



NEWSLETTER

Carb Heat

Hot Air and Flying Rumours

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**Thursday, Feb 20 2003 8:00 PM
Canadian Aviation Museum**

FRIGID FLYING

By IAN COOK

Feature Presentation

Torsional Damper Design

By Martin Poettcker

President:	Gary Palmer	596-2172	gpalmer@nortelnetworks.com
Vice President:	Russell Holmes	820-8572	Russell.Holmes@city.ottawa.on.ca
Ops, Publishing, Tools:	Dick Moore	836-5554	rjmoore@uottawa.ca
Membership:	John Montgomery	599-1240	1arm@rogers.com
Secretary:	Curtis Hillier	831-6352	hillier@mosaid.com
Treasurer:	George Elliott	592-8327	gelliott@igs.net
Editor:	Rodney Stead	836-1410	sttstmp@sympatico.ca
Webmaster:	Martin Poettcker	271-6113	poettcker@rogers.com
EAA 245 Website:	http://eaa245.dhs.org/		

**President's Page
by Gary Palmer**

Winter retains its icy grip on us, which means more opportunities to work on your project, as long as you aren't trying to do fibreglass work in a hard to heat garage. If you are building using more traditional materials, you will probably be making more progress than us composite types.

South African Homebuilders visiting Carp enroute to Oshkosh 2003

Many of our members will remember a **Fairchild F24W**, piloted by **Chalkie Stobbart** and **Peter Hengst**, which stopped in at our chapter in 1992 enroute to OSH, having started from South Africa. This year Chalkie has organised a group of South African homebuilders who will be making the same pilgrimage in their homebuilts and would like to meet up with our chapter members. Please check their website www.sa2usa2003.com to see the proposed itinerary, and participating aircraft. This is a daunting undertaking, and I wish Chalkie and mates all the best of luck. I'll keep you advised as I learn more about their odyssey.

Chapter Bylaw revisions planned for February 20th meeting.

As noted last month, the executive have updated our chapter bylaws to reflect current realities, and the most recent EAA headquarters guidelines; as well as position us with more flexibility for the future. The bylaw changes will be presented for approval of voting members at the February meeting. Members wishing to see a copy of the proposed new bylaws should contact me via email, or phone.

Membership Renewals.

Our 2003 membership drive continues with the March meeting being the deadline for renewals. As a reminder, all Associate, and Full members are required to keep their **EAA national membership current**. This is particularly important in the new aviation insurance climate, as it is a condition to keep our chapter insurance in force.

Upcoming meetings.

Looking forward we have an interesting tentative slate of speakers and topics planned including:

March	Gary Loubert will provide an update on the design of his own custom Engine Instrumentation system for his Sonex project.
April	Martin Poettcker will describe the overall design and fabrication issues for building a planetary gear reduction drive for his Subaru EA81 powered CH601.
May	Partenavia Mystere S45 presentation

Thursday Jan 16th meeting

Bill Reed and **Martin Poettcker** outlined the information gleaned from attending a Transport Canada and MDRA sponsored seminar in Midland. They presented a large quantity of information and fielded many questions from the audience. Their presentation is now up on our web site, and Bill Reed would be happy to answer any further questions you may have.

Thursday Feb 20th meeting @ NAM: Torsional Damper Design for Subaru EA81 engine conversion

Martin Poettcker will describe the overall design and fabrication issues for building a torsional resonance damper for his Subaru EA81 powered CH601. Martin has been monopolising time on our milling machine and lathe creating vast quantities of aluminum shavings. He has managed to turn his own creative design into impressive looking components that appear to be more than up to the job. This session promises to be very educational.

I look forward to seeing you at the Aviation museum, at our normal start time of 8:00 PM.

Gary

Frigid Flying

Most regions of Canada face winter operating conditions that require pilots to go beyond simply starting an aircraft and flying it away. The same can be said about much of the northern US, yet many light aircraft manufacturers don't comprehensively address this issue in their various operating manuals. For example, some operating hand books do not give a temperature below which preheating of the engine is necessary, and others do not state that an aircraft is untested below a specified temperature. In fact, the Federal Aviation Regulations under which light aircraft are certified do not require some aircraft to meet specific standards for cold weather operations. Considering that a single cold start can cause wear equivalent to 500 hours of normal operation, and an even colder start can cause serious damage immediately, perhaps cold weather operating deserves more attention. In my own experience a few years ago as an operator of a maintenance organization in Whitehorse, Yukon, I found that most local owners and operators knew about cold weather operations as a matter of course. New arrivals and those passing through, however, sometimes got themselves into trouble. In one instance, a brand new Cessna 207 was being ferried to an operator in Alaska via Whitehorse. On the morning of departure the temperature was about -30 °C and the pilot elected to try and start the aircraft cold without preheating it. I don't know how the pilot got the thing started in the first place, but start it did. After a bit of a warm-up, the forty-hour-old engine began to make unusual clunking sounds and the oil pressure began fluctuating madly. The pilot shut down the shiny new airplane and we towed it to the hangar where we removed the oil screen and found it full of various types of metal. When the engine was later torn down at the factory it was discovered that the clearances around the crankshaft had tightened so much at this low temperature that it was easier for the front bearing to break loose of its locating dowel and spin in the crankcase than it was for the crankshaft to turn inside the bearing.

Engines

So what can pilots and AME's do to prevent similar cold weather disasters from occurring? When starting a piston engine one of the most important things to know is what temperature the engine should not be operated at. Find out what the cut-off temperature is for the aircraft in question and at what temperature ranges it is wise to preheat. Engine manufacturers offer some information in their service letters, but these can be somewhat ambiguous at times. A good rule of thumb is, to preheat (a piston aircraft) anytime the outside air temperature (OAT) is below 0°C and definitely when it is below -10°C. In the old days when there was no electricity available near a parked aircraft, a pilot would drain the oil from his engine as soon as it was shut down. The container of oil was placed near a stove overnight making it good and hot to pour back into the engine in the morning. This may have worked in old engines where clearances and tolerances were fairly loose, but in modern power plants this is not entirely sufficient, nor realistic. Modern engines often have miniscule tolerances and as temperatures change dramatically so too do the clearances between parts especially those made of dissimilar metals. For instance, aluminum expands more when hot, and shrinks more than steel does when cold. An aircraft engine with a steel crankshaft supported by an aluminum alloy crankcase, such as the Continental 10-520, has a minimum crankshaft clearance of 0.0018 at room temperature. In a new engine built to this tolerance, that clearance becomes zero somewhere around -25°C. Even at slightly warmer temperatures, clearances can become so small that there is no room for oil to be pumped in where needed. This causes bearings and crankshaft to be scuffed from lack of lubrication. Likewise, pistons are generally made of aluminum working inside steel cylinders. When cold the clearances actually increase so you may think, "No problem." Well, on initial start-up you would be right, but the piston is instantly heated by combustion and is not exposed to the same blast of cold air that the cylinder is, and aluminum heats up and expands much faster than steel. What happens shortly after starting is that the piston expands faster than the cylinder causing scuffing, particularly at the top end of the cylinder. There are a few approved engine preheat systems that can be installed to prevent this from happening though.

Some, such as Tanis heaters, involve installation of an electrically heated pad fixed to the bottom of the oil pan or crankcase, with a heating element inside each cylinder head. Other systems use a heated band around the cylinder base, and recently a heated rocker cover gasket has been developed. Combined with an insulated engine cover installed over the cowling, you can simply plug the airplane in overnight, and in the morning the engine is warm and ready to start. Some people attempt to achieve the same results with a strategically placed car heater, but keep in mind this is an uncertified part inside the engine cowling with no guarantees. There is always the potential of the heater shaking itself to bits and pieces jamming a control or severing an oil or fuel line. In any case, it is unknown how even the heat distribution is with this system. Regardless, if you do a lot of winter flying, installation of a proper preheat system makes good dollars and sense. Hot air preheating is another way to go, or to be used in conjunction with electrical heating systems. There are several brands of fuel-fired and electric forced air heaters. These duct hot

air into the bottom of the cowl and can be routed into the aircraft cabin. The trick with these units is knowing when things are warm and evenly heated enough. If the top surfaces of the crankcase and cylinders are warm to touch it is safe to say the engine is warm enough to start. How long it takes to get the engine to the point where it is safely ready to start will vary with the degree of heat output of the heater and the coldness of the day. In any event, don't be in a rush and jump the gun too soon; the results can be expensive. If you do start the engine prematurely it may spin over freely, fire, then quit. After this no amount of cranking will bring the power plant back to life, because when the engine fired moisture was created and when it quit this moisture froze on the spark plug electrodes prohibiting any spark. All you can do now is either move the aircraft into a warm hangar for some time, or remove the plugs and warm them up until the ice melts and they are dry.

Then there is the type of engine oil to consider for your aircraft. There are plenty of arguments for and against modern multi grade lubricants as an all-season oil, but most experts seem to agree that these are the better oils to use in winter. It is thinner when cold and will get to the important parts sooner than a single grade lubricant. Winter kits are offered for some models of aircraft. These generally are pieces of sheet metal that block part of the cooling air intakes in the front of the cowling, and another piece to block some of the oil cooler air. The manufacturer will state the maximum temperature for operation with this kit installed. A word of warning though. Some people have attempted to make their own cold weather kits by blocking the front of the cowl with duct tape. Engines have been overheated and damaged or even failed during the first flight. Manufacturers test airflow over the engine with their kits, and measure temperatures at various points around the engine when the kit is installed. This cannot be done with the duct tape version. Now, you may think that many of your problems are eliminated if you keep the airplane inside a warm hangar. Certainly many of the starting issues are solved, but there can be other problems worth bearing in mind. For example, if an aircraft is rolled out of a warm hangar when it is snowing, the flakes can melt on the warm wings. As the wings cool the melted water can freeze becoming lumps of ice impinging controls and adhering to critical surfaces with all the unwanted results both situations entail.

Batteries

Another major cold weather concern is your electrical power supply. Batteries lose power in frigid weather, so they must be kept warm if they are expected to start the engine. An automotive battery blanket is a safe, effective way to achieve this. Some heat in the cockpit doesn't hurt either as instrument gyros can suffer when they attempt to spin up cold.

Wheels

Grease used in wheel bearings and retractable landing gears should also remain viscous in extreme cold. It has been known for a tire to spin on its rim and blow when an aircraft is landed. The wheel bearing grease simply would not allow the wheel to spin up quickly.

Props

Another item that can be affected by cold weather operation is the constant speed propeller. While cruising in level flight in smooth air there is no need for the prop to change pitch. As such, the oil in the hub is exposed to a blast of icy air and can congeal there so that when it comes time to change propeller pitch it is possible nothing may happen. This can be particularly serious in a twin if feathering a prop becomes necessary. To prevent this from happening, the easiest remedy is for the pilot to cycle the propeller pitch at regular intervals perhaps every twenty minutes or so just to get some warm oil circulating into the hub.

Critical Surfaces

Airframes are not exempt from cold weather hazards either. The first concern, naturally, is frost, ice and wet snow on the wing and tail surfaces. If significant contamination remains on your wings after take off you instantly become a test pilot, so in cold weather it goes without saying you should always conduct a careful inspection of the aircraft's critical surfaces. When it's cold out, though, we can be easily tempted to do a less than thorough pre-flight, but this is when things must be checked even more carefully. So bundle up and have a good look. Are the fuel vents free of ice and snow? Has blowing snow gone into any openings to add weight where it is not wanted or is it blocking full movement of the controls? Are the oleos sitting at full height or has some air leaked out of them? What about

wheel assemblies? Is there pink hydraulic fluid on the snow? Finally, what about your fuel drains? Has ice blocked them (A good way to prevent moisture in the fuel tanks is to top up immediately after landing to leave less room for condensation.)

Now, at what temperature do you say, "Enough is enough," and leave the airplane on the ground?

Well, there is no exact answer, but it is somewhere around minus forty. If you are inexperienced in cold weather operations, a warmer temperature should be the cutoff. Also keep your parka on while flying. Heaters have been known to fail. Know where your survival gear is, and have a plan to keep warm if you should have to set down. It is easy to be complacent when looking down at a winter wonderland while the heater is pumping out BTUs. However, things can go wrong quickly, and survival in these conditions is unlikely without proper preparation. With proper preparation and a knowledge of the limits, cold weather operations can be quite safe, and indeed a joy.

This article first published in Aviator magazine. Jan. 2003. Story by Ian Cook.

COMING EVENTS

RAA Chapter 4928 Third Annual Ski Fly-In

Where?	Kars Rideau Valley Airdrome	N 45 06 W 75 38 Elev 286' Rwy. 08 / 26 3,000' x 100' Comm. 123.4
	Driving in ? Go to	Dilworth Road East off Hwy 416
When ?	All day, weather permitting	Saturday March 01, 2003
Food and beverages	Mary's homemade Beans Tom Bennet's Buns Dave's World famous Irish Stew Coffee, Hot Chocolate, Soft Drinks	
No charge, donations accepted		
More info ?	Contact: Dave Stroud	613-226-7889

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 Contact Bob at robert.schmidt@jdsu.com
 or call @ 613-843-3000, Ext 1028, leave message.

11/02 Bob Schmidt

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Articles Wanted

I am always interested in receiving submissions for this,
 your Newsletter. You may bring articles to the monthly
 meetings, or mail information to the post office box, or

e-mail sttstmp@sympatico.ca



EAA Chapter 245 Membership Application

NEW:___ RENEWAL:___ DATE: __/__/__
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Annual Dues: January 1st to December 31st. (porated after March 31st for new members/subscribers).
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 Note Associate and full members must also be members of EAA's parent body in Oshkosh WI, USA

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 EAA Chapter 245 (Ottawa)
 Mail to - P.O. Box 24149, Hazeldean R.P.O., Kanata,
 Ontario, K2M 2C3