Skywriter

Monthly Newsletter of the Calgary Ultralight Flying Club

March 1991

View From Above

by Paul Hemingson

The main topic at the February 6/91 CUFC meeting was Fabric Covering. There seems to be many methods, materials and processes developed over the years, but all the techniques require forethought, patience, and cleanliness to get a strong and neat finish. Bernie and Ron Then demonstrated some of the tricks and tips of the Hipec covering system. If you didn't take notes, you can always phone 'em for advice. They have finished covering and painting their new Merlin. Thanks to them for showing us how its done. Thanks also to Dave Clements for building a "winglet" out of wood for the covering project. It was a piece of artwork in itself. Judging by Dave's woodworking skills, his 5151 Mustang should win lots of awards for workmanship. I admire the patience, discipline and attention to detail that epitomizes such craftsmen. When it comes to flying the "good enough" and "haywire" attitude needs to be guarded against.

We also watched an excellent video on state of the art Hang Gliding, and other forms of unpowered flight, courtesy of Stewart Midwinter. I learned much more about the capabilities and limitations of this method of flying. Congratulations to Stewart for this timely video. Stew recently received FAA recognition for his 100 kilometre closed course flight in the mountains last year. It all goes to show what good planning and discipline can do for a pilot.

The remainder of the March agenda was a potpourri of technical items. Thanks to Don Rodgers for the insight into the use of Helicoils. Doug Ward canvassed the groups interest for a Rotax Engine workshop. Phone Doug to sign up, or get more info.

Jim Creasser showed us how to properly maintain throttle and choke cables. I always listen up when Jim talks. One thing Jim mentioned was checking and replacement of those little rubber boots that cover the cable where it enters the carburetor. This little boot keeps dirt and moisture out of the business end. Another one of Jim's gems was proper tensioning or play adjustment. He explained how an improper adjustment allows the cable sheathe end to "ride up" on the adjustment mechanism. What you get is a 3500+ rpm idle. I know this is true...it happened to me after throttling back on short final, except the engine didn't slow to its regular idle. I had to cut the master switch to kill the engine.

I brought along a pair of Hyperdyne Corp snowskiis that generated a lot of enquiries. But now the snow is all gone!

Ron Sondergaard brought along a "Get Well" card for John Collins who is recovering from major surgery. Bill Clark is also on the mend after breaking a leg. Get better guys. P.S. None of these are flying related.

Spring is coming. I was reminded of this driving home the other day. Maybe you also noticed the ragged, torn, and angry looking cloud formations typical of unsettled weather? With the change of seasons, comes unpredictable winds. Be careful out there. The windsock commonly switches direction in its eagerness to welcome spring.

World Record Set

Stewart Midwinter has been awarded a world record by the Federation Aeronautique Internationale for a hang-gliding flight made from Golden, BC on July 28, 1990.

The record is for speed over a 100 km out-and-return course. Stewart flew 106 km in 3 and 3/4 hours. He took off at Mount Seven, Golden and flew to a turnpoint near Spillimacheen, BC, before returning to the starting point. During the flight he reached altitudes of up to 13,000 feet ASL.

Another world record was set by Jean-Claude Hauchecorne of Vancouver. His record was for speed over a 200 km out-and-return flight. He flew 214 km in 6 and 3/4 hours on July 20, 1990. He also took off from Mount Seven and flew to a turnpoint near Invermere, BC.

The FAI, established in 1908, with offices in Paris, France, is the world governing body of sport aviation. It establishes standards for international championships and record attempts in all facets of sport aviation.

To establish an FAI record, a pilot must follow strict guidelines and provide absolute proof that the flight was made as claimed. The pilot must declare, prior to take-off, the intended flight and be witnessed by an official observer. A recording altimeter, call a barograph, must be carried on board to prove no intermediate landings were made. Numerous specific photographs must be taken (at the start, turnpoint and finish points). A detailed application form with supporting charts and maps must also be provided.

Stewart is a member of CUFC and past president of the Hang Gliding Association of Canada.

Fly Paper

by Gord Keegan

Overload

Ever notice how after Christmas and New Years it seems like it takes just a little longer takeoff run to get the old weedhopper into the air. Ever think that maybe it is because the old Rotax just ain't what she used to be? Maybe not. Take a look down. Can you see your feet? How about your belt? If you're anything like me, your belt is just a fond memory.

This month I want to talk about physical fitness for the ultralight pilot. Consider the affect of putting on 10 pounds over the holidays. It may not seem like a lot of weight but with an ultralight that extra 10 pounds represents a substantial increase. Perhaps the weight of all your instruments, most of your landing gear, your fairing, you get the message.

I was out flying recently and came to the realization that it was taking more and more back pressure to keep the old bird pointing up. She seemed to be nose heavy. Next question, what is in the nose that had gotten heavier? Ding! I win the cupie doll. The point is that aircraft performance is not the only thing that most of us need to worry about. Better physical conditioning is also proven to result in better mental alertness. That extra alertness might be the mental edge that is the difference between the right decision and the wrong decision made to slowly. Needless to say, in an emergency, that physical conditioning may come in real handy depending on how far you have to walk. One real advantage is that keeping yourself in good shape may help you avoid medical conditions that could easily end your flying career for good.

I often think it was lucky that I decided to buy a 2-place machine a few years back. There is a good possibility that anything less than a Rotax would be marginal, dual carbs or not. I often imagine how much better my machine would perform if it didn't have to bear such a heavy payload. If that isn't incentive enough for most pilots, I don't know what is.

I've decided that this is the year I'm going to do something about it. When summer rolls around I want to be ready for it, fit firm, well ok, at least fit. Give it some thought guys, if not for yourself, do it for your airplane.

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Editor
Bob Kirkby
569-9541

Columnists
Paul Hemingson
Gord Keegan
Jim Creasser
Paul Pontois

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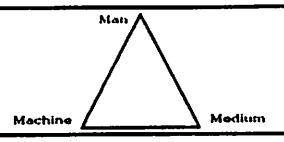
Skywriter
c/o Bob Kirkby
RR 7
Calgary, Alberta
T2P 2G7

Meetings of the Calgary Ultralight Flying Club are held the first Wednesday of every month at 7:30pm at

R.C.A.F. Association
110 - 7220 Fisher Street S.E.
Calgary, Alberta

Safety Corner

by Paul Hemingson



Pilot Indecision

I was reading an article the other day about pilot decision making. After reading it, I had the uncomfortable feeling something was missing. The author's key idea was that a pilot often gets into trouble by making the wrong decision....or not making the right one soon enough....or compounding his errors by making a series of bad decisions. Good words good advice. We've all been there...and came away wiser. Experience is a lovely thing....it allows us to recongnize when we have made a mistake.

For example, the pilot trying to salvage a bad approach decides to continue and then finds himself too low on final. He then tries to add throttle but finds the motor hesitant, and then decides to stretch his glide and stalls the airplane hard-in from 5 feet, inducing a bounce. He then pulls the stick back to hold it from bouncing harder the second time. Instead of just going around, or aborting the approach and lining up again. You can see in this xample just how the "decision process" was botched. The pilot made the wrong initial decision, (too low and non-aligned) then made the right one, (add power to decrease descent) but too late, and then compounded his problem by making a series of more bad decisions (trying to stretch the glide, and stalling-in, yielding a bounce and further stalling for a second bounce). His options quickly became limited. But, at least the pilot made some decisions based on his perception of what was happening to him.

Pilot decision making is surely an important element of safety. The notion of sequential decision making is valid when a chronology of events or possible outcomes is considered. But decisions are fiendish things, more easily analyzed in hindsight than in the heat of the moment. Some decisions are more urgent than others. As much as I found myself agreeing with this author, something in the back of my mind kept telling me that there was more to this decision enigma.

The chimerical thought bounced around inside my head for a while before it finally landed. It occurred to me that pilot indecision can also get you into trouble. Indecison is the antithesis of decision making. Further, it occurred to me that indecision is most likely to arise when time is a factor....the shorter the fuse, the more urgent is the need for action. The paradox is that we are less likely to be able to make decisions. This is subtly different from the conventional way of thinking. You might say that it is only a variation or twist, but I would like to explore the idea a bit further.

When we first learn to fly, we often make the wrong decisions because of our lack of experience and unfamiliarity with an element once reserved only for birds. At the novice stage of understanding, our basic instincts takeover in emergency situations, and prevent us from recognizing and doing what we have only been theoretically trained to do. Unfortunately, instinctive reactions are not always in agreement with trained reaction. For instance, on approaching to land we instinctively pull backstick, often too much so, and too late or too early. Either way, a bounce ensues, and the novice pilot does not recognize (or remember) that a burst of throttle or forward stick would allow the landing to be salvaged. We do not yet feel at home in the air. But, like an awkward duckling, we fumble and stumble along, gradually learning more about the man, the machine, and the medium we want to cavort in. With a little luck, and forgiving aircraft, our untimely and scrambled thoughts do not result in chaos.

As our logbook entrys increase, and with subsequent exposure to a variety of situations, our level of comfort and understanding grow. What we once considered minor emergencies are now only minor inconveniences. We learn to trust the way our wings support us, we learn to better integrate all the variables and factors that influence flight. We become more capable of making confident judgements that we are doing the right thing....and things right.

To make a decision implies that one is capable of recognizing what action needs to be taken, when it needs to be made, and that we are capable of generating and evaluating alternative actions to choose from. This comes only with experience and composure. Furthermore, it is only valid for situations we have experience with.

(continued on page 4)

(Safety - continued from page 3)

When something new comes our way, its a surprize, and at times like these we might suffer from "analysis paralysis". A personal confession illustrates this point.

I remember the first time I purposefully spun an airplane. Prior to this flight training exercise, the instructor told me how to induce it, described what it would look like, and what corrective action was required. I thought I was a good student, and faithfully remembered his words and dutifully readback the cause, effect and corrective action, to impress him. I was prepared to show him that I was an astute student.

Then, we went up for the real thing. After clearing for traffic, I got us into a spin just like the textbook said. Everything was proceeding as planned. Slow the ship to a stall, kick rudder at the top to set it off, and then as the nose and wing dropped, things really wound up. I was absolutely and completely mesmerized. The patchwork quilt of farmfields below rotated hypnotically, and I remember thinking the nose was pointed almost straight down, so much so that I might go out right thru the windscreen. The instinctive reaction to pull backpressure was overwhelming. I forgot all I had been told about the correct spin recovery procedure. Ground-bound survival instinct replaced rational thought.

I use this example to show the difference between theory and practice. I had never experienced a spin. It was a new attitude, and so visually and physically overwhelming that I was not thinking clearly. One does not have the luxury of comtemplating decision criteria in such an environment. You just have to know what to do, and in what order. I was paralyzed. Now, after experiencing and doing a number of spins, I feel comfortable and trained reaction overrides emotion. Stopping the spin has become mechanical, and I am aware of the need to beware of the highspeed stall on pullout. Their is only one right decision, and no room (or time) for indecision. I use this story to show how an "unexpected" attitude (or unexpected response of aircraft) can create a pilot frozen with indecision. He might know theoretically what to do, but is incapable of implementing it, because it's beyond his realm of experience.

This is the trap I refer to as "pilot indecision". It can befall any of us, and needs to be recognized.

Presumably, the pilot who is frozen into inaction, is paralyzed because he does not recognize what's happening, nor what to do. His perceptions are distorted. Given all the variables involved, a pilot needs to know not only the alternatives open to him, but also the consequences of his actions downstream in the decision making process. It's difficult to override the mind's instinctive desire to pull backstick when the nose drops in a stall, or a bounce boots you three or four feet back up into the air. We have been conditioned to thinking/knowing that the airplane is landed with full back pressure. When the airplane does not respond in a manner in harmony with our expectations we are inclined to become confused and paralyzed to know what to do. So, we might do nothing. We simply sit their, holding backstick, with the expectation that the airplane will quit flying. It will. But it won't be pretty.

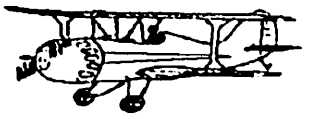
Earlier in this article I said "experience allows us to recognize when we have made a mistake". There is more. Experience also allows us to make better decisions by generating realistic options, evaluating them and taking timely corrective action. Experience also allows us to replace invalid ground-based notions with correct airminded trained reaction. But when things happen beyond our level of experience, we are not equipped and may find ourselves frozen by indecesion. I can't see anyway out of this paradox. My only conclusion is to get your experience in bite-sized pieces. Don't try to learn too much, too quick. Stay well within your own personally defined envelope of flight and think twice before trying to poke holes in it. Err on the side of being a conservative pilot, who has a bagful of options at his disposal. Good decision making is part preparation, part anticipation, part evaluation, and part expectation. Your part is to put it all together.

Springbank Breakfast and Flymarket

Springbank airport is holding a breakfast and flymarket on Sunday, May 5, 1991. Everyone is welcome. Fly or drive in. Breakfast starts around 0800 hours.

One Pilot's Opinion

by Bob Kirkby



RF Shielding

This is the third in a series of articles on aircraft radio installations. Last month I discussed the tuning of your antenna system. Once you have done this your radio is transmitting its signal and receiving the desired incoming signal as well as it can. There is one more serious problem that we have to attend to, however, if we are going to get the most out of our radio installation.

This problem is RF (radio frequency) interference from the ignition system in our airplane. First I will explain why an engine generates RF radiation, then I will discuss how to suppress it.

In a typical two cycle ignition system there is a magnet embedded in the flywheel and a coil of wire mounted next to the flywheel for each ignition circuit (spark plug). As the flywheel turns and the magnet approaches "it's" coil, an electric current is gradually built up in the primary circuit (see Figure 1). The primary circuit includes the points and the primary side of the ignition coil or transformer. As this current gradually builds so does a magnetic field in the ignition coil. As this magnetic field builds a voltage is also built up on the secondary side of the coil (the spark plug side). The voltage reached is proportional to the rate of change of the magnetic field. At exactly the right moment, as determined by ignition timing, the points open and the current suddenly stops flowing in the primary circuit. Without a current to sustain it, the magnetic field in the ignition coil suddenly collapses. This sudden collapse induces a very high voltage in the secondary side of the coil and causes a spark to jump across the gap in the spark plug. This in turn results in a very sudden and high current flow in the secondary circuit.

It is this very sudden and brief current flow through the secondary circuit that generates the RF radiation. The spark plug wire, coil and spark plug itself are acting as an antenna to radiate this energy. Because the secondary side is the high voltage side of the circuit, it radiates most of the energy. However, the sudden collapse of the current in the primary circuit will also cause some radiation from all of the elements in this circuit. This will include the wires between the ignition coil and the flywheel coil as well as the "kill switch" wires.

The radiation from the secondary circuit is of very high energy for a very short duration. It is omni-directional and chromatic in nature. So we know it is going to hit our antenna, and we can be sure that some of the radiation will be on the frequency our radio is tuned to. The result is a very short blip in our earphones. A 2 cylinder, 2 cycle engine turning at 5500 RPM is going to generate 183 of these "blips" per second. Add these up and instead of hearing a "blip" we hear a continuous "buzz".

Because this radiation is chromatic (covering all frequencies), it will actually dissipate rapidly and therefore will not travel very far. At a hundred meters or so away from the engine we would hardly notice it. This means that it will only interfere with the incoming, received signal and will not affect the transmitted signal. The station we are transmitting to will not "hear" our engine interference at all. So you don't have to be embarassed thinking that the receiving station can detect your poor shielding job, only you can hear it.

Now that we know were it is coming from, how do we get rid of it? As with antenna tuning, we will start at the point of greatest benefit and continuing making smaller and smaller improvements until we are satisfied with the results. The majority of RF radiation comes directly from the secondary circuit which includes the spark plug, spark plug wire and ignition coil. The single biggest improvement comes from installing resistor spark plug caps. These have a resistor built right into the cap. On Rotax engines the resistor should be about 5000 ohms. My Rotax 532 came with them already installed. The brand is NGK and the part number is LB05EZ. If you are not sure if you have them or not, take an ohm meter and measure the resistance through the cap. It should be 5000 ohms + or - 10%. These caps can be obtained from a Rotax dealer or most motorcycle or marine shops. If you have a different engine, check the manual or with the manufacturer for the recommended resistor size.

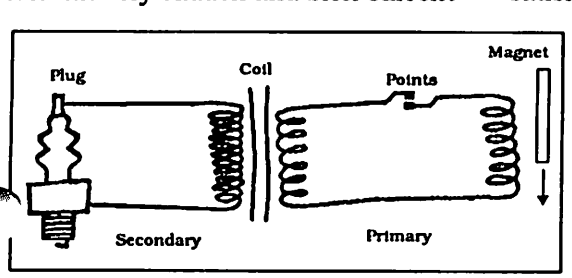


Figure 1. Engine ignition circuit.

I do not recommend inserting resistors in the spark plug wire itself (automotive shops have this type) because this adds another point of possible bad connections and failure to the circuit. We don't need any more potential for ignition failure than we already have! Also, do not use resistor plugs. These are plugs that have resistors within the plug itself. They create an even greater possibility of failure.

The resistance will reduce the current flow and increase the duration which results in lower radiated energy. If you do not exceed the recommended resistor size it will not affect the potency of the spark. This should reduce the noise in your earphones by about 50%. A boone to communications and longer lasting eardrums. This, however, will probably not be satisfactory. The next step is to start shielding. A shield is a metal conductor placed between the radiating antenna, in this case the ignition circuit, and the receiving antenna. This shield will absorb the unwanted radiation and, if it is grounded properly, it will drain the energy away to ground.

To start with, the metal structure of the airplane will provide some shielding, particularly if you have a metal firewall between the engine and your antenna. To make sure this is effective we must have a good ground connection between the engine and the airframe. You might think you already have one but don't forget that the engine is probably mounted on rubber lord mounts. So install a 16 or 18 AWG ground wire between a point on the engine and a bolt on the airframe. I use one of the bolts mounting a coil to the engine and a non-structural bolt on the airframe. Terminate the wire with proper spade or ring terminals to insure a trouble free connection. Do not use a structural bolt because even very minute currents in this conductor can produce galvanic corrosive action under humid or wet conditions.

Next we will provide a direct shield around the secondary ignition circuit, where most of the radiation is coming from. *(continued on page 6)*

(Opinion - continued from page 5)

The spark plug wire can be shielded with a tinned copper braid shield, available from most electronic supply shops. It is best if this has an inner PVC tube to provide an extra layer of insulation between the shield and the spark plug wire. If not, be sure your wire and plug cap do not have any nicks or cracks. This would result in electrical leakage from the conductor to the shield and eventual ignition failure. I install the braid shield completely over the wire and cap from the coil to the base of the spark plug (see Figure 2). Around the spark plug I expand the shield to fit the base of the plug and then cover about 1 to 2 inches of the braid with a layer of solder. This results in a firm cylindrical shape around the plug that is exactly the right size to make a snug fit at the plug base.

The plug base provides an electrical ground contact for the shield at one end but at the other end we must attach a ground wire between the shield and a bolt on the engine. Again I use a 16 AWG wire soldered to the shield and going to a ring terminal, which is anchored to a coil mounting bolt. It is very important that the shield cover the entire circuit and that both ends are grounded. If you prefer, you can buy aluminum sleeves to fit over the spark plugs which will then make contact with the braid wire shield at the top of the cap. If you use these, be sure you have a good electrical contact between the sleeve and the braid, with not gaps.

You should now have taken care of 60 or 70% of the problem. To test the results so far, sit in your airplane and tune the radio to the local tower frequency. Listen for chatter from air traffic, not the tower. Because you're not in the air you won't receive the tower well at all. Set the volume and squelch for normal listening and then start your engine. If the engine interference is strong enough to break the squelch, you still have a major problem, but it shouldn't be. Wait for more chatter from air traffic and pay attention to the background engine noise while you are receiving a transmission. Now rev your engine up and listen again. Decide whether the noise level is acceptable or not. If it is not then try more shielding, as follows.

The next most beneficial step is to shield the ignition coils. The secondary side of the coil contains a lot of wire which is part of the spark plug circuit. The best material to use here is a thin copper sheet. This may be hard to obtain, so aluminum will do. You will have to design this yourself since the location and orientation of the coil(s) varies from engine to engine. The idea is to make a box around the coil that will stop RF radiation from propogating away from the coil. It is not necessary to carry this around between the coil and the engine since the engine will stop any radiation in that direction. Bend the copper or aluminum into shape leaving two or more tabs that you can drill holes in to mount the box, using the coil mounting bolts. This will also provide the necessary electrical grounding contact to the engine. Cut out a slot or hole through which the spark plug wire and primary circuit wires can pass. Be sure to smooth all edges that might wear through the wires. After doing this you may want to do another test to decide whether or not to carry on.

The next step in shielding is to attack the primary circuit elements. This consists of shielding the wires between the coil(s) and the entrance to the bell housing. Also included in this is shielding the kill switch wires which run to the cockpit. The wires to the bell housing can be shielded using the braid again. Remember to solder a ground wire to both ends of the shield and attach them to a convenient bolt on the engine. Rather then run a shield over the kill switch wires, it is easier to replace them with a two-conductor shielded cable. The cable will have a drain wire running through it, in contact with the shield, which is used to ground the shield at both ends of the cable. One end on the engine and the other on the airframe.

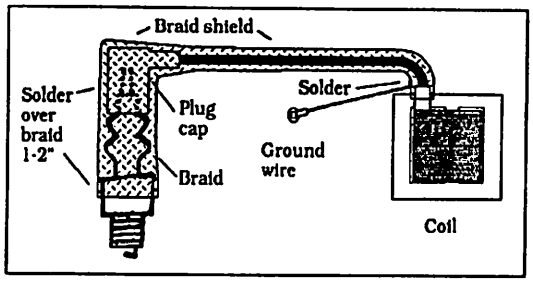


Figure 2. Shielding spark plug & wire.

You have now done all you can to come between the RF radiation from your ignition system and your antenna. You should now find the level of interference quite acceptable. There are, however, two more things to keep in mind when hooking up the radio. There are two cables connected to your radio that we have thus far ignored. These are the push-to-talk switch cable and the headset cable. Both must be made with shielded wire with the shield properly grounded through the connector into the radio. If not, they will pick up what little radiation is left floating around and "pipe" it directly into the radio. This can not only cause reception interference, but it can also interfere with your transmissions. If you buy a PTO switch it should come with shielded wire, but if you make your own, watch out for this.

I started this series of articles with the statement that installing your radio is an art rather than a science. All I can suggest is to try these steps in order of importance, which is the order in which they are presented. Stop when you are satisfied with the results. Conversely, keep going until you are satisfied.

Feel free to call me if you would like clarification or more information on anything I have covered. I can also help you get the materials needed.
Good communicating!

Classified

ABC Ballistic Chute - never used, hermetically sealed, excellent - $1000. OBO. Paul Hemingson 931-2363.

Ivo Prop - updated 3-blade, ground adjustable, 60", composite blades. LH tractor or RH pusher, new - $375. Paul Hemingson 931-2363.

Braid - for shielding ignition circuits, $2.00 per foot to CUFC members. Also shielded wire and connectors. Bob Kirkby 569-9541 or 291-5560.

Renew Now!

Better renew your membership for 1991. Rumour has it that Bernie is going to be deleting non-payers from the mailing list. You don't want to miss an issue of Skywriter!

AIRLIGHT AVIATION LIQUIDATION 403-226-0180 (eves. o k)

SORRELL HIPERLIGHT PARTS

1	Throttle quadrant	$25.00
2	5 gal plastic fuel tanks	25.00
1	Used 5 gal plastic fuel tank	15.00

INSTRUMENTS

1	Used Halls c/w prone mount (long)	15.00
1	Used winter 2-1/4" 0-70 mph a/s c/w venturi	50.00
1	Halls prone mount (long)	5.00

STRIPPING TAPE

	50' Scotch red 1-1/2"	20.00
	50' Scotch red 3/4"	10.00
	25' Scotch red & white 3/4"	6.00

ROTAX 185 PARTS

1	Condenser	4.00
1	Used coil	5.00
1	Set of starter's (updatekit)	50.00
2	Used Rotax starters (for parts)	10.00 each
4	K7 Champion spark plugs	1.00 each
1	Used Stewart Warner 18mm thermocouple for CHT	5.00
2	Sets foam aircleaners & hardware	10.00/set
1	Pair intake stacks	8.00
23	Misc. Lord mounts including panel mts.	1.00 each

LAZAIR PARTS

6	B.E. rod ends 3/16"	4.00 each
2	B.E.P. rod ends 3/16" special	5.00 each
5	3/16" Eye bolts	.25 each
25	Misc. aluminum plugs P-3 P-6 etc.	2.00 - 5.00
1	Used tail cable complete	5.00
13	3/16" inline fuel filter	.25 each
1	Pair Pioneer prop spinners	5.00

PIONEER 100CC PARTS

6	Starter bushings	.25
2	Starter housings	5.00
1	Crankshaft seal	2.00
2	Exhaust Gskt.	.50 each
2	Starter springs	5.00 each
1	Pair air cleaner mounts	5.00

FASTENERS

50	5/16" x 4" U.N.C. GR 5 plated bolts	$5.00	lot
50	5/16" x 4" U.N.C. Nyloc plated bolts	1.00	lot
20	Metric (Rotax) prop bolts plated	.50	each
200	Misc. nut plates	.05	each

FISHER

1	Small bundle misc. wood strips some grooved, some flats	10.00	lot
1	Set fiberglass wing root caps FP101	5.00	

MISC.

2	Pair Sailplane wing tip protectors (spring steel)	15.00	pair
1	Aluminum weld in fuel tank outlet 1/8" N.P.T.	10.00	
2	5 channel C/B radios with motorcycle mounts	20.00	each
1	Enclosed trailer steel with wood floor. Inside - 24' x 7.5'w x 6' high. Single axle light weight	1150.00	
1	Used Grumman spanner without intermed. plate	75.00	
1	Grumman spanner complete & painted	350.00	
1	277 Rotax with exhaust new Hegar 2.1:1 3VX up drive (for upright mounting)	500.00	
1	Pair Carlisle 15-600X6 Tires	50.00	
1	600x6 tube	5.00	
1	277 - 4130 welded engine mt. (tractor)	50.00	
1	277 - mild steel welded engine mt.	5.00	

COVERING MATERIALS

30	yds. 62" 1.6 oz. Dacron $6.00/yrd or	175.00	/lot
2	Rolls 3" Dacron tape	15.00	each
1/2	Roll 2" Dacron tape	10.00	
1	Roll 3/4" Fibreglass tape	3.00	

HEGAR HYD. BRAKE PARTS

4	Disc. brake seals	3.00	each
1	Master cyl	30.00	
1	Master cyl kit	4.00	
2	5/8" Hollow steel axles	6.00	each
1	Round brake pedal	1.00	

NEW ROTAX PARTS

2	299 333 Throttle cables	5.00	each
1	Dual Throttle cable	15.00	
13	938 795 Exhaust springs		
3	831 881 head gskt.	2.00	each
4	930 532 gskt.	1.75	each
3	850 430 gear box O ring	3.25	each
3	850 360 gear box O ring	1.00	each
2	840 270 gear box drain plug	6.00	each
1	552 280 gasket ring	.50	
1	841 820 gear box to block bolt	.75	
11	845 270 shroud washer	.25	each
11	841 490 shroud screws	.15	each
4	831 841 gasket	1.50	each
2	964 219 condenser	7.00	each
2	983 343 points	5.50	each
2	963 500 Jet needle clips	1.50	each
2	963 714 Jet needle 8L2 (503)	3.00	each
1	867 421 277 intake manifold	14.00	
1	995 510 bing carb (36mm)	75.00	
1	973 192 straight exhaust	175.00	
1	379 144 2 cyl. exh. man. 90 deg.	70.00	
1	994 874 twin cyl. pull starter complete	70.00	
2	867 486 45 deg.277 rubber int. elbow	15.00	each
12	260 370 bing grommet	.60	each
2	963 699 needle jet 2:74	3.25	each
1	241 440 carb cable adjuster	1.00	
1	831 450 carb O ring	1.25	
2	830 720 carb bowl gasket	1.50	each
2	861 180 carb floats	7.50	each

HEGAR DRIVE PARTS

1	7-3/4" 3VX pulley (new)	50.00	
1	6" 3VX pulley (used)	40.00	
1	3" 277 3VX pulley (used)	20.00	
1	3" 377 3VX pulley (used)	20.00	
2	Quicksilver prop adapters (used)	10.00	each
2	Used shafts	8.00	each
1	set 3VX x 250 belts	15.00	
1	Adapter IVO prop to Hegar drive	45.00	
1	Used squash plates Rotax	5.00	
1	Used squash plates Quicksilver	5.00	

PROPS

1	60 x 38 2bl. G.S.C. Left (447)	100.00
1	used 64 x 32 2bl. G.S.C. right 503	40.00
1	used 43 x 34 2bl. G.S.C. left 277	40.00
1	used 50 x 34 2bl. G.S.C. left 277	40.00
1	used 50" 3bl. composite left 277	30.00

KOLB PARTS

3	ASF-O wheel brngs.	$3.00 each
4	AN 210-1A pulley	5.00 each
2	Ultrastar fuel tanks 1.3 Gall Ea.	8.00 each
1	Twinstar bucket seat with upholstry	50.00
2	Twinstar main gear legs tapered spring aluminum	50.00 each
1	Twinstar tailspring fibreglass rod	8.00
4	Twinstar lord mounts	8.00 each
1	pair Twinstar steel wheels c/w carlyle 15-600 x 6 tires and tubes	100.00
2	4130 tube gear cross braces	5.00 each

All parts are new unless stated used.
All prices are a fraction of new list price.
Call Jim Creasser 403 226 0180 evenings and weekends OK