Turn & Bank

OFFICIAL NEWSLETTER OF RAAC CHAPTER 85 August 2001

Fly Safer

Reduction Drives: an Engineer's Perspective

On the Cover:
A highly modified P-51 sporting Lear Jet wings and a 5 bladed prop Rob Prior Photo
Above: the Vulcan bomber at the Scottish Aviation Museum. Photo by David Smith

The TURN AND BANK is the monthly publication of RAAC Chapter 85 and is intended to keep members informed as to the club's activities, and to promote safety and technical excellence in the field of sport aviation. No responsibility or liability is assumed, expressed or implied as to the content of articles contained in the Turn and Bank: the intention is to provide a forum for discussion and exchange of ideas.

Newsletter contributions should be mailed to George Gregory, 19470-88th Avenue, Surrey, B.C. V4N 3G5 no later than the 12th of each month. Business Fax is (604)-469-3495. Please remember to indicate "attention George Gregory" on your fax.
Enquiries to the Membership Chairman should be mailed to Rob Prior, #204-130 E.11th St., North Vancouver, B.C. V7L-4R3

For inspections of Amateur Built Aircraft Projects contact the MDRA Inspection Services , ph. 1-877-419-2111
fax 1-519-457-0980 email: mdrainsp@on.aibn.com
Regular Meetings are held on the first Tues. of each month at 20:00 in the clubhouse:

Delta Airpark, 4103-104th Street Delta, B.C.
Clubhouse phone: 596-3644
Mailing Address: Chapter 85, RAAC
c/o Delta Heritage Airpark, 4103-104th St., RR#3, Delta, B.C.
V4K-3N3

Executive meetings are on the third Tues. of each month at 19:30 in the clubhouse.
Chapter aircraft pilots, mail cheques (Payable to RAAC Chapter 85) to:
Tedd McHenry
RAAC National Homepage: http://www.inforamp.net/~raac
RAA Chapter 85 Homepage: http://www.b4.ca/raa_85
Delta Heritage Air Park Homepage: http://home.istar.ca/~bb4
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REDUCTION DRIVES:
AN ENGINEERING PERSPECTIVE

With the nearly ridiculous prices most of us are forced to pay for aircraft engines, fuel and engine components, it is only natural for the consumer to be looking for alternatives. About two years ago our company conducted a market survey of this industry to see what the current demands are and what future trends might evolve. Although we were primarily looking at aircraft configurations, the survey did touch upon powerplant options.

The results were interesting in that they pointed out a number of unexpected values the aviation buyer seems to hold dear. Although there was a significant interest in the development of alternative powerplants for aircraft, the average aircraft buyer or builder still preferred the conservative Lycoming or Continental, even if he had to pay through the nose to get it. This was especially interesting since most of those questioned seemed to consider both engines outdated, inefficient, overpriced, and mechanically poor in design.

The key to the popularity of those engines today seems to be that of perception, the feeling being that since the designs have been flying for more than four decades with relatively good performance and safety, that's what most want to stick with. Over the years a number of developers have come out with promising new engines or engine configurations only to fail within a very short time, wondering why the aviation world hasn't beat a path to their door. The answer of course is simple; the aviation engine is not a mousetrap.

Too much rides on the selection of an engine, namely your life. Again the idea of perception comes in. A new engine or reduction drive is often viewed as an item of interest or in some cases as an interesting oddity, but hardly what one would want to install into his or her airplane, not until it's proven anyway. Only when the items have been installed into an airplane, have demonstrated safe and dependable operation and have been exposed to the market in a professional and responsible way, only then will the aviation buyer consider the new product a viable option. But unfortunately even all that is not a guarantee.

The supplier or designer must also be able to demonstrate technical and engineering know-how or the credibility of the design is nothing more than meaningless arm waving; this is where I find quite a large number of the reduction drives offered today fall short. They are designed and/or fabricated by individuals who may be mechanical craftsmen, or may have a bit of technical background and an impressive array of machining tools, producing gear-trains that look to be works of art, but on closer examination I've often found the advertised performance values questionable.

After looking at the market and not finding anything suitable for our purposes, (either due to our lack of confidence in the product or its incapability to conform to our application) we've decided to design and manufacture a reduction drive of our own (the layout of the prototype is shown in Figure 1). The first box should be assembled and ready for testing by the time you read this issue although at this time there are no plans for further production or marketing.

So what designs the components of a gearbox? I was amazed at the number of different and imaginative answers I received in doing our survey. Through our experience in the arena we've developed the following partial list of considerations that need to be addressed in designing a reduction drive suitable for aircraft applications:

1) Propeller size
2) Flight conditions
3) Torsional vibration characteristics
4) Power (Torque and RPM)
5) Environmental effects
6) Material endurance properties
7) Lubrication
8) Engine selection

Notice what's at the top. In designing a reduction drive one must consider all the possible forces that the structure may see in its life. Some of these are a function of power, but the most significant loads are flight related. Lets take a look at a brief calculation using a prop similar to that used on a Lycoming O-360: Propeller of 72" dia., weighing just about thirty pounds (fixed pitch) and turning 3,000 rpm (over-speed condition). What we're looking for is the gyroscopic moment generated by the spinning prop when the airframe is momentarily acted upon by a gust or control input resulting in a momentary pitching or yawing condition. For the sake of this calculation we will assume that the instantaneous rate of pitch or yaw will be 360 degrees per second (this may sound high but is easily achievable in moderate turbulence or during aerobatics). The equation (in vector form) governing this condition is:

$$M = I0\ (\omega i \times \beta j)$$

where M is the resulting gyroscopic moment in ft-lbs; I0 is the propeller's mass moment of inertia; øi is the propeller rpm expressed in radians per second; and ßj is the rate of pitch or yaw, again in radians per second.

The propellers' mass moment of iner-

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Bulletin Board

Last I heard, Norm Helmer is looking for someone to help with his Paradyne project. The Paradyne is a cutting edge new concept in STOL aircraft that shows promise. If you're interested give him a call at 943-7887.

Dan Lawler would like you to send your email addresses to him at: dan.lawler@kvaerner.com

He will create a database so he can send announcements about meeting programs, etc. Currently he has a list of about 20 e-mail addresses, and would like to expand it and keep it up to date.

Want to learn more about aircraft construction? Get involved in the J-5 project! Also, we are looking for help from someone knowledgeable in fabric work. Talk to a member of the executive and they'll put you in contact with the right people.

August 10-22, 2001, QUESNEL, B.C. TO ALASKA: Join the second annual self-fly tour to Alaska. Visit our Web site http://www.flynorth.com or e-mailjrdale@netidea.com.

August 10-12, ABBOTSFORD, BRITISH COLUMBIA: Abbotsford International Airshow at the Abbotsford Airport. Snowbirds performance. For more info call 604-852-8511.

August 10-12, PENTICTON, BRITISH COLUMBIA: Fly-in beach party and dinner/dance at the Penticton Regional Airport. (PFC / COPA Flight 50) Saturday night dinner/dance, speaker, and silent auction. Peach Festival weekend in Penticton. Vans available for transportation. Contact Gary West at e-mail: west@direct.ca.

August 19, PITT MEADOWS, BRITISH COLUMBIA: Open House at Pitt Meadows Regional Airport. A day of family activities including vintage aircraft, model aircraft, vintage cars, sky diving and static displays. Young Eagles free airplane rides. Food available. Free admission. Visiting aircraft will be welcomed and directed to secure parking. For more info contact Ron Blakely at Tel./Fax: 604-465-1343 or E-mail: rblakely@istar.ca.

August 25, OLIVER, BRITISH COLUMBIA: The Oliver Flying Club (CAU3) is hosting the Okanagan's best fly-in breakfast starting at 8 a.m. Enjoy pancakes, eggs, sausage, fried Yukon Gold potatoes, and fresh melon. After breakfast, tour unique hangars, view warbird demonstrations, and take in the Oliver Rodeo across the runway. Contact Mike Covert at Tel.: 250-498-3342.

August 26, CHILLIWACK, BRITISH COLUMBIA: Chilliwack Flight Fest 2001 at the Chilliwack Airport. Free air show. For more info call Jeff Nelmes at Tel.: 604-858-7437 or e-mail: jnelmes@uniserve.com.

September 11-13, SEATTLE, WASHINGTON: Aerospace North America - "SAE World Congress and Exhibition" event will take place in Seattle at the Washington State Convention and Trade Centre.

September 13-16, RENO, NEVADA: Reno Air Racing Annual National Championship Air Races. Reno/Stead Airport. Call 775-972-6663.

September 16, KAMLOOPS, BRITISH COLUMBIA: The Kamloops Flying Club will be hosting a fly-in breakfast. Contact Ken Barry, COPA Flight 82, at Tel.: 250-376-6969 or E-mail: kabarry@sageserve.com.

September 28-30, OLIVER, BRITISH COLUMBIA: Second Annual Yak 'Discovery' Fly-in at the Oliver Airport. Arrangements have been made with the Southwind Motor Inn which is right on the field for special Yak rooms rates. Great golfing and winery tours and we welcome all flyers, especially other Warbirds. For more info contact Paul Dumoret at Tel.: 250-498-6208 (work); 250-490-0005 (cell); Fax: 250-495-2126; E-mail: 3bar@direct.ca.

The Chapter's second aircraft carrier trailer is for sale. It's a gem! $480 or best reasonable offer. It's at John Keon's place 16301 - 20 Ave., Surrey ph. 536-8589 or call Jim Hunter at 576-2678.

Minutes

Jim Hunter

Minutes of the General Meeting,
3 July, 2001

Call to order: 8;00 pm by President Tim Nicholas.
No minutes available from June 2001 General Meeting.
Correspondence: None received.
Committee Reports:
Treasury: Verbal report by Treasurer Don Souter.
Membership: Rob Prior: we have 110 paying and 29 complimentary members.
Library: Tim Baker: The books left for the library are appreciated. If leaving books, please leave a note saying who you are: Lost: one Lycoming cylinder wrench. Lost: One Nicopress tool. Lost: One timing light. Please return all these to Tim.
Vice President: Emily Clemens: special thanx from Emily to all the Fly-in helpers. Program: Dan lawler: Tonight we have a video on Radar Over the Atlantic.
Aircraft: Tedd McHenry: 13.1 hours on the Turbi in June. Rebuilt engine grinding itself in nicely. several members buying block time.
On the J-5 Project: Set of repairable J-5 struts donated by Peter Sleeman.
DHAPCOM: Terry Wilshire: Terry says marvellous fly-in. The Wright Flyer project committee meets 10 July.
Old Business:
1) Bruce Prior astounded at success of the Fly-in. Will give full report to next GM.
New Business:
1) Many thanx to Al and Lew Scott for their kind donation of a VCR camera to the Chapter.
2) Chapter was addressed by Mr. Ron Brown. Mr.. Brown is the son of Herb Brown who went missing on a flight very shortly out of Langley in the Spring of 2000. Mr. Brown was relating the difficulties he is having getting the tower tapes from NAVCAN.
Nicholas/Clemens: that we adjourn: and we really did.

Jim Hunter, Secretary.

Fly Safer

by Tedd McHenry
Photo by Rob Prior

This article was inspired by a talk given by John Laing, an ATP- and CFII-rated pilot and fire-bomber from Delta, BC. John spoke at a meeting of the Langley Aviation Council. He gave a fascinating presentation on the job of aerial bombing of forest fires, which I couldn't possibly do justice to by reviewing. However, at the end there was a discussion in which John passed on quite a few tips and rules of thumb that I thought readers of WCR would find interesting and useful. Some of them are reproduced here, with John's permission. For a much more complete explanation of these and other flying tips, read John's book, "IFR Hints and Pilot Principles."

There's an old saying: a little knowledge is a dangerous thing. I suppose that's true, if the "little knowledge" tempts you to mess with something you don't understand. But, in flying, a little knowledge can sometimes save the day. Here are some handy rules of thumb and simple calculations that can make flying easier, and safer.

Take-off performance: altitude, winds, and slope

We all know that density altitude affects take-off performance. So do winds and runway slope. But by how much, and how do we allow for it? Certified aircraft come with extensive charts from which you can calculate precise take-off distances. If you're really keen, you may have developed such charts for your RV. But you can make reasonable allowances for density altitude, winds, and slope without the charts.

Let's look at a real-world example. You've flown from Langley up to Prince George with a friend to visit relatives. On the way home, you decide to stop in at Barkerville (AS3) because you've been told that nearby Wendle Provincial Park is really beautiful. With your fuel load, passenger, and baggage, you're tipping the scales pretty close to gross in your RV-6, and it's a warm summer day—24°C. Are you safe to take off?

The table below summarizes the calculations we'll use to answer that question.

Conditions	
Field Elevation	4060 ASL
OAT	24 °C
Headwind Component	10 kt
Runway Slope	2.15 %
Performance	
Estimated Density Alt.	5950 ASL
Take-off Roll:	
-Sea Level	550 ft
-at density altitude	880 ft
-with headwind	790 ft
-with headwind & slope	1040 ft

Let's say that, in this configuration and weight, your 150 HP RV-6 would have a take-off roll of 550 feet at sea level. Using the density altitude rule, Barkerville's elevation of 4,060 ASL is equivalent to 5,950 ASL. (Remember to reduce sea-level standard temperature—15°C—by 1.5°C per 1,000 feet. So Barkerville's standard temperature is 9°C.) That alone will add 60 percent to your take-off roll, bringing it up to 880 feet.

Now you have to consider winds and runway slope. Let's say the winds are from the east, so that runway 11 gives you a 10-knot headwind component. That would reduce your take-off roll by 10 percent, to about 790 feet. Unfortunately, runway 11 at Barkerville slopes up with a gradient of 2.15%. Should you use runway 29 instead, and take off downhill?

Well, the gradient rule-of-thumb says to treat 3 times the gradient like wind. So a 2.15-percent upslope is like a 6.45-knot tailwind, which is less than the 10 knots of

actual headwind. In this case, it's better to take off uphill. If the runway gradient was more than 3.33 percent, it would more than offset the 10 knots of wind and you should take off downhill and downwind.

But don't make the mistake I once did! You can't just take the 10 knots of headwind, subtract the 6.45 knots of "equivalent" tailwind, and assume you've got a 3.55-knot headwind. Remember, tailwinds have about five times the effect of headwinds. So calculate the wind effect first, then the slope effect.

Your take-off roll on runway 11 will be 1040 feet.

But we still haven't answered the question: are you safe to take off? Another good rule of thumb is that the airplane should take off in the first half of the runway. If you're half-way down and not yet flying, you should abort the take off. Runway 11 at Barkerville is 2,700 feet long. That's comfortably more than twice your calculated take-off roll. So, at least so far as runway length is concerned, it looks like you're safe. But don't waste any of that 2,700 feet, start right at the button. And pick a "go/no-go" point halfway down the runway.

Climb Rate and Climb Gradient

One of the easiest in-your-head calculations that can really help you out is the conversion between climb rate and climb gradient.

To get feet per mile from feet per minute, divide by your true airspeed in miles per minute.

The RV-6 plans have climb rate plots for N66RV. They show a Vy (best rate of climb speed) of 120 mph, giving a climb rate of 1,500 fpm. They also show a Vx (best angle of climb speed) of 82 mph, giving a climb rate of 1,200 fpm. What's the difference in climb gradient?

1,500 fpm @ 2 miles/minute
= 750 feet per mile
1,200 fpm @ 82/60 miles/minute
~ 900 feet per mile

Actually, either way you're getting a pretty good climb gradient. At higher altitudes (such as on climb-out from Barkerville in the example above), you'd find a much greater difference in climb gradient between Vy and Vx.

The 1:60 Rule

One of the reasons I like using nautical miles, rather than statute miles (or kilometres), is the 1:60 rule. The 1:60 rule is based on the mathematical ratio of the length of an arc to its radius. The length of an arc is equal to its radius when the angle of the arc is about 60 degrees. (It's actually equal at about 57.3 degrees, but 60 is close enough for rule-of-thumb purposes).

This might sound like an abstract idea, but it gives us a very simple tool for estimating small angles. For example, because a nautical mile is close to 6,000 feet (6,080), we can easily compute that the normal slope of an ILS final approach—3 degrees—is equal to 300 feet per nautical mile. Ten miles back on final the glideslope will be about 3,000 feet above aerodrome elevation. If you've ever been caught unaware by intercepting the localizer when you're already above the glidepath, you'll know how handy that calculation can be.

"I'm not an IFR pilot," you might say. "Is the 1:60 rule any use to me?" You bet. It's a really handy way to estimate wind drift when you're using dead-reckoning navigation. Let's say you've been following your planned heading of 090. Ten minutes into the leg (30 miles in your RV) you see, by reference to a ground feature, that you're about a mile south of track. That's 1 mile in 30, which is 2 miles in 60, or about 2 degrees off of track. Head 086 for the next ten minutes and you should be back on track. After that, 088 will hold the track, at least until the winds change. (This technique isn't much use in the mountains, but it works great on the prairies.)

Another 1:60 ratio that's really handy comes from the fact that there are 60 nautical miles in one degree of arc at the Earth's surface. This means that you can convert the latitude markings on VNCs and WACs directly into miles. Each degree (of latitude) is 60 miles. (Note: this doesn't apply to degrees of longitude, unless you're at the equator.) Because latitude is shown in degrees and minutes, it's easy to measure a distance on the chart with a pair of dividers (or your fingers!), compare it to the latitude markings, and get a distance measurement that's accurate to within a mile!

Thunderstorms

There are few things that worry pilots more than thunderstorms. We all want to know how to avoid them.

If the lapse rate is more than 2°C per thousand feet, be extra-alert for signs of thunderstorms developing.

Lapse rate is the change in temperature with altitude. The faster the temperature drops with altitude,

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CLASSIFIED ADVERTISEMENTS

Classified Ads are free (within reason) to members. Display Ad rates are:

Business Card:$25 per year

1/4 page:	*$10/month*	*$100/yr*
1/2 page	*$15/month*	*$150/yr*
1 page:	*$25/month*	*$250/yr*

Ads that have been in for more than 6 months are subject to removal if space is required for other stuff. Please contact George the editor if you want it kept in.

FOR SALE:

52" x 34" Shettler's propeller with hub, $100.

Vic Gabas (604) 853-2778

For Sale: SIROCCO PROJECT

Fuselage, canopy, tail group complete. Air frame control components done except for cable. Main-wheel gear, wheels and brakes done. Tail-spring and wheel included. Panel made, no instruments. Lycoming 0-290 GPU Zero-timed. Will Neubert stainless cross-over exhaust with stainless muffler/ shrouds. Bendix PSC5 carb. Bendix mags with non-shielded leads. No starter, starter ring or alternator. Weldtech engine mount. McCauley prop.

Wings: ribs and minor spars done. Spar diaphragms done. Two spar-grade spruce planks. No other wing parts.

$15,000 firm, complete and not interested in parting-out

Jim Hunter 576-2678

FOR SALE:

1957 Tripacer Wings uncovered, all reworked. New leading edge. New ash tip. All Zinc Chromate ready to fabric. Included: 2-18 gal. gas tank, 2 - gas tank cover, landing light, aileron and flap, front and rear struts. Asking $4000 Canadian.

Roger Gauthier (Kelowna) (250)-763-1529
(250) 212-0832 (cel)

Wanted: PA 18 or PA 20/22 Wings. Some damage OK. 946-5881

For Sale: Electronic Tach 2.25" with generator (new) $125, 6" castoring tailwheel, $50, Electronic dimmer control, $25, 2 New 600.6 Goodyear Tires, $125 for pair, Combo EGT/CHT (needs probes),$50, Tach Cont.C85-0200, $35, Temp (OAT) gauge, new, $35, Windscreen Ant., Van's, new,$15, 525 battery (new) never had electrolyte, $75, Fuel Pressure Gauge O/H, $35, Lycoming Starter 0-290, 0235, 0320, 0360, for $375.

Bob Cutting 275-1603

FOR SALE: Fleet F7 Biplane replica. Very close to original copy except for uncowled engine. Engine: Kinner R55 160 hp. Aircraft is modified for solo operation from rear cockpit. Extra bellytank with wobble pump. Original Fleet wheels, brakes, pedals and stick column. Original parachute accommodating bucket seats, oversize tires, Stits covering, voice activated intercom. Ted Hendrickson Propeller, manual and extra key magswitch.

$35,000 Canadian. (604) 478-6048

Will consider small antique aircraft engine as trade-in.

FOR SALE: One set of 1500 Murphy floats ready to go.

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FOR SALE: 6 Factory new Franklin 180 hp cylinders includes installed valves $300 each, will not part out.

Tim Novak 271-8586

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Stuart Gear (604) 941-9402
E-mail:sgear@infoserve.net

FOR SALE:

ELT: ACK E-01, meets TSO c91 - A, complete with external antenna kit and remote panel $225.

David Clark Headsets $225 (mostly 10-30 type, helicopter and airplane.

Telex PT-300 PTT $30.

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Bendix RSA 10 ED1 Injector Body, no history, $400. Woodward Prop Governor #210681, no history, $400.

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Christen 5 point aerobatic seat belt harness, with 2-point Military 3" belt $350

Guido 948-3464 e-mail: glepore@direct.ca

FOR SALE: 4130 Annealed Gauge Plate now

Continued on Page 8

in stock, .025 to .375. We will sell you the plate or laser cut the parts
Industrial Laser Cutting ltd.
(604) 946-4152, Fax: (604) 946-4153
E-mail: tmw@industriallaser.com
FOR SALE: 1- Miller 200 amp ac/dc H.F. Tig/stick welding machine - 220V 1 ph. $1200. 1- Miller 120 amp MIG (wire) welding machine, 110 volt. Portable sheet metal type, c/w gas kit (almost new) - $800.
Pat O'Donnell 533-1839
FOR SALE: Zenith 250 plans and parts, wing rib moulds $360. Christavia Mk IV project, 4130 steel tube, wing ribs, flaps ailerons, gear legs, wheels and brakes, tail stab and rudder, $3600.
Paul Trudel 532-8570
Building Partner Wanted:
partially completed Kitfox Model IV-1200. Time too limited to complete myself. Seeking building partner with some experience. Partnership arrangement - terms to be discussed. Call Marty BillinkoffDays (604) 322-7545 Cell (604) 351-0222 Evenings (604) 946-6475 email: martyb888@aol.com
WANTED: CASSUTT sport/racer preferably in flying condition. Will consider a project or an RV project. Contact Adrian Cooper tel/fax (604) 324-2104, or email at adriancooper@canoemail.com

Fly Safer *Continued from Page 6*

the less stable the air. Be particularly alert for lapse rates greater than what was forecast. That means that the air is less stable than the forecaster thought; the risk of thunderstorms is greater than forecast. Whenever the lapse rate is more than 2°C per thousand feet, you're in relatively unstable air.

Thunderstorms are meanest on the side toward which they are moving, and the side from which they are fed.

In the northern hemisphere, thunderstorms are usually fed by southerly winds and travel eastward. So you can generally expect the worst conditions to be on the south and east sides of thunderstorms.

Thunderstorms are not all bad news, though. CB clouds create strong, low pressures. Like all lows, air flows into them following a counter-clockwise path. So, as with all lows, if you pass a thunderstorm on the right you'll get tailwinds. This effect is strongest at altitudes below the base of the CB. Remember to remain well clear of the thunderstorm area though—as in tens of miles clear.

Performance Rules of Thumb

-For density altitude, add 1,000 feet to the field elevation for each 8°C above standard temperature.
-Increase sea-level take-off distance by 10% for each 1,000 feet of density altitude.
-Decrease take-off distance by 1% per knot of headwind; increase take-off distance by 10% for each 2 knots of tailwind.
-Triple the runway gradient (in percent) and treat that like knots of wind (headwind if downslope and tailwind if upslope).

Technical Guy

Continued from Page 3

tia, a function of weight and diameter, can be approximated by the following equation (for a two blade prop):

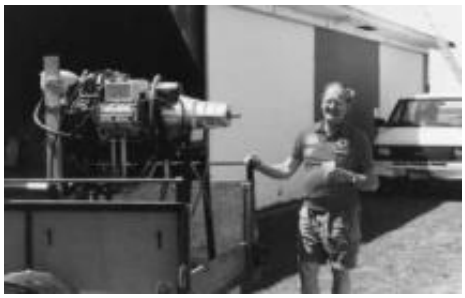
Io = .66667(m)(l)2

where "m" is the propeller's mass (weight divided by 32.17) and "l" is the length of the blade from the output shaft's center-line to the tip of the blade (propeller's radius). (This is extremely conservative - the designer should use numbers supplied by the propeller manufacturer.)

Substituting all the appropriate values we get an applied moment of over 11,000 ft-lbs to the end of that gearbox. If the output shaft supports are about six inches apart, this moment translates to a radial bearing load of over 22,000 pounds!!

Granted, this is momentary and a worst case condition, but in the life of an aircraft loads of similar magnitude will occur quite often due to turbulence or control input (the latter is especially true if flying aerobatic maneuvers). The condition is critical in selection of the bearings and design of the case, especially if the latter is fabricated from an aluminum casting (very low endurance limit - on the order of 4,000 psi for rough or grooved material).

Next month, the conclusion of Bill's article on reduction drives



Scenes from June 30's DHAP Fly-In: Top right, John Vlake shows off his Subaru conversion with its PRSU. Centre right, an overview of the event. Bottom Right, the prototype RV-7 was flown up from Oregon for the event. Bottom: a visiting Blimp buzzes the field.