December 1983

Uni Gliding
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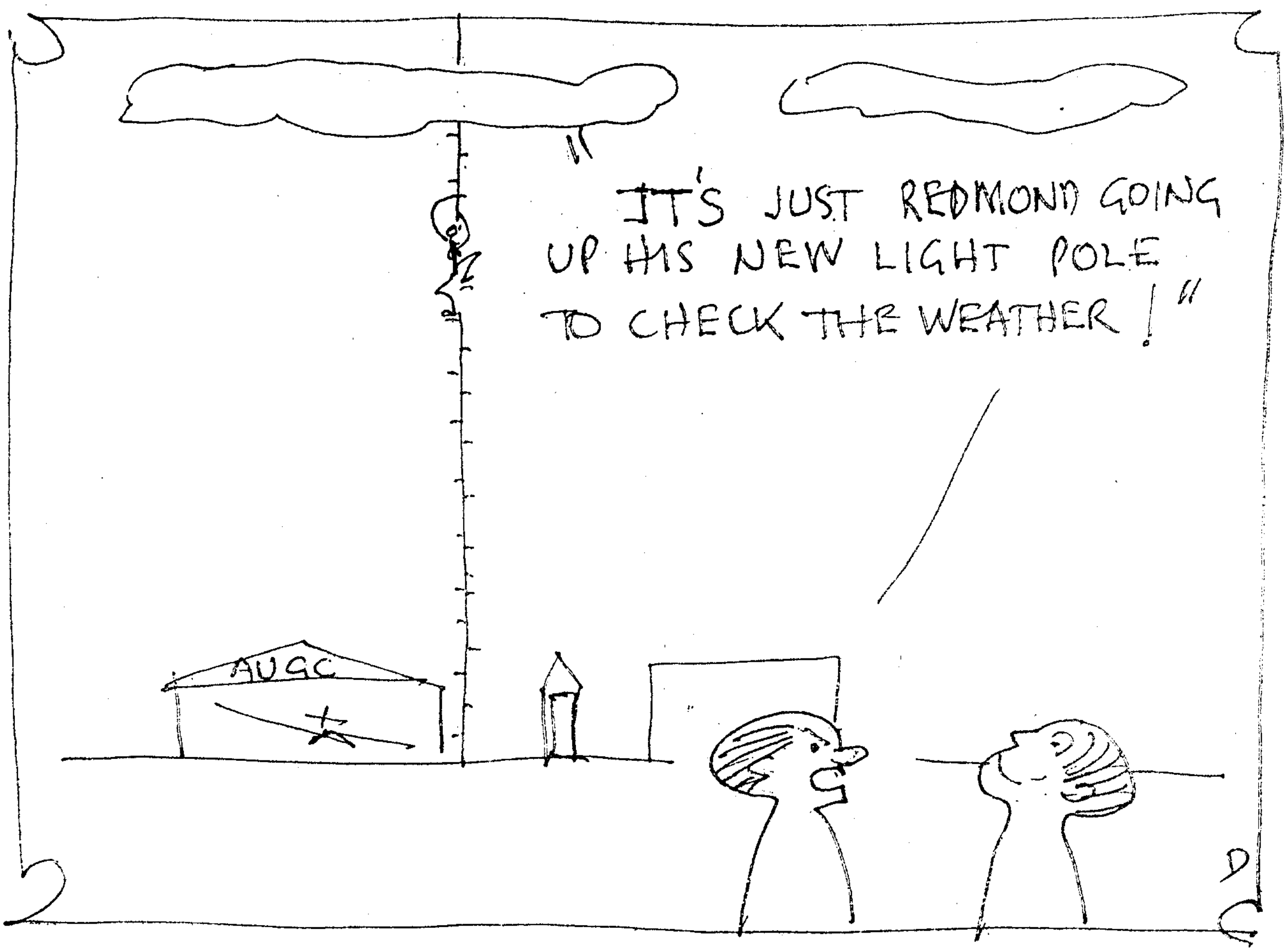
Official Journal Of The Adelaide University Gliding Club.



Next Meeting

Wednesday, 7th December, in the
Jerry Portus Room.
This will be a special extra short meeting,
starting at 7:30 p.m. and finishing by 9:00.

Thus, the anxiously awaited Ultra-low quality
video that we have been promising for so long
is put off again.

Registered with Australia Post for transmission through the post. Publication # SBH 191

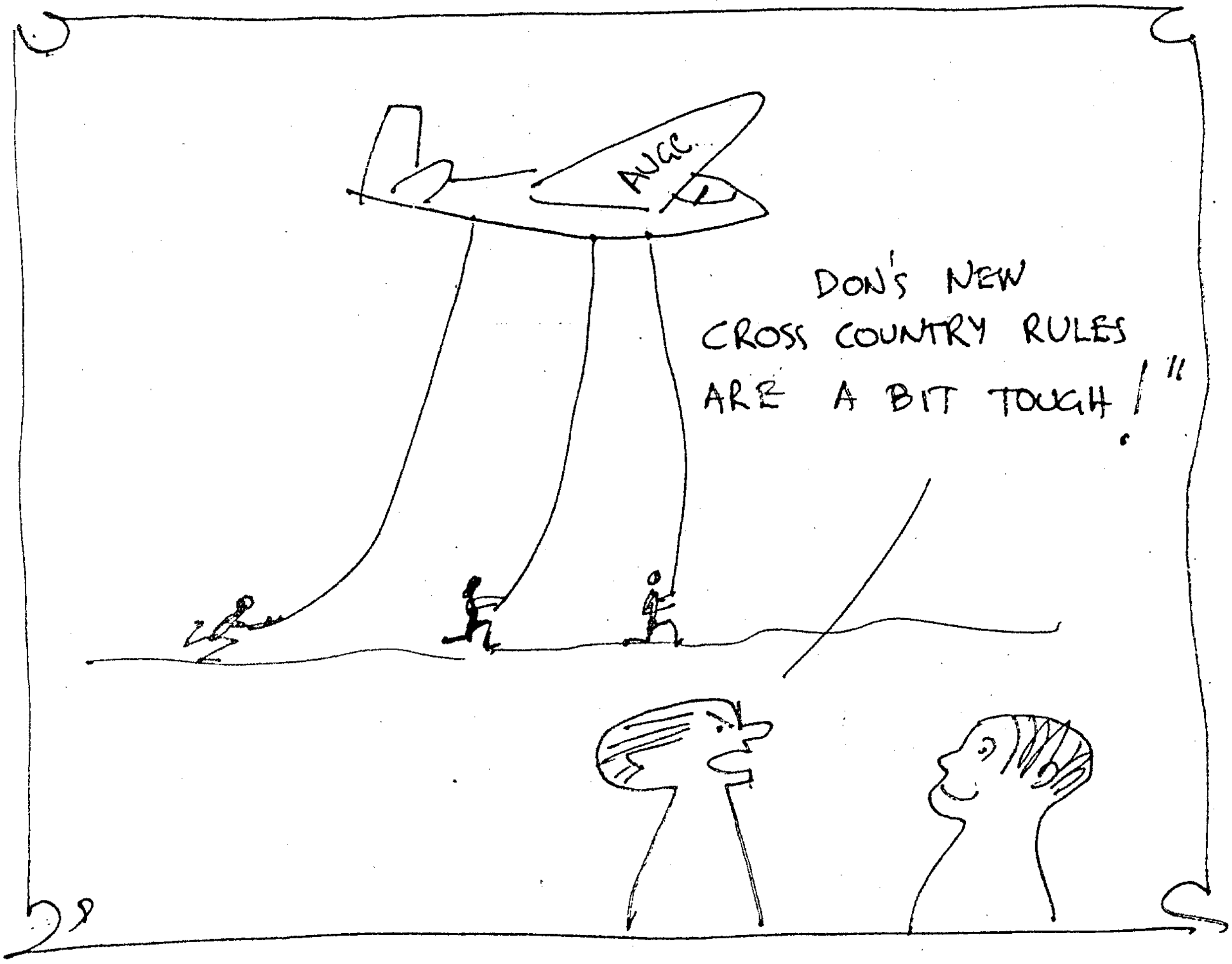
Editorial

At last! Exams are over (for a while, at least) and the Soaring Season is upon us. We all have lots of free time, and so at last everybody can do what has had to wait till the availability of time - now one and all can write articles for the newsletter, draw cartoons, etc. (we may even find some time to do some maintainance on the Bocian, and who knows; after that there may possibly be a remote chance of flying!).

I mention again that gliding photos might now be published, so if you have any that you think may be suitable, get them to me; either direct, at a club meeting, or via the gliding club pigeon hole in the Portus Room.

N.B. - As predicted last month, this newsletter is dated <u>DECEMBER</u>. This does not mean that you have missed out on an edition, but simply that UNI GLIDING is now more in step with other publications.

Andrew



President's Report

SHEARERS QUARTERS
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We are very lucky to have the use of the shearers' quarters to stay overnight near the field. However, on a couple of occasions recently, the state of the quarters after we have used them has been less than desirable. Nothing major, just that things were not as clean or tidy as they could have been. So, clean up afterwards, sweep those floors, empty those bins, wipe down the stoves and handbasins, replace consumables. Do a bit extra, e.g. clean windows. The shearers' quarters are a wonderful facility that we use free of charge --- let's show our appreciation!

To change the subject, flying has been a bit thin lately (to say the least). But the KA6 is back in the air, and the Berg Falke should be in operation very soon (if not already by the time you read this). The Bocian though still needs a reasonable amount of work on it.

Summer is here, let's get in lots of soaring and enjoy ourselves, while also putting in our spare time in Adelaide to get the Bocian going again to bring our fleet back up to full strength.

Dick Temple
President

OPTICAL ILLUSION

Notice how the large black triangle in the centre of the above rectangle disappears as soon as you look at it.

HOLIDAYS ARE HERE!! The pressures of exams are off!

You have been putting off flying all year on the grounds of too much work - now why not come up to Lochiel to unwind?

Fly this weekend!!

ring one of the numbers below (preferably before Thursday) and confirm your place.

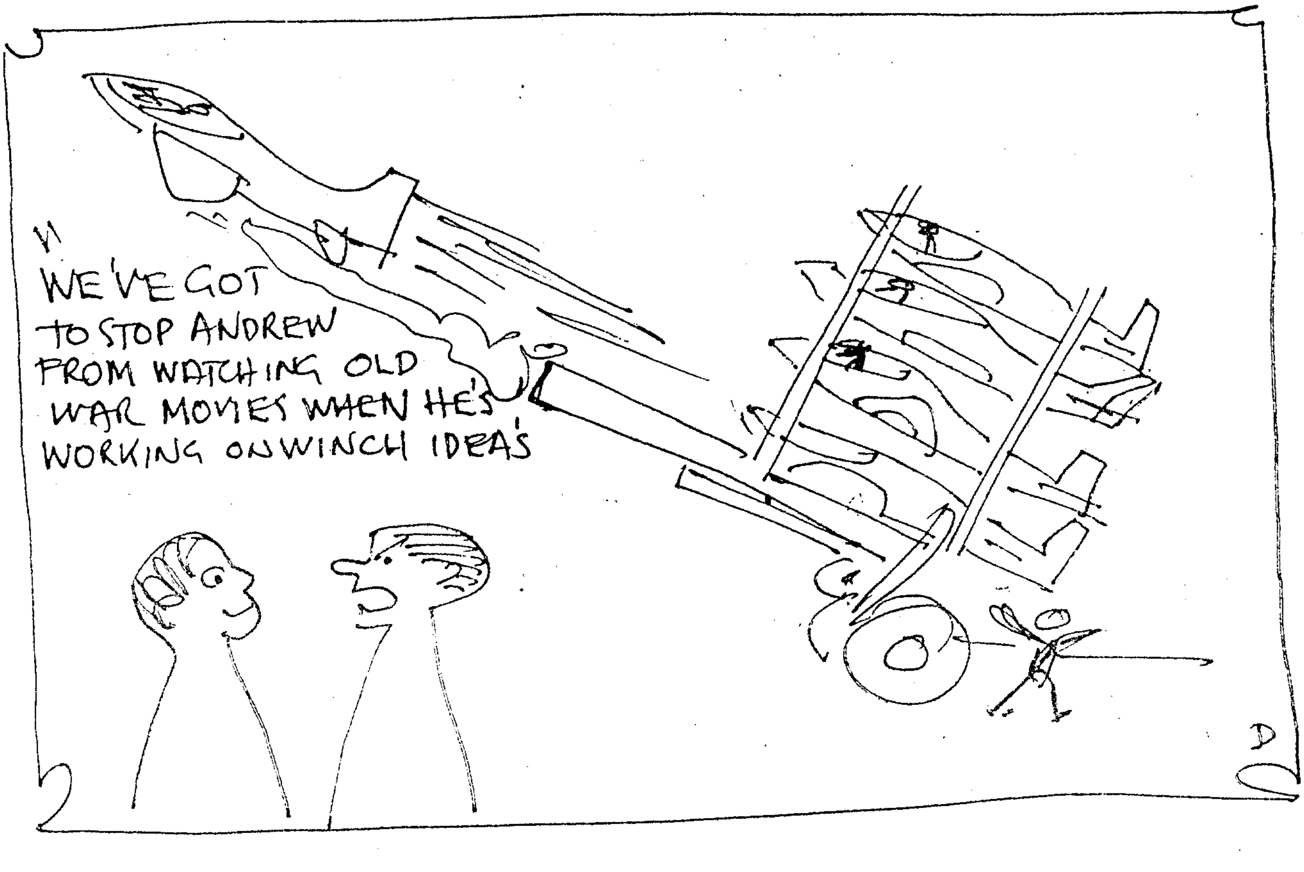
Don't worry if you don't have transport; ring up anyway, and arrangements can be made to get you picked up by someone on their way to the usual 7:30 rendezvous at Bolivar.

Remember, flying continues thoughout the holidays, so now is a good time to get some training done. For those interested in learning to fly, the Christmas camp is an ideal opportunity to advance flying skills; a few days in a row are so much better than a few days scattered over weeks. Stay up at the Shearer's Quarters for all or part of the camp; accomodation is free.

For those with a few hours already (though not necessarily solo), attending a competition may be just what you need, flying in a twin seater with an instructor.

Contact one of these members:

Me (Andrew Mc[illegible], Newsletter Editor);	356-2466
Don [illegible] (C.F.I.)(Till Jan. '[illegible]);	261-4245
Dennis [illegible] (Secretary);	42-5093
Dick Temple (President);	390-1827
Russell Norman (Treasurer);	390-1824



MINUTES OF THE EXECUTIVE MEETING OF THE ADELAIDE UNIVERSITY GLIDING CLUB INC. HELD ON WEDNESDAY, 19TH SEPTEMBER, 1983.

IN ATTENDANCE: D. Temple (President), D. Medlow (Secretary), R. Norman (Treasurer B. Giles, A. McGrath.

APOLOGIES: T. Nemeth (A/g CFI)

VISITOR: R. Quinn

RESOLUTION 1: *THAT the minutes of the previous meeting on 17/8/83 be approved as a true and correct record.*

A.McGRATH/D.MEDLOW
Carried.

The motion on notice regarding CFI appointments was deferred.

BUSINESS ARISING

BergFalke C of A:

It was noted that Mr. Hein's shed was now able to accommodate aircraft. The committee was unsure of the status of Mr. Forsters own aircraft and hence his availability for its C of A was unknown.

REPORTS

President:

Mr. Temple did not have much to report since he had not been on field very often in the past month. He said he was concerned about the winch project and has spoken to Mr. Quinn regarding this. He reminded the committee that the club's allocation must be spent by the end of November.

Secretary:

The Secretary reported that the telephone had been repaired, that a new membership list had been issued and that the Adelaide Soaring Club was holding a Cross Country Course in the near future.

Treasurer:

Mr. Norman reported that the club's operating a/c stood at about $800 with a general operating pool of about $2,000.

He reminded the committee that an $1,800 loan repayment was due at the end of the year. He added he was concerned about the level of subsidy of the club by the Union with only about 6 active members and said he was considering putting up a non-student club rate. There was some debate on this topic with argument being that non-Union members already pay an additional S.A. membership fee. No motion was proposed.

CFI Report:

Since the CFI was absent there was no report. The committee discussed the matter of Mr. Giles' instructorship and the matter of outside instructors.

RESOLUTION 2: *THAT the Executive requests the CFI to pursue the matter of Mr. Giles' instructor's rating with the view to ratifying Mr. Giles as an instructor as soon as possible within GFA guidelines.*

D.MEDLOW/D.TEMPLE
Carried.

/2

RESOLUTION 3: *THAT the Executive requests the CFI to look further into inviting other instructors to our field for instructing with the view of filling gaps in our instructor rosters.*

D.MEDLOW/D.TEMPLE
Carried.

Airworthyness:

The Secretary reported that the Ka6 would be out of service in 6 weeks time. Mr. Quinn reminded the committee that the Bocian required a recabling at the next C of A and this must be an expert job for it to remain airworthy.

The President is to contact Mr. Forster with Mr. Hein re airworthyness matters.

Newsletter:

The Secretary requested a full page add for the Whyalla visit. The Editor said it would be out early next week.

NEXT GENERAL MEETING

On 5/10/83. Video of field to be shown if possible a parachute lecture will be given.

WHYALLA VISIT

Will be held on 1st & 2nd of October, Instructors to be Mr. Quinn and Mr. Hein. The Secretary will stay over with the pilots.

WINCH

Mr. Quinn reported he was no longer interested in a 4WD winch and that he is now looking for a Bedford J-1 truck and a Ford Cleaveland V8 engine with a FMX or C4 auto transmission with capability to use either type. He said the cost should be approximately $1,050 for engine and gearbox. The engine will be taken to Kadina for overhaul.

RESOLUTION 4: *THAT R. Quinn be authorised to purchase a J-1 Bedford Truck up to $1,100 in suitable condition.*

D.MEDLOW/D.TEMPLE
Carried.

RESOLUTION 5: *THAT R. Quinn be authorised to purchase a Cleaveland Ford V8 engine with auto transmission for up to $1,100.*

D.TEMPLE/R.NORMAN
Carried.

OTHER BUSINESS

B. Giles & R. Quinn will examine the possibility of erecting a light pole for the club floodlight.

The Committee passed the following resolution regarding Official Observers.

RESOLUTION 6: *THAT any club member at the Secretary's discretion be nominated as an official observer.*

D.MEDLOW/D.TEMPLE
Carried.

Signed as a true & correct record ....
D. Temple (Presi
26/10/83

CONTINUED FROM LAST MONTH.

Table I

Type	Year	b (m)	S (m^2)	AR	M/S (kg/m^2)	M(kg) empty	M(kg) loaded	L/D_{max} @(V-km/h)	z_{min} @(V-km/h)
Wright	1911	9.8	27.9	6.8	5.7	86	160	8 (46)	.75 (42)
Blaue Maus	1921	9.5	15.5	5.8	8.3	53	128	12 (54)	.80 (52)
Vampyr	1921	12.6	16.0	9.9	12.2	120	195	17 (52)	.80 (50)
Konsul	1923	18.2	21.0	15.8	13.3	200	280	21 (52)	.75 (47)
Darmstadt II	1928	18.0	16.9	19.2	14.4	162	245	21 (58)	.70 (54)
Wien	1929	19.2	18.4	20.0	13.9	160	255	22 (54)	.60 (52)
Fafnir I	1930	19.0	18.6	19.4	16.9	220	315	24 (60)	.58 (56)
Austria	1931	30.0	35.0	25.7	13.8	392	482	26 (60)	.55 (56)
D-28 Windspiel	1933	12.0	11.4	12.6	11.9	55	136	24 (52)	.66 (47)
D-30 Cirrus	1938	20.1	12.0	33.7	24.7	198	296	36 (77)	.52 (72)
Weihe	1938	18.0	18.3	17.7	18.3	230	335	29 (70)	.58 (60)
Olympia Meise	1939	15.0	15.0	15.0	17.0	160	255	26 (69)	.67 (59)
Horten IV	1941	20.0	21.1	19.0	16.5	230	349	32 (72)	.55 (56)
RJ-5	1950	16.8	11.5	24.5	27.1	223	314	41 (80)	.55 (74)
Schweizer 1-26A	1953	12.2	14.9	10.0	17.5	161	261	23 (79)	.82 (64)
Schleicher Ka-6CR	1956	15.0	12.4	18.1	24.2	190	300	29 (78)	.68 (67)
Phönix	1957	16.0	14.4	17.8	18.5	164	265	40 (78)	.51 (69)
Foka 4	1962	15.0	12.2	18.5	31.6	245	386	34 (95)	.70 (79)
D-36	1964	17.8	12.8	24.0	32.0	282	410	44 (93)	.56 (83)
AS-W 15	1968	15.0	11.0	20.5	37.1	230	408	38 (90)	.59 (73)
SB-10	1972	29.0	23.0	36.5	39.0	577	897	53 (90)	.41 (75)
Ventus A	1980	15.0	9.5	23.7	45.0	215	430	44 (109)	.66 (93)
Nimbus 3	1981	24.5	16.8	35.7	41.8	360	703	60 (80)	.36 (76)

shows the trend in maximum lift-to-drag ratio of sailplanes from Lilienthal's to the present. The principal characteristics of these machines are listed in Table 1.

HIGH-PERFORMANCE SAILPLANE DEVELOPMENT 1911 - 1981

Early Development

The Wright brothers, celebrated as pioneers of powered heavier-than-air flight, are perhaps best credited for the practical realization of the three-axis, aerodynamic flight-control system without which the evolution of powered and unpowered aircraft could scarcely have progressed beyond the hang glider stage. The Wrights were early to grasp the significance of atmospheric lift to the soaring flight of birds. They continued to experiment with gliders even after the success of the 1903 *Flyer*, and in 1911 Orville succeeded in making a number of true soaring flights of more than five minutes duration. On October 24 of that year he was able to soar over the sand dunes near Kitty Hawk for 9 minutes and 45 seconds, establishing a duration record which was to stand for 10 years. This was slope soaring in its most elemental form, flying almost directly into the wind and essentially hovering over a small area (these early soaring flights were conducted in winds of up to 40 miles per hour).

This first "sailplane" of 1911 was typical of Wright brothers designs. It was a biplane, the two planes being of equal span with no stagger, with twin vertical stabilizers and an elevator on the fuselage frame behind the wing (a conventional configuration, except that there was also a vertical stabilizer mounted just ahead of the wing leading edge). The span was 9.8 meters, and the wing loading somewhere around 7 kg/m^2, which is about the same as a modern high-performance hang glider.

The real soaring movement began in post-World War I Germany, where aeronautical development was restricted by the Treaty of Versailles to low-powered or unpowered aircraft. The first glider meet, organized by Oscar Ursinus, was held in 1920 on a mountain in the Rhön region called the Wasserkuppe. Twenty-four young Germans showed up with their gliders. Outstanding among this early crop of soaring machines was Wolfgang Klemperer's *Schwarze fel*, a streamlined, cantilever, low-wing monoplane very low wing loading (8.3 kg/m^2). Launched into the by bungee cord, Klemperer easily set a world's reco gliding distance, covering 1.82 kilometers. Orville Wr endurance record still stood, however, and neithe *Schwarzer Teufel* nor any of the other participating g ever actually achieved soaring flight that year.

The next year, Klemperer was back with the *Blaue* a development of the *Schwarzer Teufel* with a better c enclosure (the pilot was still exposed from the ches however). The 1921 contest was the occasion of an esting demonstration of the relative effect of parasite and induced drag on gliding efficiency at low flying sp The *Blaue Maus* was tied for the lowest sink rate (abo m/s) with a glider built by the Aero Club of Munich Munich glider was not streamlined (i.e., it had much h parasite drag relative to the *Blaue Maus*) and was o kilograms lighter (about 5 percent of the gross weight). gliders had the same wing area, but the Munich gli wing had 1.5 meters more span and hence less inc drag than the *Blaue Maus*.

The most significant technical achievements of 1921, ever, were embodied in the *Vampyr* (Figure 12), desi

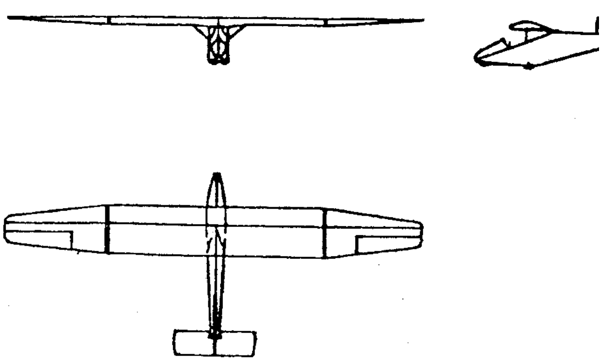


Figure 12. Vampyr (

by Madelung, Blume, Hentzen, and Martens of Akaflieg Hannover. The *Vampyr*'s wing was laid out in a serious attempt to minimize induced drag. With an aspect ratio of nearly 10, its wing spanned 12.6 meters, far greater than any of its contemporaries. The outer wing panels were tapered and mated to a constant chord center section. In order to keep the parasite drag level down, all but the pilot's head was enclosed in the fuselage, and the landing gear consisted only of three leather footballs on the belly of the aircraft. The airframe was constructed primarily of wood, as were nearly all aircraft of this period.

Madelung's stated design goal for *Vampyr* was a glider with minimum sink rate, the most important performance parameter for slope soaring. What Akaflieg Hannover really accomplished with *Vampyr*, however, was a dramatic increase in maximum lift-to-drag ratio. Based on wind tunnel measurements, *Vampyr*'s maximum L/D was 16, compared to an L/D_{max} of about 5 for the Wrights' first "sailplane." Its measured minimum sink speed was 0.8 m/s, twice that of the *Blaue Maus* and the Munich glider.

In the *Vampyr*, Martens was able to break Orville's longstanding endurance record with a 15-minute flight, including two full circles, but in fact no altitude was gained and this was not considered true soaring flight. It was not long, however, before the first true slope soaring flight was accomplished by Friedrich Harth in a Harth-Messerschmitt glider along a ridge near Hildenstein. The following year, *Vampyr* achieved spectacular success at the hands of Hentzen and Martens slope soaring from the Wasserkuppe, including a record flight by Hentzen lasting 3 hours and 6 minutes with an altitude gain of over 300 meters.

If the *Vampyr* was a trend-setter aerodynamically, it also incorporated one very important structural innovation, the single-spar wing with stressed skin nose. The single full-depth spar carried the bending loads while the nose formed with the spar web a torsion-resisting D-tube. This construction method allows an accurate airfoil leading edge shape to be maintained from one rib to the next. The concept remains in common use today.

The German Akaflieg system has had no counterpart in the United States. Due to the many contributions of this unique institution to soaring technology throughout the history of the sport, it merits special mention before resuming this narrative. An Akaflieg (AKAdemische FLIEGergruppe or, literally, academic flying group) is essentially a combination undergraduate technical fraternity and flying club associated with a technical university (notably those in Aachen, Braunschweig, Darmstadt, Hannover, Munich, and Stuttgart). The students in an Akaflieg, at their own discretion, undertake the design, construction, and testing of experimental aircraft. University faculty serve mainly in an advisory role. Financial assistance is provided by donations from private sources and the government. The various Akafliegs have traditionally been the source of many of the major advances in sailplane technology.

Progress During the 1920's and 1930's

For the most part, sailplane development through the 1920's was characterized not by major technological breakthroughs but by refinements within the limits of existing technology. Akaflieg Darmstadt, which would figure heavily in the future technical development of soaring, took the quest for increased aerodynamic efficiency a step forward by building one of the first successful long-span cantilever wings in 1923. Their sailplane, the *Konsul* (Figure 13), had a span of 18.2 meters. It was of high aspect ratio (AR = 16) and was first to use the Göttingen 535 airfoil section which would remain popular with designers for the next 15 years. Other design innovations appeared in this sailplane which

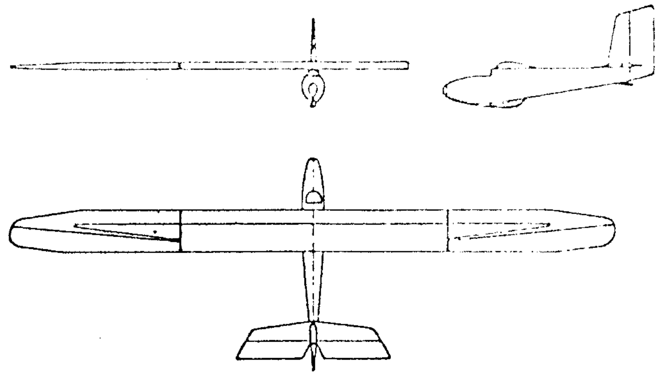


Figure 13. Konsul (1923)

were soon widely adopted by other designers. The fuselage was well-streamlined with an elliptical cross section to minimize drag. The ailerons were rigged to move differentially in order to minimize adverse yaw.

Akaflieg Darmstadt introduced the elliptical planform cantilever wing in 1927. Based on the work of Trefftz, it was believed that the most efficient wing must be of elliptical planform in order to achieve an elliptical variation in span loading and hence minimum induced drag (it was also recognized that induced drag could be reduced by increasing span). A series of sailplanes was produced to exploit this idea, including the *Darmstadt I*, the *Darmstadt II*, and the *Starkenburg*. By 1928 it was clear that this line of development had reached its limit, for attempts to further improve performance by increasing span were foiled by the increased weight associated with such a change.

During the late 1920's, as slope soaring techniques were perfected, more able pilots found they could use ridge lift to soar cross-country, eventually covering distances of over 100 kilometers. Simultaneously, the possibility of using convective air movement to stay aloft began to be explored, beginning with an inadvertent ride in the updrafts of a developing thunderstorm by Kegel in 1926 (he survived).

By 1928, it was realized that a straight tapered wing could be nearly as efficient as an elliptical wing — and with considerable weight savings. Alexander Lippisch of the Rhön-Rossitten Gesellschaft (RRG), an aeronautical research institute located on the Wasserkuppe, accordingly designed the *Professor* in 1928 and, in 1929, the larger, more refined *Wien* (Figure 14) which had highly-tapered, cantilever, outer wing sections with a strut-braced, constant-chord center section. The reversion to strut bracing allowed an increase

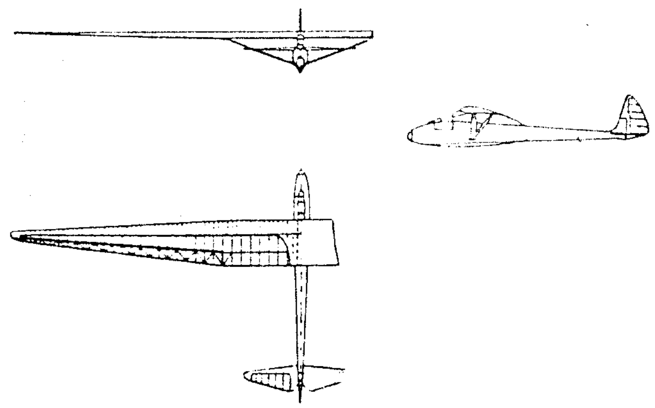


Figure 14. Wien (1929)

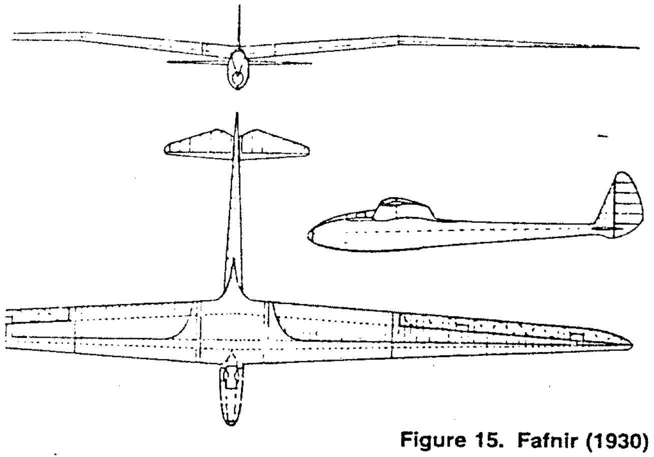


Figure 15. Fafnir (1930)

in span and aspect ratio without a corresponding weight penalty. The *Wien* proved to be outstanding in competition, and at the hands of Robert Kronfeld made one of the first cross-country flights using thermal lift as well as ridge lift.

With the increasing sophistication of soaring technique came the realization that not only low sinking speed and high glide ratios but also high maneuverability about the pitch and roll axes were required to take full advantage of ridge (and later, thermal) lift. Lippisch was the first to meet this new design challenge. Like the *Vampyr*, the *Konsul*, and the *Wien*, his *Fafnir* (Figure 15), which appeared in 1930, incorporated design features which would become standard on high-performance sailplanes for years to come. Rolling inertia was minimized by using a strongly tapered wing planform and by mounting the wing on top of the fuselage, closer to the center of gravity, rather than on a pylon. The wing was built in a cranked (gull-wing) configuration, ostensibly to provide ground clearance on takeoff and landing, and for improved stability in turns, but aesthetics may have been as much a factor in this design decision as aerodynamics. Aerodynamic twist was built into the wing by varying the airfoil section from the Göttingen 652 at the root, to the less highly cambered Göttingen 535 at midspan, to Clark Y at the tip. Several degrees of washout were also incorporated, and in this way aileron effectiveness at low speeds was improved and premature stalling of the wingtips was avoided. Aileron effectiveness was further improved by maintaining a constant aileron chord length over about 80 percent of their span from the inboard ends. With the highly tapered planform this resulted in increase eron chord fraction and thus increased aileron effectiv toward the tips.

Lippisch also paid attention to drag reduction. *Vampyr*, the *Fafnir*'s wing was fully cantilevered. Th tential for increased interference drag due to the prox of wing and fuselage was recognized, and by trial and a satisfactory wing fairing and cockpit enclosure developed.

Fafnir was built by RRG and entered by Günther Grö in the 1930 Wasserkuppe meet. The ship flew well, an next year he set a world distance record of 220 kilom after a bungee cord launch from the Wasserkuppe.

The patterns of sailplane development have tended dictated largely by the style of soaring which predomin at a given time. Through the 1920's and well into the 19 ridge soaring was the predominant mode of soaring fl Designers, therefore, assumed that a glider would s more time in lift than in sink, so their sailplanes were timized for low sink speeds at low forward speeds, an high maximum lift-to-drag ratio. Low wing loadings thick highly cambered airfoils were considered neces to achieve the desired low sink speeds. Even after the vent of thermal soaring, designers continued to empha low-speed performance in their sailplanes.

This pattern of sailplane development was taken t practical limit with the *Austria* (Figure 16), designed by Kupper and constructed by Akaflieg Munich in 1931 to order of Robert Kronfeld. Kronfeld thought that dol soaring might be the best way to utilize thermal lift cross-country soaring. The design of the *Austria* represe an all-out effort to achieve high L/D and low minimum speed at the expense of maneuverability. According to principle that induced drag is driven (down) by increa span, the *Austria's* wing was given a span of 30 meters be equaled (almost) only by the recent SB-10 of Aka Braunschweig. At that time, state-of-the-art sailplanes spans of about 20 meters. Without the benefit of mod materials, a wing of such great span was unavoidably g to be quite heavy. In order to keep the wing loading in with contemporary practice (12-17 kg/m²), the wing had to be increased drastically to about 36 m². This resu in an aspect ratio of about 25. All that span and all that made for a magnificent floater, but *Austria* never set records. Why? With such a low wing loading the ai section had to work at very low lift coefficients in hi speed flight. Despite the incorporation of camber-chang flaps (deflected up to reduce the camber for flight at hig

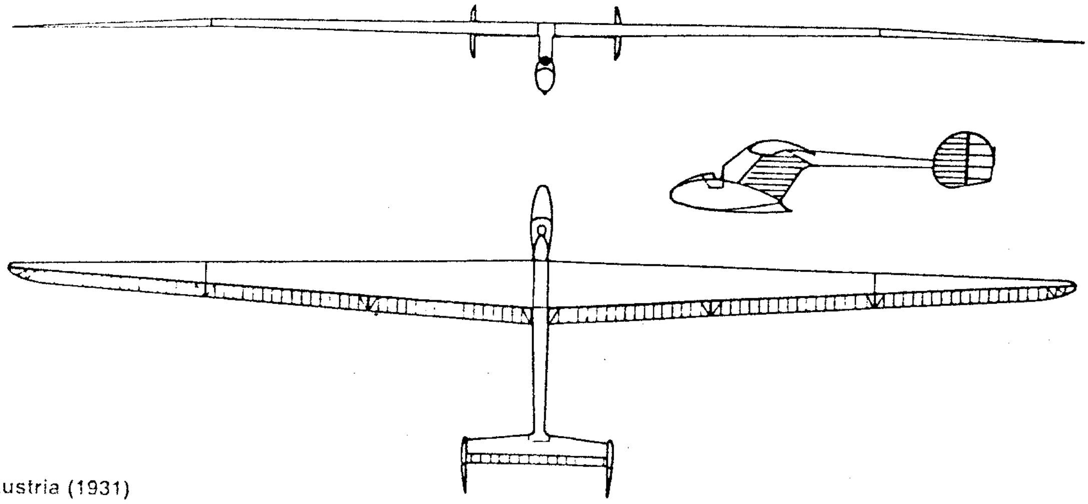


Figure 16. Austria (1931)

speeds), its thick, highly-cambered Göttingen 652 airfoil section was simply unsuitable for interthermal dashes. This airfoil had a high maximum lift coefficient and maximum L/D, but was inefficient at low lift coefficient values (more discussion on this topic later). Needless to say, the unwieldy *Austria* was not particularly well-suited for circling in thermals either, but this technique was just being developed as the *Austria* was being built.

Although not a complete success, the *Austria* was an impressive technical achievement and incorporated many innovations now taken for granted. Besides being the first sailplane to use cruise flaps, the *Austria* was also the first to have full-span segmented flaperons, a wing skinned entirely with plywood, and air brakes. The *Austria* met its untimely end in July of 1932 when the turbulence inside a large cumulus cloud proved to be more than Kronfeld and his minimal blind flying instruments could handle. The ship broke up in a steep spiral dive.

By 1932, a better understanding of how to use thermals had been reached. There was at this time a prominent school of thought which argued that most thermals were small in extent and rather weak. Akaflieg Darmstadt hypothesized that a highly maneuverable sailplane with the minimum possible sink speed would best be able to take advantage of such small thermals. From such thinking came the D-28 *Windspiel* (Figure 17), which appeared in 1933.

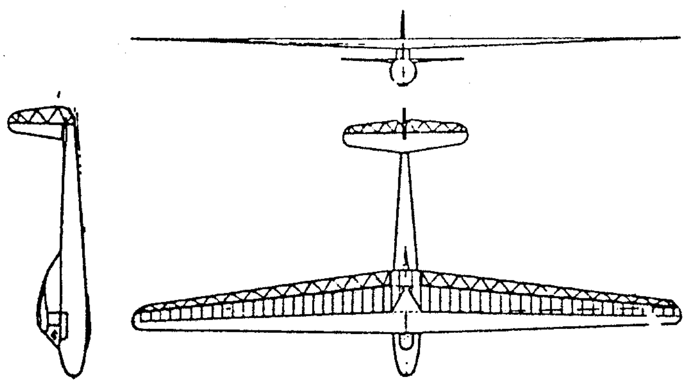


Figure 17. D-28 Windspiel (1933)

Spanning only 12 meters and weighing only 55 kilograms empty, the *Windspiel* was a true ultralight sailplane. Low structural weight was achieved by milling out most of the structural members, by keeping very close dimensional tolerances, by removing excess glue from joints, and by using light alloys for fittings and the aileron spars. As with the *Austria*, great pains were taken to minimize excrescences, and the cockpit was fully enclosed. An interesting innovation was the "flapped" rudder. The vertical fin was deflected with the rudder at a 1:2 differential, which increased rudder effectiveness and reduced required rudder area. Although the *Windspiel* was compact, it was inordinately expensive and difficult to build and required careful ground handling.

In March of 1934, Hans Fischer set a world distance record of 240 km in the *Windspiel*. The following year, however, this record was broken by Wolf Hirth, flying his 20-meter *Moazagotl*. Hirth is said to have been the first to have demonstrated that a sailplane could circle within a thermal to utilize such lift to best advantage. His 262-kilometer flight showed that a large-span sailplane could be made sufficiently maneuverable to use thermal lift effectively, thus rendering the *Windspiel* obsolete. Too great a penalty in induced drag was paid in limiting span to a mere 12 meters.

The middle to late 1930's saw a general awakening on the part of the soaring community to the importance of a flat glide polar for an effective cross-country soaring machine. Designers went to more moderately-cambered airfoils and higher wing loadings and found that good high-speed per-

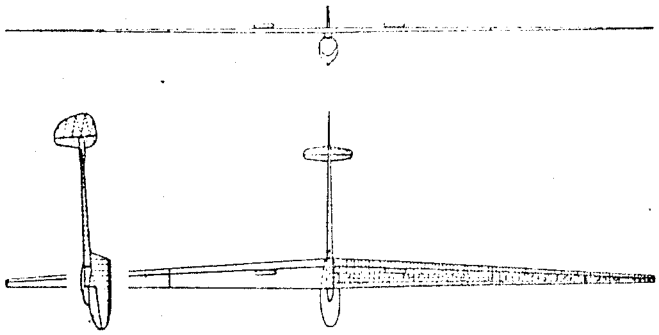


Figure 18. D-30 Cirrus (1938)

formance could be achieved while maintaining sufficient low-speed capability for climbing in thermals. The D-30 *Cirrus* (Figure 18) can perhaps be considered the crowning achievement of this period of sailplane development. Like the *Windspiel*, the *Cirrus* was a project of Akaflieg Darmstadt. Its span was only 20 meters, but with only 12m² of wing area (giving it an aspect ratio of 34!), its wing loading was well over 20 kg/m², remarkably high for its time. The *Cirrus* was a very clean sailplane as well, and its glide ratio was around 36 at a respectable 77 km/h. This kind of performance would not be equaled until the early fifties. The light weight of the *Cirrus* could be attributed to the use of aluminum and magnesium in its primary structure. The high wing loading, the incorporation of cruise flaps, and the use of an NACA airfoil section of low camber contributed to its excellent penetration (high-speed) capabilities.

★ *Next month author John McMasters will pick up the story of soaring's technical history following WWII with sections devoted to the introduction of composite structures, the continuing evolution of sailplane airfoils, significant designs, and a rundown on recent developments.* — Ed.

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(Additional references will appear next month with Part II)

MINUTES OF THE EXECUTIVE MEETING OF THE ADELAIDE UNIVERSITY GLIDING CLUB INC. ON 26TH OCTOBER, 1983 AT 7.45 P.M.

IN ATTENDANCE: R. Temple (President), D. Medlow (Secretary), D. Hein (C.F.I.), R. Norman (Treasurer), B. Giles, A. McGrath.

APOLOGIES: M. Forster (Airworthyness)

The Secretary read out the minutes of the previous meeting.

RESOLUTION 1: *THAT the minutes of the previous meeting be taken as read as a true and correct record.*

D.TEMPLE/A.McGRATH
Carried.

BUSINESS ARISING

C.F.I. Motion:

There is no GFA ruling on fixed terms for CFI's. The CFI said that the RTO/Ops had said there was both advantages & disadvantages in the system. The New Zealand practice is for terms of 2 years. The CFI recommended deferment of the motion again but added that the instructors panel would not object to any decision of fixed terms.

RESOLUTION 2: *THAT the Instructor's Panel be requested to conduct elections for the position of CFI biannually.*

D.TEMPLE//D.MEDLOW
Carried.

Recommendations to Instructors Panel:

The CFI said the matters must be referred to RTO/Ops and he will attempt to raise the matter soon with him. He suggested inviting RTO/Ops to our meetings to discuss such matters. The CFI recommended that the matters be referred to the next meeting to give him the opportunity to report.

REPORTS

President:

Nothing much to say except that the club cannot operate because it has no aircraft.

Secretary:

The Secretary notified the executive of the Barossa Valley regatta & invitatio
He explained that he had written to Whyalla with details of flying and to request payment.

Treasurer:

Mr. Norman reported that the club had spent $700 out of its operating a/c to buy a winch engine and we will be reimbursed by the Union. He mentioned that the C of A's currently being conducted will produce some expenses. The CFI expressed concern over the amount paid for the motor.

The Treasurer reminded the Committee that the special grant money had to be spent by the end of November.

CFI Report:

The CFI reported that the National Coach has circulated a recommendation that (for legal purposes) all fare-paying passengers be flown by instructors. The club legal officer is to be contacted by the President in this regard to determine the club's position. The CFI reminded the club that all independent operation ratings were withdrawn with the exception of Mr. Giles, and he will not issue any further endorsements until he is satisfied with their capacity. He said that several pilots are to start training or to be rated soon as back-seat pilots (D. Medlow, A. McGrath, T. Parish, J. Boroky, B. Heath). He said the club did not have many cross-country endorsed pilots, the qualification being C certificate & course attendance and endorsement for cross-country in single seater. For cross-country P1 in fully occupied twin seater a silver 'C' and a previous P2 flight in the twin is required.

The CFI added he is prepared to issue a front-seat passenger rating but would prefer to have back seat flying of passengers.

The CFI said there had been no incidents but noted the falling standard of circuit practice.

Airworthyness:

The BergFalke may be able to go to Lochiel on 5/11/83 either flown or trailered up, the Ka6 should be ready the same weekend and will be trailered up. Mark Forster is doing the BergFalke C of A. Some minor repair work will be needed. Bob Giles is doing the Ka6 work. The RTO/Air has visited the workshop and is satisfied with the inspection arrangements. Mr. Forster will sign out the Ka6.

It was reported that drag pins still need to be done, in addition to the rudder and elevator. Wing work is to be done tomorrow (dye checking etc). It was estimated that at least $150 is required for instrument calibration. Mr. Forster asked for compensation for going to Lochiel to inspect Bocian last Saturday.

RESOLUTION 3: *THAT the club credits Mr. Forster's a/c the sum of $18 for a journey to Lochiel.*

D.TEMPLE/R.NORMAN
Carried.

It was noted by the committee that the Bocian will be out for at least a month for C of A, and Mr. Forster will return the Bocian wheel to Don Hein for work to be done on it. The committee discussed bringing back aircraft for C of A during winte Don Hein suggested the setting up of his shed as a repair center. Andrew McGrath will look into subject of instrument calibration.

Newsletter Editor:

The Editor reported that an edition of the newsletter would be published next week.

GENERAL BUSINESS

Next General Meeting:

Russell Norman is to book video if possible.

Membership Plan:

Deferred to next meeting.

NEXT MEETING

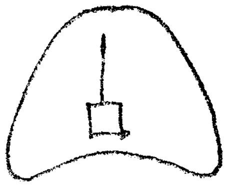
The next Executive meeting will be held on Wednesday, 23/11/83 at 7.30 p.m. at the CFI's residence, Vale Park.

Signed as a true & correct record ....
for President A.U.G
23/11/83

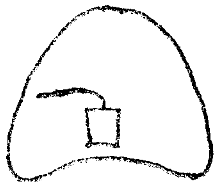
KNOW YOUR YAW STRING (PART 2)

The responce to last months "Know your YAW STRING" was so overwhelming that we have decided to elaborate on the subject by describing in detail:

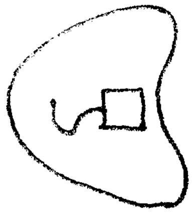
HOW TO TIE A KNOT IN YOUR YAW STRING IN FLIGHT



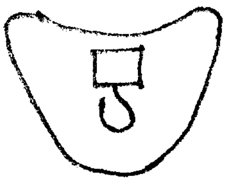
Start off from stable level flight at about 1000 ft. Push the stick well forward to give a speed of about 80 kn. The purpose of this move is to attain a straight taught string.



Pull the stick back violently letting the speed drop off until the yaw string just goes slack. At this point give a little rudder (in this case left rudder) which will cause the string to roll over to the side.



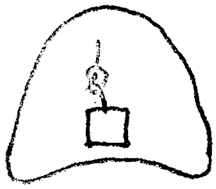
Immediately bank the aircraft in the direction of the tip of the string. It is important at this stage to maintain a slack string and a good rotational movement. The string will take the shape of a ? . Keep the tip vertical by side slipping the craft towards the ground.



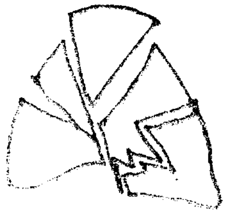
Maintain the craft in the roll. Resist the temptation to roll the craft back to the level. Remember, when you are upside down you will require a little forward stick to maintain lift. Also, a stall in this position would spoil the whole manoeuvre

Continue the roll. Make sure that the tip of the string passes OVER and not UNDER the base of the string.

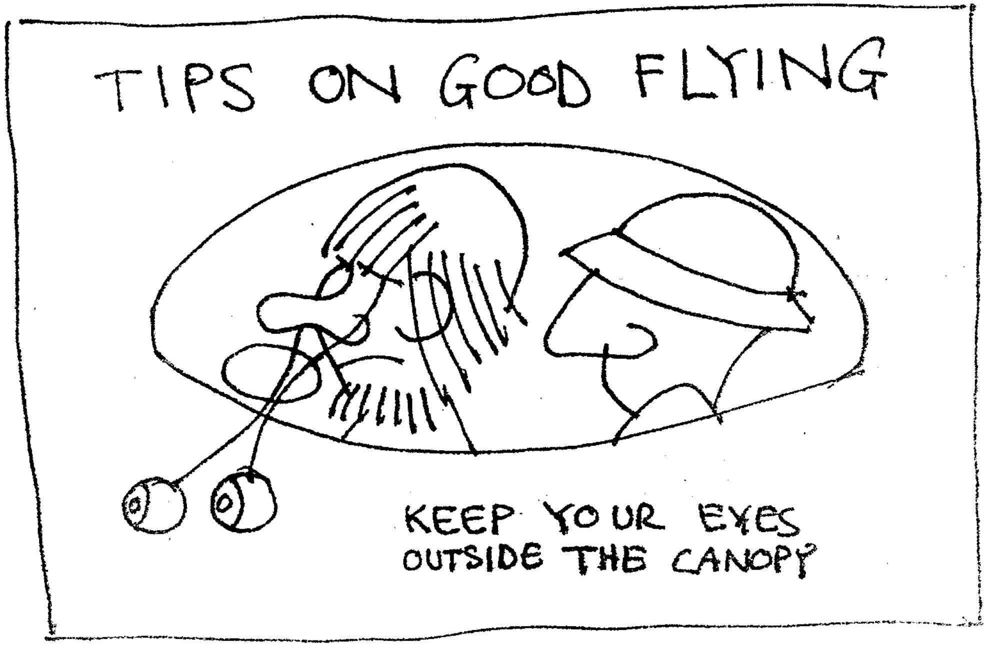
At this point the loop has to be lifted so that the tip can pass through the centre. This is achieved by giving a forward-backward pump of the stick. A pressure wave is generated at the nose and propogates along the aircraft. As it passes the loop, it lifts it.



Immediately throw the aircraft into a dive. This forces the tip of the string through the loop and pulls the loop tight.



MAINTAIN ALTITUDE !

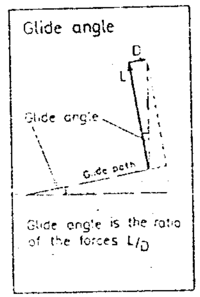


Appendix 1

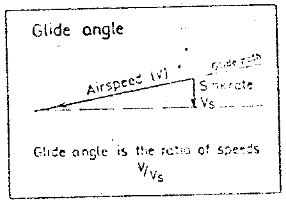
Principles of Flight

The following diagrams deal with the performances of a glider, and the use of that performance to best advantage.

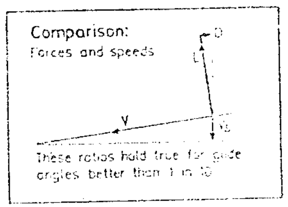
1. This diagram reminds you that the glide angle is the ratio of the lift divided by the drag. The glide angle can be more usefully related to airspeed and sink rate.



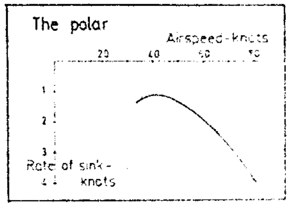
2. This is shown here: the ratio of the forward speed divided by the sink rate is a measure of the glide angle.



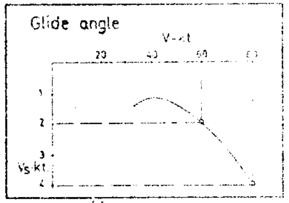
3. Here the information from the previous two diagrams is combined which should make it easy to see that the ratios L/D and V/Vs, relating as they do to identical angles, are interchangeable. These ratios hold true for glide angles of better than 1 in 10. Now the glider's glide angle is variable with speed.



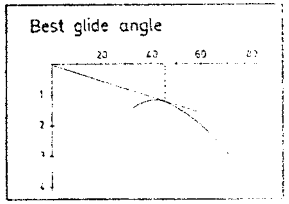
4. The different values are normally presented on this graph which is called a polar. It might at first sight appear to be an upside-down graph, but, logically, values of rate of sink are shown as increasing in a downward direction.



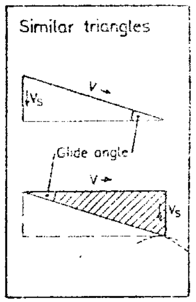
5. Just consider two points from this graph: at an airspeed of 60 knots the sink rate is 2 knots so the glide angle is 60 divided by 2, i.e. 30. At 80 knots the sink rate is 4 and the glide angle equals 20. Where then on this graph does the best glide angle lie?



6. In this diagram a tangent is drawn from the intersection of the axes (of the graph) to the polar, the point of contact between them – the tangent and the polar, that is – gives the speed for the best glide angle. This point is so important that it is stated again: the speed for best glide angle is determined by drawing a tangent from the origin of the axes (i.e. where airspeed and sink rate = 0) to the polar.

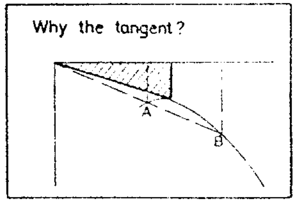


7. The triangle originally considered looked like the upper diagram but there is no reason why it should not be drawn as in the lower diagram which makes it easier to relate to the tangent to the polar.
The best glide angle is achieved when the angle is as small as it can be – best V/Vs ratio. (Bear in mind that because of the different

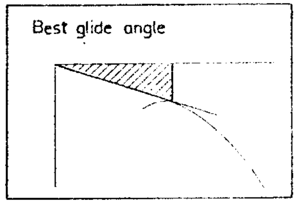


scales used on the vertical and horizontal axis, although the glide angle is numerically correct, the actual angle in the diagram is not.) One other point you might have picked up is that in the upper diagram airspeed is measured along the inclined side of the triangle whilst in the lower one it is measured along the horizontal side. Because the angles are actually so small this is of no account.

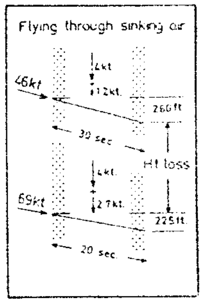
8. If we now look at the polar again it will be obvious that the triangle with the tangent forming one side is the same as in the previous diagram. Any triangle related to any other point on the polar will represent a steeper glide angle.



9. This is shown here together with the triangle for best glide angle. Note that the glide angles given by the points A and B are the same because the triangles to them are similar.
Now I want to show you that the best glide angle will be achieved at different speeds in various conditions. Consider the case of flying through air sinking at 4 knots.

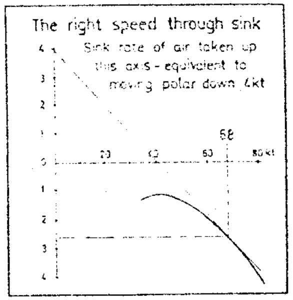


10. If we fly at best glide angle, a speed of 46 knots for the particular glider – a Dart 17R – then, assuming it takes 30 seconds to cross with a total sink rate i.e. air-mass plus glider 4 + 1·2 = 5·2 knots, which is 520 f.p.m.; in ½ minute the height loss will be 260 ft.



Fly through this air at 69 knots, then the height loss is reduced to 225 ft. Not a big saving, you may say, but it is 15% and on a cross country if this height is wasted then it does mean extra time in thermals, or more thermals by comparison with a pilot flying at the right speed. How is the correct speed for the conditions determined?

11. This diagram shows you. For air sinking at 4 knots the tangent is drawn from a point 4 knots up the vertical axis and the answer that comes out is 69 knots. (Another way of achieving the same end is to move the whole of the polar 4 knots bodily downwards on the axes and draw the tangent from the zero point.) It should be noted that this calculation is concerned with having the glider fly the maximum possible distance. There are other considerations; namely:



12. Flying for speed. The speed flown between thermals depends on the achieved rate of climb in the thermal. The construction with the polar is the same as that used previously.

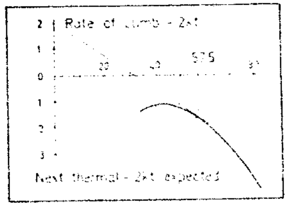
The concept of flying for speed is relevant not only to competition flying but to large badge tasks when a certain speed must be maintained to complete the distance in the available hours of soaring.

Flying for speed

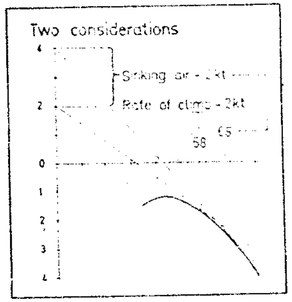
The speed flown between thermals depends upon the achieved rate of climb in the thermal

13. In this diagram the rate of climb assumed is 2 knots. Note that this value is determined from an altimeter and a stop watch, not the variometer. The speed to fly is 57·5 knots, say 58. There is one other assumption – that the next thermal will be of the same strength.

Indeed this is the whole basis of the theory. If the rate of climb had been 4 knots then the construction would have been the same as that for flying through sinking air at 4 knots, as in diagram 11.

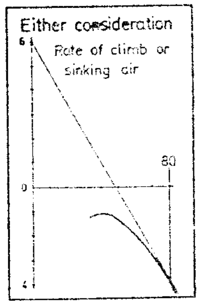


14. Taking into account two considerations – speed and distance would be dealt with as shown here. If the climb had been at 2 knots in the thermal then the speed to fly would be 58 knots. If then the glider was flown into air sinking at 2 knots then the appropriate speed would become 68 knots – which you will note is the same speed as flying through air sinking at 4 knots. The construction is the same for either consideration. To make sure you have got the idea here is another example.

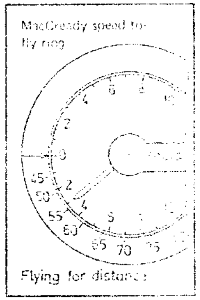


15. Determined in this case for either a climb rate of 6 knots, in which case the answer is 80 knots – flying for speed, or flying through air sinking at 6 knots and flying for distance.

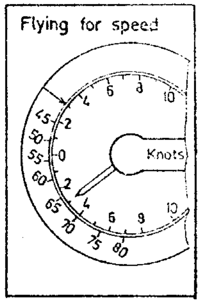
Now this information is best presented to the pilot in the form of a speed-to-fly ring which is fitted to the variometer.



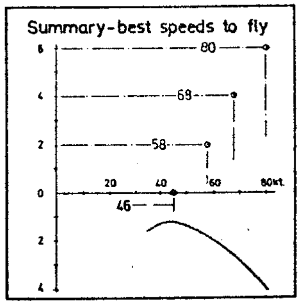
16. Here is such a speed-to-fly ring, named after the man who devised it. Notice an arrow against the variometer zero; the ring can be rotated but set in this position it is being used for distance. The speed at which the glider would be flown is 54 knots. A variometer reading of 3 knots down would suggest that the glider is in sinking air, or being flown fast, but we will assume the former.



17. The ring is rotated when the glider is being flown for speed. Here the rate of climb has been 3 knots. The variometer reading indicates that the speed to fly is 67 knots. It should be evident that to arrive at all the information to complete a speed-to-fly ring then we would need to draw a lot of tangents from various points on the vertical axis. As several points have been considered they will be summarised.

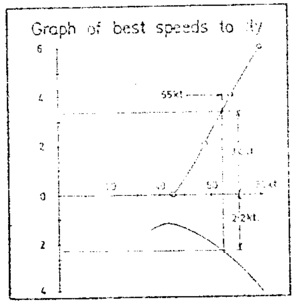


18. The graph isn't actually drawn here but the points previously determined are plotted. The point is placed where a horizontal line from the point on the vertical axis where the tangent is drawn intersects a vertical line from the point of contact of the tangent with the polar – join these points together to form the graph.



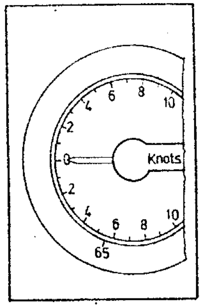
19. Here it is – the broken line. This new graph is used to determine the MacCready ring values. The values of speed on the ring were presented in 5 knot steps. This is neater than using 1 knot steps of climb rate and having speed steps with odd numbers, 46, 58, 69 etc.

In this case the example takes a speed of 65 knots and determines appropriate values of sink – a total of 5·6 knots i.e. 3·4 + 2·2.

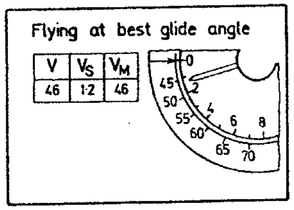


20. The variometer reading against which the speed is put is 5·6 knots and here is that single value on a speed-to-fly ring. If the variometer were reading 5·6 knots down then the speed should be 65 knots.

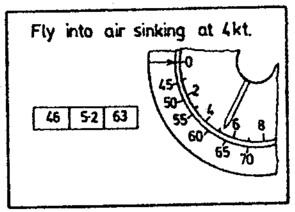
In the same way then the remaining values can be determined. Finally I want to show you how the ring would be used in practice.



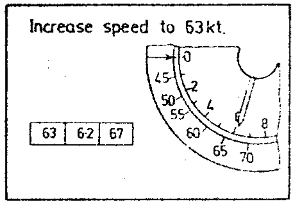
21. The state indicated here is the glider being flown at a speed of 46 knots (V) best glide angle: the variometer reads 1·2 knots (Vs) and the MacCready speed (VM) is 46 knots, so the glider is being flown correctly.



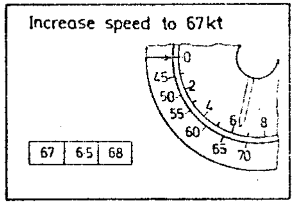
22. It now flies into air sinking at 4 knots. The variometer now reads a total of 5·2 knots and indicates that the speed should be increased to 63 knots.



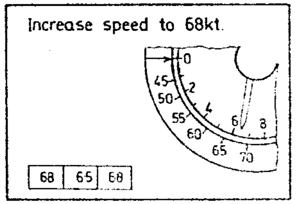
23. However, if this is done the sink rate increases to 6·2 knots, the appropriate MacCready speed is 67 knots and a further speed increase is required.



24. At 67 knots the variometer reading has increased to 6·5 knots and the MacCready speed is 68 knots.



25. The situation is reached after a series of approximations where the actual and MacCready speeds are the same, assuming that is that the behaviour of the airmass has not altered.



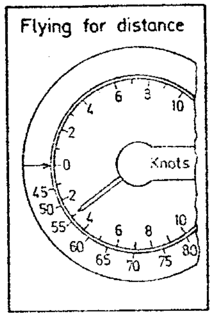
26. In practice, this is done much more easily by increasing the speed to a value a few knots above the MacCready value to achieve the recommended speed. Also in practice it is possible to anticipate the sink when leaving a thermal for example, so that the speed is increased before the sink is encountered.

To summarise, then, there are two uses for the speed-to-fly ring.

In practice

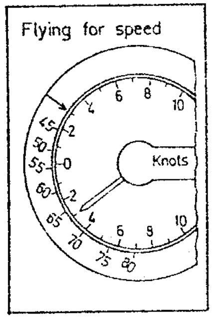
	V	V_S	V_M
Flying at best L/D	46	12	46
Into sinking air-4kt		52	63
Increase speed to 5kt above MacCready value	68	65	68

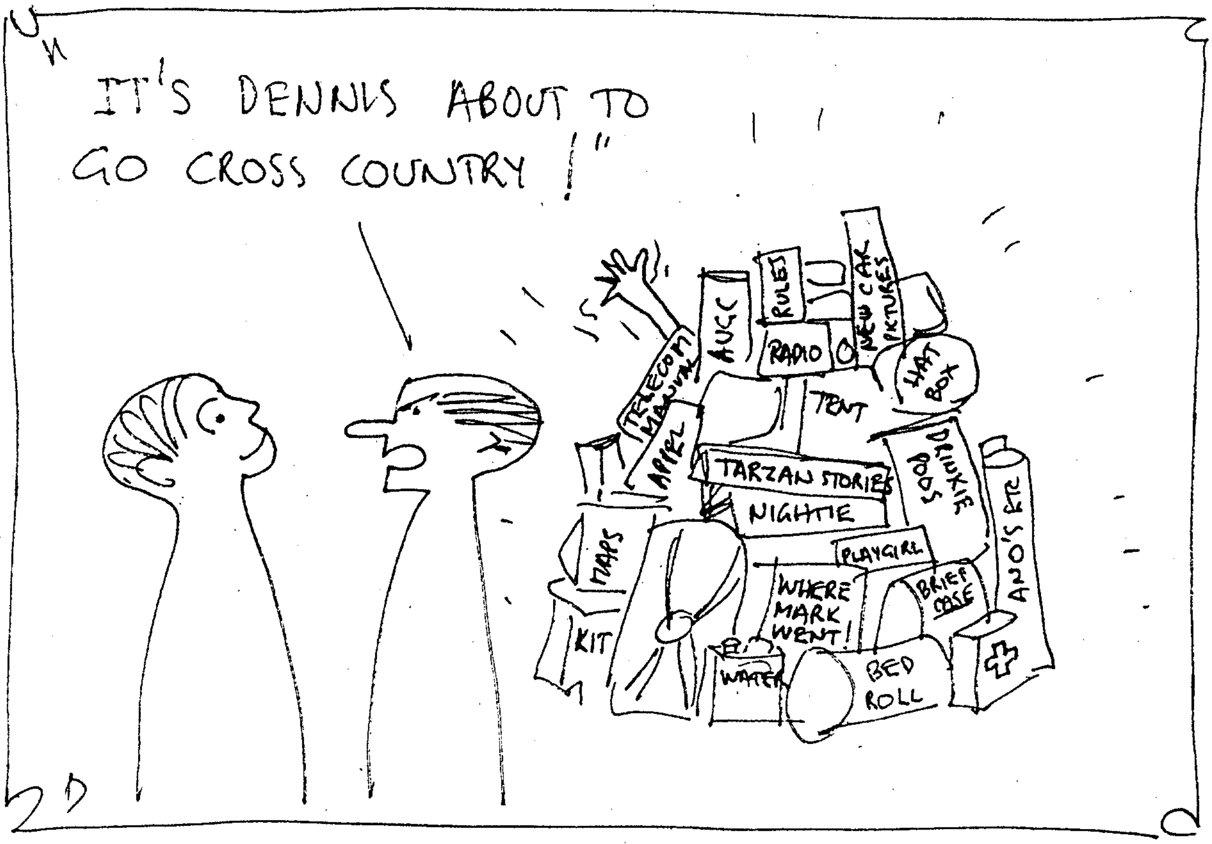
27. The first is flying for range when the arrow is set against zero on the variometer. The pilot will then fly at the speed indicated on the ring. This means that he is flying at the best speed through sinking air whenever it is encountered.



28. To fly for speed then, the arrow is set to the achieved rate to climb in the thermal. Remember that this is a timed rate of climb.

Evidently the better the rate of climb in a thermal the faster you should fly between thermals. The pilot will still adjust his speed to the value indicated by the ring and thus take into account the sinking air as well.





Notice To Members

TO ALL A.U.G.C. PILOTS

<u>Early Retirement Programme</u>

Due to the economic situation, the new executive has decided to reduce the current flying membership, and has devised a reduction of membership programme.

Under this plan, older members will be placed in early retirement, permitting the retention of members who represent the future of the club.

A programme to phase out the older pilots (over 30) by the end of the current financial year will be put into effect immediately. This programme will be known as R.A.P.E. (Retirement of Aged Pilots Early). Members who are Raped will be given the opportunity to seek other jobs within the club provided that, while they are Raped, they request a review of their qualifications and status before actual retirement takes place.

This phase of the programme will be known as S.C.R.E.W. (Survey of Capabilities of Retired Early Whingers). All members who have been Raped or Screwed may apply for a final review. This phase will be known as S.T.U.F.F.E.D. (Study of the Termination of Use For Further Education and Development).

The club's Programme Policy dictates that members may be Raped once, Screwed twice, but can get Stuffed as often as the executive sees fit

ADELAIDE UNIVERSITY GLIDING CLUB CALENDAR, 1983/84 SUMMER HOLIDAYS:

FLYING DATES.

SAT	3/12	flying at Lochiel; see detail below.
SUN	4/12	
SAT	10/12	
SUN	11/12	
SAT	17/12	
SUN	18/12	
SAT	24/12	XMAS * no flying.
SUN	25/12	
MON	26/12	Xmas flying camp.
TUES	27/12	
WED	28/12	
THURS	29/12	
FRI	30/12	
SAT	31/12	
SAT	7/1	
SUN	8/1	
SAT	14/1	
SUN	15/1	
SAT	21/1	National Gliding Comps for Sports and Two-seater at Ararat.
SUN	22/1	
SAT	28/1	Barossa Valley G.C. Regatta
SUN	29/1	
MON	30/1	
SAT	4/2	Horsham Week regatta.
SUN	5/2	
SAT	11/2	
SUN	12/2	
SAT	18/2	
SUN	19/2	
SAT	25/2	
SUN	26/2	

There will probably be flying at Lochiel on all of the above-mentioned dates (except Christmas). Try to contact us as to when you intend to fly.

SAT 3		MB	B. Giles A. McGratt R BATT N. ABBOTT M. Rafferty
SUN 4		DH.	D. Medlow A. McGratt D TEMPLE N. ABBOTT R. Norman
WED 7	GEN MEET		
SAT 10		R.Q.	B Giles D. Medlow A. McGratt R Batt NABBOTT R. Norman
SUN 11		TN	NABBOTT R. Norman
SAT 17		G.H	B. Giles A. McGratt R BATT N. ABBOTT R Norman
SUN 18		DH	D. Medlow N. ABBOTT R Norman