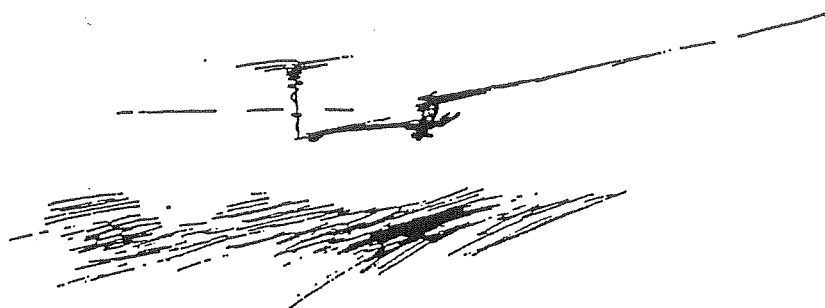


You have the controls!



• Swedish Gliding Federation 1994

Editorial notes

After the Flying Training Seminar 1993 the Swedish Gliding Federation decided to translate a short extraction of the national training programme to stimulate the international exchange of ideas. In this version, based on Robert Danewid & Robert Axelsson, *You have the controls* (Du flyger, Segelflygsport Publishing: Skövde, 1994), some text pieces and figures are excluded. Only a few copies has been printed for the Chicago meeting of Training & Safety Panel 1994. The original book has its own profile. It is generally used by students in Sweden to provide a deeper understanding of their own training progress and permits them to read the instructions in advance.

Gösta Arvastson

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Foreword — English Version

This is a short presentation in English of the Swedish gliding training syllabus as it has been standardised and used in the 85 Swedish gliding clubs since 1990. A few small changes are planned, but, broadly speaking, this syllabus will be the basis for gliding training for many years to come. It is based on the aerotow launching system. Winch launching, which once existed in Sweden, has come back on a small scale (in about 3-4 clubs), after an absence of at least 25 years.

Some parts of the Swedish text have been left out, for example, things explained in more than one place. Themes that are best studied in the compulsory theory lessons with the aid of other books, such as the chapter on different Air Space Classes, have not been included.

It should be noted that the type of landing circuit flown in Swedish clubs may differ from the circuits in most other countries. At the beginning of the downwind leg, we have an area called "nedflygningssektor". A literal translation would be a bit clumsy, but it means "the area where you dispose of your excess height". In this translation it is called the KP-sector, from the word Key Point, which occurs in British gliding. This is an "arrival area" where you should always arrive with at least 300 metres in hand, no matter where you come from. There you circle (left-hand turns!) down to about 200 metres before you start the downwind leg. It is a good way of making sure that you do not mar your landing by being too far out, too low.

The translation covers about 75% of the Swedish manual, and it is to be hoped that this slimming down has been done without detriment to the logical build-up of the exercises.

Bengt Afcrander,
translator

Introduction

The gliding pupil's manual "You have the Controls!" is an aid for your practical training up to the gliding licence. Therefore, you should have the book handy on the airfield. The book can also be used as material in a study group. Every training flight can be divided into three parts: before, during and after the flight. It is important that you do not miss out any part. Before every flight, you should read through the section "Before the Flight". This can best be done at home, before you arrive on the field.

Before you start

Before you start your training up to a gliding licence, you must know what requirements you are expected to fill in order to become a glider pilot and also learn the basic terminology.

Before you are allowed to do your first solo flight:

- you must be 15 years of age
- you must have the Flying Pupil's Training Permit, issued by the CAA.
(This may vary in different countries.)

In order to get your Gliding Licence, you are also expected to:

- be at least 16 years of age
- have the Pupil's Permit mentioned above
- have taken part in the practical training up to Licence level at an approved gliding school, e.g. your club
- have taken part in the theory courses and done the written examinations in the regulations for Gliding, Navigation, Meteorology, Aircraft Structures and Aerodynamics, Aircraft Material, and Air Physiology.
- possess a Radio Telephony Licence.

The practical requirements vary according to your experience. If you are the holder of a Power Flying Licence or a Licence for Ultralight Aircraft, your training may be shortened. The training up to Gliding Licence comprises 61 exercises. Often, one exercise is the same as one flight, but it may not be. One exercise may be split up into several flights. Basically, the training can be divided into three sections.

— Phase 1 covers Exercises 1-23 and consists of basic flight training. This means that you learn how to fly the machine in different situations, e.g. start, aerotowing, turns and landing. This section of the flight training is not very different from the training in a power plane or the Air Force training.

— Phase 2 covers Exercises 2-43 and includes, among other things, the first solo flight. Solo flights are mixed with dual flights with your instructor. At the same time as your basic knowledge gets a polish, you learn more and more applied flying technique, that is, how you fly your glider. The aim is to learn to fly in thermals.

— Phase 3 is about applied soaring technique. Dual flights and solo flights are mixed. If your club has a suitable single-seat glider, you will be checked out on that machine. You will also learn how to make a field landing, polish up your thermal flying, fly with covered instruments, etc.

The practical flight exercises are done in such a way that the instructor, before start, goes through the exercises that are to be flown. In the air, he instructs you and shows you what is to be practised. During Exercises 1-28, the instructor instructs you according to the established instruction vocabulary, but during the remaining exercises the instruction depends more on existing conditions, such as the weather situation. After that, you follow through on the controls, and then you practise the exercise yourself.

The components of a glider are shown in Figure 1. An aircraft moves round three axes, see Figure 2. When the aircraft moves round the length axis, it is said to move in the roll plane, when it moves round the transverse axis, it is said to move in the pitch plane, and when it moves round the vertical axis, it is said to move in the yaw plane.

In order to clearly understand who is flying the machine, the instructor uses the following terminology:

"I have the controls"	The instructor flies and you let go of the stick and rudder pedals.
"Follow me through on the controls"	The instructor flies, but you hold the stick loosely with your right hand and have your feet loosely on the rudder pedals.
"You have the controls"	You are flying the machine.

There must never be any doubt about who is flying the machine. Therefore, always confirm the instructor's instruction. For instance, if the instructor says "You have the controls", you answer with "I have the controls".

If you are not quite sure what the instructor said, or if you have not quite understood, then ask him to say it again.

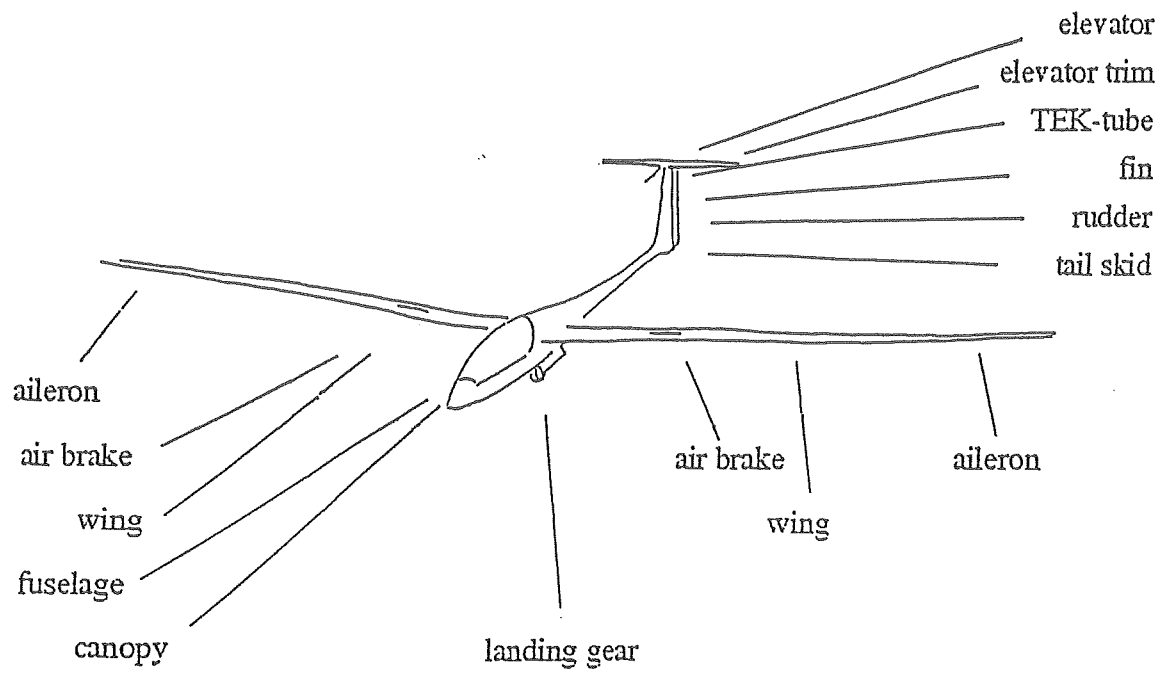


FIG 1 The components of the glider

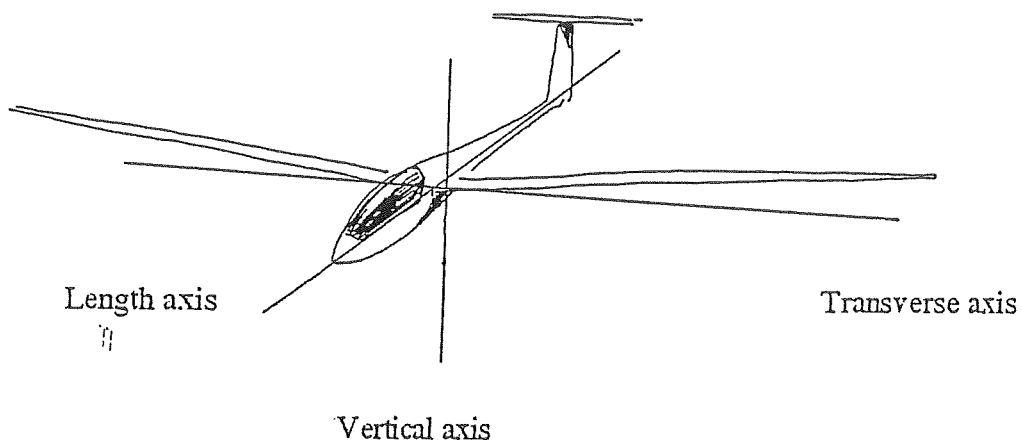


FIG 2 The three axes of the glider

DAILY INSPECTION
and
RIGGING INSPECTION
Bergfalke

A

1. NO LOOSE PARTS IN MACHINE
2. RELEASE HOOK
Function. Release wire.
3. INSTRUMENTS and EQUIPMENT
Function of turn Indicator, oxygen system and radio.
Oxygen supply. Batteries.
4. CONTROLS, including TRIM
Controls deflection in the right direction.
Ailerons connected.
Pedals adjustment.
Dual stick.
Lockings.
5. AIR BRAKES
Function. Override locking.
6. WING ASSEMBLY PINS
Visible 1.5 - 2.0 mm above and below wing fittings.
Pin and locking.
7. CANOPY
Condition.
Locking.
8. SEAT BELTS
Locked in rear seat for solo flights.

B

AILERON
Bearings.
Mechanism.
Lockings.

C

AIR BRAKES
Upper and lower.

D

STABILIZER
Rigged and locked.

E

ELEVATOR
Bearings.
Lockings.

F

1. ELEVATOR SYSTEM
Elevator correctly rigged and locked

2. RUDDER
Bearings.
Wires.
Lockings.

G

ELEVATOR with TRIM
Bearings.
Lockings.

H

TAIL SKID / TAIL WHEEL
Air pressure

I

AIR BRAKES
Upper and lower.

J

AILERONS
Bearings.
Mechanism.
Lockings.

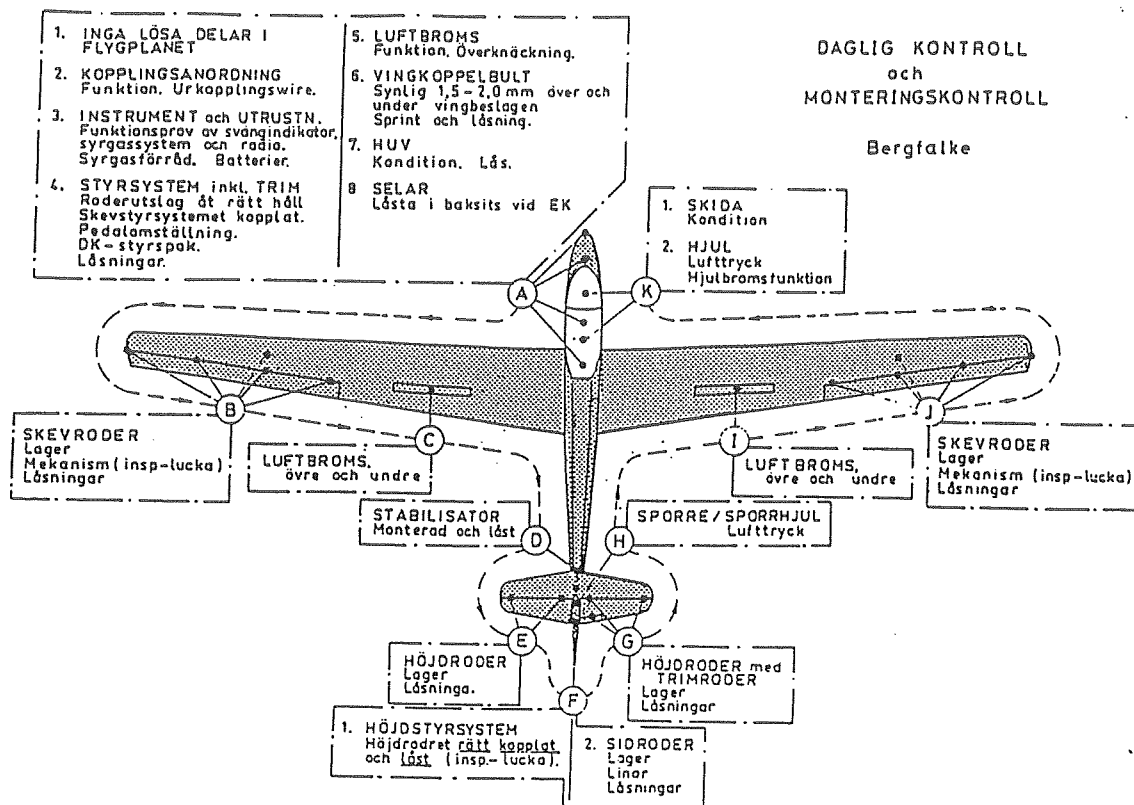
K

1. SKID
Condition
2. WHEEL
Air pressure.
Wheel brake function.

FIG 1.2 Daily inspection of Bergfalke.
The principle
is the same for all gliders.

Remember!

Take special care when
you do your D.I.



Exercise 1 (Dual) Familiarization

Aim of the exercise

To learn:

- how to prepare a flight with a daily inspection (DI) and checklist
- the start signals
- to sit in the machine and get to know it
- to find the field with the aid of given landmarks
- the position of the KP-sector, downwind leg and base leg.

Before the flight

Signals

The signals used at aerotow starts and the dropping of the tow line are shown in Figure 1.1. When winch starts are done, usually radio communication is used.

Daily inspection

The daily inspection is part of the regular maintenance of the glider. It is the most important of all checks, and is done daily before the first flight. It is done by a person who is very familiar with the type of machine. The inspection must be done systematically, going round the machine and checking for wear and damage, according to a certain inspection scheme. Figure 1.2 shows what is to be inspected on a Bergfalke, but the principle is the same for all gliders.

Signals on the ground

From	To	Signal	Significance /Action
Helper at towplane	Towpilot	Elevator lifted	Open tow hook
		Helper lowers elevator	Close tow hook. Tow line connected.
		Helper tugs a few times on the line	Tow line correctly connected
Helper at glider	Glider pilot	Waving arm to and fro	Connect tow line to glider

Glider pilot	Signal-man at glider	Ready! Waving arm to and fro	Checklist done. Ready for take-off.
Signal-men at tow-plane and glider	Tow-pilot	Arm swung in circles	Take up tow line slack
Signal-men at tow-plane and glider	Tow-pilot	Both arms straight up	Stop! Wait for new signal.
Signal-men at tow-plane and glider	Tow-pilot	Arm stops swinging and points straight ahead	Slack taken up. Runway free. Ready for take-off.
Signal-men at tow-plane and glider	Tow-pilot and glider pilot	Arms crossed repeatedly over head	Stop! Release tow line!

FIG 1.1 Signals

Signals to the tow-plane in the air

From	To	Signal	Significance /Action
Tow-pilot	Glider pilot	Repeated wing-wagging	Release!
Signal-man on the ground	Tow-pilot	Flag held straight up	Ready to drop tow line
Signal-man on the ground	Tow-pilot	Flag waved to and fro over head	Tow line dropped
Signal-man on the ground	Tow-pilot	Flag held straight down	Do not drop tow line! Come in again for new drop!

FIG 1.1 Signals, continued

Weights and checklist

Before you sit down in the machine you must check the lowest allowed weight to be carried in the machine. If your weight is lower than this weight, a ballast must be carried. This ballast is usually a lead plate or a sandbag. Remember that this ballast must be properly secured in the machine.

The checklist is a last check carried out before the start. This list is kept in the machine, and before you give the "All clear" sign before the start, you must have gone through the list. You do this by reading aloud every point on the list and carrying out the check. If you are interrupted, start over again! This checklist check must be done before the towline is attached.

A checklist can vary a little, but as a rule it looks like this:

- . Pilot weight
- . Sitting position
- . Seat straps secured
- . Free control movements
- . Air-brake check: brakes in and locked
- . Elevator trim in the right position
- . correctly set
- . Radio check
- . Canopy locked

The Landing circuit and KP-sector

When you land, you fly a certain flight path, called the landing circuit. This is not something special for gliders, it is used by all machines, big and small. The landing procedure is a very important part of the basic flight training.

The landing circuit has six different phases:

- 1) The KP-sector
- 2) The downwind leg
- 3) The base leg
- 4) The final
- 5) The rounding out and touchdown
- 6) The landing roll.

Figure 1.3 shows the landing circuit. It is a U-shaped flight path with two 90-degree turns and is therefore generally called "2 times 90". You always choose the landing direction so that you start and land as close to the wind as possible. You do this in order to get a low speed in relation to the ground when you touch down, and thus get a short roll-out.

The landing circuit can be done as a left-hand circuit or a right-hand circuit. Left-hand circuit is the normal procedure, if there are no different local procedures.

KP-sector

This sector is the "arrival area" for all landing gliders. You must arrive here not lower than 300 metres. You burn off your excessive height here in left-hand turns. At the same time you can plan how to do your circuit.

Downwind leg

You leave the KP-sector at approximately 200 metres and start the downwind leg. This should not be too near to the landing strip. There must be room for a good long base leg.

On the downwind leg, trim the machine to the right speed and get your landing gear down. There should be no full turns on the downwind leg.

Significant words:

KP-sector, at least 300 metres

Downwind leg

Base leg

Final

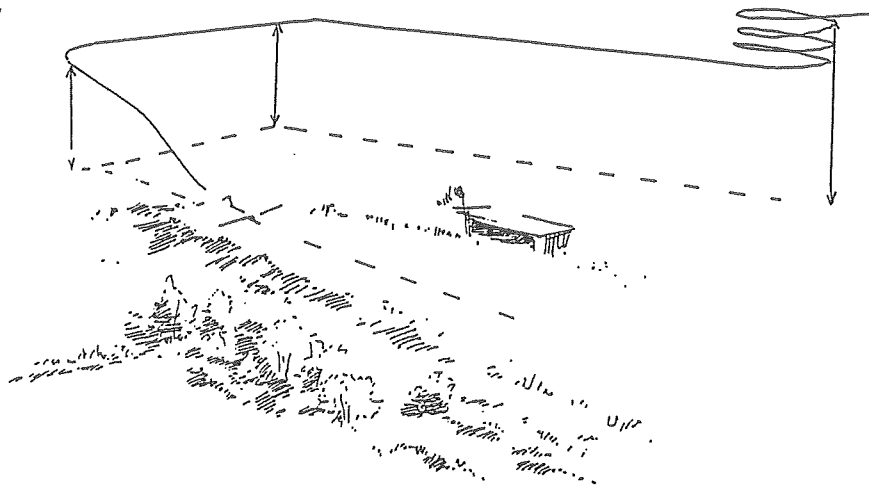


FIG 1.3 The landing circuit is composed of KP-sector, Downwind leg Base leg and Final

Base leg

The base leg can be flown near the field or further away, depending on wind conditions or sink or up ahead.

The final

The turn into the final should not be lower than 50 metres. Here, you pick your touchdown point. This should normally be about 125 metres from the landing strip threshold.

During the flight

During this first flight of yours, the instructor does the flying all the time. He will show you the situation of the field in relation to certain landmarks. Your task is to try to find your whereabouts and try to remember these landmarks. The instructor will also show you the landing circuit. Remember

- . to check the lowest permitted load of the machine
- . to see that your sitting position is correct and that you can easily reach all handles, switches, etc.
- . to find landmarks, so that you can easily find the field.

Instruction:

We will now be towed up to approximately 500 metres. I will fly the machine all the time. Go through the checklist. When you have finished, give the signal-man at the machine the sign to connect the towline. Now, the towline is connected. Give a hand sign to the signal-man - ready for start. Now the tow-line slack is being taken up - the machine is moving forward - it is picking up speed - the machine is lifting off. Now the tow-plane also lifts off - we are climbing. Our height is now around 500 metres. I release by pulling the release handle - like this. The tow line is disconnected - we turn left - the tow plane turns right. Try to sit in a relaxed way and follow the movements of the machine.

The speed is now about km/h. Notice how we fly in relation to the field. Over there is I turn left (right) and straighten out. Over there you see

The height is now 300 metres and we are in the KP-sector. We leave the sector at 200 metres and start the downwind leg, and we have now started the landing procedure. Opposite the landing area and well to one side of it, the height should be at least 150 metres. We are now turning base leg.

We are now turning finals. On finals I open the air brakes in order to reduce the height. I reduce my speed by moving the stick slowly back. The stick should be all the way back until the machine stops rolling.

Exercise 2 (Dual) Primary function of controls

Aim of the exercise

- To learn what is meant by the primary function of the controls and how the machine reacts to control inputs.

Before the flight

By the "primary function" of the controls we mean the first thing that happens at control inputs, and by "secondary effect" we mean what happens if we keep on holding control deflections. Figure 2.1 shows the primary effects of the controls and the axes around which the controls work.

Elevator

The primary function of the elevator is to move the machine round the transverse axis, in the looping plane.

Rudder

The primary function of the rudder is to move the machine round the vertical axis, in the yaw plane.

Ailerons

The primary function of the ailerons is to move the machine round the length axis, in the roll plane.

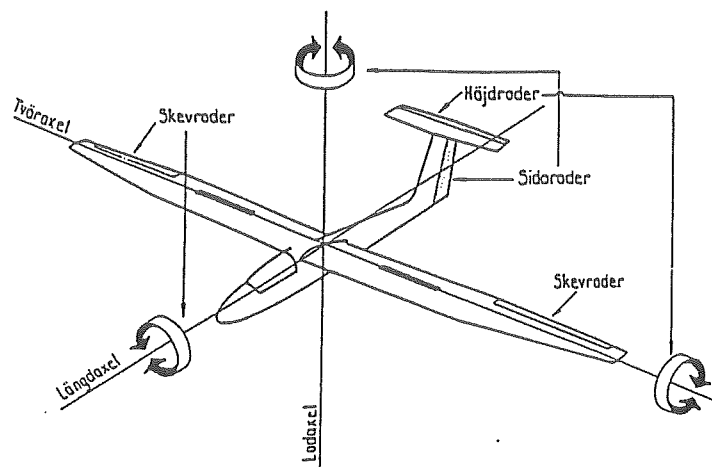


FIG 2.1 The primary functions of the controls

During the flight

The instructor will now show you the primary functions of the controls. After that, you will fly yourself. Remember

- to sit relaxed
- to look straight ahead when the instructor shows you the control movements, and also when you fly yourself
- to hold the stick with your right hand and to let the left hand rest on your left knee. You may rest your right arm on your right leg. This is the normal "sitting attitude" when flying.
- to make the control movements gently but firmly.

Instruction

I will now show the primary functions of the controls, that is, what happens if I give a control input. I will do the controls in the following order: elevator, ailerons and rudder.

I start with the elevator. Follow me through on the controls. Look straight ahead. Notice the attitude of the nose in relation to the horizon. I move the stick gently forward - the nose goes down - like this. The speed increases. I pull the stick gently backwards - the nose goes up - like this. The speed goes down. The machine moved

in the looping plane. Now, you have the controls - lower the nose - raise the nose - lower the nose - raise the nose and try to find the attitude we had before.

I have the controls and I will now do the ailerons. Follow me through on the controls. Look straight ahead. If I move the stick left, the machine will lean left. I say that I give left aileron or I bank left. If I bank right, the machine will lean to the right. The machine moves in the rolling plane.

You have the controls - bank the machine left - give right aileron - bank left - bank right and bank left and try to put the machine level.

I have the controls and will now do the rudder. Follow me through on the controls. Look straight ahead. If I push left foot forward the nose goes left - like this. I say that I give left rudder. If I give right rudder, the nose goes right - like this. The machine is moving in the yaw plane.

You have the controls. Give left rudder - give right rudder. Move the nose left - move the nose right. Fly straight ahead.

I have the controls.

Exercise 3 (Dual) Aileron drag

Aim of the exercise

- To learn the effect of aileron drag and how it can be countered
- You are to do the rudder during the aerotow.

Before the flight

Aileron drag

When you operate the ailerons, one aileron goes up on one wing and down on the other. The one going down increases the underside curvature of the wing and, in doing so, also increases the lift. A lift increase always means that the drag increases. This means that the drag of the wing with the aileron going down increases, whereas the drag of the other wing, with the aileron going up, decreases (the aileron going up means less lift and less drag). All this means that the machine wants to turn round the vertical axis. This is shown in Figure 3.1. This yaw tendency is called the aileron drag because one wing has a braking effect.

Therefore, if you bank left the machine will lean left but, at the same time, the nose wants to go right. The aileron drag is countered by giving rudder in the same direction as the aileron deflection.

This is something basic and important: For every aileron input you must, at the same time, give rudder in the same direction.

Aerotowing

The towline is of a special type, and, as a measure of safety, it is fitted with a "weak link" at one end.

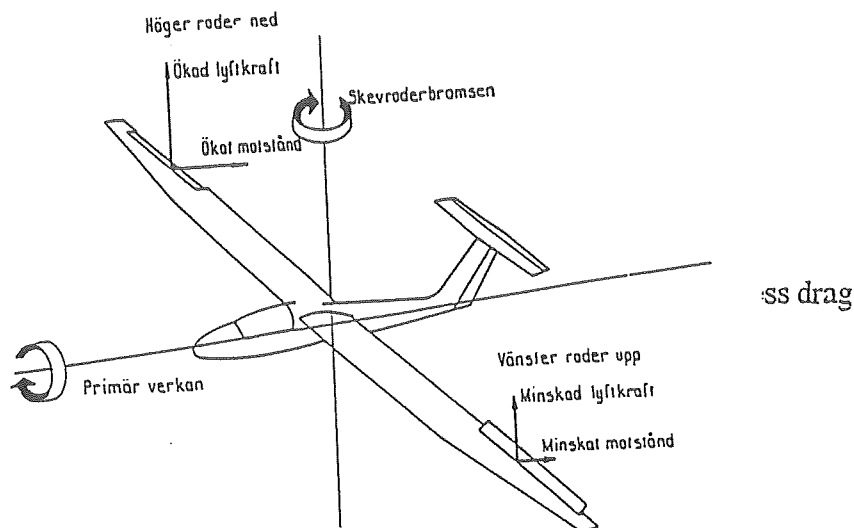


FIG 3.1 The Aileron drag

Remember!
When you operate the ailerons you must
give rudder at the same time, in the
same direction

The end of the towline with the weak link is the one to be connected to the tow-plane.

After the glider is airborne, it should stay behind the tow-plane at a height of 2-3 metres.

If you start in a cross-wind, there may be a yaw tendency. Be prepared for this, and counter with the rudder.

When the tow-plane is airborne, it first keeps a constant height to collect the proper speed for climbing. After that it starts to climb. It is important to keep up with the climb.

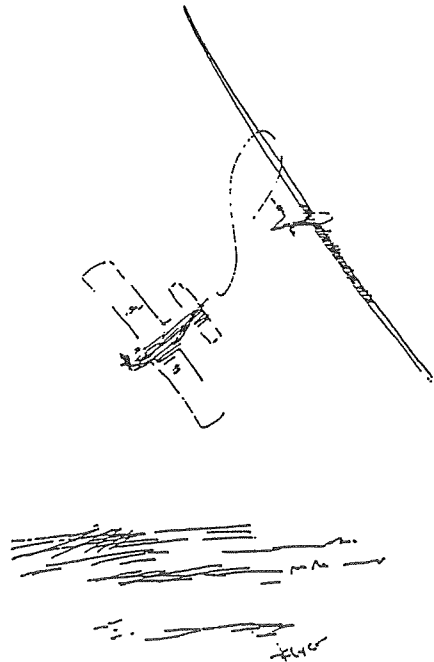
During the tow, the sideways position is directly behind the tow-plane. The vertical position may depend on the type of tow-plane. Figure 3.2 gives an indication of what the correct position looks like. If you get too low, you get into the tow-plane's slipstream. Correct position is usually a short distance above the slipstream.

Figure 3.3 shows a correct turn during an aerotow. The nose of the glider points a little bit out, not direct at the tow-plane. You will therefore be able to see the inside fuselage side of the tow-plane during the turn.

During aerotow, you may easily over-correct disturbances in the flying attitude. If you have to make a correction, it is important to stop the correcting movement before you are back in the correct position behind the tow-plane.

When it is time to release, pull the release handle twice and check that the towline has really gone. After that you turn left, at least 90 degrees.

If the tow-pilot wants you to release, he waggles his wings clearly. The reason may be some technical trouble with the tow-plane.



The position of the glider during aerotow

- a) too low
- b) correct position (wheels approximately on horizon)
- c) far too high

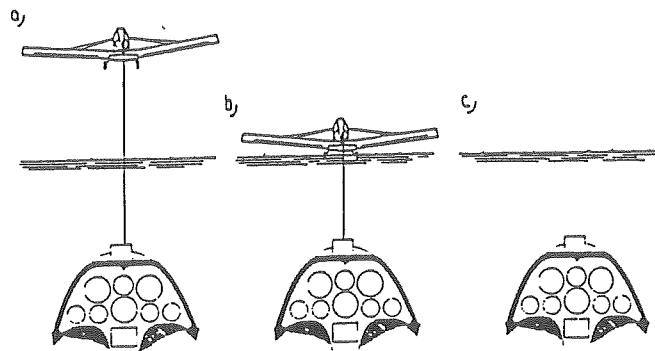


FIG 3.2

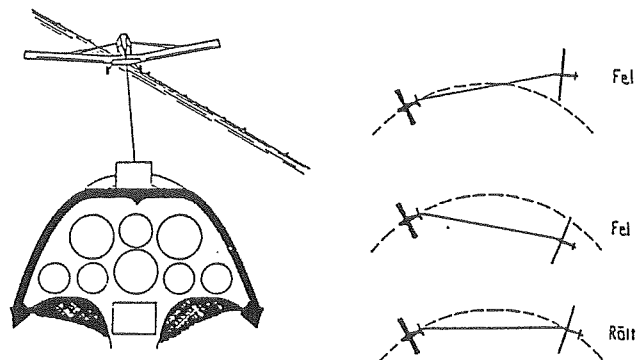


FIG 3.3 Position of glider during an aerotow turn

During the flight

The instructor shows the start. During short periods you do the rudder. Remember

- if the nose goes sideways, to meet the movement with a gentle but firm rudder input in the opposite direction
- to stop the movement before the nose is back straight behind the towplane. Overcorrecting is all too easy!

After the release, the instructor shows you the aileron drag effect and after that you practise wing waggling. Remember:

- Pick out a landmark on the horizon and give distinctive aileron inputs left and right and meet the aileron drag with the rudder: left aileron - left rudder, right aileron - right rudder, etc.
- During the wing waggling the nose must point on your landmark. To be able to do perfect wing waggling demands a lot of practice and is an excellent way of practising your co-ordination ability.

Instruction

Follow me through on the controls! Look straight ahead at the tow-plane. Now the towline slack is being taken up - we start rolling forward. Now we are airborne - we climb up to 2-3 metres and stay there. We follow in the climb and stay right behind the tow-plane. The tow-plane must be on the horizon.

We are now at 200 metres. You have the rudder! Try to keep a straight course after the tow-plane. If the nose goes left, give right rudder and remember to stop the movement in good time. If the nose goes right - give left rudder - stop and centre - like this. I have the controls. After release, we turn left.

I will now show you what is called the aileron drag. Follow me through on the controls. Look left at the left aileron. I give left aileron. Left aileron goes up - like this. Look right, at the right aileron. I give left aileron again. Right aileron goes down - like this. The aileron going down has a greater braking effect than the one going up. Therefore, the machine wants to turn in the direction of the aileron going down.

Look straight ahead. We keep the rudder neutral. When we now give aileron inputs, left and right, notice how the nose swings to and fro, in spite of neutral rudder - like this. The aileron drag has its effect in the yaw plane and must be countered with the rudder.

Notice how we can keep a straight course with the rudder while we are giving aileron left and right. When I give left aileron I also give left rudder, and when I give right aileron I give right rudder.

Follow me through on the controls. I will now waggle the wings. Try to keep a straight course with the rudder. Later, when you have the controls you should continue to practise waggling the wings. Remember to look straight ahead and give left aileron - left rudder, right aileron - right rudder.

Exercise 4 (Dual) Flying on a straight course, precision landing 2 x 90

Aim of the exercise

- . To practise flying on a straight course with constant speed
- . To practise flying on a straight course with aileron drag effect
- . To fly with the rudder and to follow through on other controls during aerotow.
- . To practise precision landing.

Before the flight

- . You should have read through this exercise.
- . Make sure that your sitting position is correct, so that you sit comfortably and relaxed during the flight.
- . There should be no strong wind and no turbulence.
- . You should be familiar with the function of the air brakes.
- . You should have decided where your touchdown point is.
- . Check the setting of the elevator trim.
- . Try to make this flight with the aid of outside references and remember to look at the attitude of the nose in relation to the horizon.
- . } Try beforehand to think through how you fly in the KP-sector, how you fly the downwind leg, the base leg and the finals, and how you touch down at the decided point.
- . Try to remember that when we are on the downwind leg, opposite the touchdown point, we have the best distance from the field if we see the field at an angle of about 30°.

During the flight

- . Keep a good look out and do not concentrate only on the instruments.
- . After great course deviations, make sure to get back on the right course.
- . Relax during the flight. The instructor will show you that the machine can fly "by itself".

- . You fly for short periods and change landmark.
- . The instructor will test that you have understood the instructions by making small disturbances.
- . Use the horizon as a speed indicator. Note that the ASI (air speed indicator) is lagging behind.
- . During the flight, keep your left hand on your knee.

Instruction

Follow me through on the controls. We are now on aerotow. You have the controls and you try to stay right behind the tow-plane. We will now look at possible disturbances during the tow and the kind of faults we can make during the tow and also how we can put everything right.

Follow me through on the controls. If the machine drops one wing, we lift it up by using aileron and, at the same time, rudder to stop the aileron drag - like this. If the tow-plane sinks below the horizon - we are too high - we correct this by lowering the nose gently - like this. If we are too low - we raise the nose - like this. Remember to stop the movement in time and centre the controls in time.

You have the controls. Try to stay right behind the tow-plane. We are now at our intended height and we release and turn left. I have the controls. We are now going to practise flying on a straight course. We do the controls in the following order: elevator, elevator trim, aileron and rudder.

Follow me through on the controls. We start with the elevator. In order to keep correct speed, km/h, we notice the attitude of the nose on the horizon. If the nose goes down, I move the stick gently back and stop where we had the correct nose attitude before - like this.

Now, you do the elevator and keep the nose in its right attitude. In order to keep the right speed we also use the elevator trim. Keep the nose attitude steady and, at the same time, trim the machine so that you do not have any stick pressure. If the nose goes left - give a little right rudder and move the nose back on its right course. Remember to stop and centre the controls in time!

I have the controls. I will now show how you keep a straight course and keep the wings level. Follow me through on the controls. We take as a landmark a point on the ground, as far away as possible, and fly on a straight course towards it. If now the left wing goes down we lift it up by giving right aileron and, at the same time, a little rudder in order to meet the aileron drag - like this. When our attitude is correct again, we stop and centre the controls. If the right wing goes down, we give left aileron and, at the same time, a little left rudder. When our attitude is correct we stop and centre the controls.

You have the rudder and aileron - check the landmark - keep a straight course and keep the wings level. Now you also have the elevator and fly with speed for best glide. km/h.

I have the controls. We are now going to practise making a precision landing. Today we fly a left-hand circuit. We fly over to the KP-sector where the height should be at least 300 metres. The height is now 200 metres and we start the downwind leg. We also report on the radio: "On the downwind leg". We have the best distance from the field when we see the field at an angle of about 30 degrees. Opposite and well to one side of the touchdown point the height should be at least 150 metres. We continue on the downwind leg towards the base leg. The base leg should be at such a distance that we can always reach the field. The lowest height for turning base leg is 100 metres. We turn left into base leg. Follow me through on the air brakes. Shortly before we pass the extension of the touchdown point, we make a left-hand turn into the final. The lowest height for turning finals is 75 metres and the turn should be finished at not lower than 50 metres. We aim the machine immediately to the right of the touchdown point. Note the glide path down to the touchdown point.

Exercise 5 (Dual)

Effect of rudder and elevator in a turn, precision landing

2 x 90°

Aim of the exercise

- To learn the effect of rudder and elevator in a turn.
- To practise aerotow with all controls.
- To learn flying along a glide path.
- During landing, to follow through with all controls and also with air brakes.

Before the flight

- You should have read through this exercise.
- A demonstration of the exercise with the help of a model should be made.
- Think over again what is meant by "bottom rudder" and "top rudder".
- Remember to watch the attitude of the nose in relation to the horizon and also to note the turn rate during the exercise.

- Think over again some of the basics of aerotowing, especially bearing in mind "to have the same bank in the turn as the towplane" - "too steep bank - we are slipping inwards" - "too little bank - we are skidding outwards" and "keep the towplane on the horizon" - "keep a straight course with the rudder".

During the flight

- You will practise the use of elevator and rudder in turns, with very firm inputs, without any secondary effects.
- You will be shown various faults made during aerotow.
- You will be asked to explain the effect of the rudder and the elevator in a turn and to discuss possible problems during the tow.

Instruction

I will now show the effect of the rudder and the elevator in a turn.

I start with the rudder. Follow me through on the controls. We look around and enter a normal left-hand turn. A rudder input upwards in a turn is called "top rudder" and downwards it is called "bottom rudder". Note the attitude of the nose in relation to the horizon. I give bottom rudder, the nose goes down. I give top rudder, the nose goes up. You have the controls. Decrease the rate of turn - increase the rate of turn.

Rudder and elevator are the "turning controls". Therefore we must combine elevator and rudder to decide the rate of turn and the attitude of the nose in relation to the horizon. We are turning into the downwind leg and continue with the precision landing. I will now show what it looks like when we are below, over and on the correct glide path.

Follow me through on the controls. We are now turning finals. Note where the touchdown point is. We open the air brakes and can see how the touchdown point is moving forward. We are now below the normal glide path. We retract the brakes and can see how the touchdown point is moving backwards. Now we pass the normal glide path and we are now too high. We open the brakes again and now we are on the correct glide path and retract the brakes about half. We are now on the normal flight path with half brakes open. Note how the touchdown point remains in the same place in relation to the machine. When we are sure to reach the touchdown point, we open full brakes.

Exercise 6 (Dual)

Staying in a turn, leaving a turn

Aim of the exercise

- To hold the machine in a turn and to be able to correct faults in a turn.
- To make the turns with constant rate of turn without slipping or skidding.
- To learn why opposite aileron is necessary in a turn.
- To learn leaving a turn, which you are to do on your own.
- Leaving turns should be done against a landmark.
- To fly the landing glide path again and to understand the touchdown procedure.

Before the flight

- You should have read through all the previous exercises.

Some general points about turns that you should revise and think over again before the flight:

- Keep a good look out before and during the turn.
- A turn with a bank less than 35° is considered to be a flat turn.
- When you bank the machine in order to turn, part of the lift is needed for this, and therefore the speed must be increased. In order to achieve this, we apply elevator during a turn.
- In a turn, the outer wing travels faster through the air than the inner wing and therefore it gets more lift and a little more drag. This is compensated for by opposite aileron and a little bottom rudder.
- The machine is slipping in the turn if the rate of turn is too slow in relation to the bank. The ball is inwards in the turn and the canopy wool string points outwards.
- The machine is skidding if the rate of turn is too fast in relation to the bank. The ball is outwards and the wool string points inwards.
- Remember that all controls should be applied simultaneously when leaving a turn.
- Elevator and rudder are called "turning controls" and are operated at the same time.
- Make sure always to make your turns with the same bank, about 35° .