% of the ULs on the register that are basic ULs and cannot carry pax. Passengers will only be allowed in AULAs, and amateur built or certified aircraft that meet the UL definition.

The NPA dealing with the instructor includes a new requirement, that all UL instructors have the flight test, essentially to get the pax rating. This is not status quo. For the administration of the ULFTE program by Transport, the instructor who wants to become a ULFTE must take a course, also he cannot test his own students but must recommend them to a second ULFTE. This is the way it works in the 'conventional' world. It will not work in many parts of the country because of geographic isolation; to further complicate things, there are so many different types of ULs, the nearest ULFTE may only be able to give a flight test on a trike or powered parachute because he doesn't fly fixed wing. Accessibility of the ULFTE becomes a problem for the pilot who wants to carry a passenger, but more importantly, it becomes a problem for all instructors since they have no choice, they will have to have a flight test.

The April, 1998 proposal that was accepted by CARAC, left the instructor alone recognizing that there was nothing specific to carrying a passenger in any license or permit. and that instructors were already successfully training pilots to fly ultraligths. We agreed to more experience, the increase to 25 hours with more dual and some cross country time.

Our compromise position is that instructors who want to become ULFTEs be required to have the pax rating and leave the current requirements for those that do not want to alone.

As for the exam, it has to be developed. When it is, all UL pilots will take it. There will be no second exam for those that want the pax rating. I have been told that current UL pilots will not have to take the new exam. One of the comments UPAC is looking for is for the exam question bank to be published as it is now, which would mean a higher pass-mark, maybe 80%. The question bank will necessarily be larger because there will be more subjects included. But if the exam is supposed to test what TC wants you to know then publish the questions to let the students know what is expected and test for that.

Transport needs to hear this from other persons besides me. They need to hear from UL pilots in all parts of Canada. So your voice counts."

For those of you who are stymied by all the acronyms, we can define them at our discussion as well.

See you on the 10th ✈

ICOM IC-A4 Raffle

Last chance to get in on this raffle is our next meeting date of June 10.

Tickets are 3 for $10 or 1 for $5.

If you can't make the meeting call Bernie Kespe.

Mailbag

Spins

A bit of a follow-up to the conversations held at last month's meeting regarding spins and spirals. I had a bad experience some time ago with a high time pilot who got himself into a situation that ended up taking way too long to correct - in fact the plane made the correction not the pilot. Fortunately we had enough altitude that day, we both lived to tell the tale. Note, I said this was a high time pilot. It was one of those experiences you never forget - my hands still get a little sweaty thinking about it.

Anyway, after listening to one of the speakers we had at a club meeting a few months ago inform us that spin training will no longer be required in Canada, (this comment implied to me and probably others in the audience that spin training wasn't important) I decided to ask Transport Canada if in fact spin training and testing were being removed. The response below is what I received from Mr. Dow. I liked the response - it confirms we do have some very good people working in Transport Canada. The short version of all this is to recognize early what is happening and to know the proper recovery - common sense. I believe that if you have to "think" about how to recover, then you're in need of some training from a qualified instructor.

We now have some Ultralights on the market that will spin like crazy if given the chance, hence my concern.

One last comment - training should always be FUN, if it isn't, keep searching until you find the right instructor, it makes all the difference.

Bruce Dignem

Reply:

Mr. Dignem

You heard wrong about the spin training. To set the record straight, in the hope that you will pass it on to your source, this is what is happening:

1. On July 1, Exercise 13, Spin, will be removed from the private pilot flight test.
2. The spin remains in the training.
3. A second stall is added to the flight test, requiring both power-on and power-off stalls
4. The spin remains in training and testing for the commercial pilot licence.
5. The spin remains in training and testing for the flight instructor rating.

The decision to change was made after a study of stall-spin accidents in Canada over the last 10 years. In 39 accidents, all but one happened at altitudes so low that knowing how to recover from the spin would have made no difference. We are going to be putting a LOT more emphasis on the training of stalls from realistic flight situations, the kind that are causing the accidents. By simulating these at altitude, we can do a better job of ensuring that all private pilots RECOGNIZE the stall-spin situations. The situations that are causing the fatal accidents are stalls (with subsequent wing drop and the start of autorotation) on overshoots, in climbing turns after takeoff, or in descent when turning final, especially when a lot of drift is present, or, after an engine failure after takeoff when people try to turn back to the field - a bad move.

I hope this helps.

Jim Dow
Chief
Flight Training

Skywriter

Skywriter is the official newsletter of the Calgary Ultralight Flying Club and is published 12 times per year. Forward your articles and letters to:

Editor: Bob Kirkby 569-9541
e-mail: kirkby@telusplanet.net

Assistant-editor: Bernie Kespe (see below)

Calgary Ultralight Flying Club

Meetings of the Calgary Ultralight Flying Club are held on the second Thursday of every month, except July and August, at 7:30 pm, at the Northeast Armoury, 1227 - 38 Avenue NE.

President: Wilf Stark 935-4248
e-mail: wstark@compuserve.com

Vice-President: Stu Simpson 255-6998
e-mail: simpsont@cadvision.com

Secretary: Bernie Kespe 255-7419
e-mail: kespeb@cadvision.com

Treasurer: Carl Forman 283-3855
e-mail: formanc@cadvision.com

Director: Jim Creaser 226-0180
e-mail: creasser@cybersurf.net

Past President: Ed D'Antoni 247-6621
e-mail: ed.dantoni@logicnet.com

Classified

For Rent - Fully enclosed T-hangar at Chestermere-Kirkby Field for rent. Will accommodate 30 ft wingspan. $60 per month. Call Bob 569-9541 (6/99)

Chinook WT II - single place, 1983, warp wing, "0" time 277 Rotax, can be seen at Indus Airfield, $3,500 OBO. Dan 403-243-7934 H or 403-230-6415 W (6/99)

Wanted - Low-time 2-stroke engine between 40 and 65 hp for newly built trike. Call Ron Linkes 250-389-0800. (4/99)

Lazair A-87 - has 3rd engine, 3/4 enclosure pod, wider landing gear, always hangared, includes enclosed trailer, $5500. Betty Whitney 403-684-3459. (4/99)

KR-2 Sport Plane - 35 hr TT, 1834cc HAPI VW conversion with dual ignition, carb heat, oil cooler, cruises at 125mph, full power 155mph, registered as homebuilt. ½ share $7000 including flight training and ultralight pilot permit. J.T. Hibberd 617-1831. (3/99)

Murphy Elite Tail Section - horizontal stab, elevator, rudder, 75% complete waiting for inspection, includes approx. 1000 clecos, $6000. Dave Dedul, 403-823-2214. (3/99)

Suzuki engine - 3 cylinder, 65 HP @ 5500, with belt reduction drive 2.21:1, can be seen running, $3000. Ken Johnson 546-2586. (3/99)

Challenger - Single place, 288 hr TTSN, Rotax 447 CDI, Instruments: Tack, compass, altimeter, air speed, CHT, Gas gauge, Hr meter, 12-volt power outlet, radio antenna, (GPS & mount optional), fully enclosed with cabin heat, ski package, tundra tires & reg. wheels with pants included, always hangared, at Indus, $9,800.00. Ray at 403-274-4388, office 275-6540, cell 540-2492. (3/99)

Rotax 447 - with carb and muffler, low time, $2700. Chuck duff 938-6157 (3/99)

Wanted - Looking for a future Eureka Customer who would like to trade labour for up to 50% off Airframe Costs. Should be comfortable cutting/drilling/filing aluminum tube/channel/bar. Wilf 935-4248 (1/99)

Mini-Max - Rotax 447, GSC Ground adjustable prop, Full panel, always hangered, only 114 hours since new. This great flying, well known little airplane can be seen at Transport Canada's photo album at: www.tc.gc.ca/aviation/GENERAL/RECAVI/Pictures.htm Dale 293-3826, e-mail: dacl@cybersurf.net (10/98)

Forward ads to Bob Kirkby 569-9541.

Flying Events

June 4th - 6th Medicine Hat, AB
RAA Western Convention, Medicine Hat Airport, Contact Lyle Clarkson 403-524-2407

June 19th, Bishell Airstrip, Carstairs, AB
3rd annual fly-in/drive-in breakfast, 8 am -1 pm, tie-downs and camping available, Glen Bishell 403-337-2564.

June 13th, Hinton, AB
Hinton flying club fly-in breakfast and airshow, contact Jim Fry, 780-865-2159

June 13th, Innisfail, AB
Annual Innisfail airport breakfast 7-11 am, contact Wilhelm Vohs, 403-728-3341

June 13th, Beiseker, AB
Fly-in breakfast 7-11 am, Beiseker airport, contact Richard 403-546-3125

July 7th to 11th, Arlington, WA
NW EAA Fly-in, Arlington, Wash.

July 10th, Moose Jaw, SA
Saskatchewan Airshow at CFB Moose Jaw

July 17th, Chestermere-Kirkby Field
Annual fly-in pancake breakfast, 8:00 am to 12:00 noon, for more information contact Bob Kirkby at 403-569-9541.

July 18th, Vulcan, AB
Vulcan Flying Club annual fly-in breakfast, 8-11:30 am, contact Jack Deans 403-485-6484

July 28th to Aug 3rd, Oshkosh
EAA Airventure, Oshkosh, Wisconsin

July 31st to Aug 1st, Red Deer
Red Deer Airshow, Snowbirds perform

August 4th, Cranbrook, BC
Cranbrook Airshow, Snowbirds perform

August 14th - 15th, Lethbridge, AB
Lethbridge International Airshow

Innovation Engineering Sold

Innovation Engineering, manufacturer of the Genesis and Revelation line of aircraft, has been sold, according to Innovation president Marideth De Salvo. The sale to SlipStream Industries, a Wisconsin corporation, was consummated January 4 and "accounted for as a purchase of assets."

My interests have led me to pursue another business venture at this time," De Salvo says, "but it was imperative that I found the right buyer to carry on the Genesis legacy."

Mike Puhl, president of SlipStream Industries, has had a close relationship with Innovation Engineering since he purchased a Genesis in '96. Puhl has been a dealer for Innovation Engineering since the beginning of '98.

Sean Curry, general manager of Innovation Engineering, will continue in his role with the new company. Production is expected to remain in the Davenport, Iowa area for the foreseeable future, according to Innovation Engineering.

In addition to the Genesis, the company currently produces the Revelation and SkyQuest aircraft, the Quickfix cable-bracing-to-struts conversion kit for Quicksilver-type ultralights and FlyBouy floats, as well as parts and accessories.

Innovation Engineering reports a new single-seater is under development in the prototype stage. The company hopes to introduce the new aircraft this spring

Info: Innovation Engineering,
8970 Harrison St.,
Davenport, IA
52804.

Phone: (319) 38&6966
Fax: (319) 3864569
e-mail: flygenisis@aol.com

The Genesis, now manufactured by SlipStream Industries

One Pilot's Opinion

by Bob Kirkby

For a number of years Lethbridge, AB has been a nice weekend flight destination from Calgary. In my Cherokee 235 it's only a 45 minute hop. Sometimes the triangular route, Calgary - Lethbridge - Medicine Hat - Calgary, made a leisurely morning's flight. One Saturday in early April three of us decided it would be nice to head for a fly-in breakfast the next morning. I consulted the calendar of event in all my aviation publications and came up dry. Undaunted we chose to fly to Lethbridge and have breakfast at the nice little restaurant in the terminal building.

Sunday morning turned out to be a good flying day so off we went at about 9:00. We landing in Lethbridge 45 minutes later and pulled up to one of the FBO's there for fuel. While waiting for the lineman to top off the tanks I asked what time the restaurant opened on Sunday, hoping not to be too early. "Oh, that closed down about a year ago," the young man replied. "Not enough business I guess." Wonderful! It never occurred to me that there wasn't enough business at the Lethbridge airport to support a small restaurant.

I settled the fuel bill of $104.00 and asked where we could get breakfast. The attendant shrugged and offered to call us a cab for the city. They didn't have a courtesy car. The cab arrived 15 minutes later and we headed for the nearest restaurant which turned out to be a Humpty's egg place. We enjoyed an excellent meal then returned to the airport by cab for an enjoyable flight home. The billed for breakfast and the cabs came to about $55.

Although I won't be flying to Lethbridge for breakfast again I was sure I could find another excuse to fly there in the future. Or so I thought. Three weeks later I was startled to receive an invoice in the mail for $12.00, plus tax, from the County of Lethbridge for landing at their newly acquired airport. Apparently they took it over from Transport Canada since the last time I was there. Well that was the icing on the cake for me. After dropping $159.00 on the businesses of Lethbridge during a two-hour visit they had the nerve to bill me $12.84 for the privilege. No wonder their airport restaurant is closed due to lack of business.

This aviator won't be in a hurry to fly to Lethbridge any time in the near future.

Privatization of the aviation facilities in Canada strikes yet another blow against the recreational aviator. ✈

Building a Hummelbird

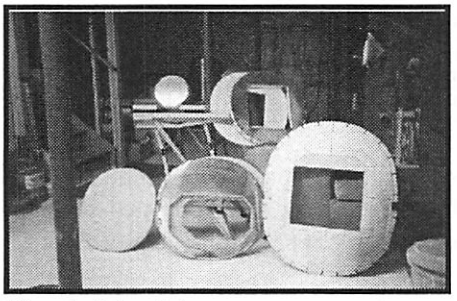
by Winston Brown

Welcome to the beginning of my Hummelbird. I will try to keep you updated on what is happening in the construction of this plane. A few facts about the plane.

It is all aluminum, weighing about 270 pounds dry. It will have a servicing ceiling of 13,000 feet. This will be achieved on a half Volkswagon engine. The engine I will be using is a 1700 CC V/W. The notebook says you can build this plane for approximately three thousand dollars, but it is amazing how gullible we can be. After pricing some materials out, I believe the cost will be around six thousand dollars.

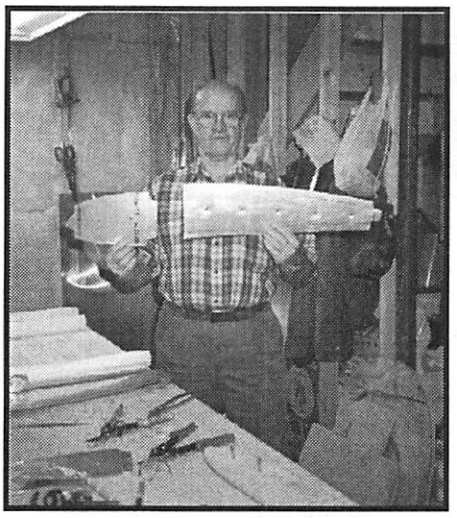
A bulkhead

I have started building bulkheads, four in aluminum, one in stainless steel. Every step in the construction of this plane presents a new challenge. A person must dig deep into the gray matter to come up with solutions. To date I do not see any major problems.



More bulkheads!

In building this craft, most of the construction will be done in the basement. When the weather is favorable, I will start the assembly in my garage.



Winston and a Hummelrib.

If anybody is interested in having a look at what I am doing, drop by, but please call first to insure I am home.

Winston Brown 236-4081

HORSEPOWER and TORQUE

by Robert Borovec

Picking an engine and propeller is not as easy as it once was. In the past, you just bought an old Lycoming or Continental with a matching propeller. The usual free advice from hangar buddies was all you needed to pick a good combination. Used engines were available, affordable and reliable. Those happy days passed with the arrival of modern overhaul prices. Alternative engines exist today, but choosing one isn't easy.

Try answering these questions. Is a 65 horsepower Rotax the same as a 65 horsepower Continental? How much power does a Subaru lose running direct drive instead of gear reduced? How believable are manufacturers' claimed horsepower ratings? How does one select a gear reduction ratio? Alternative engines bring new and unfamiliar questions. Unfortunately, the answers aren't simple Worse yet, they require math. On the bright side, the questions do have answers. Better yet, anyone can do the math.

Each of the above questions has appropriate math formulas and answers. The basic horsepower formula is a good one to start with. live heard debates about the advantages of horsepower versus torque in aircraft engines. There seems to be some confusion about the relationship between horsepower and torque. The basic horsepower formula can help clarify this debate. This article will try to demystify engine calculations by "scratch building" the basic horsepower formula.

Background

Some definitions may be helpful. Force is exertion, commonly measured in pounds. "If you push on it, that's force." Work is force over distance, commonly measured in foot-pounds "If you push it and it moves, that's work." Power is work done in a unit of time, commonly measured in foot-pounds per second. "If you push it and it moves, and you time it, that's power."

Way back in 1769 lames Watt, the steam engine inventor, first tried to measure power in a way that was understandable to others. A horse was an understandable amount of power and was the most powerful thing people could relate to then. Watt measured how far a healthy horse could lift a known weight in a given period of time. From this experiment he gave us a definition of horsepower we still use today.

Definition

Horsepower is defined as a foot - pound - second unit of power, equivalent to 550 foot-pounds per second. In other words, it takes one horsepower to lift one pound 550 feet in one second (or lift 550 pounds 1 foot in 1 second).

Imagine a 550-foot line wound around a drum with a one pound weight at the end of the line (see Figure 1). it takes 1 horsepower 1 second to raise the 1 pound

(continued on page 6)

Torque *- continued from page 5*

550 feet. If we put a longer line on the same drum and give it more time, it takes 1 horsepower 1 minute to raise the 1 pound 33,000 feet (550 x 60 = 33,000).

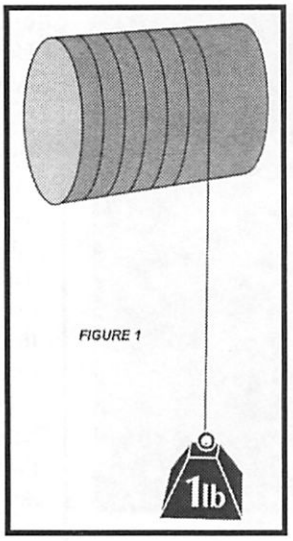


FIGURE 1

Let's give the imaginary drum a 1 foot radius. A 1 foot radius drum has a circumference of 6.283 feet (see Figure 2). This means the drum reels up 6.283 feet of line with each revolution. The drum will revolve 5,252 times reeling up 33,000 feet of line (33,000/6.283 - 5,252). Reeling up line at the rate of 33,000 feet per minute translates to 5,252 revolutions per minute (rpm).

Torque is a force that tends to cause or resist rotation. When you try to tighten or loosen a jar lid, you're using torque. A foot-pound of torque is equivalent to 1 pound of force applied at a 1 foot radius. In our example, the 1 pound weight pulling the line down applies 1 foot-pound of torque on the 1 foot radius drum. The 1 horsepower works against this resisting torque while reeling the line up.

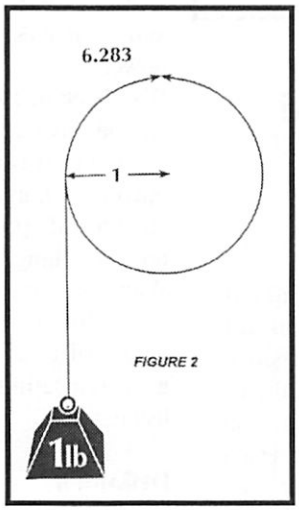


FIGURE 2

To summarize, 1 horsepower revolves a 1 foot radius drum at 5,252 rpm to lift 1 pound at the rate of 33,000 feet per minute. The 1 pound weight applies 1 foot pound of torque on the same drum, resisting the rotation. In other words, it takes 1 horsepower to revolve at 5,252 rpm against 1 foot-pound of torque resistance. This defines the horsepower - rpm - torque relationship.

Equation and Formula

A defined relationship exists now, but it still needs to be converted into a math formula. This is a direct process best illustrated by an example:

4 quarts is the same as 1 gallon. This simple relationship makes a simple equation:

4 quarts =1 gallon (or 8 quarts = 2 gallons)

Note that the number of gallons is found by dividing the number of quarts by 4. That's how the gallon equation converts into a gallon formula:

Where: GAL = gallons (calculated)

QT = quarts (known)
GAL = QT/4 (GAL Formula)

The GAL formula is a simple quarts to gallons formula. For illustration, we'll do a GAL formula example and find how many gallons are in 8 quarts. By substituting 8 for QT in the formula, we calculate GAL equals 2 gallons.
GAL = QT/4 or 8/4 = 2 gallons

Horsepower

The same formula creation process can now be applied to the horsepower-rpm-torque relationship. Remember, it takes 1 horsepower to revolve at 5,252 rpm against 1 ft lb. of torque resistance. This relationship can be made into an equation:

1 horsepower = 5,252 rpm x 1 ft.-lb. torque

In the same way quarts are divided by 4 to get gallons, a given rpm is divided by 5,252 to calculate horsepower. The horsepower equation can be made into a horsepower formula:

Where: HP = horsepower (calculated)

RPM = revolutions per minute (known)

T = torque in foot-pounds (known)

HP = RPM/5,252 x T or HP = RPM x T/5,252 (HP formula)

The HP formula is the basic horsepower formula. The HP formula states that all engines producing a certain torque at a certain rpm are producing the same horsepower. It's how manufacturers come up with their horsepower figures. They run their new engine on a dynamometer or Prony-brake and measure torque and rpm. That's why power is sometimes listed as BHP (brake horsepower). Torque and rpm are measured numbers. Horsepower is a calculated number.

We'll do a HP formula example. Maximum torque occurs at a lower rpm than maximum horsepower. For this reason, manufacturers commonly list torque and horsepower separately. By example, the Rotax 582 lists 55.3 ft.-lb. Of torque at 6,000 rpm and 64.4 horsepower at 6,500 rpm. On two-stroke engines, it's good practice to use the rpm at which maximum torque occurs as the maximum cruise rpm. In the Rotax 582 example, the engine should cruise at 6,000 rpm, not 6,500 rpm. The HP formula will let you calculate the horsepower available at 6,000 rpm. By substituting 6,000 for rpm and 55.3 for T in the formula, we find the engine produces 63.2 horsepower at that rpm.

HP = RPM x T/5,252 or 6,000 x 55.3/5,252 = 63.2 horsepower

As expected, the power is a little lower at 6,000 rpm compared to 64.4 horsepower at 6500 rpm.

Torque

Now that we have the basic horsepower formula, it can be rearranged to calculate torque instead of horsepower. The algebra is simple, and we'll skip over the rearranging process.

Where: T = torque in ft lbs (calculated)
(continued on page 7)

Torque - continued from page 6

HP = horsepower (known)
RPM = revolutions per minute (known)
T = HP x 5,252/RPM (T formula)

The T formula is a variation of the HP formula. The T formula states that all engines producing a certain horsepower at a certain rpm are providing the same torque.

We'll do a T formula example. The Rotax 582 lists 64.4 horsepower at 6500 rpm. The T formula will let you calculate the torque available at that rpm. By substituting 64.4 for HP and 6,500 for RPM in the formula, we find the engine provides 52.0 ft.-lb. of torque at that rpm.

T = HP x 5,252/RPM or 64.4 x 5,252/6,500 = 52.0 ft.-lb. of torque

As expected, the torque is lower at 6500 rpm compared to 55.3 ft.-lb. of torque at 6000 rpm.

We'll do another T formula example. We've already found the Rotax 582 produces 63 2 horsepower at 6,000 rpm (and 55.3 ft.-lb. of torque). What effect would a 2:1 gear box have on the same engine? Obviously, the propeller rpm changes. With a 2:1 gear box, the propeller rpm is cut in half, going from 6,000 rpm down to 3,000 rpm. Nothing has been done to change horsepower. The engine still has the same 63.2 horsepower, but it is now turning the prop at 3,000 rpm. By substituting 63.2 for HP and 3000 for RPM in the formula, we find the engine and gear box combination will have 110.6 ft. lb. of torque at the propeller (ignoring gearing losses).

T = HP x 5,252/RPM or 63.2 x 5,252/3,000 = 110.6 ft.-lb. torque

Note that cutting the propeller rpm in half doubled the torque compared to the 55.3 ft-lb. of torque at 6,000 rpm.

Rpm

The HP formula can also be rearranged to solve for rpm.
Where: RPM = revolutions per minute (to be calculated)

HIP = horsepower (known)

T= torque in foot-pounds (known)

RPM = HP x 5252/T (RPM formula)

The RPM formula is a variation of the HP formula. The RPM formula states that all engines producing a certain horsepower at a certain torque are doing it at the same rpm.

We'll do an RPM formula example. Many original WW I fighter planes were power by high torque low rpm rotary engines turning large diameter propellers. Modern WW I fighter replicas are often geared down to give them the necessary torque to turn replica props. By example let's say an ultralight WW I replica needs 200 ft.-lb. of torque at the propeller. It uses a Rotax 582 producing 63.2 horsepower (at 6,000 rpm). The RPM formula will let us calculate the rpm necessary to provide the desired torque using the horsepower available. By substituting 63.2 for HP and 200 for T in the formula we find the needed prop speed will be 1,660 rpm.
RPM = HP x 5,252/T or 63.2 x 5,252/200 = 1,660 rpm

By gearing a 63.2 horsepower engine to turn 1,660 rpm at the prop we get our desired 200 ft.-lb. of torque at the prop.

The gear reduction ratio can be found by dividing the engine rpm by the needed prop rpm. The reduction ratio would be 3.6:1 for the 6,000 rpm Rotax 582 (6,000/1,660 = 3.6).

You can get any torque you want by gearing down enough. You could gear a 3 hp lawnmower motor down low enough to get 200 ft.-lb. of torque from it. Of course you'd have to be content with the resulting maximum prop speed of only 79 rpm! That's below the idle speed of any aircraft engine.

The T and RPM formulas will only give accurate torque and rpm numbers if the "known" horsepower number is also accurate. Manufacturers or suppliers sometimes exaggerate engine horsepower numbers.

Conclusions

Torque alone does not tell you how powerful an engine is. You also need to know at what rpm the torque is being produced. Horsepower is a useful way to combine torque and rpm in a single number.

The HP, T and RPM formulas will allow anyone to calculate horsepower torque or rpm if the other two values are known. By selecting the formula that has the two known values on the right side of the formula you can calculate the correct answer for the unknown value on the left side of the formula. Confused yet? ✈

A GUIDE TO THE EAR IN THE AIR

by Dennis Pagen

A standard conversation—recounted only half in jest—from the early days of ultralight flying might have run something like this: "Hey, Rudy, did you see those honeys waving at us when we flew over that private beach back yonder?"
"What?"
"Yeah, I swear that one was topless!"
"Huh?"
'Whattaya say we cruise on back and get to know 'em?"
"Did you say something?"
Rudy had been flying his ultralight for about a year. Specifically, it was an Easy Riser biplane with a MAC101 12-horse engine spinning a short prop on direct drive. This setup was designed to transform a mixture of gasoline and oil into pure noise, with a smidgen of climb as an afterthought.

Rudy learned to fly in the boonies where parachutes, helmets and earplugs were for the sissies. As Rudy accumulated hours of airtime, he simultaneously acquired a hearing deficit. Someone should tell him that debilitated senses have nothing to do with manliness. Be sure to speak loudly.

Actually, Rudy's story could have been my own, for my first ultralight was a 'Riser set up exactly as his. However, I learned a lesson from my rock 'n' roll days: continuous loud noise produces hearing loss well before the point of ear discomfort. To see medical science in action, peek into any bar with a live band. You'll find it impossible to carry on a conversation, get a phone number or hear any subtleties in the music through the high-decibel onslaught. All you can do is dance.

This state of affairs occurs because the band members have progressively damaged their own hearing so they keep jacking up their amplifiers. Unfortunately, their loyal fans come to share the same fate.

Well, I still play my electric guitar, but the volume is held at bay. I also have used earplugs on every ultralight flight I have taken over the years. For this I am thankful because the simple fact is this: you can sustain hearing loss due to any continuous noise above the level of 60 decibels—about the level of a loud conversation. The effects of repeated exposure to loud noise are cumulative.

In my belief system, something we do for enjoyment should not prove detrimental to the other phases of our life. We fly ultralights for fun—and shouldn't have to expect to hear a whining in our ears long after the flying is over. Unfortunately, many pilots ignore this bit of philosophy, so we offer this little discussion as a warning.

Hearing Loss

Ultralights employ 2-cycle engines due to the good power-to-weight ratio of a 2-cycle. Unhappily, 2-cycles are ear-splitters, partially due to the necessity to scavenge exhaust gases. Propellers are also major noisemakers on ultralights, due to their fast tip speeds which can approach the supersonic at high rpm's.

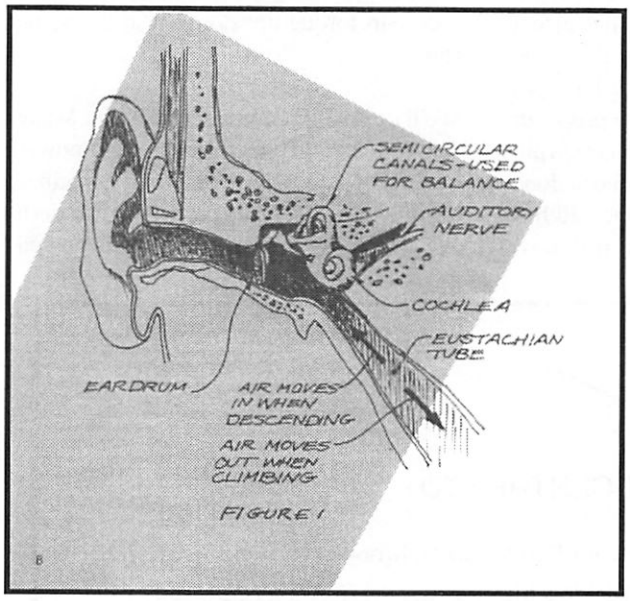


FIGURE 1

Today, better muffler systems, reduction drive systems (allowing slower, longer props), scimitar (curved) propellers and rearward mounted engines have all contributed to a lowered noise level at the pilot's seat. However, the intensity of sound in most ultralights is still high enough to cause hearing loss. Note that the Air Safety Foundation recommends earplugs in all small airplanes.

Just how does loud sound damage hearing? The judge is still undecided, but the jury seems to think it happens in the cochlea. In Figure 1 we see the cochlea is the last stop before the auditory nerve sends sound impulses to our brains. The cochlea is curled like a snail and is filled with a fluid. The walls of the cochlea are lined with tiny hairs (cilia) which pick up the sound vibration at different frequencies and change it to a nerve impulse. Actual damage or destruction of these cilia occurs when they are vibrated too strongly by overly loud noises. It turns out that the area of high frequency detection is in the forepart of the cochlea coil, so hearing loss occurs most commonly and initially at the upper range of our hearing spectrum. Partial hearing loss usually means an inability to detect certain tones.

So have you heard enough about big noises and tiny hairs that you're convinced? You already know the preventive measure: wear earplugs. The best are the waxy foam cylinders made by E.A.R. Corporation. They are available at most airports and some sport shops. All wax, dry foam, rubber and other material earplugs are said to be less effective, according to controlled tests.

Helmets with built in ear muffs can be as effective as earplugs. However, the rule should be to don your helmet before you start your engine. Also, it's wise to keep some earplugs handy for those occasions when you are tuning your engine at the hangar. Remember, any ringing in your ears means you have over stressed the delicate mechanisms and can indicate irreversible hearing loss.

A problem represented by the necessity to *(continued on page 9)*

Ear in the Air - continued from page 8

wear earplugs is a reduced ability to use our sense of hearing to monitor airspeed—as is possible on a hang glider. This means we must develop our sense of feel all the more acutely. Yes, I know that's what we have airspeed indicators for, but I have yet to use an airspeed indicator on an ultralight that provides more than a general idea of true airspeed. The point is, new pilots need to be aware of the elimination of hearing from their sensory arsenal during ultralight flights.

Ear Pain

We cannot consider our discussion of the ear in the air complete without looking at pressure equalization. As you know, air pressure changes about 3 percent per 1,000 feet. Since we have air on both sides of our eardrums, this pressure drop would likely burst our eardrums as we climbed if we could not equalize this pressure. Look again at Figure 1. You'll see the Eustachian tube which leads from our sinuses to our inner ear. As we go up, air must flow out of the Eustachian tube to equalize pressure on the eardrum. As we go down, air must flow through the tube to the inner ear (see arrows).

Air seems to flow out of the inner ear easier than it flows in. If you've ever had trouble "popping" your ears when diving into water, or descending in an airliner, you'll know what I mean. The pain can be excruciating, debilitating and an instantaneous eradicator of fun In its most severe form, damage to the eardrum can occur due to the inability to "clear your ears." Also, unbalanced pressure in the ear can lead to disorientation due to vertigo.

The problem of unequal ear pressure occurs most often when you have a cold or swelling of the sinuses. As indicated, it is experienced as ear pain when you descend from altitude. Unfortunately, you're already up there and can't camp out until a cold runs its course. The best thing to do is to climb back up to an altitude where the pain goes away, then try descending slowly. Periodically—even continuously—you should then try clearing your ears in stepwise fashion.

Here's how some scuba divers work on their ears during descents. Move the jaw quickly from side to side while tugging on the ear lobe (one hand at a time, please). if this doesn't work, try holding your nose, closing your mouth and exhaling slightly to force air up your Eustachian tubes (don't overdo it and blast out your eardrums). if you get to a point where the pain returns, climb back up and start over. Now you also know another one of the reasons you should always maintain a reserve of fuel . .

Most airplane guides recommend the use of a nasal inhaler to assist the clearing of troublesome ears. This may be a good idea if you have this problem on a recurring basis. Another good idea is chewing gum, which promotes jaw movement and helps pump air All in all, the best word of advice is to avoid flying entirely when you have a cold, for besides the very real possibility of experiencing severe pain, colds can lead to a loss of balance and acuity of judgment. It is important to note that if ear pain persists for more than a few hours after a long descent, you should consult a physician and explain your flight caused plight.

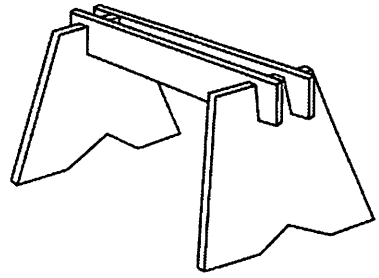
The more experience you gain as a pilot, the more you learn how complicated matters can be. However, if you take your learning gradually and study carefully, the challenge of new material is all part of the fun. Perhaps the most important material you can explore concerns aeromedical factors (see Powered Ultralight Flying and various general aviation books for this information).

Hearing loss is a very real possibility when flying ultralights. It is a particularly insidious malady because there are no signs of damage until it is too late. B e wise and wear earplugs. Don't end up like our friend Rudy who would need a bit of shouting and some graphic gestures to understand the important message he missed. ✈

Breakdown Sawhorse

by Fred Frank of Huntsville, AL

Everyone needs good sawhorses when working on projects. Whether they are building airplanes, boats, refinishing furniture or painting a ceiling, this is it.

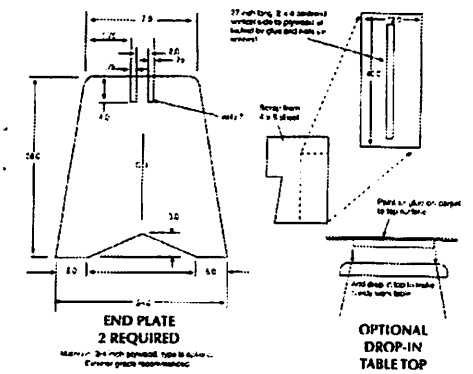


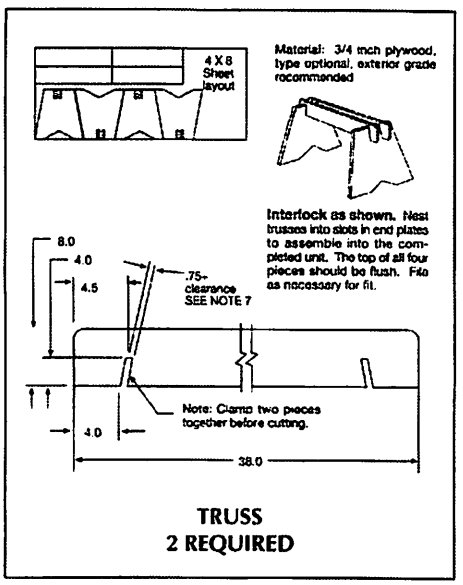
Made from 3/4-inch plywood, they assemble like the exhort dividers used in *(continued on page 10)*

Sawhorse - continued from page 10

cardboard boxes. The parts interlock and the more weight you put on them, the tighter they get. They disassemble and can be stored flat or stood up in a corner. They can be built with hand tools or power saw. I built mine with a skill saw. I have used mine for about five years; they are weathered, painted, abused, dropped and run into with a car. What more can I say about a good, proven design. I commonly give copies of the plans to all my friends and hope every CUFC member can use them.

Assembly requires no tools or fasteners as this design relies on the fit of the trusses into the end plates for stability. This also allows flat storage when disassembled.





Instructions

1. Cut four end plates and four truss pieces from 4 x 8 sheet of 3/4 exterior plywood as shown in detail.

2. Trim end plates as shown in detail except for the slots in the top.

3. Clamp end plates together and cut slots on band saw.

4. Trim trusses except for slots.

5. Clamp trusses together and cut slots on bandsaw.

6. Finish is optional. However, if heavily painted, allow an additional 1/16 inch kerf on slot cuts to prevent binding on assembly.

7. If you don't have access to a bandsaw, slots can be Skilsaw cut. Sand and/ol- file all edges lo prevent splinters.

Fuel Flow

by Bob Kirkby

You may remember in the November issue of Skywriter I reported on a fuel starvation incident I had encountered in my Renegade. To recap briefly I accidentally took off with only one of my two fuel tanks selected and the engine quit on climb-out. I was able to land in the field at the end of my runway without further problem and subsequent investigation revealed a partial blockage in the selected fuel line.

I chose to completely replace all my fuel lines since they were several years old. In the process of re-installing the lines I decided it would be a good idea to do a fuel-flow test. If I had built the Renegade as a home-built aircraft this would have been a required test, but as an ultralight it is not.

I use 1/4" Tygon tubing so I started at the tank exit which is a 1/4" brass barbed fitting. I filled the tank approximately ½ full and ran a length of tubing into a 10 litre can. I then opened the valve and measured the time it took to fill the can. The flow was gravity fed with a drop of about 4 feet. This gave a flow rate of 141.2 litre/hr or 33.6 gals/hr (imperial).

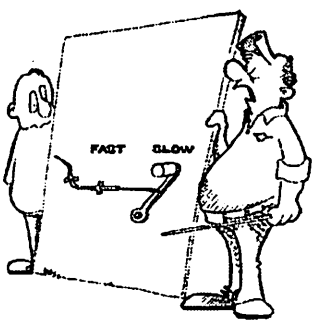
The next step was to install my fuel filter (I have one at the exit of each tank) and see how that reduced the flow. I repeated the test and this time obtained a flow rate of 18.1 gals/hr. The filter made a dramatic difference.

In one of my lines I have a "T" fitting to take off fuel to the primer pump. This is a 1/4" barbed fitting with an 1/8" "T" going to the primer line. I repeated the test with this fitting in the line. This time I recorded a flow rate of 17.9 gals/hr. Not a big decrease from this fitting.

This brought me to the final fitting before the fuel pump. At the inlet to the pump I have another "T" fitting to bring the two lines, from the two tanks, together. This is a 3-way 1/4" barbed fitting. I install this and repeated the test again. This time I recorded 15.9 gals/hr. It is interesting to note that the decrease is not the same when I installed one and then two fittings in line.

The conclusion is that into the fuel pump, under gravity feed conditions, I am getting at least **15.9 gals/hr**. The Rotax 532 has a consumption rate of about 4 gals/hr at full power.

So now at least I know there shouldn't be a problem - providing I can keep the bugs out! ✈



"It's a 'systems trainer' for ultralights."