EAA CHAPTER 1410 HIGH RIVER, ALBERTA, CANADA

Chapter Waypoints

Volume IV: Issue 2
FEBRUARY 2009

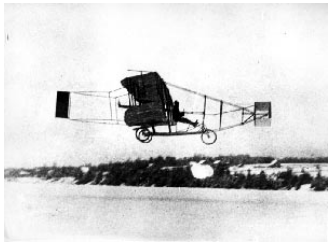
FROM THE FLIGHT DECK

Happy One Hundredth anniversary of flight Canada! Mark your calendars— February 23, 2009 is the actual date.

On February 23, 1909, J.A.D. McCurdy made history when he flew the Silver Dart from Bras d'Or Lake at Baddeck, Nova Scotia. The Silver Dart only flew a half mile, but it was the first heavier-than-air machine to fly in Canada and the entire British Commonwealth.

So celebrate in your own way! Go flying! Pound an extra rivet! Spend an extra hour reading an aviation magazine you never got to reading!

Have a toast to mark the significance of something that a few committed individuals did 100 years ago which has impacted our lives and passions.



Imagine a world without aviation!

This is my second newsletter and once again, the Chapter members continue to impress me with their contributions. Lars took time to write about a topic he wanted to discuss—engine leaning. Jeff also sent in some wonderful pictures of his trip to the Kermit Weeks museum in Florida. Andrew sent in our meeting minutes so we can be more efficient.

It really shouldn't be a surprise — we have an amazing chapter!

Paul Gregory
Editor

Inside this issue:

Editor's Note Pot Luck Details	1
Upcoming Meeting Speaker Air Venture Update	2
January Minutes Introducing Lars Oyno	3
Fantasy Of Flight Museum	4
Tech Desk: Engine	6
More photos	9
Chapter Contacts	10

CHAPTER NOTAMS

- Next chapter meeting February 5, 2009 at the Dueck hanger (see www.eaahighriver.org for directions)
- Chapter Pot Luck is now set for February 7, 2009 1800Hrs
- Chapter meeting—feature speaker Pat Spenser on aerobatic competition
- 2009 Membership fees are due. See the last page for details.

ANNUAL CHAPTER 1410 POTLUCK

Mark February 7 1800Hs at the Dueck hanger on your calendar! It is our **Fourth Annual Chapter Potluck Dinner**! We are excited to have guest speaker Soren Christiansen who will be talking about his exciting adventures flying to Alaska. Come hear his experiences playing bush pilot!

Members Jean Dueck (jean.dueck@gmail.com) and Scott Church (churchsc@telus.net) are the organizers the event so feel free to contact them.

Guests welcome. You will be asked to contribute $5.00 to cover costs and also provide a main course, an appetizer or dessert. Along with the pot luck, a ham will be provided. Don't miss it!

OUR UPCOMING MEETING

Make sure you attend this coming chapter meeting Feb 5th. We are pleased that chapter member Pat Spencer will be our feature speaker.

Pat gave a talk on himself and the aerobatic sport last year, so most of the attending members know Pat already.

Last time he did not talk about competition, but rather the history of his flying and what he enjoys about the sport.

This time he will talk about the rules, requirements and opportunities to participate in the sport.

Come and hear Pat talk about flying upside down, sideways and every which way!

Pat Spencer with his Christen Eagle C-GMBP

In addition the following agenda has been tabled by Jeff Seaborn (our president) subject to your approval.

Agenda

1. Introduction of Guests
2. Acceptance of past minutes
3. President's report
4. Vice President's report
5. Treasurer's report
6. Newsletter Editior report
7. Potluck News
8. Young Eagles
9. Canada 100 Celebration
10. New Business
11. Guest Speaker – Pat Spencer

LAST MONTHS POLL

I am sad to say that only 18% of our website pollsters got the correct answer in last month's poll on our website www.eaahighriver.org. It was not Charles Lindberg who was the first **solo** flight. Many fell for the trap of assuming Alcock and Brown were the first—they were the first to cross the Atlantic "**non-stop.**"

The true answer is Major Albert Read (**but in multiple stages**). From May 8 to May 31, 1919. U.S. Navy Curtiss flying boat NC-4 under command of Albert Read, flew 4,526 statute miles (7,284 km), from Rockaway, New York, to Plymouth, England, via Trepassey, Newfoundland, Azores, Lisbon, Portugal, and other intermediate stops, in 53 hours, 58 minutes spread over 23 days. His was the only aircraft to make it and it was named "Lame Duck." Later that year, a British Vickers Vimy piloted by Alcock and Brown made the first **non-stop** transatlantic flight.

(source http://en.wikipedia.org/wiki/Transatlantic_flight)

Website Poll Stats

Who was the first of the following to cross the Atlantic in an aeroplane?

Answer	%	#
Charles A. Lindberg in the Spirit of St. Louis	22	5
Albert Read in Lame Duck	18	4
John Alcock and Arthur Brown in a Vickers Vimy	54	12
George H. Scott in a R34 airship	4	1
Total Answers : 22		

UPDATE ON AIRVENTURE CANADA CELEBRATIONS

This past month a press release from EAA International announced intentions to mark the 100th anniversary of Canadian flight at this year's Airventure.

If you don't already know (see last month's newsletter), members Jack Dueck and Paul Gregory are helping to organize the event under the guidance of EAA headquarters and the new Canadian Homebuilder Council Members.

The Canadian Homebuilders Council has had their elections and the new positions are now in place.

Jack and Paul are in discussions and conference calls with EAA leadership and have begun to contact possible participants.

We will keep you informed as more developments come. If you would like to contribute ideas or help out, feel free to contact Paul at eaahighriver@shaw.ca or call 403-701-0480.

AIRVENTURE OSHKOSH EAA

Go to www.Airventure.org for details.

LAST MEETING'S MINUTES

Minutes from meeting January 8, 2009

Meeting called to order at 7:15pm. Minutes from December amended as follows: Guest speaker for the annual potluck will be Soren Christiansen. Clark Seaborn accepted, Marvin Fenrich seconded.

President's Report: Jeff Seaborn quizzed the membership on the Silver Dart, which was the first powered fixed-wing aircraft to fly in Canada and the British Commonwealth. Taking off from an ice-covered surface at Baddeck, Nova Scotia, John McCurdy flew the Silver Dart on February 23, 1909.

Chapter 1410 will be matching a donation of $200 made by chapter 262 to the E'pervier project in Sherbrooke Quebec.

Vice President: Lars Oyno looked into the idea of the chapter buying an airplane. According to EAA rules, an EAA chapter can own a non-flying airplane or build an airplane for education and sell when airworthy. Someone outside the membership could possibly pursue this idea further.

Treasurer: Marvin Fenrich commented the treasury is in a transition phase. Next meeting membership fees will be discussed.

Newsletter: On Paul Gregory's behalf, Jeff said any news articles would be appreciated.

Community Outreach: Jean Dueck reported there will be nothing new until spring.

Annual Potluck: Volunteers Jean and Scott have guest speaker Soren Christiansen confirmed. Along with the pot luck, a ham will be provided. The date is set for February 7th at 6pm. Invites will be sent out and will see if e-vite can be used.

Young Eagles: Allan Logan has a request for a flight near Calgary. Lance, Marvin and John volunteered for the planning of the next Young Eagles Event scheduled for June 21st. CFTC is interested in a combined event.

Canada 100 Year Celebration: Jack Dueck states there will be activities all over Canada and a Canadian theme at Oshkosh. There will be special recognition of Canadian activities and many different models present. Planning is still preliminary due to a late start and activities going through the Canadian Counsel. Stay tuned...

Guests:

Jeff introduced Soren Christiansen and Lars introduced Greg MacGillivray and Robert Fridman

Meeting adjourned 9:00PM

INTRODUCING LARS OYNO, CHAPTER VICE PRESIDENT

I am a Norwegian (that is why I have this funny accent) working the oil business. Flying has always been the huge interest in my life, and I started flying radio control airplanes at 10 years old. Flying gliders took over at 15, and powered aircraft when was old enough for that. Even though I still have much more hours on gliders (and a glider back in Norway), I enjoy flying my Rotax-powered MCR01 tremendously. The MCR was finished in 2004, and was brought over the Atlantic together with the family's furniture when we moved here in 2007. The newest project now is rebuilding a BD-4 (the family needs 4 seats), which I put 30 hours on last summer before taking everything apart for the winter.

I enjoy building and flying equally well. EAA is a great organization linking people together with the same interests, and it is great to be part of such an organization. The High River EAA club is a thriving and healthy club, where I hope to make a contribution keeping it in this state. This requires work, but I believe having a club to belong

to is important to homebuilders and pilots alike. We can all learn from each other and share experiences and stories.

A FANTASY OF FLIGHT

BY JEFF SEABORN

Aviation is a passion.

Pilots often fly to nowhere in particular for the shear passion of flying. There are people who build an airplane for the passion of creating their dream machine.

There are others, repeat offenders, who are passionate about building. They have built many airplanes and are continuing to build more. There are people who will spend countless, passionate, hours researching, collecting, archiving, and restoring airplanes to original airworthy condition.

There are pilots who share their passion by performing at air shows, demonstrating the capabilities of their aircraft and their flying skill. Some passionate people design newer, better airplanes, or make improvements on existing designs.

Outside the Fantasy of Flight Museum in Florida

Some pilots compete in them, pushing their passion higher and higher. There are others, pilots or not, who share their passion by writing books about aviation, sharing stories about pilots and their exploits, creating beautiful paintings of aircraft.

Some of us may be passionate enough about aviation, that we will do a couple of these things in our life. Some of us may even do a couple of these things at the same time.

In December, I had the opportunity to see the works of someone so passionate about aviation, that he's done all of these. I went to Kermit Week's Fantasy of Flight Museum in Florida.

This is a museum built to share the pas-

FANTASY MUSEUM—CONTINUED

sion of aviation. Let me say, any one of the aircraft in his collection would be a treat for an individual to own. But we're talking about an individual that has collected countless airplanes. Have you ever dreamed of owning a Mustang? How about two of them? Have you ever seen a privately owned Short Sunderland? How about the pressurized nose section of a B-29? Have you ever considered owning a GeeBee racer? No, how about three of them?

Kermit's private collection is nothing short of amazing. When I say private, I only mean privately owned. He does not keep it private, away from the eyes and hands of enthusiast. He opens it up to everyone. This collection is not just for show though; many of the airplanes are still flown regularly.

Who flies them? Kermit does. Why does he fly them? Because that's what airplanes are meant to do, fly. It may not be economical. It may not be efficient. It may not even be practical to fly them, but that's not the intent. Kermit's Museum is there to share his passion of aviation.

What are you doing to share your passion of aviation?

Jeff Seaborn

From The Tech Desk: Engine Leaning

Lars Oyno is our Chapter Vice Present and a homebuilder. At a recent lunch gathering of pilots, a discussion about proper engine leaning techniques sparked a long discussion. This prompted Lars to research more on the topic and I asked Lars to document his research and prepare this article.

When flying a well-instrumented Arrow recently, the instructor stressed that I lean according to target fuel flow, and that the temperatures were only used for verify we were in "the green". I attempted to object, but was told this was the way "everybody leaned", and which was recommended by Lycoming.

Well, I started asking around and quickly found out that the methods of leaning are as many as the pilots you ask for their opinion.

So, I started looking into mixture management. There had to people out there with a little more scientific approaches to leaning than the statements "this is the way everybody leans", or "Lycoming recommends this" or "running too lean will blow up your engine".

10-15 years ago, we were lucky if we had a single Cylinder Head Temperature (CHT) and a single Exhaust Gas Temperature (EGT) in our flying apparatus. The readings were course, and we had little faith in their absolute value readings. With the new engine monitoring units, both for certified planes and for homebuilts, this has changed completely. We now have possibilities to monitor all EGTs and CHTs with good accuracy and repeatability, and even log the data for storage and analysis / diagnosis. This opens the possibilities for completely different mixture management procedures than we were taught in the bad old days.

Now, to the disclaimer: Please do not shoot the messenger! What I will refer to in this article, is what people with much more knowledge about aircraft engines than me preach. I have attempted to pull out common advice from several sources, and also attempt to refer what the engine manufacturers recommend.

But before diving into the discussion, a couple of facts that are not disputed:

- To obtain maximum power at any altitude, the engine must be run at Rich Of Peak (ROP).
- Too high combustion temperatures can damage your engine. Lower temperatures are generally better for your engine.
- Modern EIS instruments and sensors are much more accurate that old steam gauges, and enables much better engine monitoring and optimization.

Figure 1 shows a plot of engine parameters for an IO 550 for a constant MP and constant RPM. Note that this is not constant power.

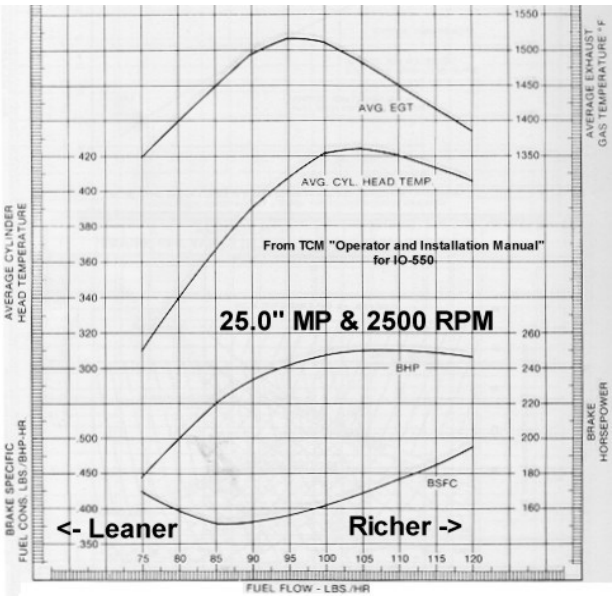


Figure 1. Performance data for an IO-550 engine running at 25"MP and 2500RPM (Ref 5)

Some pilots target 50 deg ROP (EGT). Note that since the EGT peaks at a lower fuel flow than max CHT, increasing richness to 50 deg ROP here will put the engine right at it's peak CHT, where we do not want to be. Increasing fuel flow to 100 deg ROP will put the engine's CHTs to around 410 degrees F, which happens to be the same temperature you get at peak EGT! It is very evident that from Figure 1 that the coolest cylinders are obtained by flying with a very lean mixture, provided the engine is able to run at this setting, and that the (reduced) power is acceptable.

Exactly the same can be seen in Figure 2, which is a similar plot for a Lycoming O-360 running at full throttle at sea level with a fixed pitch prop. Note that leaning for "best economy cruise" provides lower CHTs than "max power cruise."

Ground Leaning

Here in the Calgary region, engines should be leaned on the ground. Ground leaning will not cause detonation, (Ref 2). The recommended practice is (Ref2):

- Lean right after start-up
- Lean so hard that the engine will not run full throttle. This way you will not take off with too lean mixture
- Do the run-up with leaned mixture
- In the takeoff apply full throttle and lean to what feels like full power during the start of the roll

Notes:

1. Lycoming recommends leaning at takeoff and climb above 5000ft density altitude (Ref 4) which is often reached at ground level in Calgary in the summer months
2. A decrease of 20%-25% power can be experienced by

From the Tech Desk: Engine Leaning *(Continued from previous page)*

taking off full rich.

3. Full rich mixture should be used for takeoff at lower altitudes and at sea level (Ref 4, Ref 2)

Climbing

Provided above 5000ft density altitude, lean for best power, 100 deg F ROP is recommended by Lycoming (Ref 4) and others (Ref 5) Use full throttle and full RPM, there is no good argument for "sparing the engine" or "saving fuel" in this phase of the flight (Ref 9). The only reason why a lower throttle or RPM setting should be used is for noise concerns (on the ground or in the aircraft)

Cruise

This is where the big debate on LOP vs. ROP is concerned. Spokespeople for LOP operations are getting more and more numerous, and LOP running is now even recommended by Cirrus in their POH.

Lycoming two methods for leaning are as follows:

- For best economy: Lean to roughness starts to occur, then enrichen slightly to eliminate roughness. Peak EGT is targeted if instrumented.
- For best power: Lean until maximum RPM with fixed pitched prop and maximum MP with CS. When using EGT this corresponds to 100 deg ROP.

The main reason Lycoming is not recommending running LOP is clear from their statement:

"The operating procedures that Lycoming recommends combine techniques that have been found to promote good engine service life and accommodate normal pilot skills. Lycoming does not custom design operating instructions for each pilot skill level or individual aircraft based on instrumentation." (Ref 3)

I think the latter part here is worth noting. Since we are all expert pilots (or consider ourselves to be), and many of us now have very advanced engine monitoring equipment, Lycoming's recommendation start to seem overly conservative.

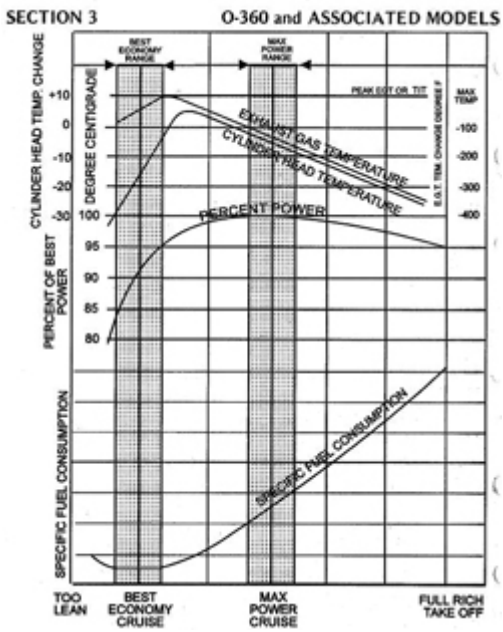


Fig 2. Performance data for a Lycoming O-360 engine running at full throttle at sea level with a fixed pitch prop (Ref 4).

Let's look at the two factors:

1. **Skill level:** Flying LOP requires more understanding of the engine, monitoring systems and procedures. Flying LOP requires the pilot to consciously transit from ROP during climb into the region of LOP for cruise. It is also much easier to accidentally lean too much resulting in a momentary roughness scaring the passengers.

2. **Instrumentation:** With the old single EGT, it should be mounted on the leanest cylinder (Ref 4). Setting the EGT to 100 deg ROP would put us in the maximum power area on the curve (See Figure 2). However, flying with this limited instrumentation LOP is not recommended, since we only monitor the leanest cylinder. The instrumented cylinder is leanest when flying LOP as well, so when setting the EGT 50 deg LOP, the other cylinders could easily be in the maximum danger zone (i.e. richer). It is only where we have full instrumentation of all EGTs and CHTs where flying LOP can be conducted without risk of harming the engine.

Also, the LOP requires uniform distribution of fuel to all the cylinders which is not the case for all fuel injected engines.

Uniform distribution of fuel to all the cylinders is NOT the case for any carbureted engine. In fact, the fuel distribution to each cylinder is so uneven that we can consider a 4 cylinder carburetted four cylinder engine to be four individual cylinders flying in close formation. This is due to vortices and aerodynamics in the inlet manifold which has to be of unequal length and shape. Figure 3 illustrates this well (Ref 7). The figure shows CHT data for a RV7A, O360 with a carburetor. It can be seen that the #1 cylinder is much leaner than the other three, and causes the leaning process to be halted prematurely. A couple of tricks can be used to achieve a more uniform mixture, however (Ref 11).

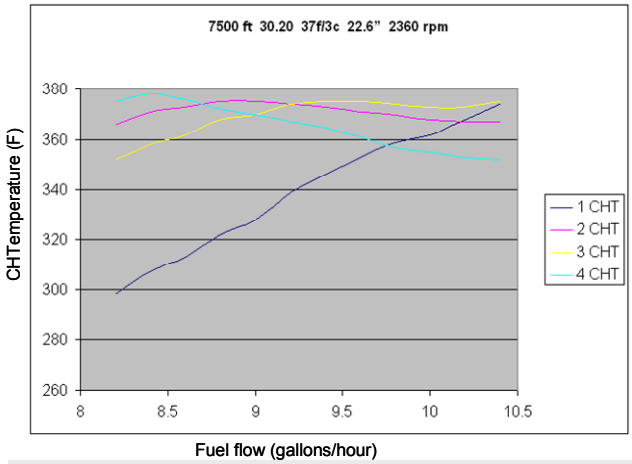


Figure 3. CHTs from a carburetted RV7 with a Lycoming O-360 engine. Note that Cylinder 1 is much leaner than the other three cylinders (Ref 7).

Backing off very slightly from full MP achieves better mixture in the manifolds.

Running with Partly or Full Carburetor Heat

I think the best advice for leaning in cruise I have found is given

From the Tech Desk: Engine Leaning *(Continued from previous page)*

by Mike Busch (Ref 1). He suggests you ask yourself, "do I want to go far (or save money) or do I want to go fast (save time)?"

If the answer is go fast/save time, he leans until his hottest running CHT does not exceed 380 deg F. This can be done both for ROP and LOP operation, see Figure 1 and 2. Mike Busch uses LOP invariably, but by looking at Figure 1 it is evident that if speed is ALL that matters, ROP will get you to your destination faster (more power).

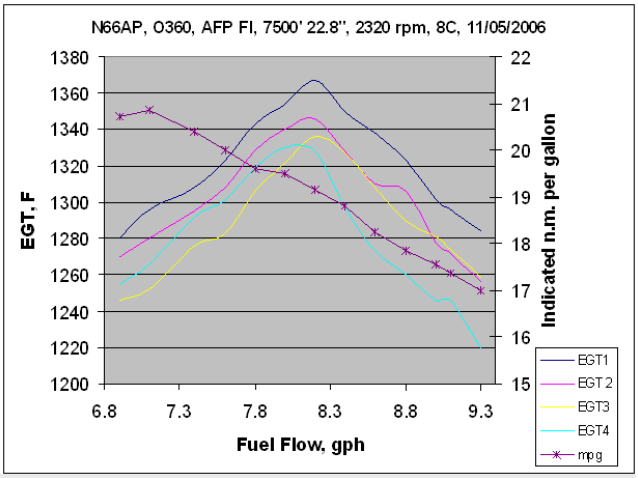


Figure 4 EGTs from a well-instrumented RV6 with fuel injection and a Lycoming 360 engine.

If the answer is to go far / save money: He suggests leaning until you calculate you will reach your target destination with your personal reserve in addition. If you frequently fly shorter trips where range is of no concern, but fuel economy is, the suggestion is to lean until you see 50 deg LOP EGT or 20 deg LOP CHT, whichever is preferred. Most sources recommend using EGT rather than CHT for leaning because the temperatures respond immediately to changes in mixture, compared to CHT. However, keep in mind that absolute values of EGT are very dependable on sensor location, so EGT measurements should be applied based on the trends and not absolute values. Figure 4 shows EGT data for an instrumented RV6 with O360 engine. It is evident which setting you want to use to stretch your range/money (Ref 4).

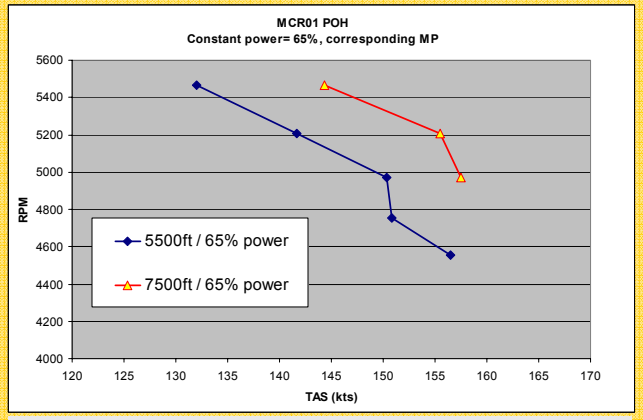


Figure 5. TAS vs. RPM. Note that the MP is adjusted to achieve constant power in these cases.

Descend:

For landings at our elevation, the cruise leaning setting should be kept unchanged (Ref 6). This is also recommended by Lycoming (Ref 4). If landing at or near sea-level, full mixture can be applied as a part of the landing checklist in anticipation of a go-around.

Manifold pressure and RPM settings

The Arrow-instructor also tried to teach me the square-philosophy between RPMs and manifold pressure that aviators have been using for decades. This preaches that you set your RPMs to correspond with your MP (for example 2400RPM/24'MP, 2200RPM/ 22'MP). Why it is called square I have never understood. Why it is still taught I also do not understand.

A couple of established facts:

1. Lycoming does not prohibit operating their engines under- or oversquare. These limitations we use on our engines are inherited from old CFI's used to fly behind rotary engines that could be overloaded by using high MP combined with low RPM. Lycoming allows settings like 1800 RPM / 25'MP (Ref 4), and clearly states that this "squared settings philosophy" is obsolete (Ref 4, Ref 10).
2. Power from the engine is approximately proportional to the RPM * MP. This means you can reduce your MP or your RPM to achieve a desired power setting. Usually pilots think of only MP as their power lever, that is NOT true!

When converting to variable pitch propeller, I measured the whole range of RPM, MP, airspeed and fuel consumption on my ROTAX 912S. There is a relationship between these parameters that are not well known. Figure 5 shows the True Air Speeds of my MCR01 with different RPM and MP combinations corresponding to 65% power setting. It is evident that low RPM combined with high MP gives better speeds for a given power setting (and thus fuel burn). This has been known for years; Charles Lindberg preached this to P38 pilots during the Second World War (Ref 8). Lycoming states the same (Ref 4), and claims this is due to lower friction in the engine caused by the lower speeds of rotation. I suspect it also has to do with propeller efficiency, we all know a propeller is more efficient at lower speeds due to lower aerodynamic drag. You can convert the same argument into fuel efficiency, very well described in the referenced articles (Ref 9, Ref 10).

The table below are from the Arrow POH, all settings give 65% power:

Altitude	2100 RPM	2400 RPM
SL	25.9 MP	22.9 MP
1,000	25.6 MP	22.7 MP
2,000	25.4 MP	22.5 MP
3,000	25.1 MP	22.2 MP
4,000	24.8 MP	22.0 MP
5,000	F. T. MP	21.7 MP
6,000	F. T. MP	21.5 MP

A couple of things are evident from the table. There are many RPM and MP settings that can give the same power output. The RPM and MP are nearly proportional in combining to give a re-

From the Tech Desk: Engine Leaning

(Continued from previous page)

quired power setting. The Arrow POH clearly states here that "over square" is perfectly all right

For those still not convinced that low RPM and high MP give the best economy and is best for your engine, compare it with how you drive your car on the highway: do you select the highest gear giving the lowest useful RPM, or do you do select third gear with half open throttle and the RPM screaming at redline? Many people actually fly their aircraft like that!

Conclusion

To sum up, many of us manage our engines using techniques that were made at times when instrumentation was very limited, and using procedures made for all types of pilots in all types of aircraft. I believe engine management can be conducted with much more finesse now, but it requires that we understand what we are doing.

Lars Oyno flying his homebuilt MCR01

The Gang at last years Potluck

Last years Pot Luck Dinner!

Paul at the controls of a Vulcan Bomber

Chapter Waypoints

EAA CHAPTER 1410 HIGH RIVER, ALBERTA, CANADA

Make sure you visit the website for more info! www.eaahighriver.org

We are an enthusiastic group of like-minded individuals from various backgrounds who share a passion for recreational aviation in Southern Alberta.Whether you have a casual interest in aviation, you are an active pilot, or you are an avid homebuilder of aircraft, we offer the chance to meet others who combine fun with learning.We meet to learn from informative speakers, participate in various social activities, and are active in the flying community. Come by and visit!

Chapter Memberships are $40 for singles and $50 for families with a membership in EAA. Contact Marv or any of the following chapter volunteers

Role	Name	Phone	E-mail
President	Jeff Seaborn	(403) 720-6554	jseaborn@telus.net
Vice President	Lars Oyno	(403) 282-2150	lars.oyno@chevron.com
Treasurer & Membership	Marvin Fenrick	(403) 242-2096	mdfen56@telus.net
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Newsletter Editor & Webmaster	Paul Gregory	(403) 271-5330	eaahighriver@shaw.ca

How to join...

- ✓ Attend our next chapter meeting. Ask for anyone and they will be pleased to help. All the required forms and such will be available for you to fill out.
- ✓ You must be a current member of EAA International so please have your EAA membership number - if you aren't a member you can join EAA at the meeting.
- ✓ Contact us by email, or post at EAA Chapter 1410, Box 5280, High River, Alberta, T1V 1M4. We can send you the forms for you to register.
- ✓ Call us. You can call Marv Fenrick (see left).
- ✓ Print, fill-out and mail or fax the form on our website to register. (www.eaahighriver.org)