SPORT AVIATOR

newsletter of the Sport Aircraft Association (Auckland Chapter) Inc.

September 2010

Spitfire prior to take-off Battle of Britain commeration Ardmore Sept 2010

This Month's Guest Speaker

The Enigma Cipher Machine

From the nephew of the great inventor Dr. Arthur Scherbius, our very own Manfred Scherbius.

It is said that it shortened WWII after the British cracked the German codes. The "ULTRA" secret held tight till for over 35 years. History books had to be rewritten after it was declassified.

Presidents Report

Big thanks to Don for organising our guest speakers. We will continue to have interesting meetings.

Supporting our news letter with interesting stories and pictures keeps everyone in the loop. Good ideas help us all build better safer planes.

Experimental can be costly!!!

You may have heard about the Titan T51 crash in Christchurch recently. The accident report is out and puts the cause as harmonic vibration causing gearbox failure and subsequent loss of drive to the propeller.

This was the third failure on this aircraft. Engine is the Suzuki V6 with a 4 blade variable pitch Vesta prop. The initial install used the Vesta Ho Vo chain PSRU.

The PSRU drive shaft key sheared in flight causing a forced landing. Assumption was faulty gearbox design.

The Neil Hintz PSRU was fitted. This is a 3 gear oil bath configuration which has now several hundred hours service. After about 40 hours the gearbox suffered an instant failure of the drive gear over heating and folding the teeth. Another forced landing.

Failure was thought to be due to too tight a backlash between the teeth. Neil had made this box slightly tighter than standard.

The gearbox was rebuilt by Neil and refitted. 10 hours into test flying and the gearbox failed again in an identical manner. Attempting a forced landing, the pilot stalled and spun in from about 50 feet. Luckily escaping with only bruising from the straps.

CAA did the investigation and came to the conclusion that this prop cant be used with the Suzuki, PSRU combination due to catastrophic harmonic vibration.

To date not problems have occurred using the Titan 4 blade propellers.

I have taken a keen interest in this case as I am running a Suzuki V6 with Neil's PSRU. To date I am unaware of any torsional vibration test having been done on any setup and chances are ground running may not show up any nasties anyway.

Presidents Report cont'd

Inflight data logging of the torsional vibration through the entire fight envelope is the only sure way. A time consuming and expensive exercise. But not doing it has cost the loss of an aircraft and 2 PSRU's.

To stay safe, we need a good intelligence network to help keep us on the straight and narrow. This incident has shown how costly is can be using untried combinations without exhaustive measuring and testing.

I'm glad others are doing this before I get to fly.

On a happier note. We have many great trips ,visits and events in planning for the summer. We are in for a lot of fun.

Regards

Warren Sly

From Don Wilkinson

On the matter of News

Don Says:- What a great acquisition those scales were. Thanks to, I seem to recall, Mike Paauwe who found and initiated this. I picked up the scales from Manfred at Ardmore and in under an hour we weighed the TOY and Paul Munro's RV8.

So simple, we were able to change the unit to read in pounds and had the results straight away.

The previous day I had tried the TOY on the bathroom scales but half way through one wheel came off the scale. That flipped Brenda's "borrowed" scale arse up with a clatter and from then on they failed to read at all.

Next day I visited Manfred and did it properly. Thing is you can zero the scales with all required dunnage on it and then there are no deductions to calculate. All wheels at the same time. They are a great piece of equipment.

And the result? I'm happy and so was Paul.

The TOY is considerably less than half the RV and has not grown alarmingly since new some 28 years ago considering I have added a second ignition with coils, a generator, regulator and associated wire, an auxiliary fuel pump for the belly tank and an ELT with aerial.

I have tried to compensate with a reduction in Pilot weight.

Member's Projects from Mike Tunnicliffe

Now here is a quick rundown on what chapter members have been up to.

Kevin Moir has been installing a fuel tank filler on his Taylor Monoplane, this has been a little challenging as the canopy slides forward over the filler, he has also been installing attachments for a Cardwell Racing 5 point safety harness.

Member's Projects from Mike Tunnicliffe cont'd

Cameron Russell now has most of the metal parts made for his Corby Starlet and has been installing pulleys prior to getting cables made.

Stuart Mackereth has been finishing details on the Raven wings for his modified Pitts S1, he has also been rebuilding a Lycoming 360 under supervision.

Alan Miekle now has the wing centre section glued up for his Chilton DW1 and is currently fitting the undercart prior to making a start on the fuselage.

Peter Armstrong is building a MCR-4S and has the wings painted, installed kilometres of cables and currently is assembling the panel. He is also installing a BRS, it is getting much closer to completion.

Mike Tunnicliffe has had a break from working on the airframe of his Pietenpol aircamper, in order to get the power plant underway, the patterns are at the foundry and he is hoping to pick up the castings any day.

Steve Chilcott has completed the fuse and tail structure of his Menestral and is about to start building the wing spar. (Ed - lifted magnificently by the Armstrong family with a "little help" from Steve to its temporary resting home over his working area!!!).

Gavin Magill has had a couple of months break from building his KR2S in order to sit his PPL and modify a sindicate owned Sonex for full dual control, he has now recieved the Alluminium to make the control hinges for his KR and is looking forward to getting back into it.

Paul Blackmore has been assembling the Aerovee engine for his Sonex and has found the importance of attention to details as when correctly assembled, a conrod was found to be hitting the camshaft, requireing some relieving of the shaft.

David Horton now has 65 enjoyable hours in his Murphy Rebel, and has just fitted a Garmin Aera 500 GPS, he has a Dynon EFIS and it can feed HSI data to the screen.

George Richards after having a few unwelcome surprises, splashed out on a ZAON XRX PCAS at Oshkosh and is now installing it in his Falco.

Perhaps these gentlemen could give a little talk at one of our meetings, to enlighten those of us who do not know what these names mean.

If you have been missed out, please contact Mike Tunnicliffe for inclusion next time.

From Gordon Sanders

Comms Van Review

The Chapter's comms van, which picked up the name 'Popemobile' in its early days, was purchased ex Airways Corp in 2001. At this time Airways had decommissioned the van as one of their two mobile control vans, replacing it with a transportable control cab built in a shipping container. SAA had previously had the use of the van for SportAvex, which was regularly held at Matamata, and were welcome to borrow the new cab, if it was available. However we would have to pay for transport from, and return to, wherever in the country it was at the time. The cost estimate for SportAvex 2002 was $4,500 to move the cab from and to Napier, hence the decision to go it alone.

Of course Airways had stripped all the techo bits out of the van before the Chapter took it over, so total re-equipment was required. The major work and fund raising was rushed through to get the van operating for SportAvex 2002. It was acknowledged at the time that much work would remain to tidy it up and make deployment easier, but we met the deadline and got it working in the field.

Since the 2002 deployment progressive improvements have been made, and are continuing. The loss of Pikes Point in 2005 was a major set-back as housing in the rear of the ARMAC hangar had been free. The van was housed by Graeme Weck in his Patamahoe hangar for a number of months while Bob Keith, Don Kirk, Manfred Scherbius, and I completed significant work, but eventually the hangar space was required for aircraft. Wayne Matthews was then able to arrange housing in the Aviation Sports Club hangar at Whenuapai at an initial cost of $10 per week. Later this rose to $15 ($780 p.a.) and it looked likely that the space would be required for aircraft.

Fortunately Brian Wigley was able to negotiate with NZ Warbirds for it to be housed in a corner of their Ardmore hangar free of charge in exchange for occasional use. A good rapport has been established with Warbirds and particularly manager Peter Houghton so the system works well. During recent bursts of work Manfred Scherbius has provided shelter for the van in his new Ardmore hangar, where its approx 2.5m height clears the door by about 20mm. Don't leave the roof vent open!

After being a financial drain for several years, mainly due to storage costs, the van turned a profit for the Chapter in the 2009-2010 season. November saw it deployed to Raglan for the annual Black Sands fly-in, followed in February to Tauranga City Air Show as communication centre for the show, then up to Parakai for their annual fly-in and open day. March saw it down to Whitianga with the Warbirds for the Whitianga air show, followed by its furthest distance yet, to Stratford for the annual MAANZ rally. The Chapter tries to keep the rental costs reasonable so the van gets used and, with its sign writing (kindly donated by Dennis Horne), provides publicity for SAANZ and the Chapter. Rental for a club fly-in is normally $150 plus hirer tows the van. For the Tauranga air show (and previous SportAvex events) we charge $500.
So how is the van equipped and what facilities can be provided with its use? The first thing is the power supply, as, without electricity, nothing. Everything is designed to run on 12 volts DC. For deployments of up to 2 days the large battery will normally have sufficient capacity. If mains power is available the battery is continuously float charged (13.8V) or can be boost charged (14.7V) if required. If there is no mains the 2 KVA super quiet Honda generator can be used to recharge the battery and supply other loads. For the SportAvex events at Tauranga the generator powered the whole airfield P.A. system as there was no mains supply on the airfield.

Aircraft communications are provided by two Icom VHFs. These are sets designed for use in airfield vehicles. In addition there are two Icom airband hand-helds and a set of 20 Doro PRS 'walkie-talkies' for personal communication on the airfield.

Met information is provided by an anemometer, a wind direction indicator, and an altimeter. When the altimeter is set to indicate airfield altitude the QNH is read from the sub-scale. The sensing head for the anemometer and wind direction indicator is mounted on an external mast which also carries one of the VHF aerials. Analogue instruments were deemed necessary for displaying the wind information as they present data in a more easily assimilated manner than do digital displays. However no suitable instruments could be located on the market. We therefore made our own.

The anemometer head was initially a boating item which generated two pulses per revolution using rotating magnets to operate a reed switch. We fed these pulses to a small electronic circuit to convert the pulse rate to DC which could then be displayed on a 270° movement meter, which was recalibrated 0-40 Kts. This worked but the very slow pulse rate in light winds meant that the needle was always bouncing. An even more annoying characteristic was that, because the wires up the mast were open circuit when the reed switch was open, the VHF transmitters would cause the meter to go full scale. The operators thus had to read the wind speed before calling an aircraft. To overcome both problems the head was redesigned. A slotted wheel out of a dead computer mouse was used to interrupt the light beam in an optical slotted switch (LED and a photo-cell) thus providing a much higher pulse rate for any given wind speed and a low impedance interference resistant output. Solved both problems.

The wind direction indicator was also a problem. We wanted a 360° indicator to follow the wind direction vane. Obviously mechanical means were out of the question as it would require a large vane coupled to an extremely low friction system. A synchro system, where turning the shaft of the transmitter causes an equal rotation of the output shaft of the receiver, looked to be the best hope. Synchro transmitters and receivers look like small electric motors, normally with five wires coming out of them. They are used extensively in more expensive aircraft, like the stuff Boeing make, and that is where we sourced the required transmitter and receiver. Ones that had just failed calibration tests (the specified accuracy can be as tight as ±0.02° or tighter) but were otherwise fine.
However aircraft synchros normally operate on a 400Hz power supply (standard in heavy metal) and these were no exception. We therefore had to design and build a power supply that ran on 12 VDC and supplied 26 VAC 400 Hz. Manfred modified a standard electrical panel meter so the pointer was driven by the synchro receiver and the wind direction vane bearings were replaced by a synchro transmitter, with the vane attached to the synchro shaft. It worked but was too prone

This Months Evening Meeting will be held on:

Thursday 30th September 19:30, at the Auckland Society of Model Engineers Club Rooms, Peterson Rd., Panmure Basin, Mount Wellington.

From Gordon Sanders - Comms Van cont'd

to swinging widely, including full circles, in turbulent air flow. A larger but strong and light vane was obviously needed to replace the small stainless steel one, but how to make such a thing? Carbon fibre came to mind and Giovani Nustrini happily obliged when asked. Epoxied in place it worked well.

Compared with the instruments, the P.A. system was comparatively easy to install. A standard amplifier that would operate on 12V and 230V was purchased, along with a pair of waterproof horn type loudspeakers. When deployed the speakers are mounted on the roof, plugged in, and you're ready to talk. A crash alarm and chime are built into the amplifier. Access to the van roof for erecting speakers and aerials is provided by a combination step ladder carried on board. It is also used for the erection of the two-piece mast which clamps to the van's side.

Safety equipment has not been overlooked. Two dry powder extinguishers are stowed within the van but moved to external mounts when deployed, providing quick access. A large first aid kit, identical to that carried by fire tenders, is carried. This would provide serious first aid equipment to people at an accident site and, while few of our members would be knowledgeable enough to use all the equipment, there are often medical people who just happen to be nearby but not have equipment with them. A bag of rescue equipment, including an axe, pry bars, cutters, leather gloves etc is also carried but hopefully never needed.

For its size the van is heavy, built, it seems, to brick out-house specs. The chapter's scales were recently used to weigh it, coming out at 1015 Kg all-up, with 124.5 Kg of that on the drawbar. This drawbar weight seems heavy, and requires careful handling when not attached to a vehicle, but results in good towing characteristics. It will also reduce as speed increases due to the high aerodynamic load imposed by the rectangular top with its outward sloping windows.

When we purchased the van it was placarded, in true Government style, 'Do NOT exceed 70 kph when towing'. One day I chanced to meet an ex-Airways person who had towed it a lot and he assured me that it snaked like the proverbial if you exceeded 70 k. Probably had a lot to do with the 4 large batteries and generator stowed in the rear of the van (our single battery is forward with the generator at the rear) plus a water tank (now scrapped) under the rear floor. I have had it over 100 kph and it has been reported to me that a more powerful vehicle has had it around 115 kph, still rock solid behind the tow vehicle. Only problem is that with the amount of drag you can watch your fuel gauge heading for the left stop.

That's a potted history, with more people than personally mentioned contributing their energy and experience to many and varied tasks along the way. While the initial requirement for the van, to act as airshow and flying control at SportAvex, has passed with relocation to Tauranga, it is still a substantial and useful asset.

Recently I emailed members asking for assistance in carrying out improvements prior to the coming deployment season. The work was aimed at simplifying and expediting erection and dismantling when deployed, thus making it easier for 'non-regulars' to set it up and use it. It was expected that the A team would be central to the effort, but it was disappointing to receive only one offer from the rest of the chapter; thanks Brian.

The van was relocated to Manfred's hangar on 4th Sept (thank you Manfred) and work begun. At the time of writing work completed or nearly so includes a new stowage facility for the mast sections and simplifying assembly to the mast of the wind sensors and VHF aerial. Radio operation has been improved by having the sets serviced (won't bore you with the tech details) and designing and fitting connection facilities for the use of aircraft headsets and/or 'stereo' earphones, particularly useful when engines are running nearby (noisy bloomin' aircraft!).

Retaining the stools (operators' bums for the supporting of) during transit is being greatly improved by the addition of a proper retention system, rather than lashing them to the footrest. This had made the mast and ladder inaccessible when the stools were stowed. A fixed spirit level has been added to speed up the levelling process and a master fuse fitted in the battery lead (only took one accidental short with a couple of smoked up cables to point this out as a desirable, but previously overlooked, feature. Don Kirk is exploring the availability and cost of protection for the cab glass during transit. We had one stone strike last season and can do without a repeat.

The van has four bookings already for the coming season; Warbirds are using it as their P.A. centre for the Ardmore Open Day on Sunday 19th Sept (probably history by the time you read this) followed by Black Sands (Raglan) early Nov and Parakai and North Shore Aero Club on consecutive weekends in February.

There are other improvements that we'd like to do but, as always, resources are stretched, so if you would like to help please contact me on 534 2464.

From Nev Hay

TIBA

What does that word mean to you as an aviator?

The recent earthquake in Christchurch was extremely fortunate –aviation wise- that it occurred at around 4:30 in the morning and not 4:30 in the afternoon.

That morning there were only about four aircraft flying in the New Zealand airspace when the radar room ceiling started to fall and all operators advised something along the lines that they were 'vacating the station due to an earthquake, call on freq XYZ and TIBA rule are now in operation.'

We could debate the wisdom of locating all radar controllers in one building, as was debated when the decision was made some years ago, but the point here is what would you do if you heard that 'call' when you were flying?

Traffic Information Broadcasts By Aircraft (TIBA) is not unlike what we do when flying VFR outside controlled airspace but what are the parameters which should be included in your message and what are the Freq you should use?

I can see this issue being a hot topic for a BFR so I suggest you open the Pink pages in your Vol 4 and have a read.

I can only imaging the Chaos which would have ensued if the almighty had his timing of this earthquake wrong. If there is ever a good time to have an earthquake this could have been it for aviators. Well that's my opinion!

Sleepless Nights in the Waitakeres

Shift work at the age of sixty two has benefits of letting you sleep in when every one else has left the house for work. On the down side I have found as the years fly by that I am not as flexible in the changing routine. Getting up at four to milk cows as a kid seems to be a world away from getting up for early shift. The consequence of all this is that with the change of routine shutting an old mind own for sleep early in the evening following late shift often results in spare time where nothing that should happen does. Some say the mind never sleeps and I think this is true. I have no idea why when the lights go out

I start to think of all the stuff that should be built and is not yet. These thoughts have often been excited by new technology and I have always been inspired by people who come up with stuff that revolutionises what we already know. It's kind of like opening the door to "I didn't know I knew that until you showed me (That)??!! This has led me to often having to get up and start the sketch book. For me the sketch always seems to start from "the other end". It derives from what should be possible from what I have learned about and ends up as a shape on paper.

This has led to building things like Arimid Kevlar motorcycle chassis. A back yard autoclave, An aluminium monocoque go-kart where the sketch was born at about 0530 in the morning in ICU where I was being breathed for and fed through tubes while recovering from Gilliam Barre Syndrome and sleep was non-existant. I later built it and though I rebuilt a few things a number of times to get it right, generally stuck to the sketches wobbly as they were, pretty faithfully. I think the sketches provide a trapdoor relief and often, once done allow me rest.

A couple of years ago Melanoma paid a visit and changed life yet again. I had a lot of bed rest. It was truly life changing and yet again I realised a lot of things. Paramount was that I had to get this old arse into gear as I had a lot to do. First I started training, I got fit bloody fit for a sixty year old and really enjoyed the feeling. I believe it was imperative in the mechanisms of arming oneself to be successful in what was to come with the operations that lay ahead. During pre-med my resting pulse rate was 51 beats per minute and I was told I had the BP of a teenager. Eight and a half months of bed rest led to hours of thinking about getting back to the things I love.

It also had me reconsidering a lot of things. Democlies sword hung over

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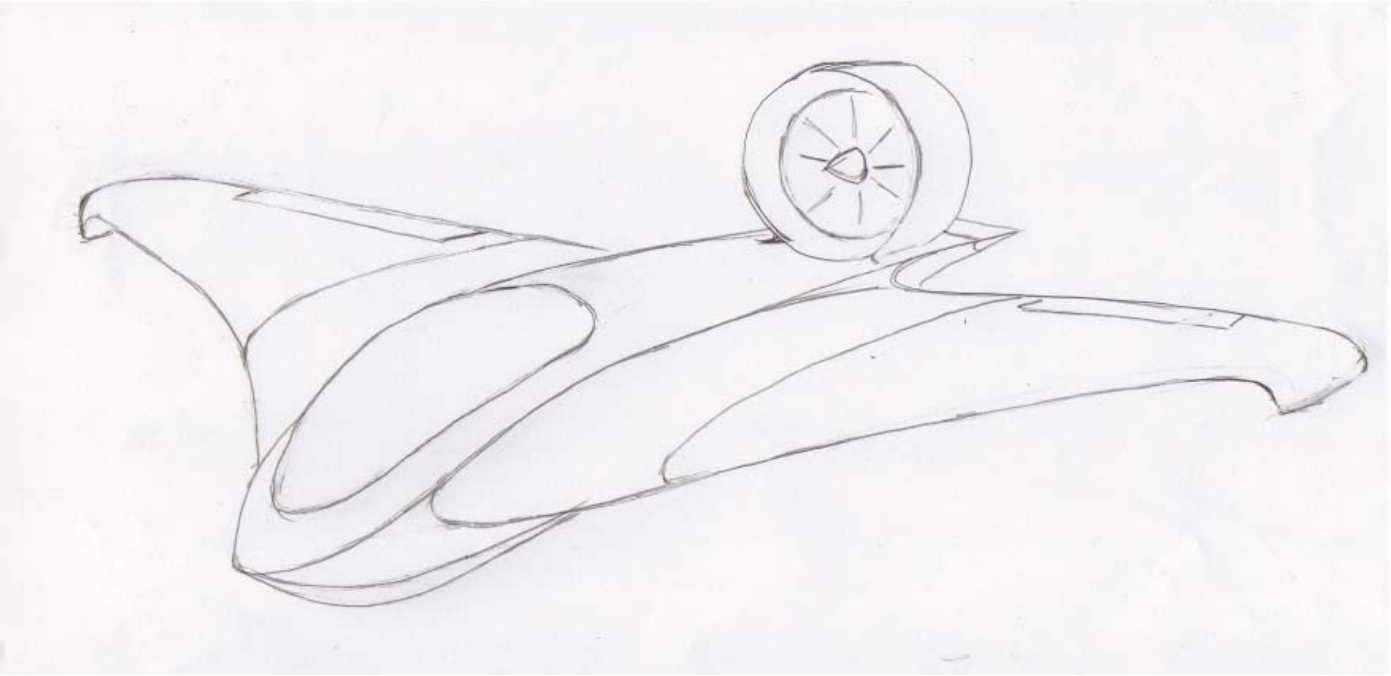
Sleepless Nights in the Waitakeres cont'd

Sleepless Nights in the Waitakeres cont'd

me and I needed to reorder things. I wanted to mount the best fight back and that started pre-op. I needed more order in my life in case things did not turn out right. I did not want to leave the best girl in the world a convoluted mess of toys to clean up. I wanted to do stuff. Most of all I didn't want to leave stuff not made. I have for a long time had a maddening fascination with things like ground effects aircraft.

When lifting body technology became public knowledge there seemed to me to be a symbiotic relationship between the two. Then came the blended wing body concept. Boy have these three things cost me some sleep. With the advent of the internet things have got worse, I can download in minutes years of insomnia. Some would call it a fertile mind but I often think it is more full of manure. Still some things take root and eventually grow. The problem is with such things is that they



are often all consuming, anyway the upshot of all this is that I started sketching something that might interest our members.

I love seacraft and particularly air seacraft. My Dad was the regional Supervising Technician for Civil Aviation. In those days at Mechanics Bay Oakland. I was lucky enough to have gone out in the big speed boats that raced down the harbour shooting out flares to clear the yachts and other craft so that the flying boats could land. In a moment I formed an attachment to seaplanes that will not go away. The problem with seaplanes is that they are often compromised. They must have a hull that will perform in such a way that they will allow it to develop enough speed to leave the water. I always view this as just a change of operating fluids. Consequently they often look the same as the proven model. Additionally the engines must be mounted out of the area of contamination of fluids they fly off, especially if it is corrosive. This often means high thrust centerlines and moments that change dramatically power on to power reduced. Accordingly drag for such designs often prescribes performance.

I have always wondered, what if we could have a configuration that incorporated the hull into an aerodynamic shape that better used water and the less viscous medium air. Could we use in ground (water) effects to accelerate lift from the water so that transition to flight time and distance could be shortened. Once in flight what design could be used to significantly reduce form drag so that a small and economical powerplant could be used. Why small? Size generally relates to mass, so smaller, if it has the ability to provide design needs has to be better. When I look at the current ilk of aero engine I think they are stoneaged when it comes to your basic motorcycle motor. If you consider the basic Suzuki Hyabusa motor straight off the floor will produce 200 horsepower, rev safely to 11000 RPM and is bullet proof. Fuel injected it is almost perfectly fuelled. Why could this not be used as an aircraft engine. To my mind there is no reason.

So this aircraft would use such an engine with the gearbox gutted (a major weight saving) and the share gearbox shaft bores reloaded with bearings and use the original primary gears as redrive. I visualise a craft with folding wings that would easily be trailered from home to the strip. Translating the wings to the flight config is done hydraulically and will result in locking into position. None of this is new, just not used by us in little aircraft. One of the things that would make this feasible is that in order to develop the lifting body form on the hull the wing root is a very deep profile. This allows for dramatic construction build methods, especially when we can use monolithic carbon fibre construction techniques. Using this concept as a central hull all of the power plant, fuel and service components can be loaded into the comparatively (to conventional craft) voluminous shape. Mass centralisation is a lot easier to manage. You can stick the engine right in the middle and drive the fan by a relatively lightly loaded shaft. With such a shaft, constant velocity joints could well remove so many of the alignment and balance problems that shafts in aircraft engine applications have often been the nemesis of otherwise inspired designs. The final drive would be a protected toothed belt as these do not transmit or generate period vibration..

On my design I would utilise the support frame for the ducted fan as the leading edge of two small directional control rudders that are utilised to straighten fan jet and provide lowspeed longitudinal control that elevons would not. I also think that a small elevator at the tail of the fuselage again in fan flow would be a big aid in low speed stability.

Sleepless Nights in the Waitakeres cont'd

Cooling for the engine would be from a radiator that lies flat in the tail and uses again a small amount of ducted fan air discharge. I don't want things to project into slipstream. Form drag reduction is as essential as lightweight. As an aid to getting to the in ground envelope I have considered hydrofoils that are the same as the aircraft form at three hull stations and would retract flush to that form. If we can retract things ungainly as wheels and undercarriage why not hydrofoils? For New Zealand conditions this must be an amphibian.

As stated we already will have hydraulics to used for wing positioning and hydrofoils so with the space available in the hull void a fully retractable landing gear design will not be a problem. It will have an alternate extension capability. In flight the aerodynamic lift is derived from the entire form shape. It is semi lifting body concept and modified blended wing. It is often thought that such flying wing designs will not stall. This is not strictly true from what I have read, any wing that loses lift due to high angle of attack will cease to provide the same characteristics as when flow is laminar. What this design provides is a broad section of wing profiles with an equally diffused stall response. Hopefully the incorporation of a longitudinal control always in the fan jet will provide dynamic control that flying wing profiles do not normally have with the consequence of positive angle of attack control.

The blended wing should provide good lateral stability and incorporates rolled down tips that reduce vortex drag and act as tip skis for water operation. These are designed to prevent tip drag that would result in ground looping. Additionally I have toyed with the incorporation of leading edge slats and retractable vortex generators on the leading edge high speed portion of the outer wing sweep. Ducted fans. I actually found it hard to get definitive design data that suited the envelope such as this aircraft would fly in. Why use a ducted fan at all? My original idea was to increase fan efficiency with a smaller diameter. A good thing about fans is that they are far more critical of duct profile than fan design, so that may well mean that I can fabricate the fan. The duct design is another story, how long should the duct be? What is the most efficient position of the fan in the duct length? What design will limit or extend the thrust performance?

Many fan designs I saw seemed to mimic turbofans and this is not correct for what I need to achieve. With turbo fans the faster they run the better the turbine engine performs. Consequently in the design of their fan cowl inlets the design will, as a function of speed, decrease the incoming airspeed and increase the static pressure to aid turbine compressor efficiency. Decreasing the inlet airspeed is essential to stop the compressor blade tips from going supersonic which destroys efficiency and causes dynamic inlet instability. As thrust demands increase with altitude and speed a gas turbine engine function is ideally suited to make the increased power demands by adding more fuel.

Conversely an internal combustion engine is distinctly limited by comparison. It's power output reduces with an increase in altitude unless aspiration is assisted by charging. At the same time a ducted fan must accelerate air flow into the fan in order to optimise the amount of air the fan has to work on. So the duct has to have a large rounded profile inlet area and reducing diameter at the fan bore. This acceleration of the air as the aircraft airspeed increases means the engine must work harder to effect the same relative change in airspeed across the fan (thrust) at speed than it does not moving.

Conventional aircraft engines are to limited in their RPM range to allow effective ducted fan design. But an engine that has an effective power band from 3000RPM to 10000 RPM make ducted fans feasible. Nobody to date uses motorcycle motors, but power output per capacity they leave all other powerplants wanting. With the engine mid mounted ingesting the warmed cockpit air inlet icing would never be an issue. There are many other things that I would like to employ, such as high efficiency twisted element ducted turbine generators that would be driven ducted ram air at flying speeds for such things as LED position, nav and strobe lights.

This is what sleepless nights in Waitakere leads to:

From Peter Armstrong - Useful Information

The working speeds of a 100mph airplane of average design. For faster or slower airplanes, the figures are different, but the proportions are the same. For airplanes of extreme design – patrol bombers, fighters, stratosphere ships – the proportions are different.