



# TANDEM WORKSHOP

*Kamshet, India January 17th-25th 2024*

## **ACTUALIZATION, EVALUATION AND CERTIFICATION OF EXPERIMENTED TANDEM PILOT**

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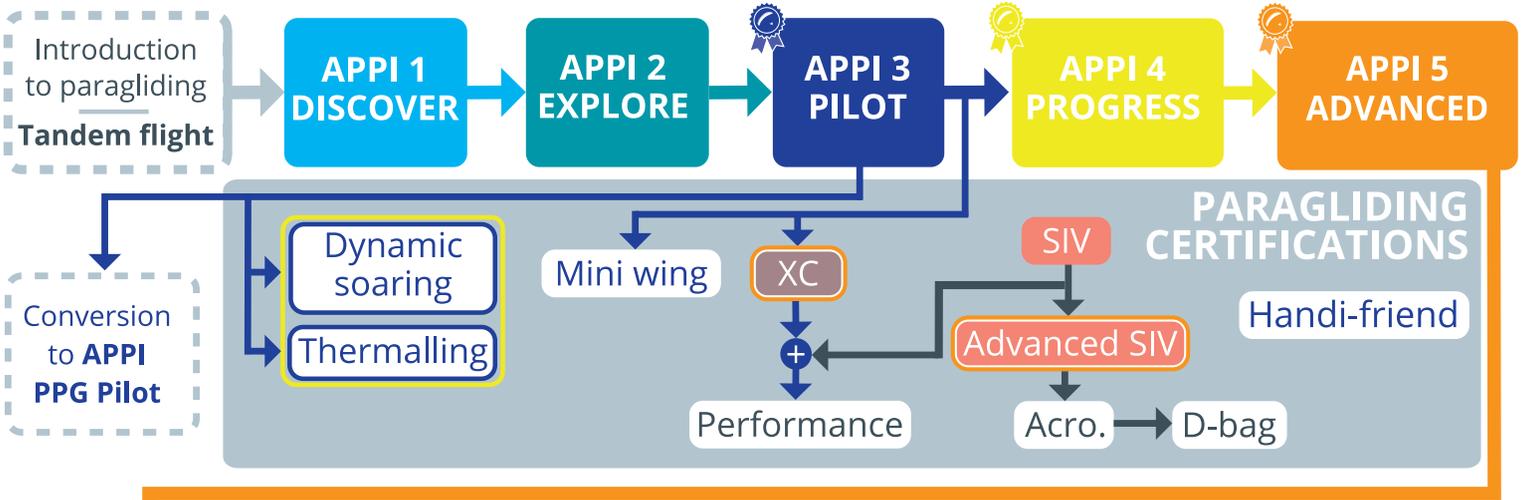
Document developed by Manu Bonte

*Organized by:* Templepilots

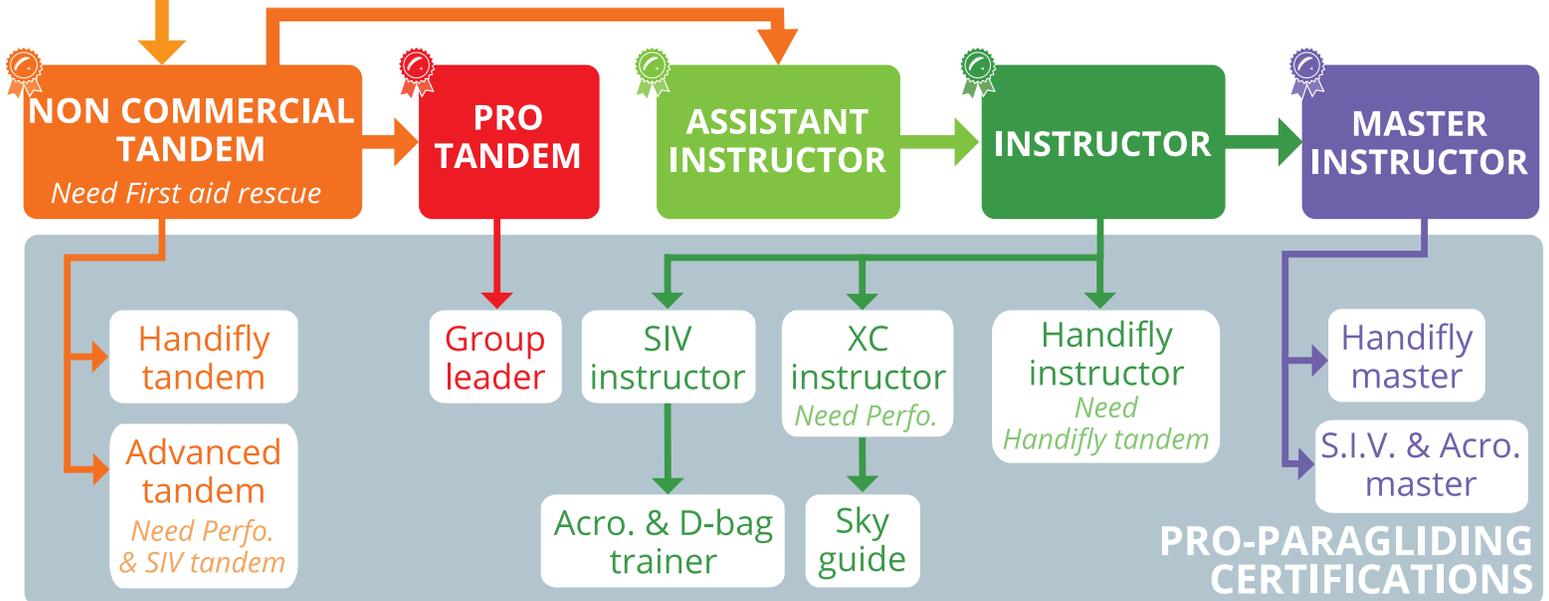
Paragliding School & Club

*Supported by*

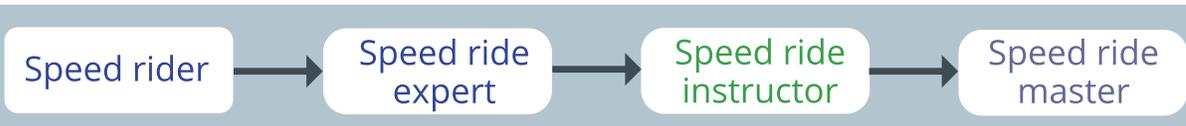
# PARAGLIDING LEISURE PILOT



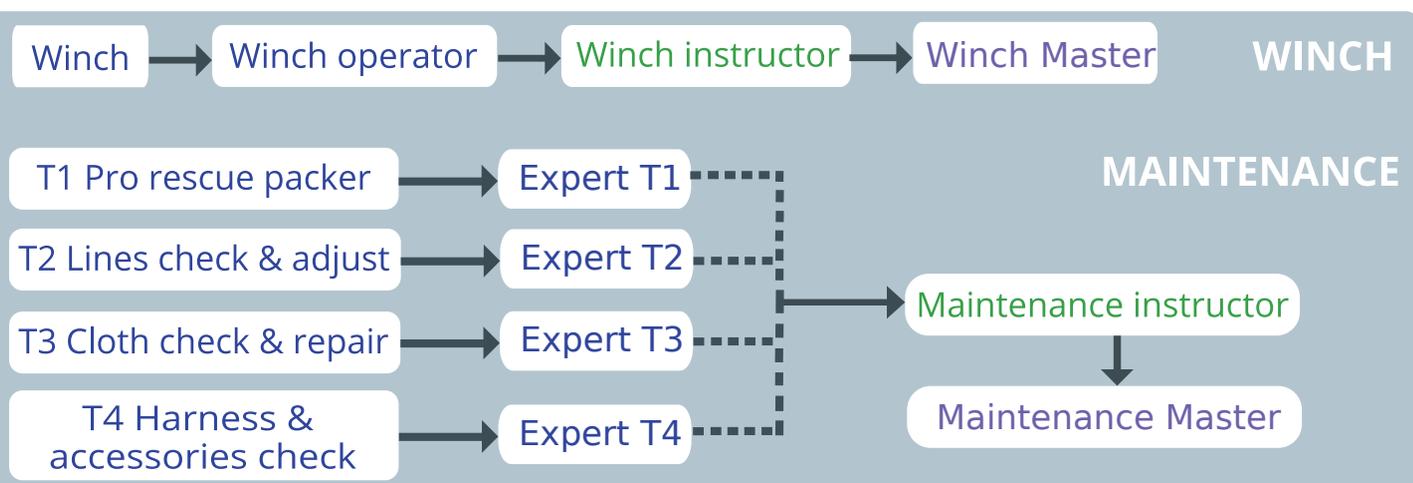
# PARAGLIDING PROFESSIONAL



# SPEED RIDE



# TECHNICIAN



# Unit n°1: Gear

## 1. GENERALITIES:

- ✓ Indicated total flying weight range
- ✓ The theory of flying at the top of the indicated flying range and the reality
- ✓ EN certification, flight and structure, what does it mean?

## 2. WING COMPONENTS

### A. The cloth

- ✓ Manufacture and characteristics
- ✓ Ageing and consequences
  - Porosity
  - Stiffness
  - Breaking and tearing strength
- ✓ How long does the cloth last? typical alerts
- ✓ Conclusion
  - Ageing agents, how to limit cloth ageing

### B. The lines

#### Generalities

- ✓ Materials and characteristics
- ✓ Where to find information about the lines of a glider (length, materials)
- ✓ Effect of a knot on the strength
- ✓ How to splice a line
- ✓ G load in flight, various manoeuvres
- ✓ Line load depending on glider's design

#### Line ageing control

- a) Lines losing breaking strength
  - ✓ What materials are concerned
  - ✓ How to proceed to control and “survival technique”
  - ✓ Criteria for replacement
  
- b) Glider getting out of trim
  - ✓ What is the trim of a glider
  - ✓ What happens, what materials are concerned
  - ✓ Typical alerts

- ✓ Measurement and correction of line set up
  - Preliminaries: read a plan, identify a line
  - The differential method
  - Make a differential table
  - Measurement technique
  - Introduction to correction techniques
  - Permitted tolerances

### **Conclusion**

- ✓ Control frequency and life of a line set, depending on material and glider's type
- ✓ Real life examples of ageing
- ✓ Controls after an intervention prior to fly

### **3. RESERVE**

- ✓ Models
- ✓ Certification (shock resistance, sink rate, aperture time, oscillations)
- ✓ Types of mounting, benefits and disadvantages
- ✓ Problems that may occur: extraction, aperture, neutralisation
- ✓ Maintenance
- ✓ Conclusion:
  - How to find your handle
  - Five cases in which you should pull reserve immediately
  - The three types of situation when its time to throw, and the technique to use in each of those situations

### **4. HARNESS**

- ✓ Geometries and position
- ✓ Adjustment
- ✓ Pod harness and glider certification
- ✓ Maintenance
- ✓ How long should a harness last?
- ✓ Conclusion

Table 29 — Classification of a paraglider's behaviour in the asymmetric collapse test

Measurement and ranges (according to Table 28)	Classification	
Change of course until re-inflation Less than 90°	Maximum dive forward or roll angle	
	Dive or roll angle 0° to 15°	A
	Dive or roll angle 15° to 45°	A
	Dive or roll angle 45° to 60°	C
	Dive or roll angle 60° to 90°	D
	Dive or roll angle greater than 90°	F
90° to 180°	Dive or roll angle 0° to 15°	A
	Dive or roll angle 15° to 45°	B
	Dive or roll angle 45° to 60°	C
	Dive or roll angle 60° to 90°	D
	Dive or roll angle greater than 90°	F
	180° to 360°	Dive or roll angle 0° to 15°
Dive or roll angle 15° to 45°		C
Dive or roll angle 45° to 60°		C
Dive or roll angle 60° to 90°		D
Dive or roll angle greater than 90°		F
Greater than 360°		Dive or roll angle 0° to 15°
	Dive or roll angle 15° to 45°	C
	Dive or roll angle 45° to 60°	D
	Dive or roll angle 60° to 90°	F
	Dive or roll angle greater than 90°	F
	Re-inflation behaviour	Spontaneous re-inflation
Inflates in less than 3 s from start of pilot action		C
Inflates in 3 s to 5 s from start of pilot action		D
No re-inflation within a further 5 s		F
Total change of course		
Less than 360°		A
Greater than 360° with tendency to recover (g force decreasing, rate of turn decreasing)	Greater than 360° with tendency to recover (g force decreasing, rate of turn decreasing)	C
	Greater than 360° without tendency to recover (g force not decreasing, rate of turn not decreasing)	F
	Collapse on the opposite side occurs	
	No (or only a small number of collapsed cells with a spontaneous re-inflation)	A
	Yes, no turn reversal	C
	Yes, causing turn reversal	D
Twist occurs	No	A
	Yes	F
	Cascade occurs	
No	No	A
	Yes	F
Folding lines used	No	A
	Yes	D

5.5.18.14.2 Small asymmetric collapse

Stabilise the glider in straight flight at trim speed. Release the control handle on the side to be collapsed and attach it to the riser.

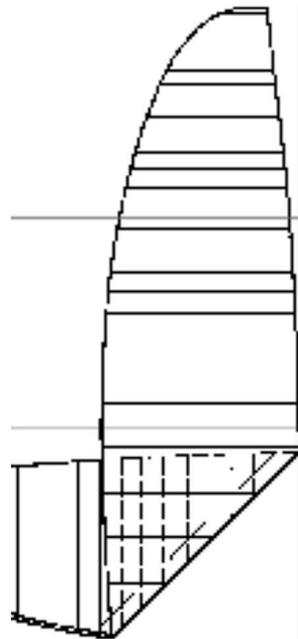
Pull down the appropriate lines on one side as fast as possible to collapse the canopy asymmetrically at approximately 50 % of the leading edge along the marked line.

As soon as the collapse is achieved, release the lines quickly.

The pilot shall take no further action and remains passive until the glider either recovers, or changes course by more than 360°, or 5 s elapses.

In the status of the maximum shape of the collapse, the bend line has to be completely (right through to the trailing edge) inside the marked tolerance field as shown in Figure 7.

As soon as the collapse is achieved, release the lines quickly. The pilot shall take no further action and remains passive until the glider either recovers, or changes course by more than 360°, or 5 s elapses.



Class	Description of flight characteristics	Description of pilot skills required
A	Paragliders with maximum passive safety and extremely forgiving flying characteristics. Gliders with good resistance to departures from normal flight.	Designed for all pilots including pilots under all levels of training.
	Paragliders with good passive safety and forgiving flying characteristics. Gliders with some resistance to departures from normal flight.	Designed for all pilots and may be suitable for pilots under training if recommended by the manufacturer.
C	Paragliders with moderate passive safety and with potentially dynamic reactions to turbulence and pilot errors. Recovery to normal flight may require precise pilot input.	Designed for pilots familiar with recovery techniques, who fly "actively" and regularly, and understand the implications of flying a glider with reduced passive safety.
	Paragliders with demanding flying characteristics and potentially violent reactions to turbulence and pilot errors. Recovery to normal flight requires precise pilot input.	Designed for pilots well practised in recovery techniques, who fly very actively, have significant experience of flying in turbulent conditions, and who accept the implications of flying such a wing.

Technical Data Sheet

**Skytex 45  
Hard**

DESCRIPTION

Fabric	9092
Finish	Side coated (polyurethane)
Yarn	PA 6.6 high tenacity - 33 dtex
Width	158 cm
Pattern	Rip Stop
Internal ref.	09092 - E29
Length of rolls	150 lm

Utilization / End-uses

Paragliding, Kite

Technical Specifications

Characteristics	Test Method	Unit	Tolerance
Coated fabric's weight	ISO 2286-2	g/sqm	45 +/- 3
Tear Strength	ISO 4674	DaN	1 mini
			0.7 mini
Elongation	Internal Method	%	2 maxi
			3 maxi
			15 maxi
Break strength	ISO 1421	DaN/5 cm	40 mini
			33 mini
Air porosity	ISO 9237	l/sqm/mn under 1000 Pa surface 100cm <sup>2</sup>	100 maxi

Technical Data Sheet

**Skytex 27  
Classic**

DESCRIPTION

Fabric	70000
Finish	Side coated (polyurethane)
Yarn	PA 6.6 high tenacity - 22 dtex
Width	158 cm
Pattern	Rip Stop
Internal ref.	70000 - E71
Length of rolls	150 lm

Utilization / End-uses

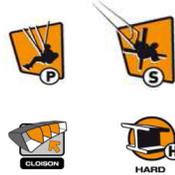
High performance paragliding, kites

Technical Specifications

Characteristics	Test Method	Unit	Tolerance
Coated fabric's weight	ISO 2286-2	g/sqm	26 +/- 2
Tear Strength	ISO 4674	DaN	1,5 min
Elongation	Internal Method	%	10 maxi
			18 maxi
			30 maxi
Break strength	ISO 1421	DaN/5 cm	25 mini
			22 mini
Air porosity	ISO 9237	l/sqm/mn under 1000 Pa surface 100cm <sup>2</sup>	20 maxi



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Technical Data Sheet

**Skytex 45  
Classic**

DESCRIPTION

Fabric	9092
Finish	Side coated (polyurethane)
Yarn	PA 6.6 high tenacity - 33 dtex
Width	158 cm
Pattern	Rip Stop
Internal ref.	09092 - E38
Length of rolls	150 lm

Utilization / End-uses

Paragliding, Kite

Technical Specifications

Characteristics	Test Method	Unit	Tolerance
Coated fabric's weight	ISO 2286-2	g/sqm	44 +/- 3
Tear Strength	ISO 4674	DaN	2 mini
			1,5 mini
Elongation	Internal Method	%	8 maxi
			16,5 maxi
			28 maxi
Break strength	ISO 1421	DaN/5 cm	40 mini
			33 mini
Air porosity	ISO 9237	l/sqm/mn under 1000 Pa surface 100cm <sup>2</sup>	10 maxi

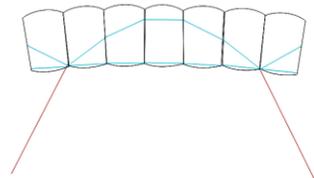
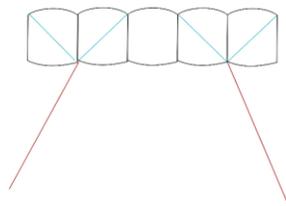
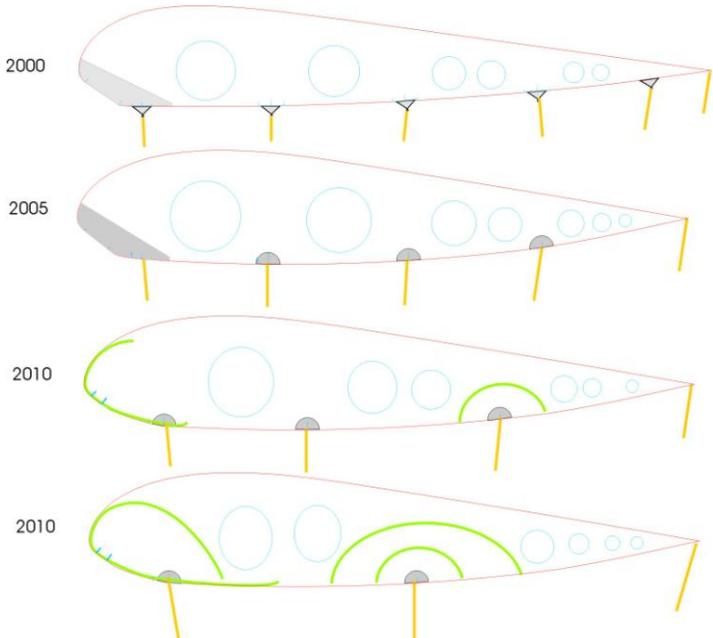
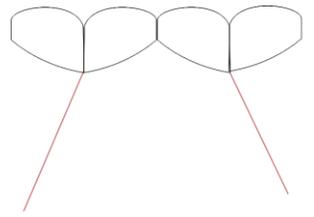
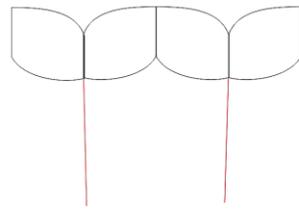
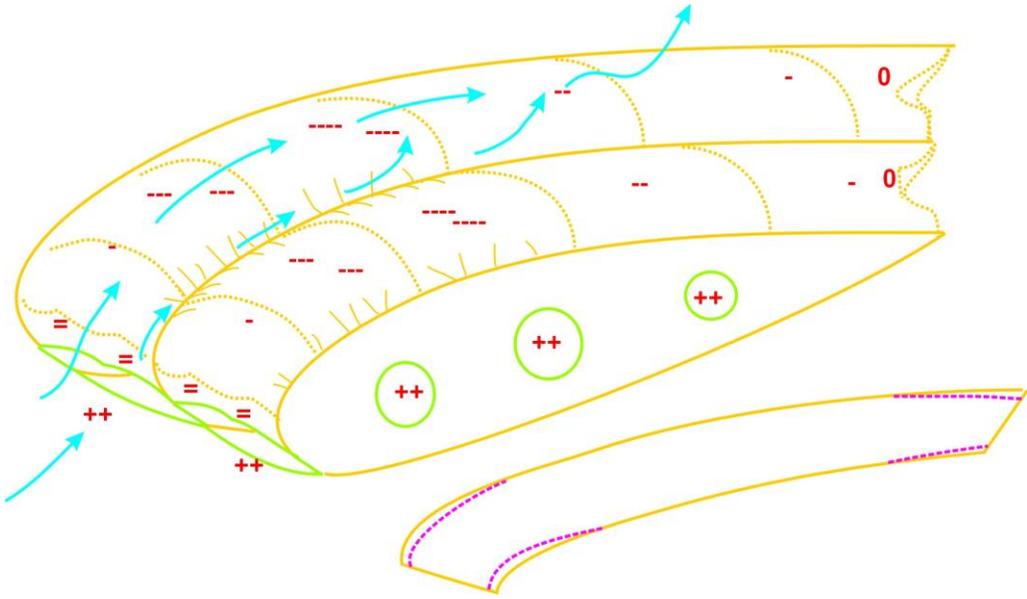
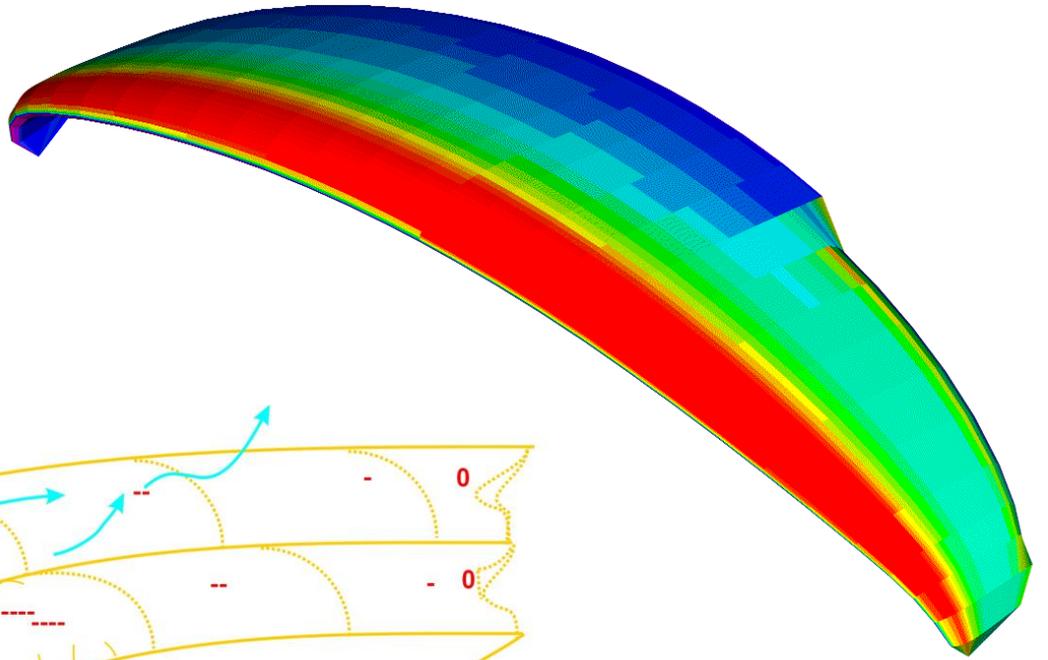
Ageing performances

Air porosity after Washing 1h at 30°	Internal Method	l/sqm/mn under 1000 Pa surface 100cm <sup>2</sup>	40 max
Air porosity after fluttering 15 mn	Internal Method	l/sqm/mn under 1000 Pa surface 100cm <sup>2</sup>	40 max



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## APPI WORKSHOP

### Line characteristics



MATERIALS	Commercial name	Use	Color	Density	Deterioration	Melting point	Elasticity	Abrasion	UV resistance	Ageing : Sheathed line dimensional stability	Ageing Un-sheathed line dimensional stability	Ageing : Breakage strength
<b>Aramid</b>	Kevlar	lines risers	yellow fiber, it can be colored	1,44	500°C	500°C	little	poor	bad	very good	Good when protected, then it deteriorates	bad
<b>Ultra-high molecular weight polyethylene</b>	Dyneema	lines risers	white fiber, it can be tied with a polyurethane coating	0,97	110°C	147°C	little	very good	good	average	average	excellent
<b>Copolymer polyester</b>	Vectran	lines	yellow fiber, it can be colored	1,41	500°C	500°C	little	poor	very bad		Good when protected, then it deteriorates	bad
<b>Polyester</b>	Tergal, Dacron	lines sheaf, risers	It can be easily tied, good color ageing	1,38	220°C	260°C	a lot	good	good			
<b>Polyamide</b>	Nylon	reserve lines	white	1,14	230°C	260°C	soft and elastic	good	average			

Fichier Configuration ? 09:34:44

Sélection du fichier vidéo

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Décalage vidéo - fichier 00:06:20

Sélection du fichier enregistrement

Sélection du décalage entre la vidéo et l'enregistrement

vidéo

AFFICHAGE DES COURBES

X  Y

Z  Résultante

Température  Pression

VISUALISATION

X10

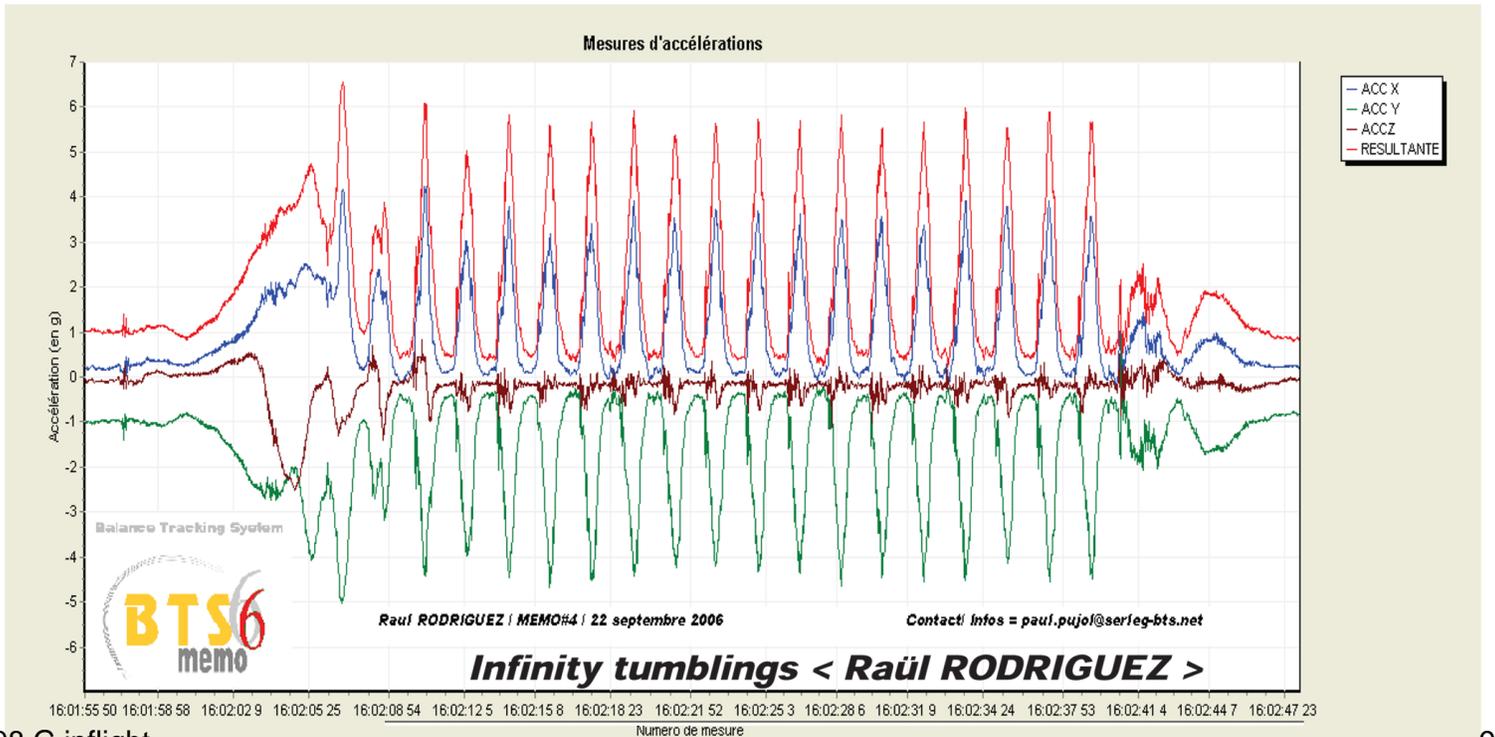
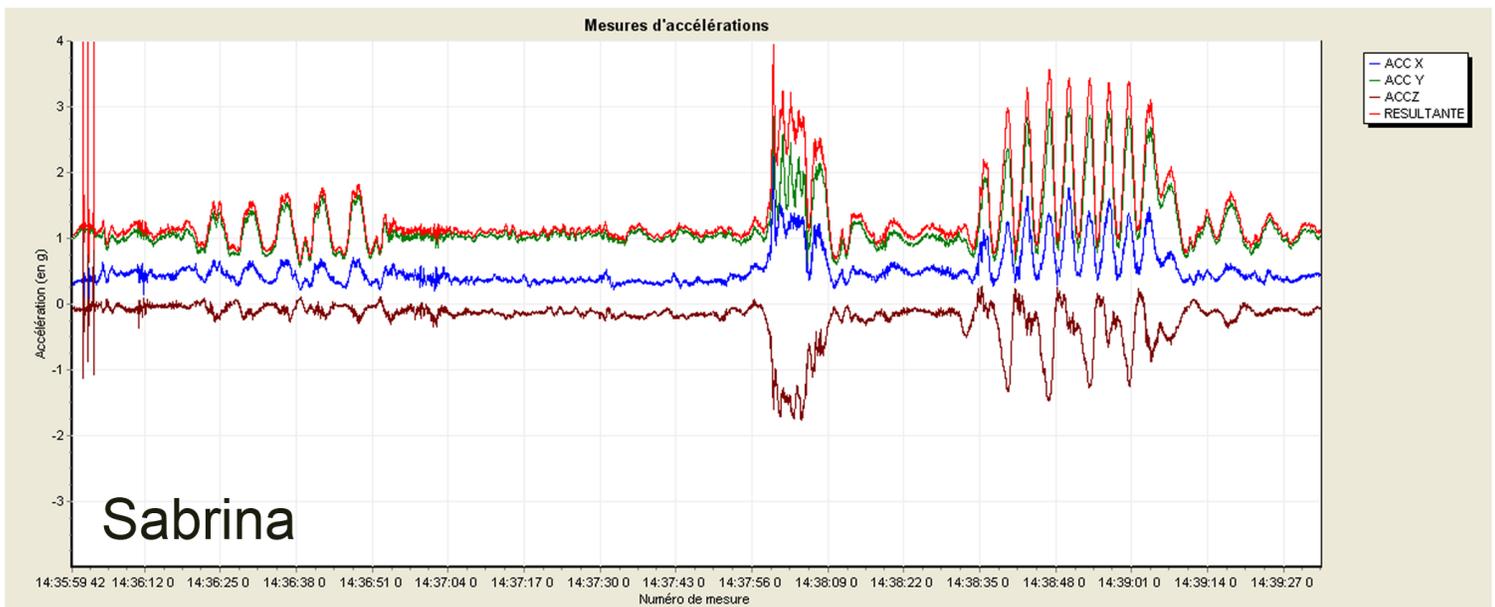
Gauche Droite

Aller à OK

Enregistrement (synchronisé avec la vidéo)

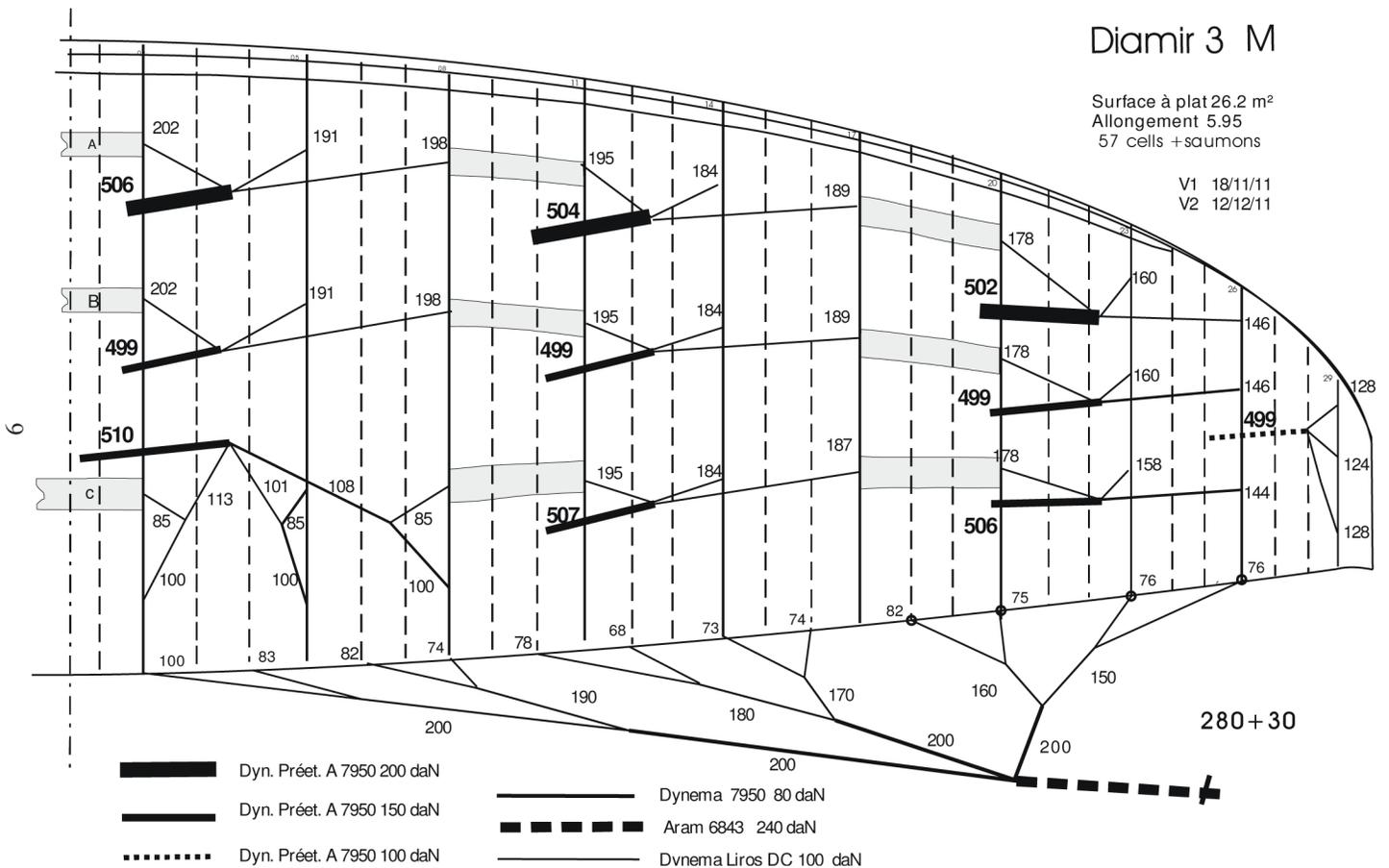
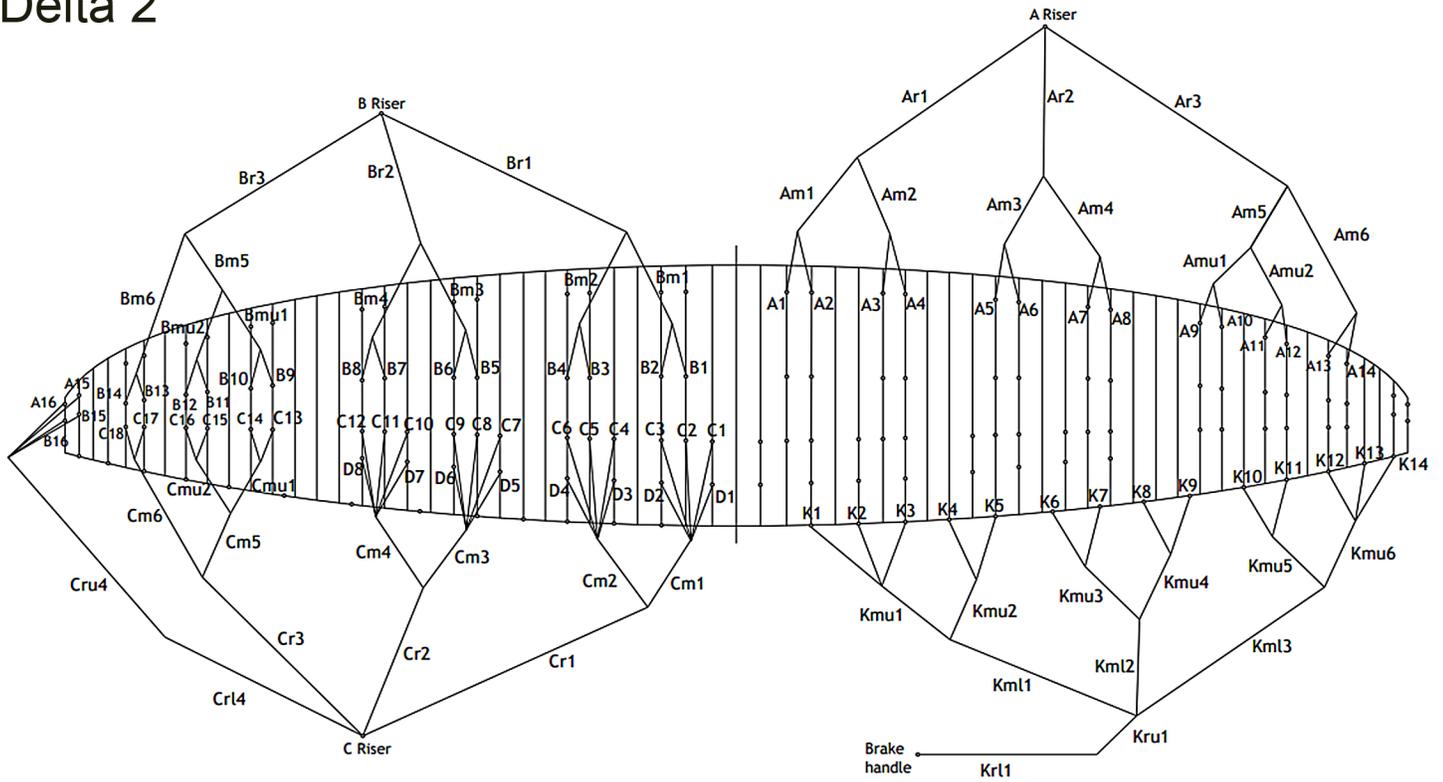
Sélection des courbes à afficher

Sélection de l'affichage de l'enregistrement



LINE DIAGRAM

Delta 2



glider



**Length Table**

wing center	1	2	3	4	5	6	7	8	9	10	11	12
A												
B												
C												
D												
E												
F												

**Differential Table**

	1	2	3	4	5	6	7	8	9	10	11	12
arch control →	A1-An											
A-B												
A-C												
A-D												
A-E												
A-F												

**Differential measurement**

	1	2	3	4	5	6	7	8	9	10	11	12
arch control →	A1-An											
A-B												
A-C												
A-D												
A-E												
A-F												

negative values: x is too short compare to A

**Differential error**

	1	2	3	4	5	6	7	8	9	10	11	12
arch control →	A1-An											
A-B												
A-C												
A-D												
A-E												
A-F												

APPI WORKSHOP



	Rescue fitted in a harness with connection points on the shoulder straps	Front mounted rescue with connection points on the shoulder straps	Front mounted rescue system connected on the main Karabiners
<b>Harness and glider are permanently hooked</b>	proper use	ok	not suitable, as the rescue is connected inside the risers you have to put on the harness, then the rescue is hiding the leg straps, there is a risk to forget them.
<b>The harness is always disconnected from glider</b>	proper use	ok	proper use
<b>Installing/removing the rescue</b>	complicated	A bit easier but you need tools (for ex. pliers)	immediate
<b>Harness transfer to another harness</b>	very complicated, the rescue has to be fitted in a container... or install the reserve in the new harness	You need the other harness feature connection points on the shoulders otherwise you need to modify the way the risers exit the container	immediate
<b>Practical to use on take off</b>	Fine, the reserve and container are integrated in the harness	The rescue hangs on one side, the handling is not pleasant. Be careful not to catch the handle.	Perfect. Follow this procedure : 1 /connect the harness, check /2 connect the rescue /3 risers /4 speed bar
<b>Interaction with speed bar</b>	no problem	Be careful to put the speed bar inside of the rescue risers!	No problem
<b>Pins'checking</b>	You have to do it before putting on the harness, after it is more complicated	Possible at any time	Possible at any time
<b>Special feature</b>	no	no	Connect the karabiner, wire gate outside. Be aware of a bad installation to the container strap instead of the riser
<b>Can you see the handle in flight?</b>	complicated	obvious	obvious
<b>Can you see if the handle is disconnected?</b>	sometimes impossible	yes	yes
<b>Can you throw the rescue with both hands?</b>	no	yes	yes
<b>Can you throw the rescue on both sides?</b>	not recommended	not recommended	yes
<b>In case of centrifugation, how can you reach the handle?</b>	difficult	easy	easy
<b>Impact of G forces on harness deformation and rescue deployment</b>	important	no	no
<b>Body position when the rescue is deployed</b>	standing up, rescue behind, wing in the front	Standing up, rescue behind, wing in the front	sitting, rescue in the front, wing behind with a half twist
<b>How to neutralize the glider?</b>	If there is no twist, the rear risers are directly reachable	If there is no twist, the rear risers are directly reachable	It is recommended to neutralize the wing immediately with the brakes
<b>Body position when the glider is impossible to neutralize (mirror effect)</b>	Lying on the back, standing up is virtually impossible	Lying on the back, standing up is virtually impossible	sitting, risers in front of the eyes, you can grab the risers to stand up and soften the impact
<b>Body position when the rescue is twisted</b>	The head is stucked downwards, reacting is impossible	The head is stucked downwards, reacting is impossible	Sitting, risers in front of the eyes, you can grab the risers to stand up and soften the impact
<b>If main karabiners break</b>	The rescue karabiners will take over	The rescue karabiners will take over	One broken karabiner: the rescue works but the position of the pilot is tricky. 2 broken karabiners: fatal accident. Installing a double karabiners system? The connection straps of the harness could come apart in case of mirror effect (resistance not tested)
<b>position if hanged after landing ( in the trees, cliff)</b>	Body standing up. Might be uncomfortable in case of long wait, also if reserve twisted and pushes head down, difficult to move	Body standing up. Might be uncomfortable in case of long wait, also if reserve twisted and pushes head down, difficult to move	sitting in the harness, comfortable to wait rescue, upper body free to work.
<b>Installing the rescue</b>	It stays in the harness, karabiners are tighten and installed once and for all; for the rescue steel Quick Link (Péguet) are recommended	It stays in the harness, karabiners are tighten and installed once and for all; for the rescue steel Quick Link (Péguet) are recommended	Karabiner, wire gate outside

### 5.5.6 Harness dimensions

The test pilot (and the passenger when testing in two-seater configuration) shall use a harness with a perpendicular distance from the harness attachment points (bottom of the carabiners as shown in Figure 3, measured from connector centrelines) to the seat board top surface as shown in figure 4 depending on the total weight in flight as shown in Table 48.

The horizontal distance between the harness attachment points (measured between connector centrelines) shall be set depending on the total weight in flight as shown in Figure 5 and Table 48.

When testing in two-seater configuration the horizontal dimension of the passenger's harness is set to the same width as the pilot's harness.

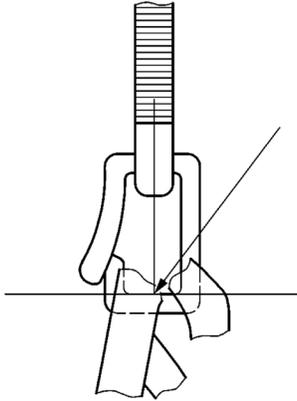


Figure 3 — Harness upper measuring point

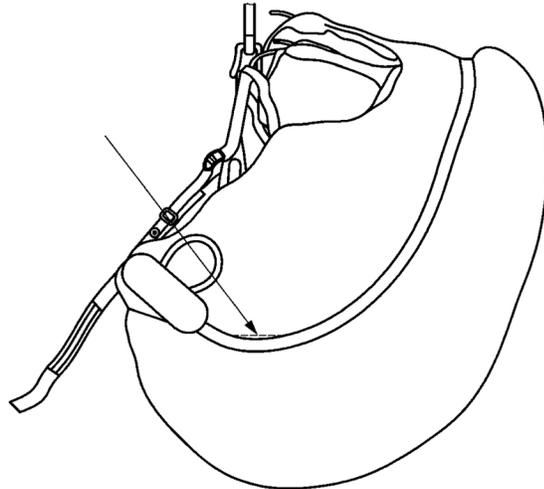


Figure 4 — Harness lower measuring point

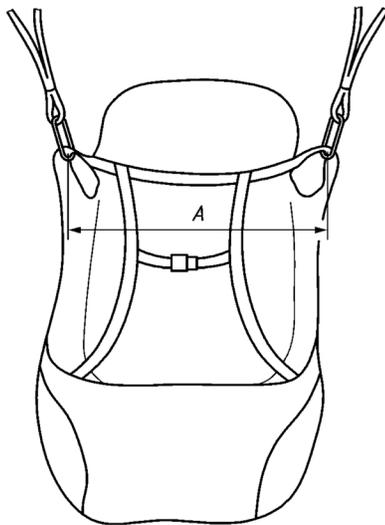


Figure 5 — Width of harness attachment points

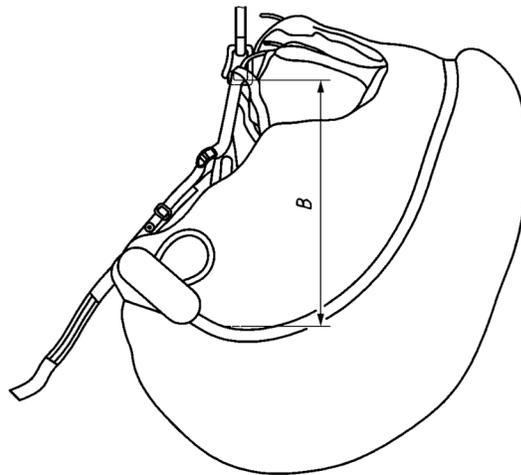


Figure 6 — Height of harness attachment points

Table 48 — Total weight in flight

TWF ( total weight in flight)	< 80 kg	80 kg-100 kg	> 100 kg
Width (Measurement A on Figure 5)	(40 ±2) cm	(44 ±2) cm	(48 ±2) cm
Height (Measurement B on Figure 6)	(40 ±1) cm	(42 ±1) cm	(44 ±1) cm

### 5.5.8 Sitting position

Unless the test procedure states otherwise, the test pilot should adopt a normal upright sitting position with his feet perpendicularly below his knees.

## Unit N°2

# *Aerodynamics, flight mechanics, piloting*

**Aerodynamics:** effects of a fluid stream on an object

**Flight mechanics:** effects of the forces on a trajectory

### 1. PRELIMINARIES

- ✓ Vectors
- ✓ Pressure
- ✓ Stream on an object, Cx

### 2. AERODYNAMICS

How does a paraglider fly, common misconceptions.

#### A. The profile

- ✓ Forces and application point
  - Aerodynamic forces
  - Pressure point
  - Lift and drag
- ✓ Angle of attack variation and limits
  - Collapse
  - Stall

#### B. The wing

- ✓ Reality of air circulation around the wing, induced drag
- ✓ Total drag and glider polar

#### C. The complete paraglider

- ✓ When in equilibrium
  - Global balance pilot/wing
  - Attitude, glide angle
  - Balance: lift / drag
  - Numeric evaluation of drag
  - Load factor and consequences

- ✓ Transitory movements
  - Pendulum effect
  - Migration of pressure point
    - Profile stability and instability
    - What's happening when you «brake»: 2 cases
  - Inertia and damping
- ✓ Rain and profile
- ✓ Wind gradient

### 3. FLIGHT MECHANICS

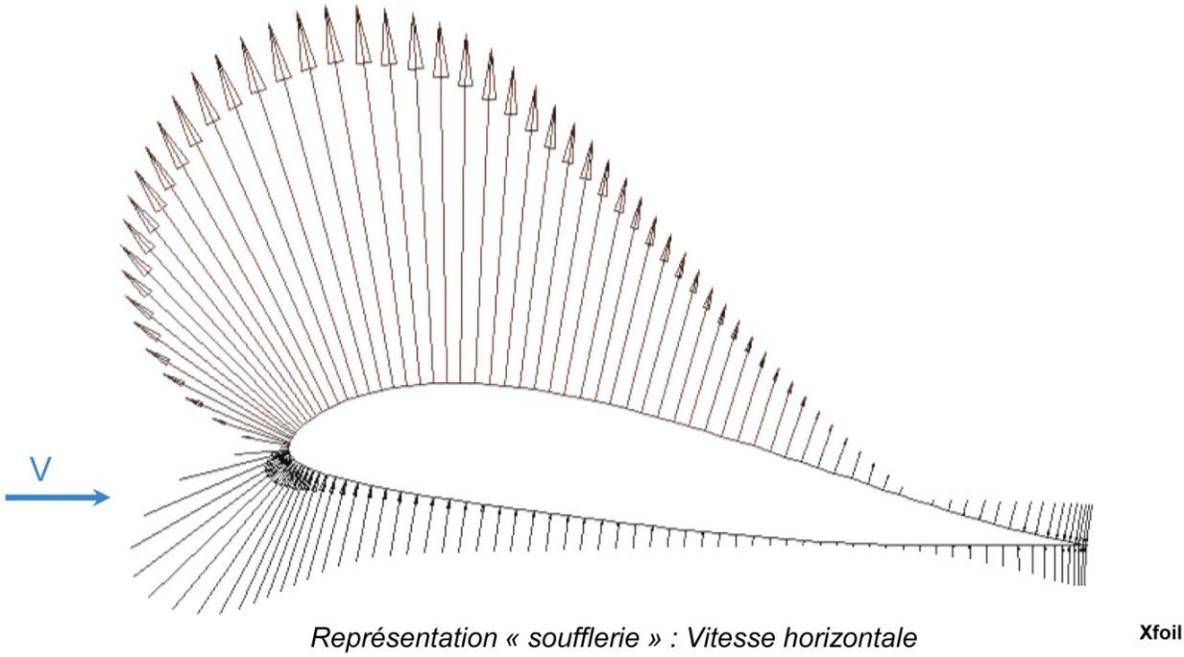
- ✓ The pitch
- ✓ How does a paraglider turn?

### 4. PILOTING

- ✓ What is piloting?
  - Aerodynamic and pendulum movements
  - Pitch piloting, generate, damp, stop
  - Roll movement, generate and damp
  - Piloting skills
- ✓ Piloting mistakes
  - Over piloting
  - Under piloting
  - Wrongly timed piloting
- ✓ S.I.V.
  - How to pilot classic incidents
  - Asymmetrical collapse
  - Cravate
  - Symmetrical collapse
  - Stall
  - Spin
  - Spiral
  - Cascade
  - Spiral neutrality

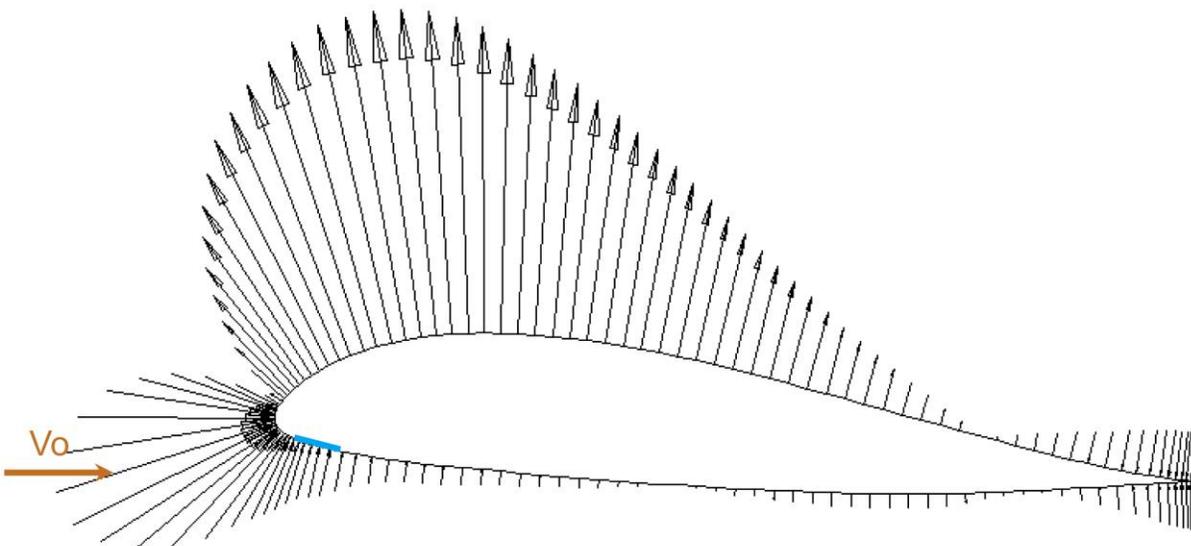
Incidence  $7^\circ$   
 $C_z = 0.93$   
 $C_x = 0.013$

• Typique de l'incidence du vol « bras haut »



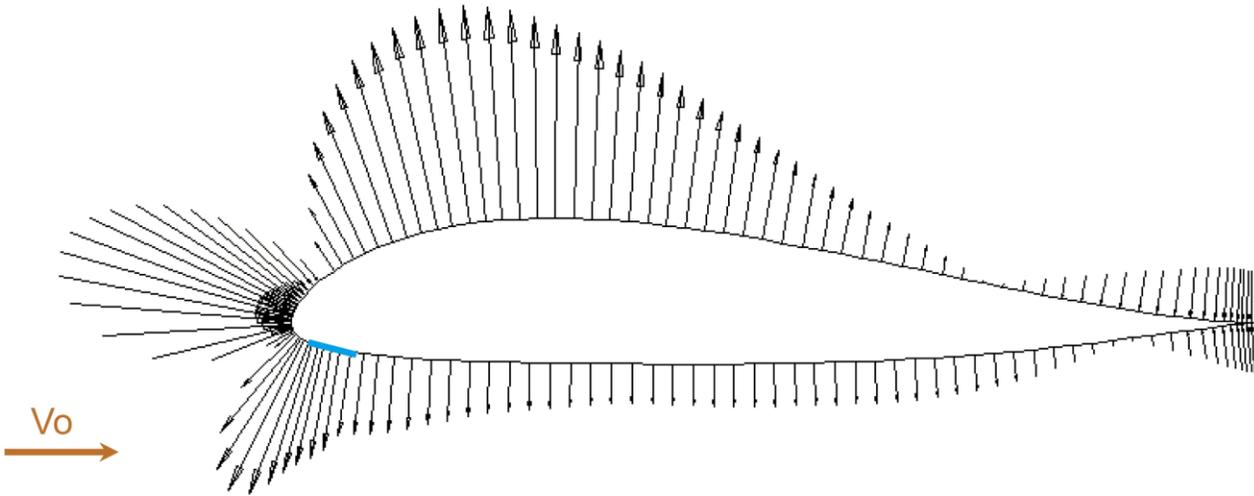
Incidence  $4^\circ$   
 $C_z = 0.59$   
 $C_x = 0.011$

• Typique de l'incidence du vol accéléré  
• La pression du point d'arrêt remonte sur le BA  
• L'entrée d'air reste en légère surpression



Incidence  $0^\circ$   
 $C_z = 0.13$   
 $C_x = 0.008$

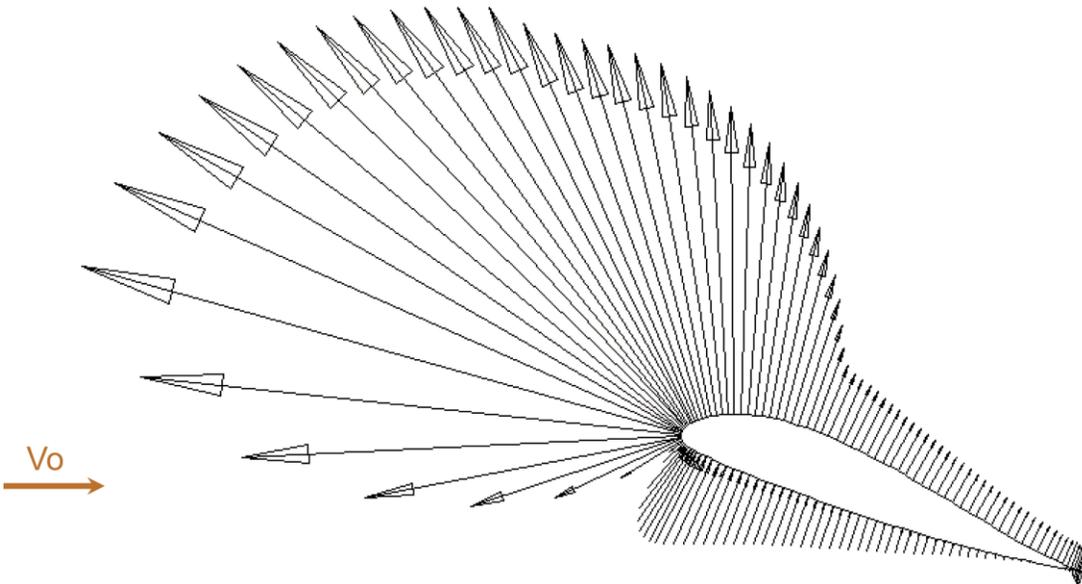
- Typique de l'incidence de fermeture (frontale, asym.)
- L'intrados du BA est en dépression : vidage

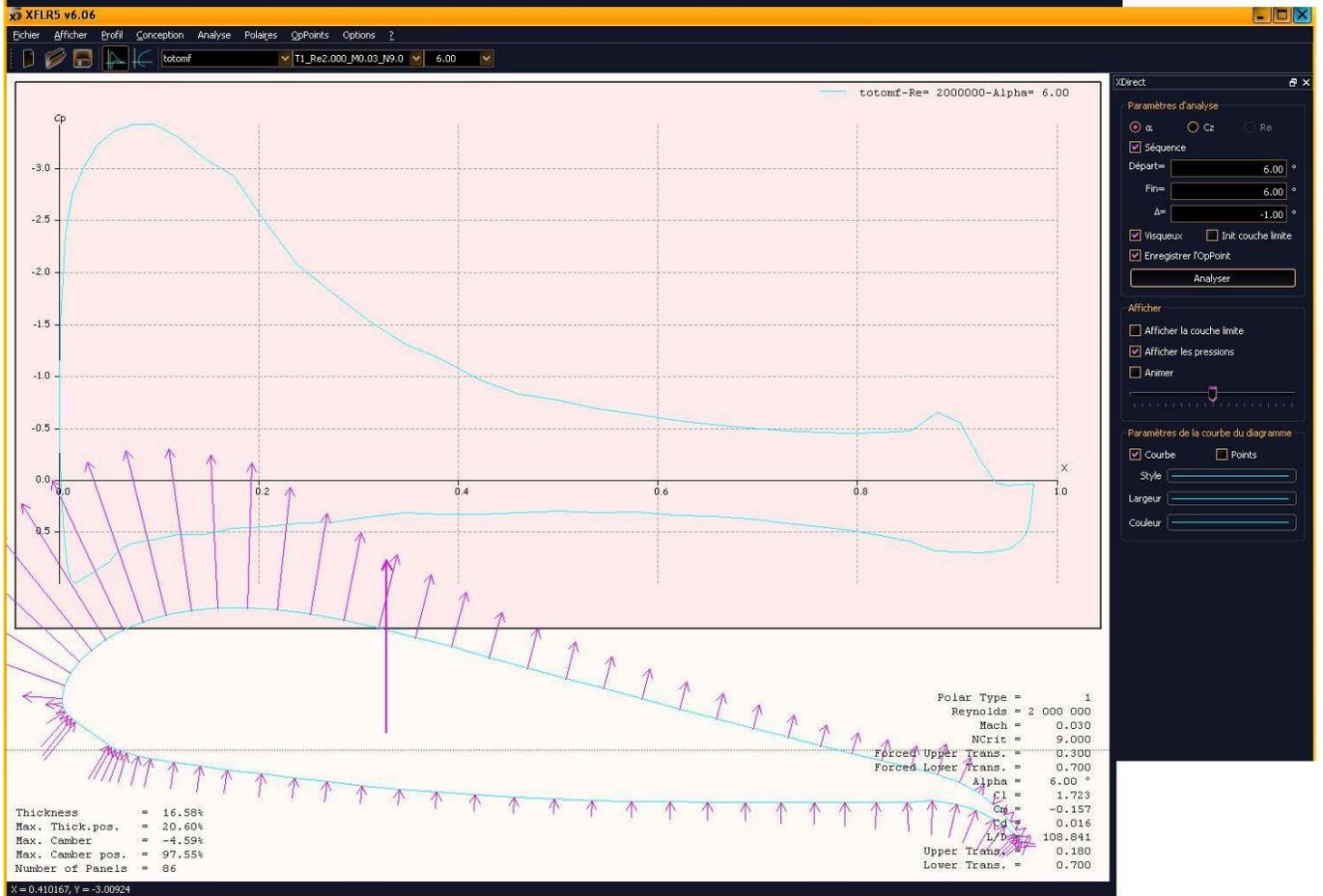
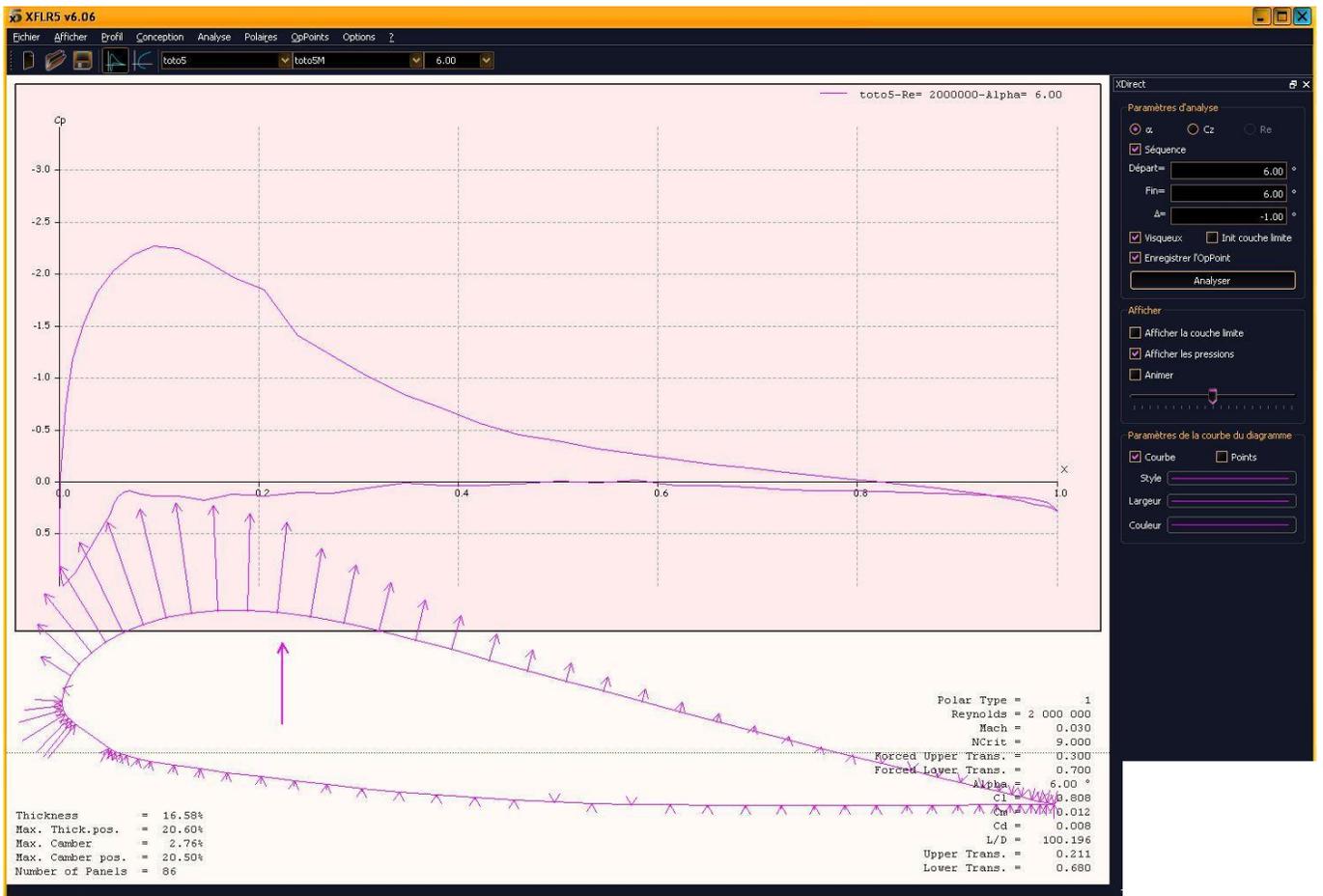


Incidence  $19^\circ$   
 $C_z = 1.46$   
 $C_x = 0.096$

**Typique de la sortie de phase parachutale**

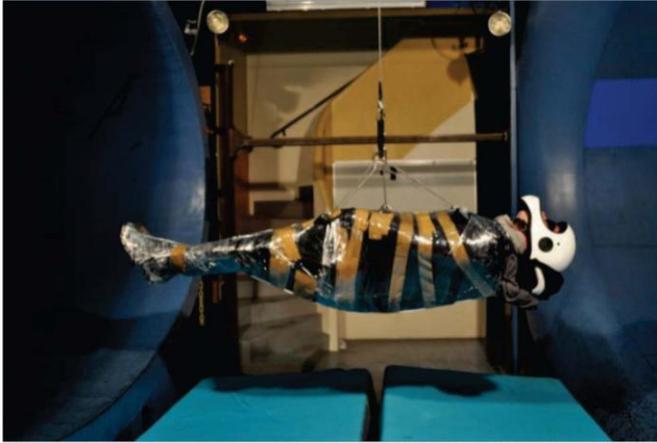
- Incidence importante, succion du BA
- Le Coefficient de portance diminue peu
- Le Coefficient de traînée double





# Fourchette de valeurs Scx

- Faible :  $SCx=0.08$



- Importante :  $SCx=0.44$



# Sellette Simple / Elaborée

- $SCx = 0.164$  à 14 m/s



- $SCx = 0.128$  à 14 m/s



- $SCx = 0.242$  à 14 m/s



- $SCx = 0.198$  à 14 m/s



Moniteurs

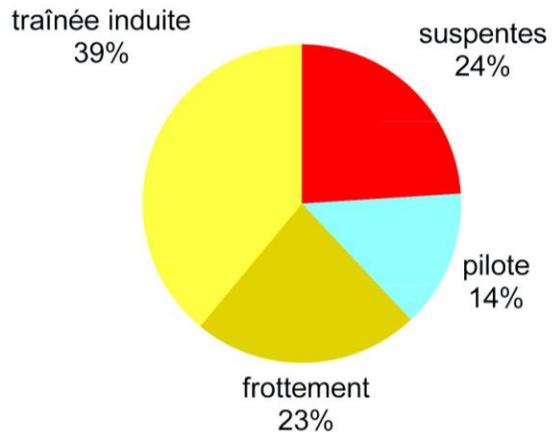
rvé Belloc -

76

## Bilan de Traînée du Parapente Complet

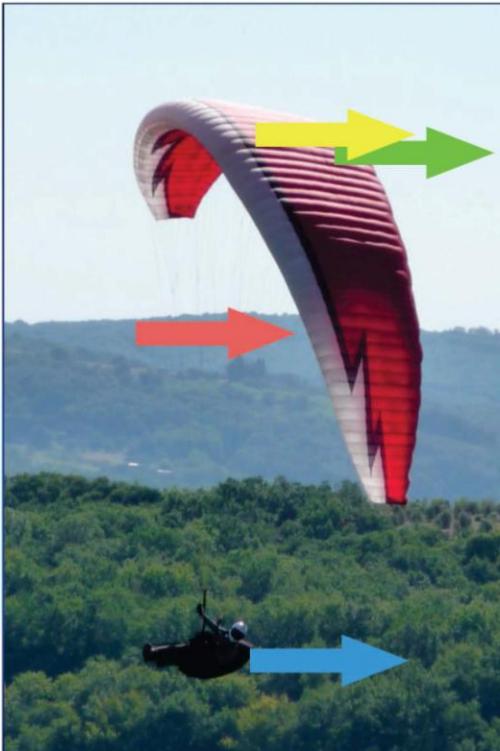


PTV : 90 kg  
 Finesse : 9  
 Vitesse : 10 m/s  
 Rx : 9,7 daN

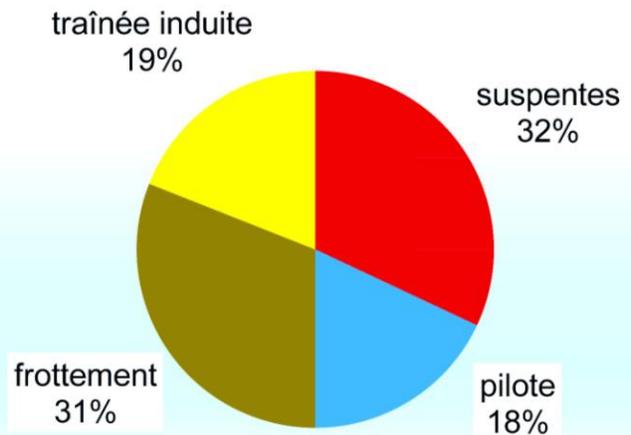


*Valable avec cocon et voile non accélérée*

## Bilan de Traînée du Parapente Complet



PTV : 90 kg  
 Finesse : 7.3  
 Vitesse : 13 m/s  
 Rx : 12 daN



*Valable avec cocon et voile accélérée*

**Unit n°3:**  
***Meteorology and aerology***  
***Human factors***  
***Performance***  
***Airspace***  
***Environment- free flight authority***

**1. METEOROLOGY AND AEROLOGY**

**A. Global scale: meteorology**

- ✓ Global circulations, pressure systems

**B. Local scale: aerology**

- ✓ Breezes
- ✓ Obstacles effects
- ✓ Thermals
- ✓ Convergences

**C. Weather forecasting**

- ✓ Global forecasting tools, the models
- ✓ Local forecasting tools
- ✓ Stability and instability, the sounding
- ✓ Dangerous phenomenon

**2. Human factors, security**

**A. Safety**

- ✓ introduction, 3 simples rules
- ✓ Risk homeostasis
- ✓ what is the definition of the risk?
- ✓ Conclusion, the 3 levels

## **B. Psychological aspects of paragliding**

- ✓ Three stages of stress
- ✓ Coping: four strategies
- ✓ Three times to deal with the stress
- ✓ Four stress factors
- ✓ Two tools

## **C. Risk management**

- ✓ Accident causes
- ✓ Avoid accidents
  - typical risky situations
- ✓ what to do in case of accident

## **3. PERFORMANCE FLYING**

- ✓ Drift and strategy
- ✓ Wing polar best air glide, best ground glide
- ✓ Flying fast. Why, how.
- ✓ Transition strategy
  - Best glide strategy
  - MacCready strategy, what it is and how we can use it
  - Which one to use and in what situation

## **4. AIRSPACES**

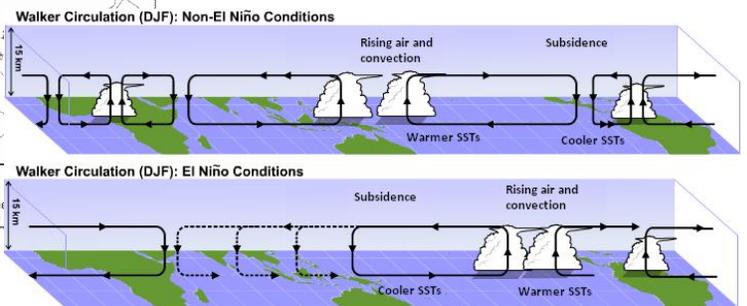
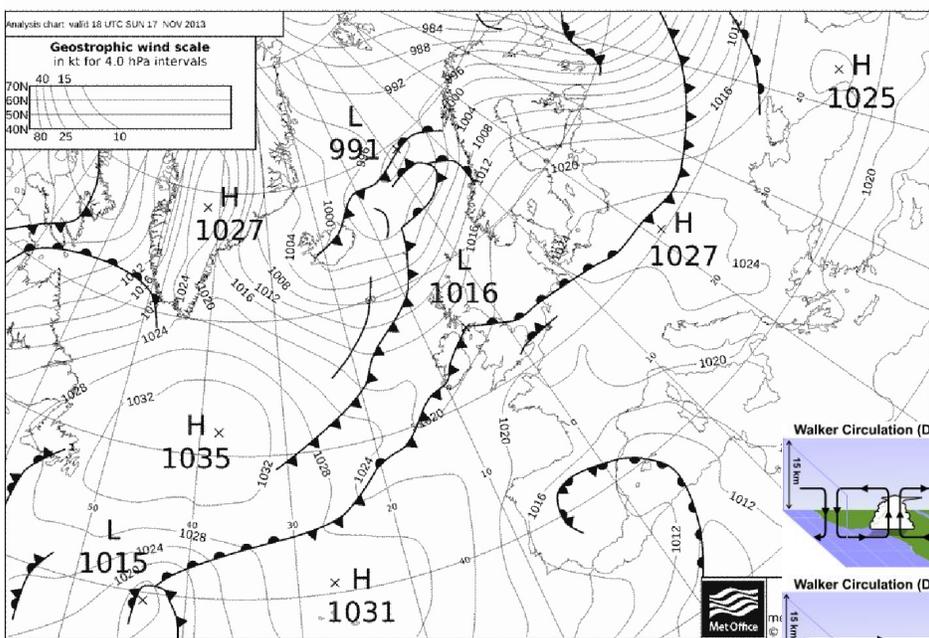
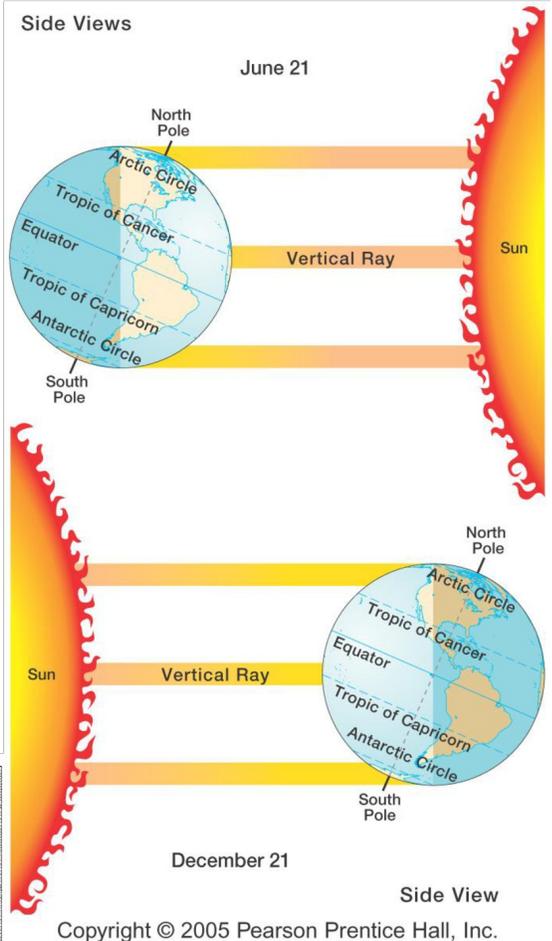
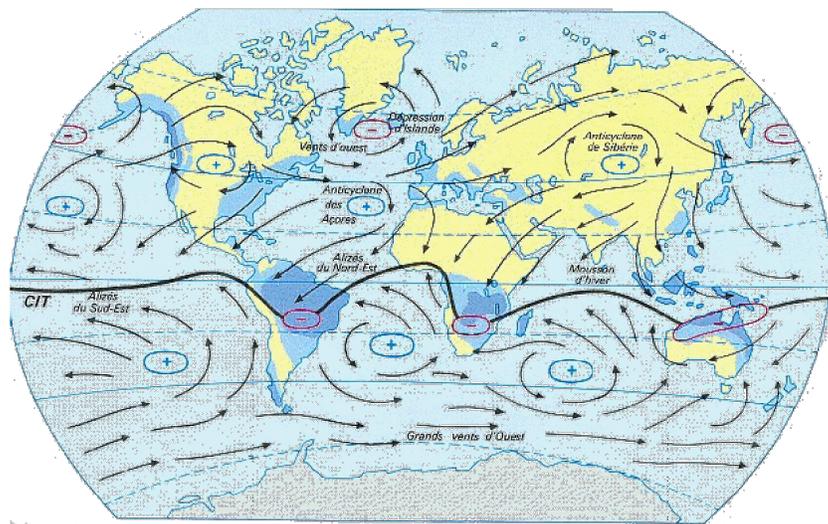
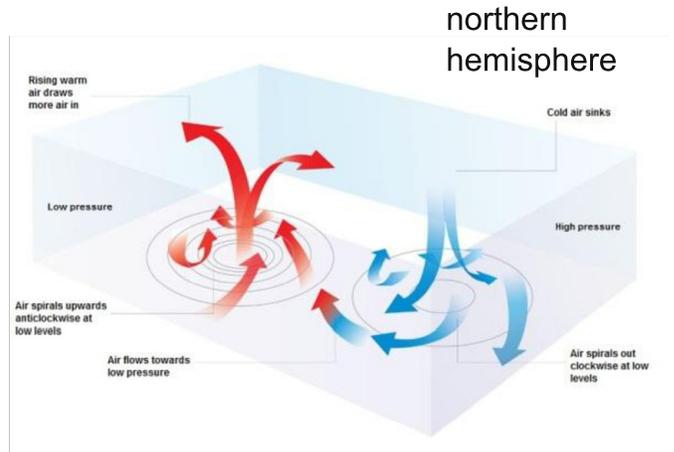
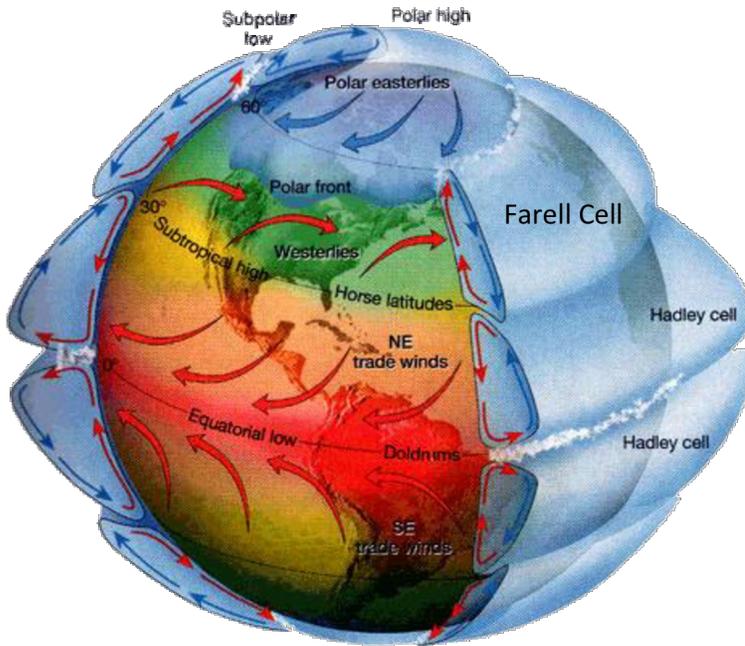
- ✓ Airspaces CTR TMA AWY..., NOTAM
- ✓ Rules

## **5. ENVIRONMENT**

- ✓ Personal attitude, community

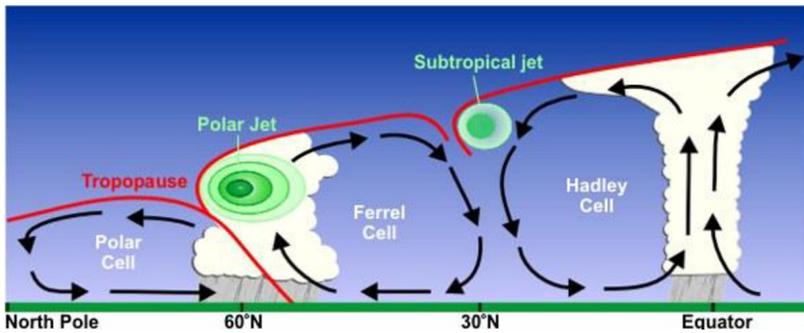
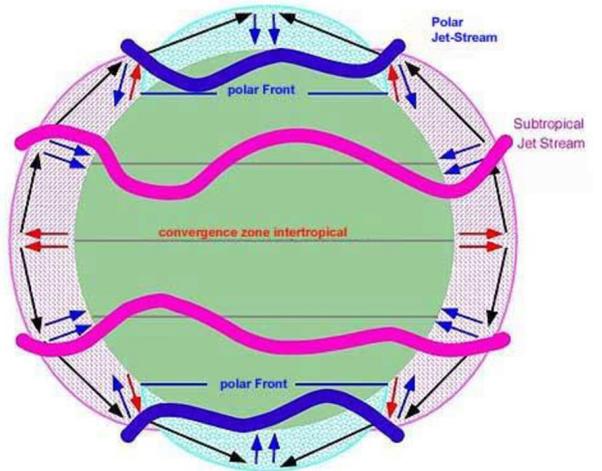
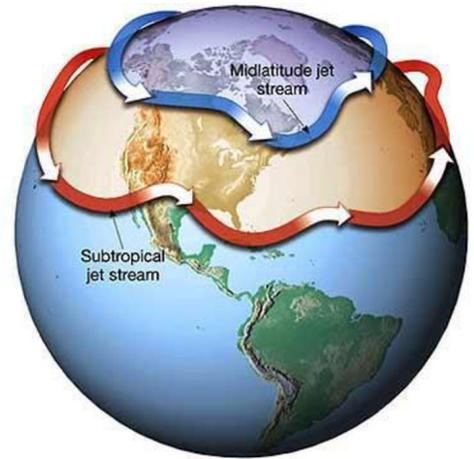
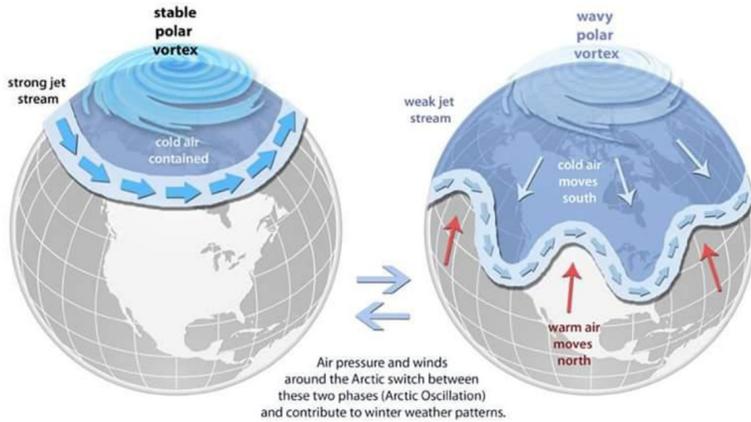
## **6. FREE FLYING AND AUTHORITIES**

- ✓ Free flight history and philosophy
- ✓ Civil Aviation, FAI - CIVL, EHPU, Federation and club, APPI



# The Science Behind the Polar Vortex

The polar vortex is a large area of low pressure and cold air surrounding the Earth's North and South poles. The term vortex refers to the counter-clockwise flow of air that helps keep the colder air close to the poles (left globe). Often during winter in the Northern Hemisphere, the polar vortex will become less stable and expand, sending cold Arctic air southward over the United States with the jet stream (right globe). The polar vortex is nothing new — in fact, it's thought that the term first appeared in an 1853 issue of E. Littell's *Living Age*.



## Alpines Pumpen

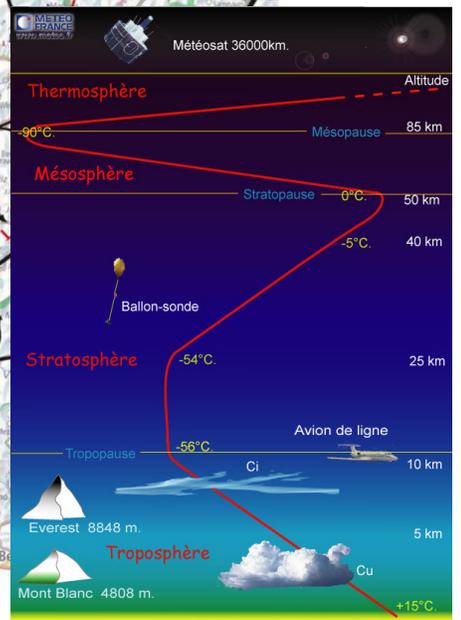
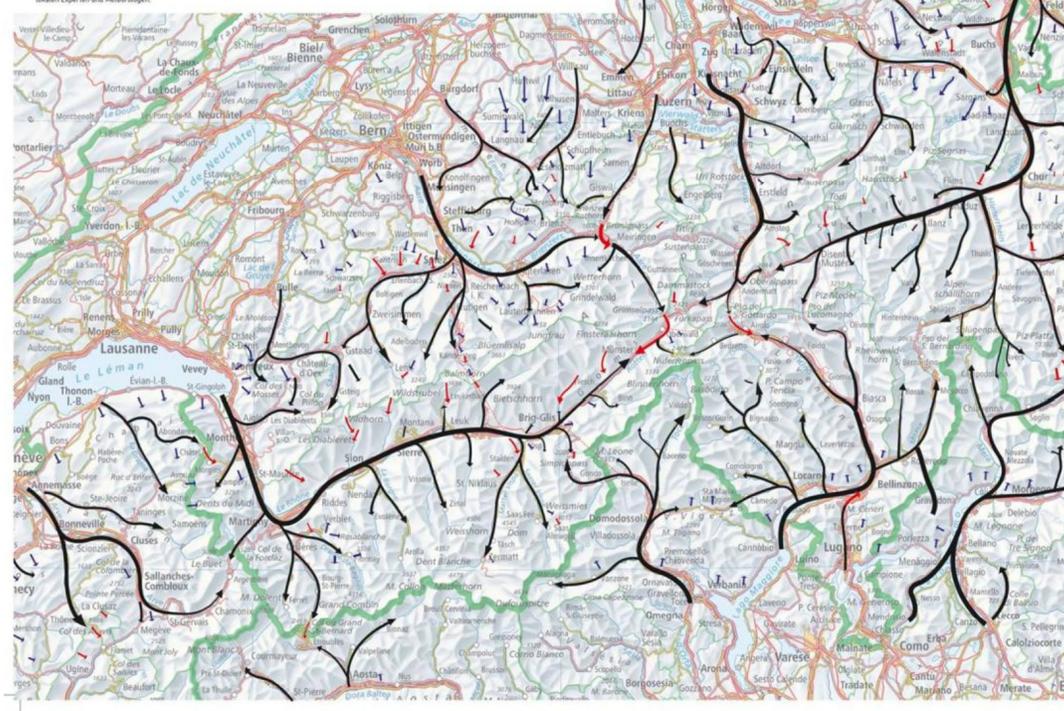
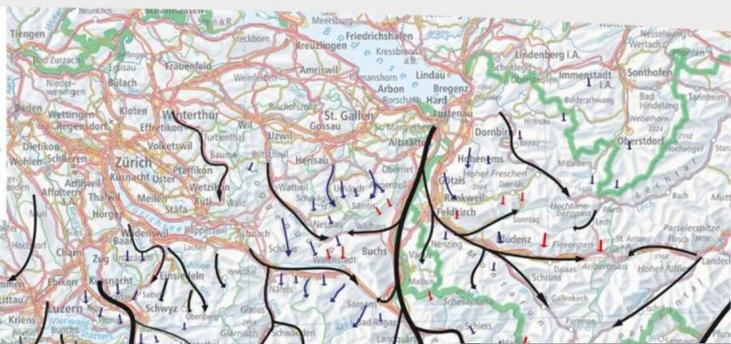
Auf der Karte stellen die Pfeile die Windrichtung an einem ansonsten windstillen Tag, nachmittags und im Hochsommer aufgezeigt werden. Die eingezeichneten Winde entstanden also in erster Linie durch das Alpine Pumpen. Es ist jedoch unmöglich, jedes Winchen zu erklären, diese Winde kann nur einen Überblick über die durch das Alpine Pumpen verursachten Winde verschaffen.

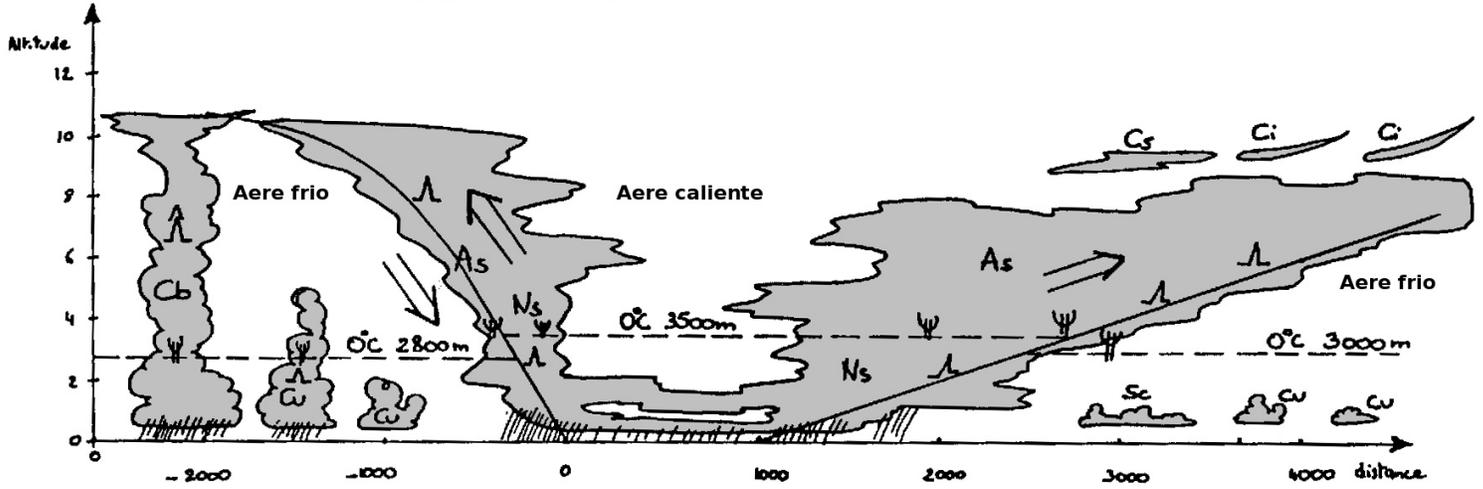
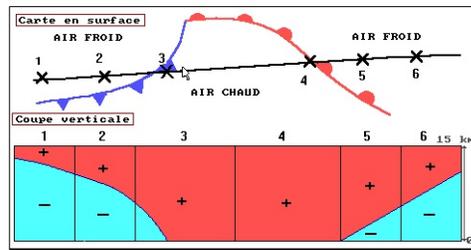
- Die als normale Talwinde fließenden Ausgleichsströmungen.
  - Durch das Alpine Pumpen entstehende Aufwindbereiche.
  - Abwindzonen, also Winde die über Berge und Pässe wehen, die durch das Alpine Pumpen entstehen.
- Verändern sich die großräumigen Druckverhältnisse, überlagern diese die eingezeichneten Strömungen.  
So werden z. B. die Pässe Savetsch, Ravil, Gemmi und Lütchepass, sowie auch die Pässe in die Survelina bei Stübliwind nicht mehr überflutet.  
Bei der Grimsel jedoch nicht mehr überflutet, braucht es schon binnahe Föhn.  
Die Angaben basieren auf Informationen von erfahrenen Streckenfliegern, lokalen Experten und Meteorologen.

## Pumping alpin

Cette carte indique l'influence du vent au cours d'une journée par ailleurs sans vent, un après-midi au cœur de l'été. Les vents indiqués sont donc essentiellement générés par le pumping alpin. Il est cependant impossible de saisir tous les petits courants d'air; la carte ne peut que donner un aperçu des vents généraux par le pumping alpin.

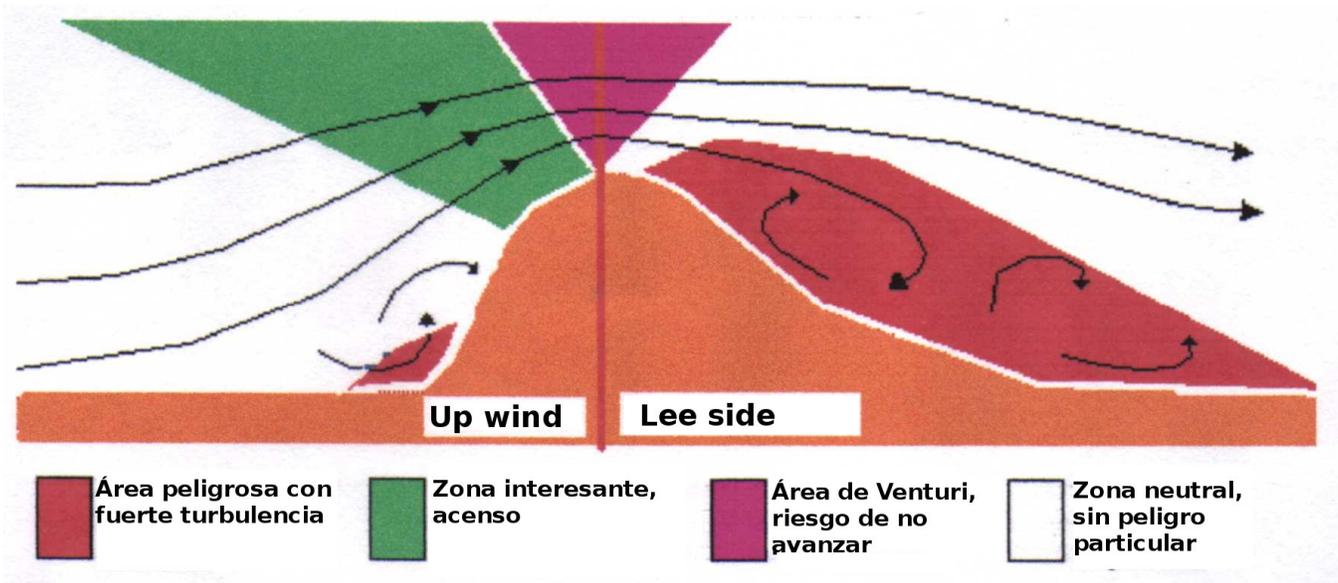
- Courant compensatoire s'écoulant sous forme de vent de vallée normal.
  - Zones de vent descendant, ou vents passant par-dessus les montagnes et les cols, générées par le pumping alpin.
  - Zones de vent descendant, ou vents passant par-dessus les cols du Sämi, du Ravil, de la Gemmi et du Lütchen ainsi que les cols vers la Survelina, p. ex., ne sont plus battus en cas de surpression au sud. Mais pour que le vent ne passe plus par-dessus la Grimsel, il faut quasiment que le föhn souffle.
- Ces données se basent sur les informations fournies par des pilotes de distance expérimentés, des experts locaux et des météorologues.

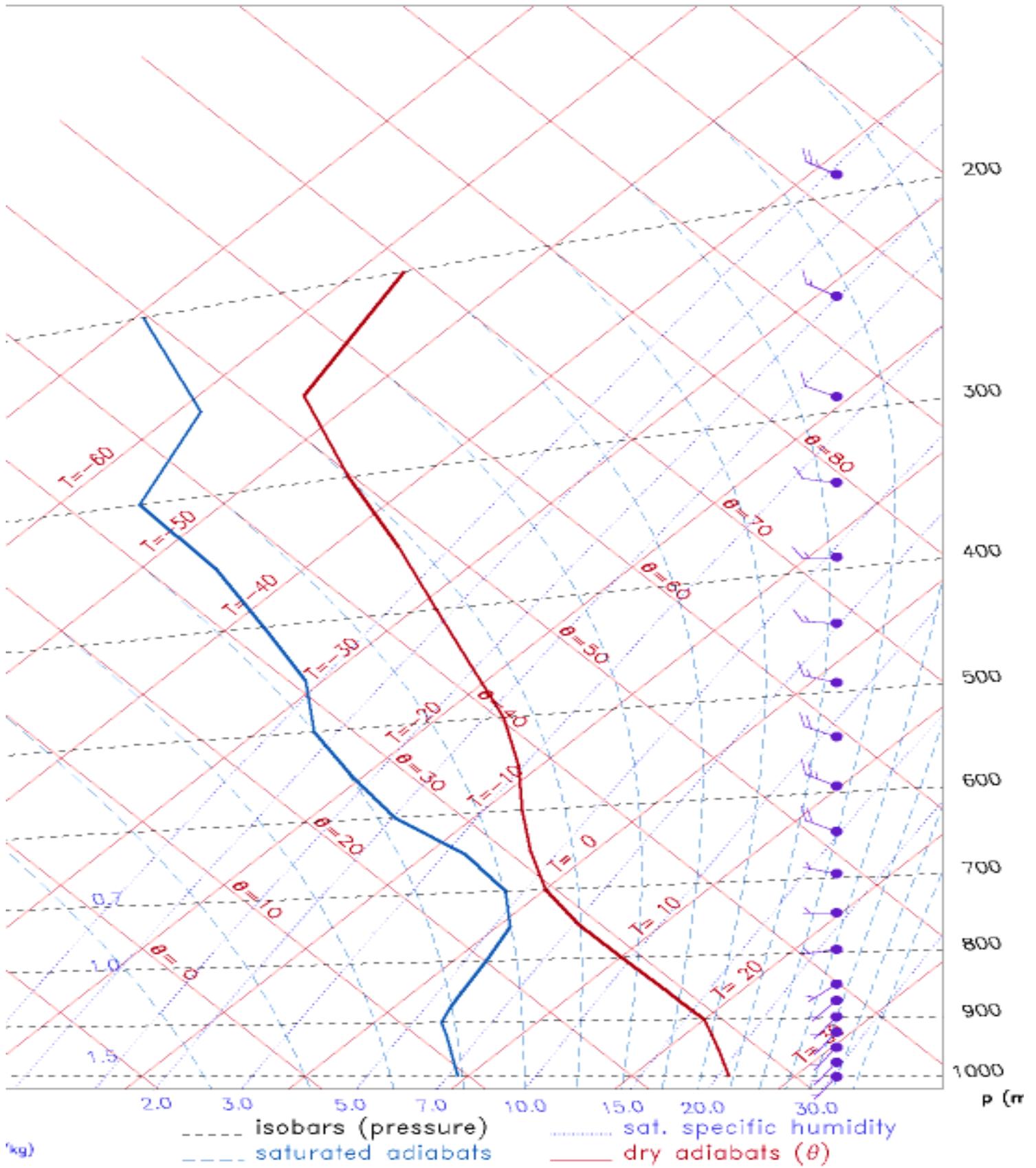




Las precipitaciones	aguacero	Lluvia Pesada	llovizna	Lluvia Pesada	Comenzando a llover	no Lluvia
Las nubes	Variando, tipo Cu o Cb	Bajo techo, cielo oscuro, NS and As	Cielo gris con estratos	Bajos y oscuros, nimbostratos	Cielo cubierto completamente, altoestratos and estratocúmulos	Nubes altas, cirrus más densos
Temperatura		bajando	estático	subiendo		
Viento	Norte Oeste	Cambio de Oeste a Norte Oeste enderezando	Oeste regular	Sur Oeste cambiando a Oeste	Sur Oeste	
Presión		sube	estático	Cae rápido	bajando	bajando
Visibilidad	Muy buena	Mala durante precipitación	Mala o pobre	Mala durante precipitación	Promedia	Promedia

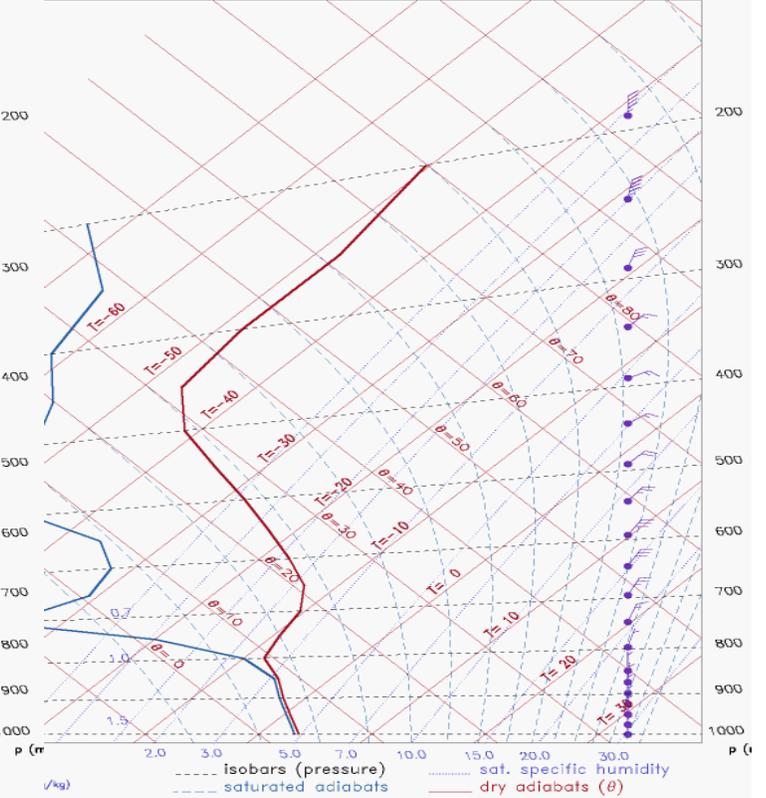
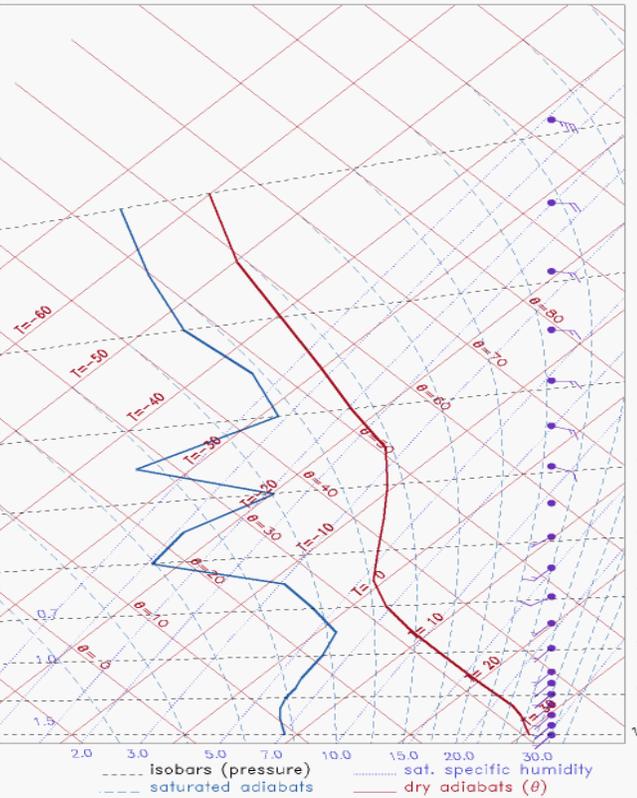
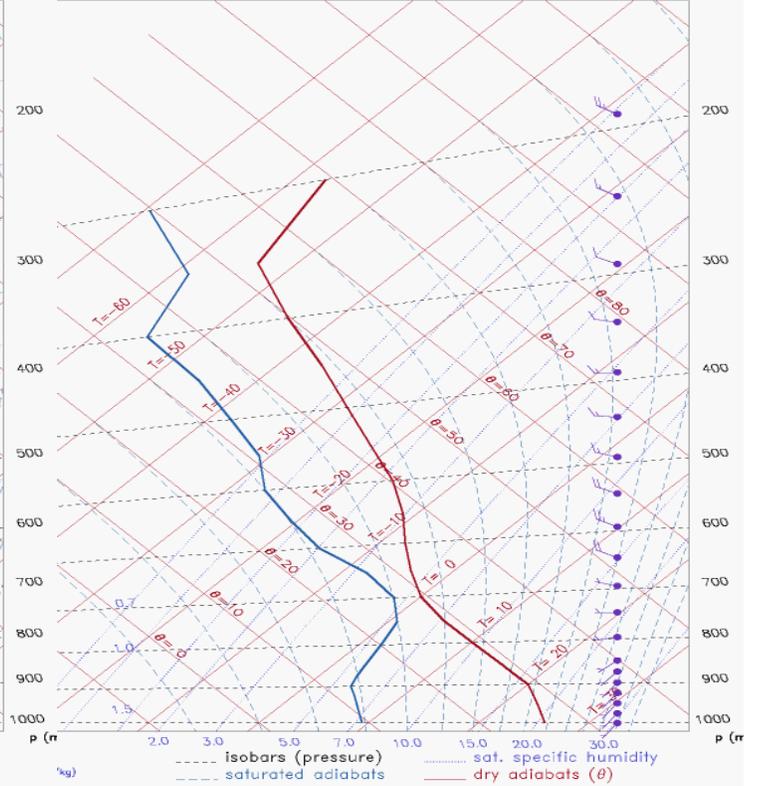
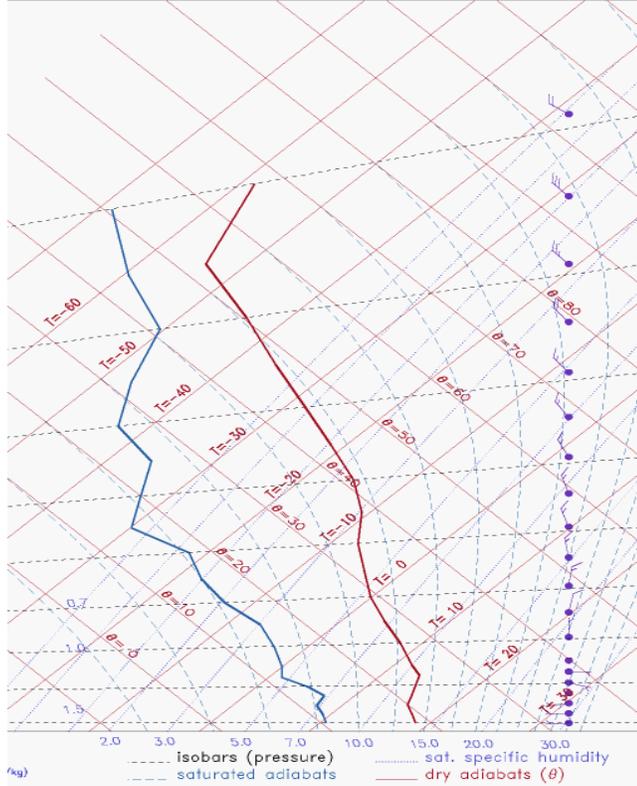
A medida que la perturbación se mueve de izquierda a derecha, en el punto de vista de un observador la tabla debe ser mirado de derecha a izquierda.

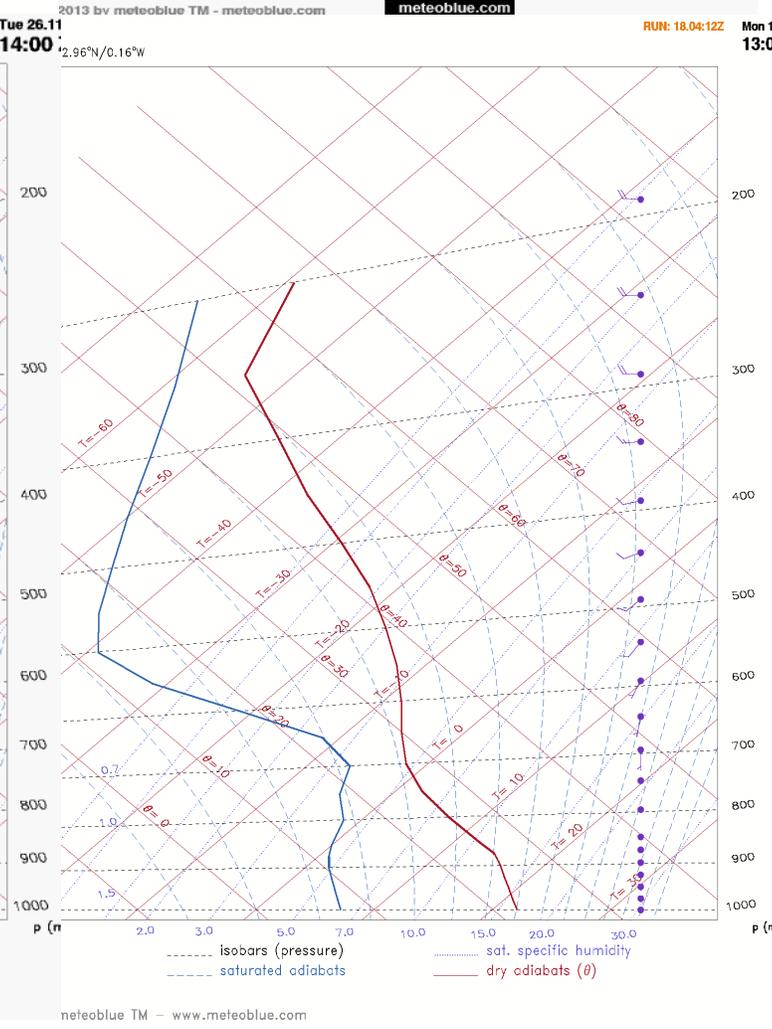
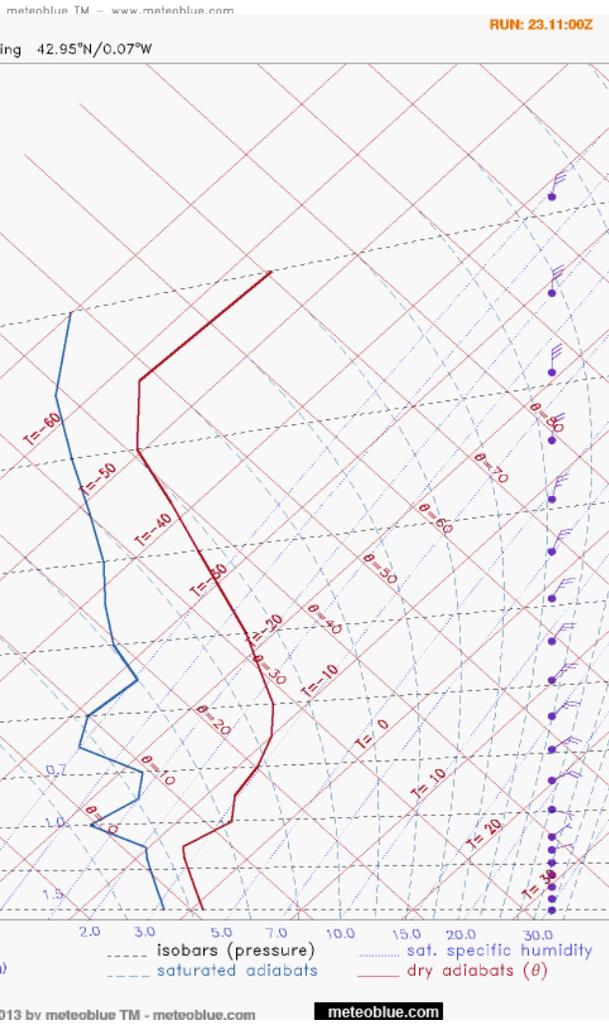
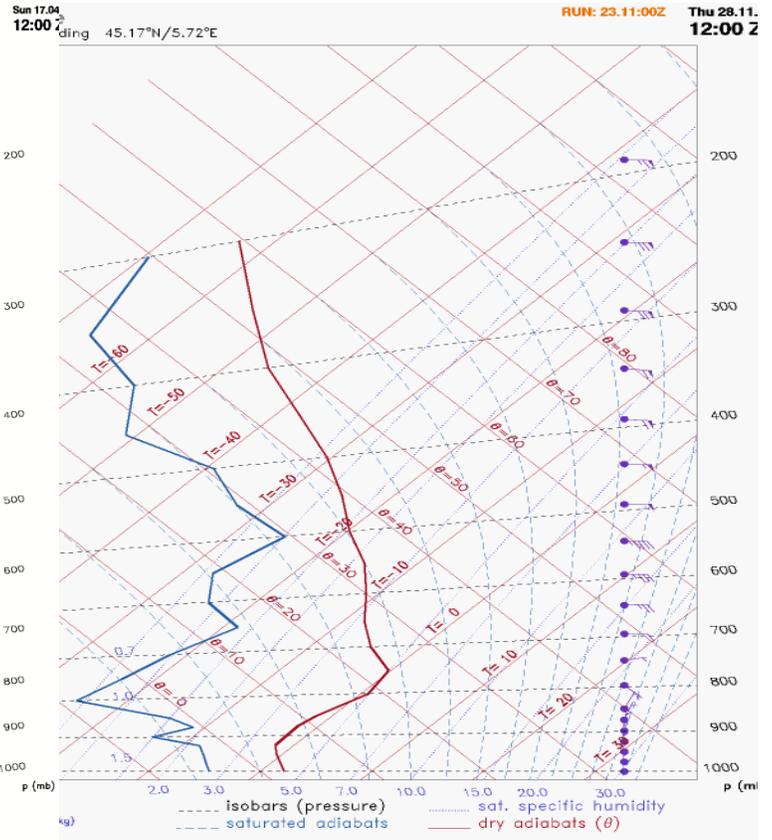
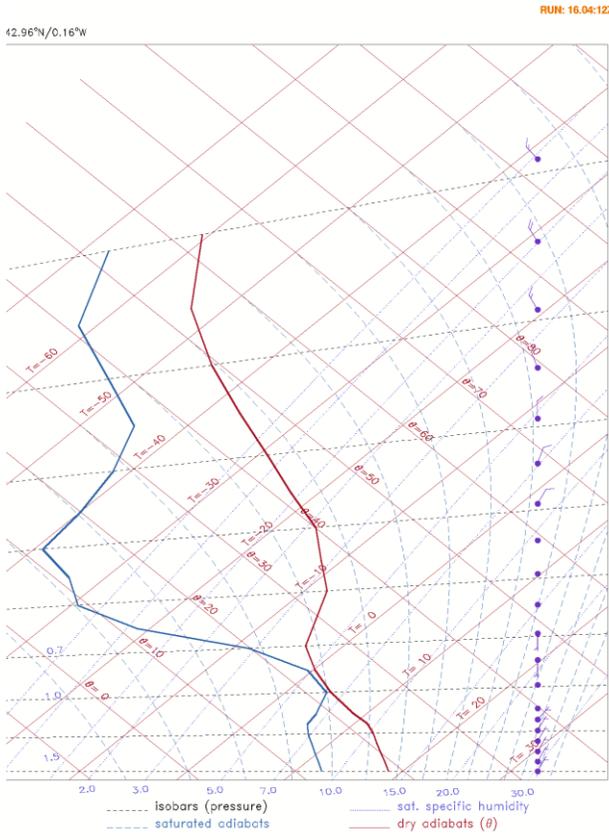




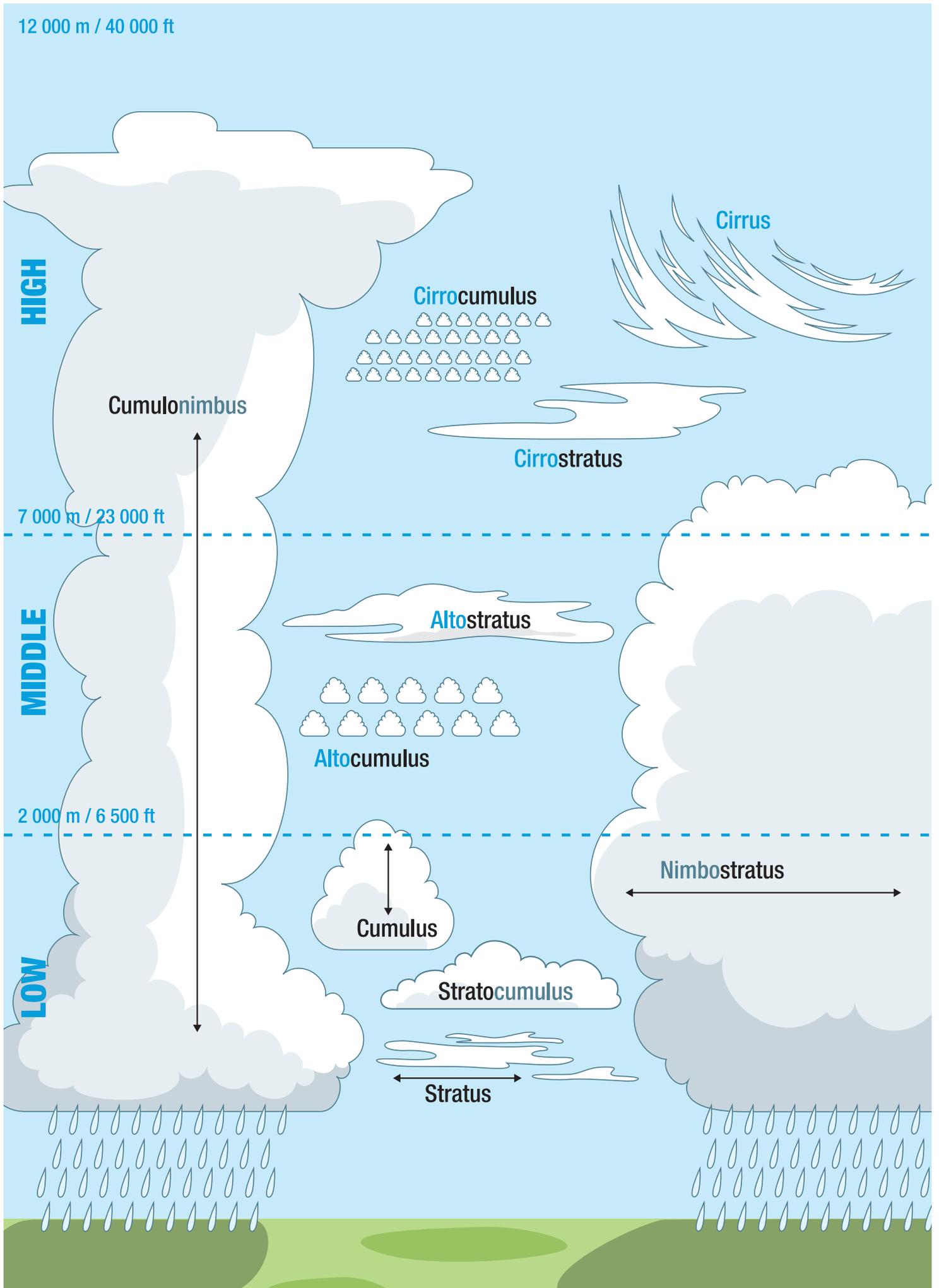
kg)

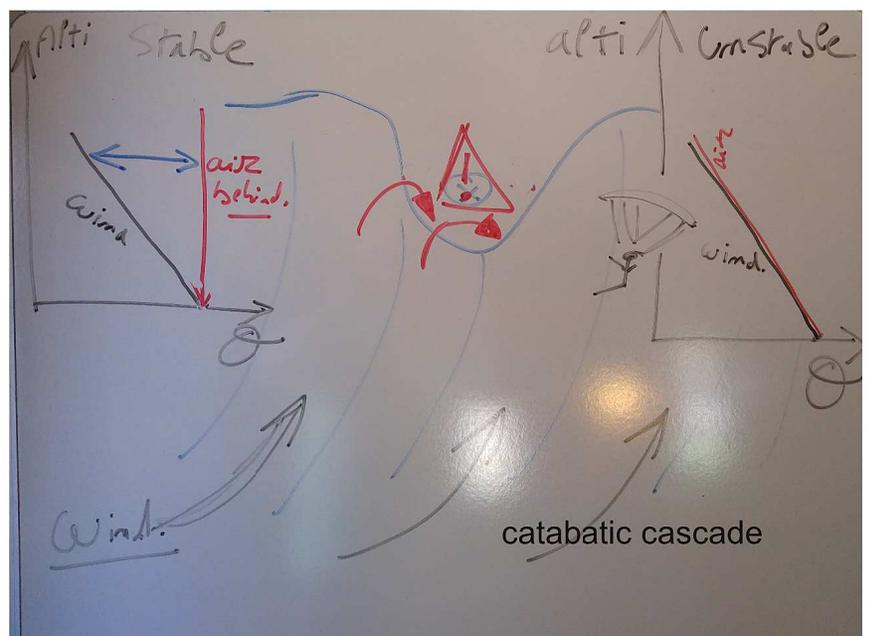
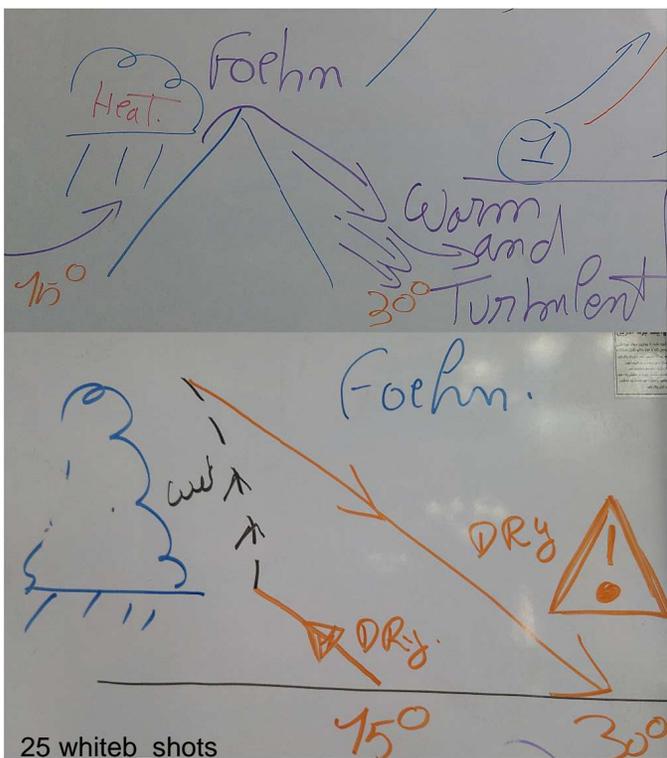
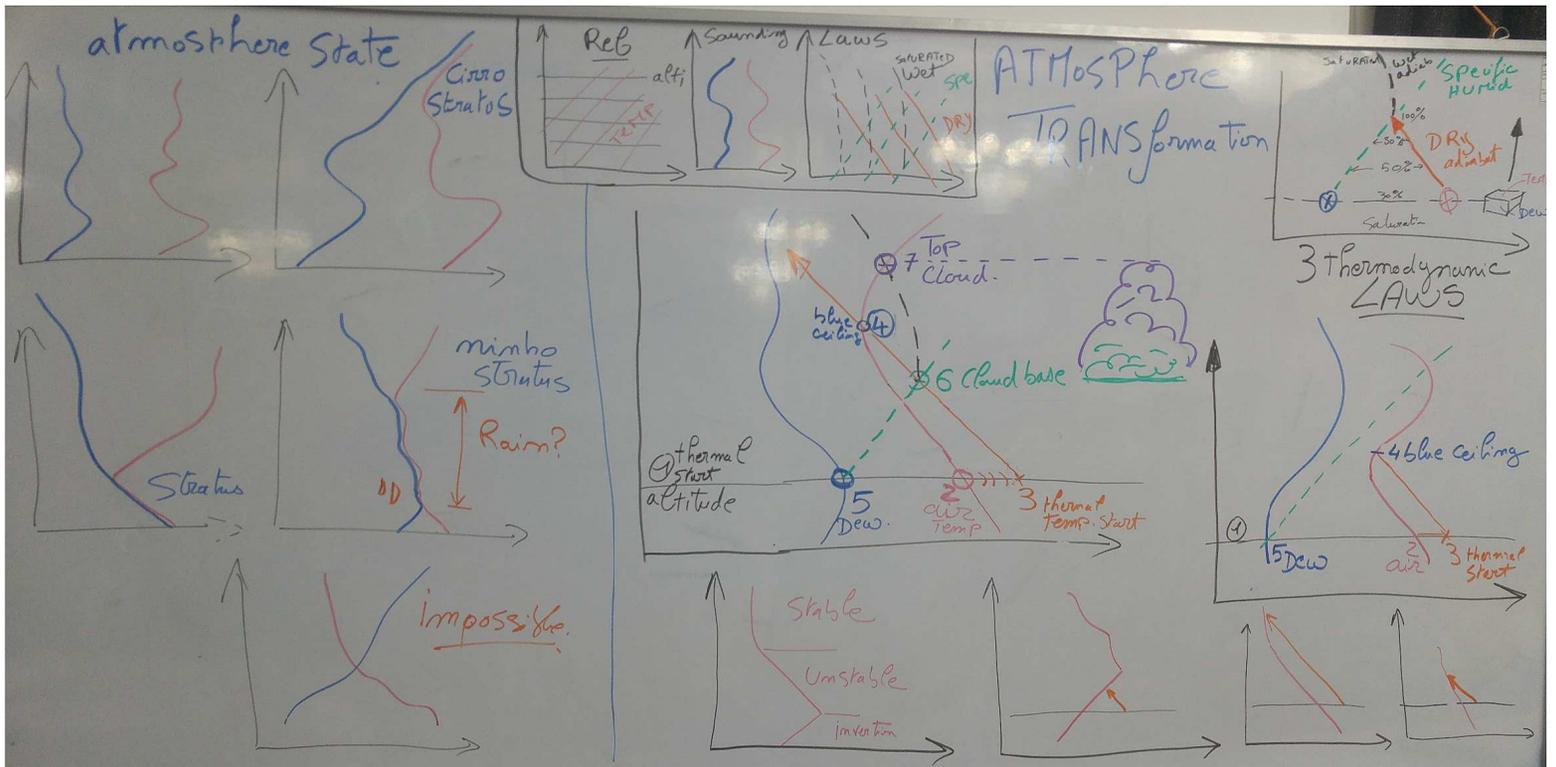
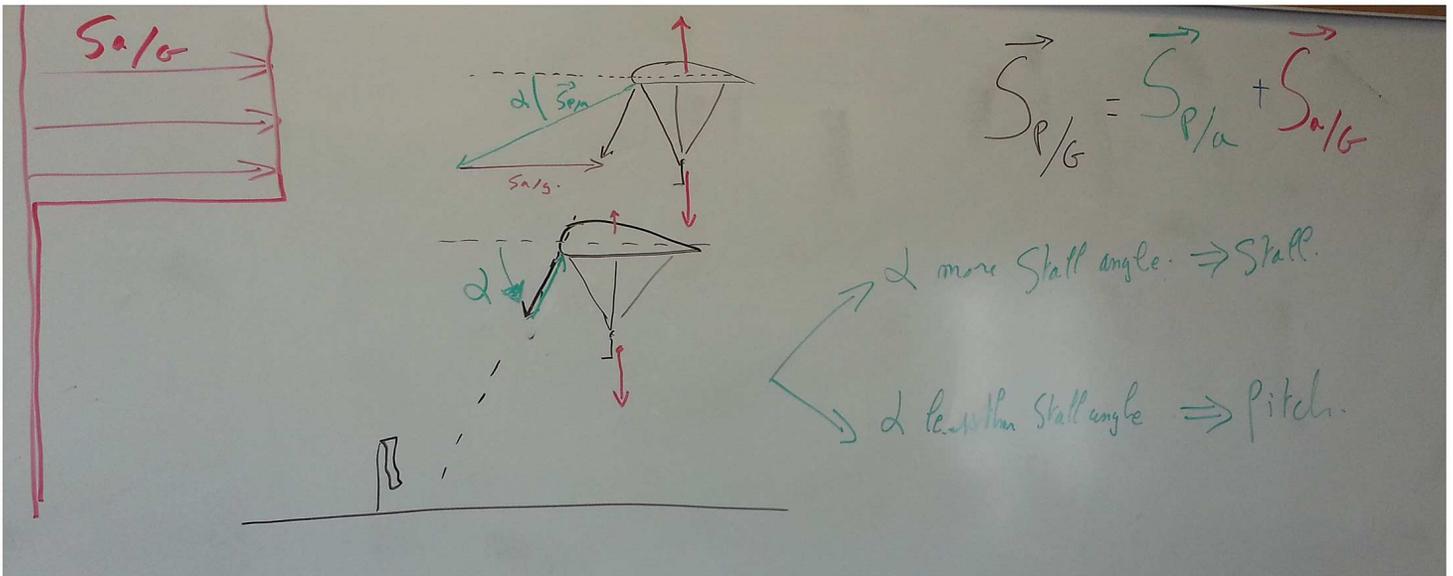
----- isobars (pressure)      ..... sat. specific humidity  
- - - - - saturated adiabats      ——— dry adiabats (θ)





# TYPES OF CLOUD





## MENTAL STRENGTH SELF-EVALUATION



This tool is inspired by the mental strength evaluation made by Antoni Girod (2003). It helps to be able to know one's weaknesses and strengths and to define improvement guidelines.

21 mental abilities are proposed. Give a value to each of them. If it fits you completely, cross out 6; if it is the contrary cross out 1.

You may use the columns - - and ++ if you consider yourself excessive in one way or the other.

Mental qualities	- -	1	2	3	4	5	6	++	Comment
Passion									
Enthusiasm									
Pleasure of flying									
Taste for making an effort									
Discipline									
Respect									
Humility									
Constancy									
Willingness									
Ambition									
Determination									
Courage									
Boldness									
Autonomy									
Motivation									
Self-confidence									
Calm									
Concentration									
Fighting spirit									
Lucidity									
Adaptability									

Do some answers highlight a risk within the framework of your activity?

The values you will give to these abilities will change with time. Knowing your weaknesses makes it possible to work on your mental strength and optimize it. You should do this exercise on regular basis, date, archive and compare the results through time.

## ERROR DETECTOR and POSITIVE MENTAL STRENGTHENING



**Objective:**

To encourage the pilot or instructor to develop its critical thinking skills. Improve their level of vigilance, safety and performance keeping his motivation up.

**What mistakes did I make?**

Each pilot or instructor should be able to identify at least 3 mistakes he made during a flight or a class. If the prestation was close to perfect, the identified errors will be minor, otherwise they will be grosser. An important point is being able to identify the real reasons of a fail.

**Where was I successfull?**

Also identify 2 points they were successfull. Being able to identify the progress allows to keep on progressing with a positive dynamic.

**Date:**                      **Place:**                      **Event description:**                      **Event duration:**

Error	Description	Cause	Remedy/solution
1			
2			
3			

Success	Description	What ressources did you use to succeed
1		
2		

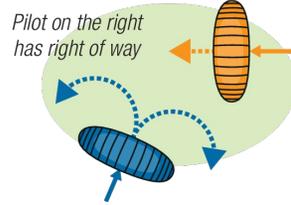
# AIRLAW

## AERIAL COLLISION AVOIDANCE

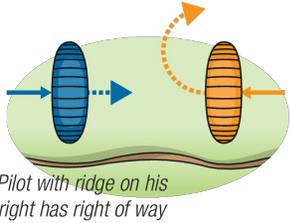
### 1<sup>st</sup> Rule



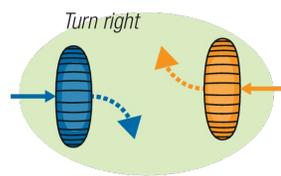
### Converging



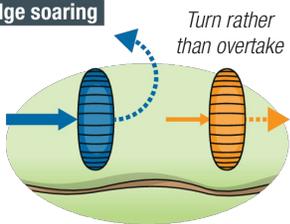
### Head on (near ridge)



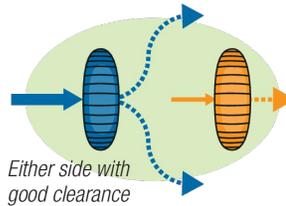
### Head on



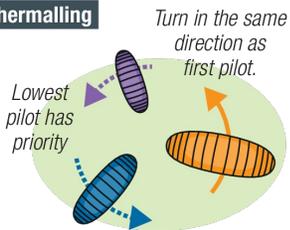
### Ridge soaring



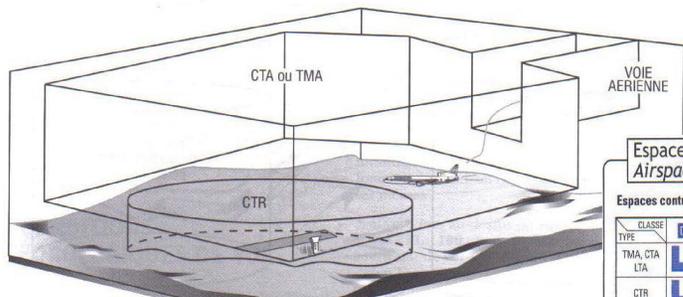
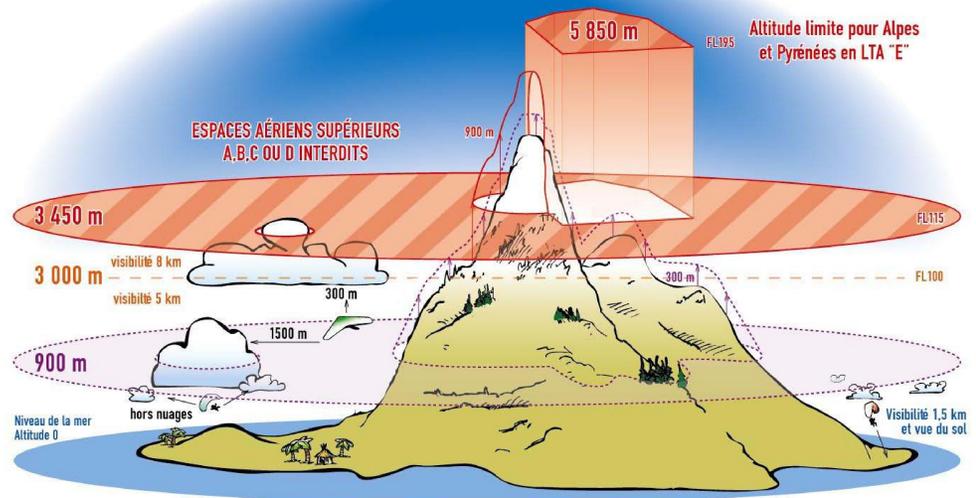
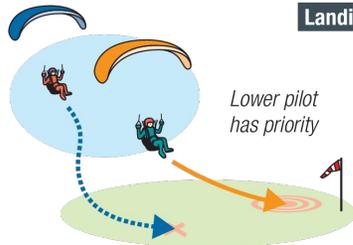
### Overtaking



### Thermalling



### Landing



**Espaces aériens**  
**Airspace**

**ALTITUDES ET HAUTEURS EN PIEDS - ALTITUDE AND HEIGHT IN FEET**  
**ESPACE AERIEN COUVERT - AIRSPACE COVERED - SEC / FL 195**

**Espaces contrôlés - Controlled airspace**

CLASSE	D	D	E
TMA, CTA	■	■	■
LTA	■	■	■
CTR	■	■	■

2500  
NICE TWR  
118.825  
SFC

Espace contrôlé nécessitant une clairance de pénétration.  
Controlled airspace; clearance required to enter

—+— Limite de FIR; FIR boundary

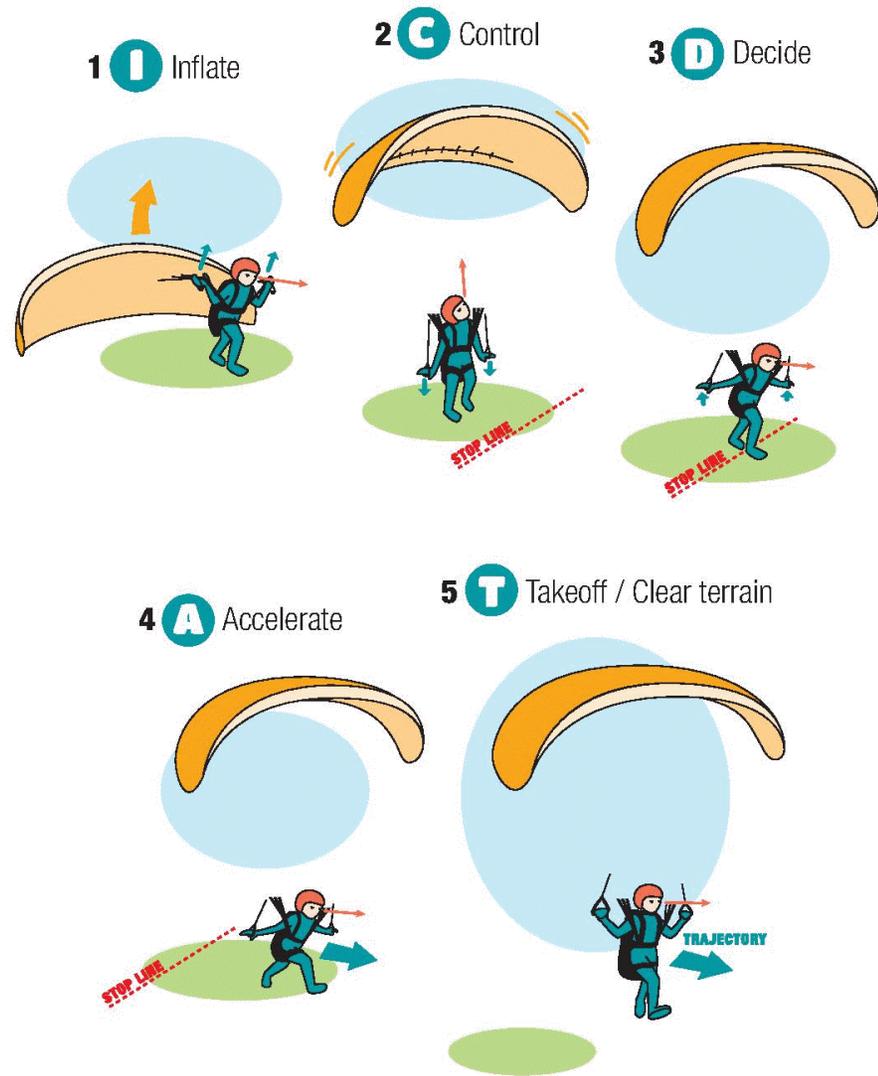
..... Limite de secteur d'information de vol (SIV)  
Flight information sector boundaries (SIV)

118.825\* Heures non permanentes  
Non permanent operating hours

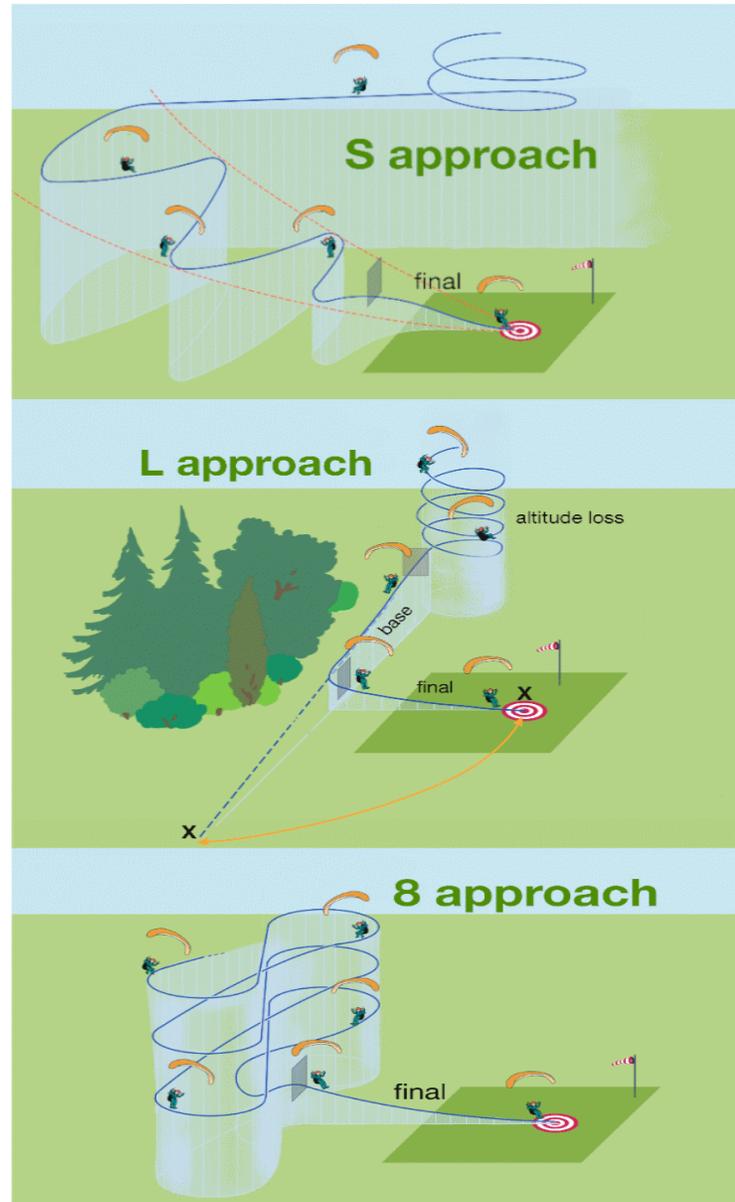
La LTA (ou FL 175 ou 3000 ASFC ou FL 195) est classée **D** à l'exclusion des secteurs indiqués sur la carte au-dessus des Alpes qui sont classés **E**.  
The LTA (from FL 115 or 3000 ASFC to FL 195) is classified **D** except sectors indicated on the chart above the Alps which are classified **E**.

Classe d'espace aérien	Espace contrôlé					Espace non contrôlé	
	Classe A	Classe B	Classe C	Classe D	Classe E	Classe F	Classe G
<b>VFR</b>							
Conditions de pénétration et évolution	Clairance				Non sauf pour VFR spécial	Non	
Ecoule radio obligatoire	Oui				Non sauf pour VFR spécial	Non	
Espace assuré	Avec tous				Non sauf pour VFR spécial	Non	
Info de trafic systématique	Interdit au VFR				Non sauf pour VFR spécial	Non	
Minimum VMC (sup FL100)	Visi 8 km / hors nuage		Visi 8 km / nuage 1000 ft 1,5 km				
Minimum VMC (inf FL100)	Visi 5 km / hors nuage		Visi 5 km / nuage 1000 ft 1,5 km			Visi 5 km / nuage 1000 ft 1,5 km	
Minimum VMC (inf 3000 ft AMSL et 1000 ft AGL)	Visi 5 km / hors nuage		Visi 5 km / nuage 1000 ft 1,5 km			Visi 1,5 km ou 30 s / hors nuage en vue de la surf.	
Limitation de vitesse sous FL100	Non		250 KIAS sauf clair.		250 KIAS		
<b>IFR</b>	Classe A	Classe B	Classe C	Classe D	Classe E	Classe F	Classe G
Conditions de pénétration	Clairance					Non	
Espace assuré	Avec tous			Avec IFR et VFR Spécial		Suivant poss. Non	
Info de trafic systématique	Sans objet			Sur VFR		Suivant poss. Non	
Limitation de vitesse sous FL 100	Non			250 KIAS sauf clair.		250 KIAS	

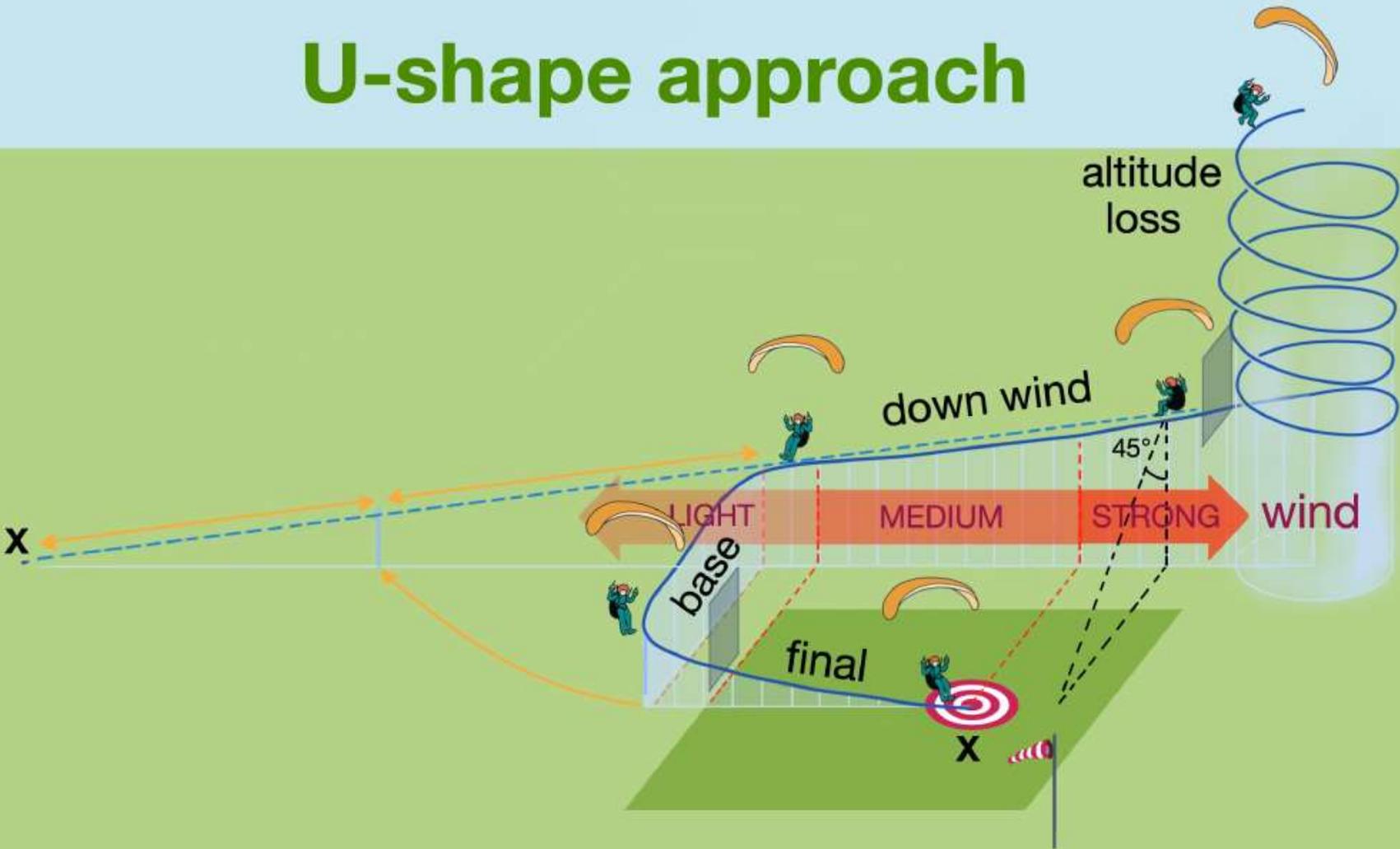
# TAKEOFF PROCEDURE



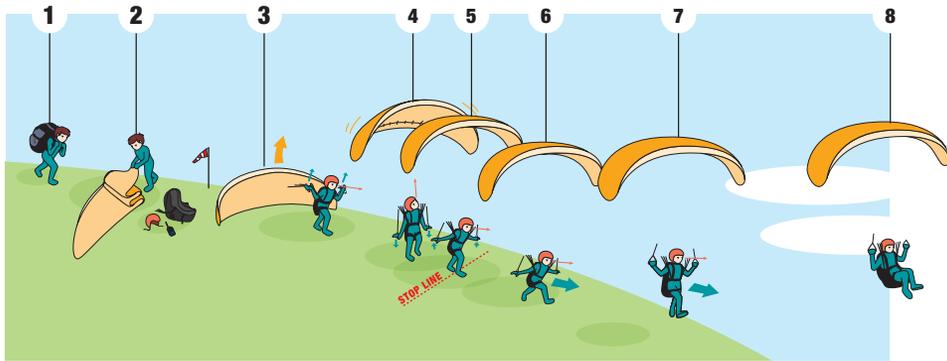
# LANDING PROCESS



# U-shape approach



# APPI GLOBAL FLIGHT PROCESS



## I - TAKEOFF

### ① Preparation / Set-up

- Mental state awareness
- Choose place (wind, obstacle, slope)
- Set-up (glider in U shape,  $\perp$  wind)
- Clear the lines (1 by 1 or pre-inflation)
- Get into harness (check reserve first)

### ② Pre-flight check: B.E.S.A.F.E.

- **Buckles** (legs, waist & chest straps, helmet, carabiners)
- **Equipment** (reserve, glider, lines, brakes, speed bar, radio)
- **Stop line** (visualize limits and technique)
- **Airflow** (wind direction, strength, cycles)
- **Free airspace and runway**
- + **Enjoy your flight**

### ③ Inflation

- Choose the moment
- Quick look around
- Symmetric position of the hands
- Chest-strap pressure

### ④ Control

- Timing (release A > commands)
- Deep action on commands
- +/- look

### ⑤ Decision > Stop or Go

### ⑥ Acceleration

- Chest-strap pressure
- Hand position
- Balance pilot/glider
- Look ahead
- Trajectory

### ⑦ Takeoff

- Don't release commands
- Trajectory, **clear terrain**
- Speed range

### ⑧ End of takeoff procedure

- Traffic check
- Get in the harness, in-flight check

## II - FLIGHT



Air speed  $\neq$  Ground speed

Air trajectory  $\neq$  Ground trajectory (Drift)

### Speed range / Air (+/- 2 km/h)

- Best glide ratio  $\approx$  39 km/h
- Hands up speed  $\approx$  37 km/h
- Min sink speed  $\approx$  34 km/h
- Min speed  $\approx$  25 km/h (not for beginner)

### Heading correction

- Visual marker 2 points
- Drift visualization and control
- Look, lean, +/- command

### Turn control

- Take markers, 90°, 180°, 360°
- From trim speed:  
look, lean, pull inside command, release.
- From min sink speed:  
look, lean, release outside command, return to min sink speed.
- Leaning and command actions are progressive
- Traffic rules

### Rescue procedure

- look-reach-pull, throw, control glider

### Exercises

- Pitch control
- Roll control
- Big ears + speed bar
- Figure of 8 (stay there, forward, backward)
- Min sink, turn

## III - LANDING

- 3 different approach-landing
- Target > get into final door at good height and good place

### Arrive in landing area high enough and upwind to

- Anticipate
- Take information (landing size, obstacles, wind direction and velocity, other pilots)
- Imagine and build your approach

### Final must be long enough to

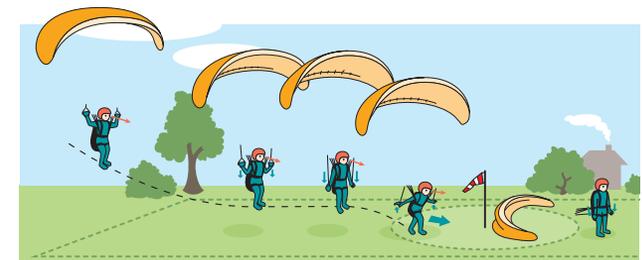
- Stand up if not done before (recommended before)
- Take speed (wind gradient, final braking)
- Adjust trajectory using weight shift
- Adjust final braking (flare, timing)

### Some basics

- When start approach:
  - Never fly over landing (keep 45° angle)
  - Never put landing in your back
- Place of the base part:
  - Windy conditions: make the base leg closer to the target
  - Light wind: base further
- No obstacle between you and landing
- Final must be into the wind
- See your fixed point

### In case of radio failure

- Don't worry about accuracy
- Choose widest place free of obstacles
- Land into the wind



## Unit n°4:

# ***APPI Open Sky Tandem Pilot - APPI tandem pilot***

### **Introduction**

Organize tandem flights with maximum safety

Five preliminary important points

### **1. LEGAL ASPECTS OF TANDEM PRACTICE**

#### **A. Three levels of responsibility**

Moral, civil, criminal

#### **B. Obligations tandem pilot**

Obligation of results

Obligation of means

Comply with national rules

APPI rules

#### **C. Insurance**

Third party liability insurance

Personal insurance of passengers

Personal insurance of pilot

### **2. TANDEM ACTIVITY**

Tandem flying requires a professional attitude that is required at every stage of this activity

#### **A. Choose and maintain the tools**

✓ Flight equipment

Paragliding: certification, new designs ...

Harness: geometry, ageing, protection and agility

Spreaders, trimmers, karabiners, helmets

Reserve parachute: types, mounting, certification, ageing, limitations

Passenger equipment

✓ The flying site

#### **B. The relationship with the passenger-client**

✓ Reservations, information, attitude

### C. Perform the flight

- ✓ Contact with the customer on the flying site
  - Attitude, psychology
- ✓ Access to the flight area, preparation, take-off
  - Security & installation
  - Briefings & checks
  - Last four steps before take-off (inc seven vital points check)
  - Take-off techniques
  - Assistance at take-off
- ✓ Flight
  - Passenger care
  - Attitude
  - Piloting techniques
    - Inertia
    - Descent techniques
    - Pictures and videos
    - Pedagogical Tandem
  - Landing briefing
  - Approach
  - Final
- ✓ End of the tandem flight, conclusion
- ✓ Most frequent problems

### 3. FLIGHT MECHANICS SPECIFIC TO TANDEM FLIGHT

- ✓ Wing loading
- ✓ Load factor, tandem structure compared to solo and conclusion
- ✓ Trimmers use at take-off, in flight, landing
- ✓ Inertia

### 4. APPI RULES

- ✓ APPI non comercial tandem pilot
  - Prerequisites, privileges and limitations
- ✓ APPI professional tandem pilot
  - Prerequisites, privileges and limitations
- ✓ Tandem flying rules
  - Specific APPI tandem certifications

### 5. CONCLUSION

## EXAMPLE of Tandem Routine

### 7 steps

case : pilot's harness not connected to glider (no André Rose system)

Pilot	Interaction with client
weather, decision	
<b>Step 1</b>  Assess passenger stress level & physical aptitude	Hello I am your pro tandem pilot first time? Sport? Why? Expectation? jokes, touch, drink, reassure.. Patagonian tiger trick
<b>Step 2</b>	Present activity We enter take off zone, traffic, for safety stay close – present flight program – take a walk on take off (check exit axis)
<b>Step 3</b>  Gear up passenger (4 important points: 1 : the 2 legs, 2 : ventral, 3 : chest, 4 : helmet)) click-pull additional (shoes, smartphone...)	Briefing adapted to conditions, terrain, technique you may use, what to do and not to do « less is more »! word choice is important
<b>Step 4</b> glider position, check quick-links, lines, trimmers gear up pilot ((5 points inc reserve check) click-pull	Let passenger focus
<b>Step 5</b> Assistant briefing if applies hook pilot/ passenger on spreaders  hook glider on spreaders, <b>Ready to go</b>	Give a « go » to measure energy, make feel & see « we are hooked together », Passenger arms position.
<b>Step 6</b> <u>! once fully Ready to go!</u> last 4 steps just before take off : 1) <b>last check 7 vital points</b>  2) assess weather, wind direction & cycles (last words), Visualize stop line, stop procedure.  3) <b>look at glider</b> , lines away from body, moving obstacles (around, in front)  4) moment choice, <b>traffic check</b> , GO	1 passenger leg-straps, 2 passenger carabiners, 3 main carabiners, 4 pilot carabiners, 5 pilot leg-straps, 6 trims symmetrical, 7 commands free.  <b>Last words: give direction</b> (far target), don't stop unless I tell you « Stop » , don't sit until I tell you  <b>ask feedback</b> “Remind me what we will do”
<b>Step 7</b> regulate passenger energy, <b>glider visual control</b> , decide, accelerate, trajectory control	<b>GO !</b> Communication with passenger
If take off fails, <b>go to step 6</b>	
Take off successfull: Trajectory control H&V, traffic, inboard check, clear terrain... Then install passenger into harness	« Knees to your chest »

### **Guidelines to develop your routine :**

- a-insure passenger safety (traffic on take off, top landing, traffic on LZ)
- b-limit time when crew is partially or totally hooked to glider and not ready to take off
- c-do the things at the right moment, briefing short but complete, use the right words, less is more.

#### ***Briefing Example light wind, alpine take off***

there are 3 important things to know for take-off: 1 you need to run, 2 you need to run, 3 you need to...run

this looks like a joke but we will have 3 stages in our take off

-1: when I tell you go, you... (walk fast, run smoothly, run fast... depending on gear, conditions, passenger) and you will feel like a brake, this is glider's inflation

-2: keep going ahead with strength, then you may feel you are being lifted, we are not flying yet, stay standing up and keep on going even if your feet do not touch the ground for a moment

-3: Finally it gets easy to go forward and the wing is lifting you: accelerate, run fast, look far, huge steps

-never sit, until I say you can sit, even if your feet don't touch the ground,

-never stop unless I tell you « stop ».

so can you repeat what we will do ?

### **also**

At what moment will you do the landing briefing?

-in flight as soon as you are sure to have enough flying time

-early enough and prepare your landing briefing to have it clear and concise

### **technique**

-Forward launch technique is preferable until reverse launch technique is obviously safer

-Reverse launch: the pilot should have the controls in the correct hands before to inflate (crossed controls)

-U-shape approach is preferable

### **Operation guidelines**

-Passenger never takes a risk consciously

-Passenger comes to have fun, just remember your first flight, your feet leaving the ground, lots of emotion. There is no need for crazy maneuvers to impress.

-Each time there is an accident, the passenger pays the price big time

-Each bad takeoff or bad landing, each passenger that vomits is a bad advertisement for your activity

-Are my passengers happy? Would they do it again?



## U1

- Cloth ageing: how to characterize it, what are the typical alerts, what is the life span of a paraglider, what are the main ageing agents, how do you care for your paraglider cloth.
- Lines aging: what are the two main line aging problems your glider may encounter, what materials are concerned in each of these cases. My glider lines are made of sheathed aramid, what should I do to control the aging, what are the criteria, what is the control frequency?
- My glider has 4 row (a, b, c, d), 5 bottom lines on each A riser, max total flying weight is 100kg. What is the max load per A bottom line in a stabilized straight line? What is the airworthiness criteria?  
Same question for a 2 liner with 3 A on each A riser
- Explain what is the trim of a glider, how can I change the trim in flight. Aging: what line material could cause the trim change, usually in what way does it move? What are the typical alerts of a wing out of trim? How do we proceed to control the trim, what are the criteria? What should I do prior to flying once the trim has been corrected?
- Reserve: 5 cases when you must throw your reserve directly. 3 family of situation you can encounter when it's time to throw, what throwing technique do you use in each case. How do you care for your reserve, what is the best technique to fold it?
- Should I fly my glider in the top, middle, or bottom of the weight range?  
My glider is B certified at the top of weight range and C certified at bottom of weight range, what could be the explanation? what is the connection with security in flight?  
My new tandem is 105-220kg certified, what should I pay attention to?  
My student has now 50 hours, he wants to buy a B glider (AR 6) "to progress", what should I explain him?
- How to set up a harness for a student? What are the benefits and disadvantages of pod harnesses?

## U2

- How does a paraglider fly? Explain aerodynamic force, lift, different drags, pressure center, global equilibrium of paraglider + pilot. Explain angle of attack and its limits
- What characterizes a stable and an unstable profile? Draw and explain. In turbulent conditions, as safety position I pull the brakes "contact +20% of brake travel". Advantages, disadvantages, conclusion. What simple guideline can I give to explain what is "active piloting"
- Pitch: what is aerodynamic and pendulum movement, draw the 3 sequences of pitch, the two borders, explain how to stop a pitch movement. Explain how to create and increase a pitch movement
- How does the paraglider turn. Drawing and explanation.
- Fine piloting: explain the 3 parameter that characterize wing movement, the 4 parameter that characterize command action. When the goal is to damp the movements of the glider, how should be the command be released? What is spiral neutrality, what to do?
- What are the 3 families of piloting mistakes? What are the possible reasons, consequences, and remedies?
- Negative wind gradient on landing, using vectors explain what are the 2 situations that can happen, what to do to prevent? How to react in both situations

### U3

- Explain the mechanism that creates wind on the globe scale. Explain breeze at the local scale
- Explain the birth of a thermal bubble and what happens when it rises in the atmosphere 1,2,3,4,5,6,7
- Analyzing a given skew-t, tell me about the situation, ceiling, cloudbase, development. What strategy would you adopt In flight, What can you say about that model?
- Explain the phenomenon of katabatik cascade, the Foehn phenomenon, the prisoner effect. Cases where they are dangerous?
- Explain what is the risk. What is the risk homeostatis? What actions can I take to lower the risk in my own practice? If I want to give a student or fellow 3 advices for safety what would they be? At the level of my flying community (club) what actions can I develop to improve safety.
- Stress: 3 stages, 4 strategy (coping), 3 times to deal with the stress
- Accident: main cause? Typical risky situations? Your Individual risk management strategy? . In flight I witness an accident, what should I do? I am about to land in the trees // in the water what should I do?
- Airspaces rules, visual flight rules?
- Using polar curve of the glider, explain the best air glide, best sinkrate. Explain best ground glide with face wind, with sink. How to figure out the best ground glide speed in flight?
- Transition strategy in XC, what defines the limits of the speed range I should use. What is the conclusion
- How can I evaluate my drift in flight? Using vectors explain what to do if I want to cross a valley with a good breeze, and arrive as high as possible on the other side no matter where I arrive?

### U4

- tandem operating: Responsibilities, insurances, obligations
- Main points of your tandem procedure
- mime Gear up passenger and pilot, give briefing (no wind, or strong wind), the 4 last steps before take off
- Influence of load on speed range. trim use at take off, in flight, at landing
- APPI rules tandem. My pilot harness has no seatboard, what is the point I should particularly check

### U 5 & 6

- Development, organizing and conducting courses, Pedagogy
- Takeoff guiding, landing guiding and instructor position
- Where does the instructor looks depending on the situation
- APPI system questionnaire