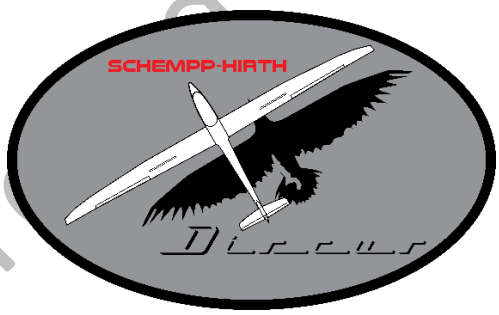
Darling Downs Soaring Club

Discus B VH-XOT

Serial Number 295

Pilot Handling Guide and Conversion Document

Schempp-Hirth



Rev 1 **June 2023**

These notes are a conversion guide only and not a substitute for the Manufacturer's Flight Manual.

Contents

Pilot responsibilities

- Clean, Care and maintain the glider, especially after its use ($85k asset!)
- Understand how to DI this glider
- Understand how to operate the glider (including limitations)
- Understand how to Rig / De-Rig the glider
- Be familiar with the Discus trailer and its use.
- Is the trailer registered?

General notes on conversions

The converting pilot must read this document (and referenced documents within), the flight manual. When you go to do your conversion, an instructor will give you a quiz on the important aspects of converting to the glider.

1. Your conversion to a new type must be authorized by an instructor who is familiar with the aircraft type.
2. They should outline the important features of the aircraft.
3. You should not do your first conversion in crosswind or gusty conditions.
4. Spend some time getting comfortable with the cockpit layout.
5. Get someone to lift the tail (while wings level) to show the take-off nose attitude.
6. Note the (minimum) nose-high landing attitude with the tail on the ground (while wings level)

For the Discus, you should purchase your own USB stick to allow you to upload a task and download a flight. For advanced users, it will also allow you to customise the OpenVario layout and upload it to the glider. The previous need for a customised panel-mounted SD for each aircraft has been removed (due to reliability issues with this arrangement). Purchase this from the DDSC Bar -see *Instrumentation* Section for more info.

Basic Overview

The Discus is a 15m unflapped sailplane constructed of fibreglass manufactured by Schempp-Hirth (Germany). This aircraft is the 'perfect' cross country glider, very easy to fly glider with very good performance. The aircraft has retractable undercarriage, conventional airbrakes, water ballast tanks in the wings and fin. The Discus can be flown with a very light wing loading, or a very heavy one. Its wing loading range is wider than almost any other glider.

The Discus and the Duo Discus are the highest performance gliders in DDSC glider fleet. Both have very similar performance.

Caution – a fully ballasted glider with other than the lightest of pilot will exceed the maximum permitted take-off weight.

The requirements to fly the Discus

The requirements to fly the Discus are stated in the current *Safety Management System - Section 1 - Standard Operating Procedures - Flying operations and Training* available for download from the DDSC website

External Features

Airbrakes	conventional double-height top surface
Flaps	Not fitted
Wing span/area	15m / 10.5sq m
Undercarriage	Retractable
Tailplane	T-tail

Limitations

Vne	Max permitted speed	135 knots *
Vra/Va	Max rough air and max manoeuvring speed	108 knots *
Vt	Max aerotow speed	91 knots *

Max airbrake operation speed	135 knots *
Max All Up Weight (MAUW) with water ballast	525 kg *(reference only)* *
Min cockpit weight, including parachute	As placarded
Max cockpit weight, including parachute	110 kg *

* all placarded values in the glider take precedence. These value are indicative only.

Cockpit Features

Canopy	One-piece canopy hinging sideways. A single red lever (moved backward) to unlock canopy. Care needs to be taken when closing the canopy to ensure the tiltable instrument panel is in the fully down position, shoulder straps aren't left over the canopy rail, etc. Always close the canopy slowly and carefully. It should close smoothly without resistance. If it does not, investigate and don't force it! As with all gliders, care is needed with an open canopy in windy conditions. Lifting the tiltable instrument panel will provide some canopy protection from the wind (but do not leave it like this). Always close and lock the canopy when leaving the cockpit area or ground handling glider. At no stage must the canopy itself or clear view side window be held to lift or close canopy. Only hold the lever or canopy frame when opening or closing canopy.
Canopy Jettison	In an emergency, the canopy may need to be jettisoned in flight with the intent of bailing out with a parachute. To do so the following is done (IAW the Flight Manual paraphrased here) 1. Open the canopy in the usual manner using the lefthand canopy locking lever (red and white) 2. With the canopy open, push the righthand canopy jettison knob forward (red) 3. Throw off canopy A jettisoned canopy is likely to damage the tail structure of a glider. Do not jettison a canopy unless committed to bailing out.

Trim Ballast	The bulkhead forward of the rudder pedals provides provision to carry ballast weights to allow lighter pilots to fly the glider. Only use the specific XOT ballast weights. 3 available Each weight is equivalent to increasing the pilot's weight by 5kg
Instruments	See specific section
Seat Adjustment	Backrest angle can be adjusted by moving knob on right side of cockpit forward or back either inflight or on the ground The seat back pivot point can be adjusted on the ground only. Tilt the backrest forward retract the right hand pin to relocate The seatback recline cable can also be repositioned on the lefthand side to give the right hand adjustment a whole new range of movement. This can only be adjusted on the ground (and is only needed for the smallest of pilots)
Control Column	Conventional with all flight computer (OpenVario) controls, PTT (radio), cruise/climb (toggle switch on front of grip)
Ventilation	Canopy defog control on top left of panel. PULL – CLOSED PUSH - OPEN
Trim	Green lever left hand side of seatpan. Pull the lever inwards to release/unlock (same as Duo).
Wheel Brake	Hand grip lever mounted on the control column
Tow Rope Release	Conventional yellow handle on lower left side
Water Ballast Lever	Black knob on right side (adjacent to the red canopy jettison. DO NOT CONFUSE)
Undercarriage Lever	Black handle on right side of seat pan
Airbrake Lever	Blue handle on left side of cockpit
Rudder Pedal Adjustment	Black knob on lower right side of control column
Batteries	Battery 1 under tiltable instrument panel. Note this must be used for the placarded pilot's weights Battery 2 behind removable panel behind seatback. *Ensure the locating pins (of removable panel) are correctly positioned in each top corner before fixing. Note the damage already caused by its incorrect fitment …*

Daily Inspection notes

In addition to the normal daily inspection routine:

- Tyre Pressures:
  - Main Wheel: 50-64 psi
  - Tail Wheel: 25 psi

To inflate the tailwheel, its aerodynamic fairing needs to be removed. This is attached via 2 self-tap screws on each end of the fairing. These need to be just tight enough (otherwise you will crack it) ALWAYS RETAPE FAIRING (as this provides significant additional restraining force).

All tyres on the Discus need a valve extension (best to get your own from SuperCheap Auto 😊)

Glider Accessories and Storage

XOT has tow out gear to enable the pilot to tow the glider to the launch point without the need for extra help. Care must be taken to ensure that the felt on the inside of the wing walker and tail dolly is in good order and is clean. Storage of tow out gear when not in use is marked on the wall of the hangar. Do not leave it on the ground.

XOT also has a canopy cover. The cover must be installed when the glider is not in use and make sure to attach the straps underneath also. When the glider is being flown store the cover in the baggage compartment behind the pilot's head in the cockpit. Take care to ensure cover is kept clean as any dirt will scratch the canopy when cover is installed. *Wash it if required.*

Flight Characteristics

Controls:

All controls are light to the feel and are responsive, especially pitch.

Take-off and Aerotow:

For the average pilot (say 75-95kg) set trim forward so that the control column rests gently on its forward stop).

On the ground roll, raise tail and balance on main wheel when sufficient airspeed is gained. In ground-effect XOT will 'fly' at less than 40knts so the above balanced-ground run is short.

Note: due to the position of the pitot opening (in the nose, adjacent to the tow hook), an airspeed of ~40kts may be indicated on aerotow. Don't panic! As soon as the tow rope is released, the correct ASI should be displayed.

Thermalling:

Recommended thermalling speed is 45 knots (50 knots when low). Unlike the Hornet the glider has no tendency to drop a wing especially if some top rudder is used.

Cruising:

XOT can be flown up to 80 knots (dry) before the sink rate becomes too excessive. The Discus has a (claimed) 42.2 : 1 best glide at about 54 knots (320kg).

Stalling:

The Discus stalls in gently in the conventional manner. Recovery is iaw the standard stall recovery technique.

Unballasted stall speed is 35-42 knots (varies with pilot weight). Stall speed (brakes open) is about 2 knots HIGHER.

Spinning:

The Discus has typical spin characteristics and recovers easily with the standard spin recovery technique. As with any high-performance glider, a polished spin recovery technique is required to ensure Vne is not approached on the resulting recovery (dive). The average pilot should not intentionally fully-spin XOT, but by all means practice incipient spins.

Water Ballast:

Water ballast should only be carried by experience cross country pilots in good weather conditions (ie predicted climbs >4kts). Carrying water ballast brings with its additional challengers/risks, and any benefit won't be realised unless the pilot is already achieving >100kph cross country speeds (ie it won't help and will probably hinder an 80kph pilot).

Carrying water:

- makes the takeoff tricky/risky especially if a wing drop occurs (ground crew need to be experienced with ballasted gliders also)
- any land back for a relight is likely to occur with at least some water ballast remaining
- thermalling is harder, especially on days with broken/tight thermals
- the thermalling speed is (5+kts) higher (ie bigger circle)
- the glider rear fuselage gets covered in water (then mud after landing) as some always spills on the flare (unless the dump valves are closed in circuit)
- the glider cruises faster (which is why we carry ballast) so decisions need to be made quicker, and more anticipation is needed to stop for a climb (again think cu vs blue days)
- need to ensure the glider is not overloaded and the CofG is within limits (eg tail tank). see the flight manual.

With the above cautions, flying with water ballast on high cu days with long glides between thermals is a lot of fun.

Carrying 60-120 litres is a sweet spot for the Discus. Anything more than this isn't recommended. To carry water, you need some means of accurately measuring the water being loaded. Pilots need to provide their own as this isn't supplied by DDSC (talk to other pilots about systems they use).

The ballast tanks are forward of the CofG (in the D-section of the wing forward of the spar). Therefore a tail tank is provided to maintain balance when carrying water ballast. Both systems dump water simultaneously when commanded.

The flight manual provides more details on loading and carrying ballast, but roughly 30 litres in the wings (15 L per side) allows 1 litre to be carried in the tail tank (eg 50 litres still only allow 1 litre in tail, however 60 litres means now 2 litres in tail, etc)

If landing with water ballast :

- add at least 5knts to safe speed near the ground
- be aware that the ground run will be long
- don't taxi off as the water may run to one wing or the other and a wing drop/ground loop may occur. A wing drop will probably occur anyway.

It will take 3 minutes to drop the majority of a 90 litre water load. Always dump ballast before outlanding (in fact start dumping when low, as any thermals down low will likely be small anyway)!

Circuit and Landing:

- Use an approach speed of 60 knots (no wind) – no water ballast with the standard corrections for wind.

- The aircraft is fitted with an undercarriage warning. If airbrakes are deployed with the undercarriage up, the system should sound.
- The flight manual states 2-point landings required. (In fact a previous version of the FM even suggested the tailwheel should touch first). All this suggests a good hold-off is required on landing – DO NOT FLY IT ON (you cannot possibly safely outland flying it on(?)). Furthermore the Flight Manual discusses the extra energy that must be absorbed with different touchdown speeds (ie ½ m V^2 - where V is speed).
- Good control authority is maintained throughout the ground roll
- On ground roll, hold tail wheel on the ground by applying full back stick. This will help with directional control and help to prevent the glider nosing over and scraping the underside of the nose.
- The wheel brake provides (can provide) adequate effect for short periods. Being a simple and old fashion drum brake, it suffers brake-fade due to heat (caused by braking) not being dissipated fast enough. Any wheel brake use should be used at the end of the ground roll where its impact is more noticeable (ie the kinetic energy of the glider is less).

Instrumentation

Figure 1- Instrument panel

Batteries

- Master switch turns on the battery in the usual fashion. Up for ON; Down for OFF.
- Select either 1, 2 or AUTO. XOT has a BMS (battery management system) such that when the AUTO state is selected, it will manage the batteries in the glider for the pilot. Therefore AUTO is the recommended position ensuring the both batteries are discharged evenly (resulting in better short and long term battery longevity)

OpenVario

- The OpenVario IS NOT A TOUCH SCREEN. AVOID TOUCHING THE SCREEN. If required, clean with water only (like a canopy)
- There is a separate and comprehensive manual about the DDSC OpenVario on the DDSC website
- The control column system has
    - 'X' Esc
    - 'M' Menu
    - 'Fn' mouse/curse mode
    - thumb remote
        - pushbutton select/ENTER
        - up/down/left/right arrow keys/mouse

- NOTE: a panel mounted SD Card facility is no longer provided.
- You need you own USB stick to fully interact with the OpenVario. .
    - The USB stick is YOURS and shouldn't be left in the glider. It would be wise to back up each in case of lose/corruption.
    - The USB socket is provided in the lower most part of the tilt up panel (see photo above) adjacent to the dittokey reader.
    - Feel free to format the look of XCSoar **by making your own profile** * to suit your needs including:
        - Number and type of screens;
        - Info boxes
        - Safety heights (default set at 1000')
        - etc. (and setting this is outside the scope of this instruction set.)
        - DO NOT change 'Devices' settings in the Menu otherwise the connected hardware will cease to communicate!
- After the Flarm and/or Borgelt Vario obtains a GPS fix, the OpenVario is ready for use.
- The OpenVario power is provided by a unique circuit breaker and switch (labelled *computer*)

* Note: the default profiles provided by DDSC are write-protected to protect the integrity of the platform for all users. You will need to create your own profile (or copy an existing profile) to effect any changes. See the separate OpenVario manual (or the author) for instructions on how to do this.

B800 Borgelt

- See the Borgelt Manual on the DDSC website
- The Vario power is provided by a unique circuit breaker and switch (labelled *vario*)
- The cruise/climb switch is on the front of the column (toggle):
    - Note the cruise/climb function will not operate (defaults to climb mode) if the OpenVario is unserviceable/OFF.
    - The OpenVario will *message* the B800 vario mode (cruise or climb).

Flarm

- LED Flarm display on upper most part of the panel.
- Can also be viewed in detail on the OpenVario by changing screens ('arrow' left or right until the desired screen is reached

- Keeping the data.fln file up-to-date in OpenVario will display the Flarmnet database (aircraft IDs). One is provided by default and will (likely) be updated annually as part of the form 2.
- The Flarm power is provided by a shared circuit breaker and no switch (labelled *flarm/dittolog*). This can only be turned off with the master switch

Dittolog

- Each pilot is issued with a unique dittokey. This IDs you as the Pilot.
- Insert your key in the lower most part of the tilt up panel (same as every other DDSC glider)
- The Dittolog power is provided by a shared circuit breaker and no switch (labelled *flarm/dittolog*). This can only be turned off with the master switch.
-

Undercarriage Warning Buzzer

- A normally closed micro switch on the undercarriage down position, another on the airbrake locked position is in series with a piezo buzzer
- If the airbrakes are unlocked while the undercarriage isn't locked down, the buzzer will sound.
- The undercarriage warning buzzer power is provided by a shared circuit breaker and no switch (labelled *flarm/dittolog*). This can only be turned off with the master switch.

Becker AR302 Radio

- See the Becker Manual on the DDSC website

Voltage Display

- this device has a momentary pushbutton to activate. It is only ON (after a short delay) while the button is being held in.
- the battery in use (as determined by the BMS) voltage is displayed.
- this instrument may be updated to perform more functions in the future (stay turned … 😊)

Shutting down the Instruments

- Turn the radio OFF
- Turn the OpenVario OFF by
  - MENU ('M')
  - Scroll to last menu item 'QUIT'
  - Enter, accept YES to shut down, scroll down to POWER OFF, ok, scroll to YES
  - Turnoff unique switch
- Switch off the Borgelt Vario at unique switch
- Switch Master down to OFF.
  - (Dittolog and Flarm shut off with the master)

End of the Day

- Clean the canopy, wings and fuselage.
- airbrakes unlocked.
- side window (clearview) closed
- canopy cover ON
- Batteries on charge
- Maintenance release completed

- If stored with one wing down place some protective carpet and a wing weight on the lowered wingtip and remove or choke the tail dolly to prevent the glider shifting.
- Notify airworthiness officer (airworthiness@ddsc.org.au) of any defects, problems, or issues (better still own them and follow through the rectification yourself).

Rigging and De-Rigging

Rigging (Requires 3 people)

1. Orient the front of the trailer into any significant wind and on level firm ground
2. Apply the trailer handbrake on the tow coupling (ensure it is released again before driving away!!!)

Figure 2- Handbrake applied to trailer

3. Unhitch the trailer from the car using the jockey wheel to lift the trailer front as high as possible. Note the trailer tilt mechanism is u/s and welded up.
4. Open the rear of the trailer
5. Remove the tailplane and winglet racks/mounts.
6. Climb into the trailer and undo the wing-nuts holding the fuselage in place through the spar opening. Undo the rear tail strap
7. Pull the fuselage out of the trailer to the end of its ramp. Remove the timber mount.
8. ensure the airbrakes are UNLOCKED and the water ballast valve CLOSED (and recheck during rigging if rigging is proving difficult).
9. CLEAN (with a rag) AND GREASE ALL FITTING and main pin!!!
10. At the front of the trailer are the wing spars, remove the R clips pin holding the wing root holders in the trailer.
11. Undo the clips on the mid wing fittings/bows
12. Take the Left wing first as the rear lift pin is *tight* when rigging.

Warning: ***carefully watch the leading edge of each wing as withdrawing from the trailer*****.** The swept leading edge means it will scrap on the trailer causing considerable damage unless the wing tip is held high enough (*see the existing damage!*)

13. Lift the wingtip with its support away from the wall of the trailer. The wing root holder has a stop that prevents it running off the trailer door but as it exists the trailer, lateral support of the wing root is lost – be CAREFUL.
14. Lift the wing root with the spar holder onto the ground. Undo the wing from the spar holder and then insert into the fuselage after rotating. Once inserted correctly, support the tip with a wing stand
15. Then the wing is carried into position, rotated and the wing-spar placed into the Fuselage and the tip onto the wing stand.
16. **Repeat the procedure for the right wing**, while the left wing is held in position at the tip.
17. When both wings are 'home', insert the main pin and secure it with the provided clip.
18. Lift the tail and lower the undercarriage (the tail needs to be lifted by 2 people while the 3rd lowers the u/c)
19. Fit the tailplane, returning the tool to the cockpit pocket.
20. Fit the winglets.
21. Fit the TE probe
22. Secure all fitting in the trailer, using all pins and clips so that they are there when required for the next derig. Secure the dolly with the fuselage strap.

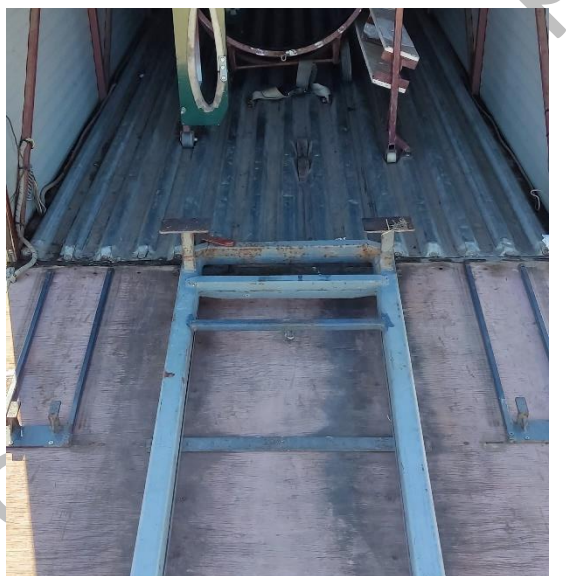


Figure 3- correctly stowed empty trailer

23. Lower the trailer onto the car hitch, releasing the trailer handbrake
24. Check lights

Derigging the glider and putting it in the Trailer

1. Orient the front of the trailer into any significant wind and on level firm ground
2. Apply the trailer handbrake (on the tow coupling - ensure it is released again before driving away!!!)
3. Unhitch the trailer from the car using the jockey wheel to lift the trailer front as high as possible. Note the trailer tilt mechanism is u/s and welded up.
4. Open the rear of the trailer
5. Remove the tailplane and winglet racks/mounts

6. Carefully remove the sealing tapes
7. Remove all fittings from the trailer (as per std convention eg *Red-Port & Green-Starboard*). Don't loose the clips or pins!!!
8. Place the fuselage dolly at the end of the trailer ramp. Place the rigged glider onto the ramp such that the dolly is just clear of the undercarriage doors (placing a foot in front of the dolly wheel while pulling on the shoulder harness will do the trick (without the glider tail dolly fitted)
9. Retract the undercarriage
10. Remove the winglets and secure them in their cradle/rack, using the retaining screws to hold in position
11. Remove the tailplane and secure it in its cradle/rack, using provided pins
12. Slide the mid wing fittings/bows onto each wings and.
13. Put the wing stand under the left wingtip and ideally place someone there to hold.
14. Take the weight of the right hand wing and remove the main pin;
15. Remove the right wing and rotate. Fit the spar support through the pin hole (the wing tip can be rested on the ground as the mid wing fittings/bows protects the leading edge.
16. Lift the wing with fitted supports into the trailer, ensuring the lateral roller is engaged as the spar support enters the trailer.

Figure 4- stop and lateral support

17. Push the wing into the trailer as far as possible, then secure the wing at the front with the R clip
18. Return to the wing bow, adjusting its position to match the locating hole in the floor and bracket on the trailer wall. Insert pins
19. **Repeat procedure for left wing.**
20. Place the timber fuselage bracket through the spare opening (note correct orientation)

21. Roll the fuselage with its trolley into the trailer and secure the spar mount with the wing nuts and the tailboom with the straps .
22. Install the tailplane and winglet brackets (while the ramp is still down)
23. Retract the ramp, ensuring the retaining bolt is put in place (otherwise the rudder will be damaged)
24. Lower the trailer onto the car hitch, releasing the trailer handbrake
25. Check lights