PURSUIT™

FLIGHT MANUAL

PARA-FLITE Incorporated

SAFETY WARNING

For safe and rewarding use of the Pursuit, please pay heed to the following instructions.

The Pursuit is a very high performance gliding parachute with unique flight and handling characteristics. A thorough understanding of these characteristics is imperative for safe and effective flight. Certain control maneuvers, improperly executed by the user, may result in serious bodily injury or death. These maneuvers, described in the manual, are especially dangerous if performed at too low an altitude. *Use of the Pursuit by an inexperienced or unprepared parachutist could be extremely hazardous as it is intended for use solely by experienced parachutists.*

The Pursuit is designed for intentional parachute jumping and should *never* be used without an auxiliary parachute assembly.

The Pursuit is a sensitive device which may be easily damaged. A malfunction in flight may occur from improper use or maintenance, accident, striking, alteration, faulty repair, excessive use or abuse. Before each flight, the Pursuit should be carefully checked out for evidence of damage in accordance with the instructions contained in the body of the manual.

As a Pursuit owner, you should not permit its use by an inexperienced parachutist. Neither you nor anyone else should attempt to use the Pursuit without having first carefully read and understood this entire manual.

5800 Magnolia Ave., Pennsauken, New Jersey (609) 663-1275

DISCLAIMER — NO WARRANTY

Because of the unavoidable dangers involved in the use of this gliding-type parachute, manufacturer makes no warranty of any kind, express or implied. The parachute is sold *With All Faults and Without Any Warranty of Merchantability or of Fitness for Any Purpose.* Manufacturer also disclaims any liability in tort for damages, direct or consequential, including personal injuries, resulting from a malfunction or from a defect in design, material, workmanship or manufacture whether caused by negligence on the part of Manufacturer or otherwise.

By using the parachute or allowing it to be used by others, buyer waives any liability of the manufacturer for personal injuries or other damages arising from such use.

If Buyer declines to waive liability on the part of manufacturer, Buyer may obtain a full refund of the purchase price by returning the parachute, before it is used, to Manufacturer within 30 days from the date of original purchase. In order to obtain the refund, the following form must be filled out and returned with the *unused* parachute. Manufacturer will bear the cost of postage.

NAME: _____

ADDRESS: _____

_____

DEALER'S NAME: _____

DEALER'S ADDRESS: _____

_____

DATE OF PURCHASE: _____

PARACHUTE SERIAL # _____

Mail to: Para-Flite Incorporated
5800 Magnolia Avenue
Pennsauken, New Jersey 08109

PURSUIT™ FLIGHT MANUAL

Table of Contents

Illustrated by Alec Itenson and Terry Crowe

INTRODUCTION TO THE PURSUIT

Although the early work and basic principles of ram air inflated airfoil parachutes must be credited to Domina Jalbert, Para-Flite Incorporated alone was responsible for advancing the technology of high performmance gliding parachutes to the point where practical sport parachuting usage became feasible. With the introduction of the Para-Plane and later, the Para-Plane Cloud, Strato-Cloud, Strato Star, Strato-Flyer, Safety-Flyer, and Swift, sport parachuting has been revolutionized, and today, years later, the Pursuit is, without dispute, the finest canopy relative work parachute ever produced. And is, in fact, the first square canopy specifically designed and manufactured for CRW.

Three extremely important proprietary developments were responsible for the overwhelming success of Ram Air parachutes. Firstly, the unique patent configuration was based on the concept of direct suspension line attachment to the canopy lower surface eliminating the bulk and extra drag produced by the then accepted method of incorporating external load distributing members of "flares" (US Patent #3724789). This "direct attach" method of carrying the payload produced an extremely efficient and aerodynamically clean high glide configuration. Secondly, the successful application of the very effective pilot chute controlled inflation retardation system (US Patent #3540684) provided a unique solution to the otherwise intolerable high opening shock load inherent to the ram air category of parachutes. This entirely new concept was based on the dynamic interaction between the drag forces exerted by the pilot chute acting against the canopy opening forces in such a manner as to precisely control and regulate the progressive exposure of the parachute's surface during deployment. Simply stated, the drag forces exerted by the pilot chute during deployment were transferred through the mechanics of the system in such a way as to progressively retard the otherwise explosive inflation rate of the canopy. Thirdly, the "deployment brake system" plays a very important part in the deployment process, besides reducing forward surging of the canopy.

In refining both the direct attach method of suspension line loading and pilot chute controlled reefing system, Para-Flite has developed the total parachute system, whereby there is complete interaction among the separate parachute components within the system. As currently manufactured, the canopy, the deployment bag and reefing system have been specially designed to function in a complementary manner to produce a staged deployment sequence. Furthermore, on the Pursuits an innovative design and construction technique (patent applied for) where the seam and panel orientation goes *across* the span, instead of from leading edge to trailing edge has been responsible for substantially reducing the size, bulk and weight of the complete system that will set the standard for Hybrid CRW square parachutes. As for opening reliability, even though the Pursuits were designed to open *very* fast, the Pursuits have, throughout the entire development and proof test program, demonstrated remarkable consistency.

PURSUIT THEORY OF FLIGHT

The Pursuit is an aerodynamically stiffened fabric airfoil which generates lift due to its forward flight through the air. The airfoil angle of attack is maintained by the relative lengths of the suspension lines, such that the leading edge of the wing is slightly lower than the trailing edge portion.

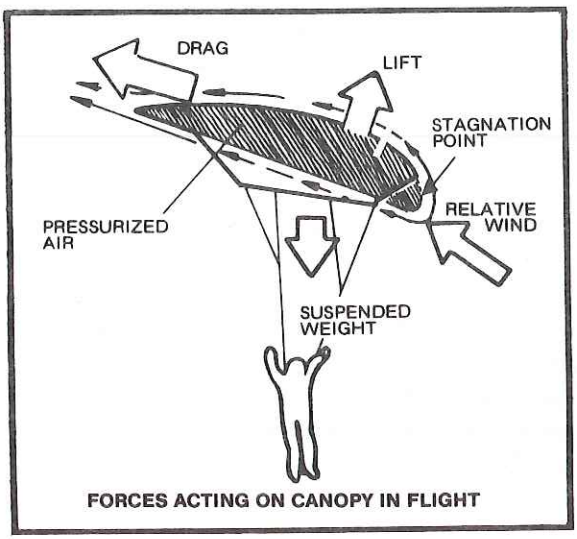
Thus, the airfoil shaped surface of the canopy is forced to slide or plane through the air, very much similar to a glider in descending flight. The Pursuit's wing generates lift in the same manner, relying on the reduced pressure of the air flow over the curved upper surface.

The leading edge of the Pursuit wing is open or physically missing, forming intakes which allow the cell to be ram air inflated. Internal air pressure causes a small amount of stagnant air to be pushed ahead of the airfoil, forming an artificial leading edge. The focal point of this stagnant air acts as a true leading edge, deflecting the relative wind above and below. Drag, which acts in a direction parallel to the Relative Wind, is the only force tending to retard the forward motion of the wing through the air. Gravity, plus the resultant sum of these aerodynamic forces on the upper surface, act to "pull" the Pursuit through the air, thus the flat glide angle.

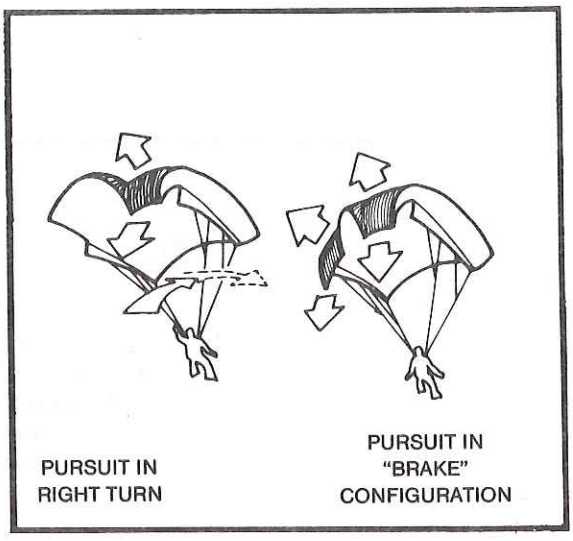
Application of brakes on the Pursuit causes the trailing edge to be deflected downward, creating additional drag and a loss of gliding speed. This also produces a proportionate loss in generated lift, resulting in a steeper glide angle. As full brakes are reached, the wing ceases to generate dynamic lift, the result being an increased rate of descent which is associated with a nearly vertical descent angle. Depressing the toggles beyond full brakes will cause the parachute to enter a stall.

Differential application of brakes (one side only or one side more than the other) produces an unbalanced drag force at the trailing edge, resulting in a yaw turn toward the side with the highest drag.

Because the "slow" side generates less lift, it tends to drop slightly in a shallow banking motion, much like an airplane. This bank angle will increase as the toggle displacement is differentially increased.



FORCES ACTING ON CANOPY IN FLIGHT


PURSUIT IN RIGHT TURN

PURSUIT IN "BRAKE" CONFIGURATION

DESIGN & CONSTRUCTION

The Pursuit construction is of the cellular configuration, which, when ram air inflated, creates a pressurized semi-rigid wing with upper and lower surfaces and an airfoil section. The cells are formed by ribs, which in the case of the reinforced load carrying ribs, are attachment points for the suspension lines.

The load lines and ribs retain the correct airfoil camber in flight and in the case of the load carrying ribs, function, in the "direct attach" method, to distribute the load evenly along the chord of the canopy without causing distortion to the basic airfoil shape.

Innovative construction techniques and scientific selections of surface and rib material have resulted in a compact system weighing only about 10½ pounds.

Construction consists of fifteen rib sections, sewn between 4 spanwise panels on upper and lower surfaces, forming cells. The Pursuit utilizes the proprietary Lissaman 7808 airfoil. This airfoil was designed by Dr. P.B.S. Lissaman exclusively for Para-Flite, Dr. Lissaman is the designer of the airfoil used on the history making "Gossamer Condor" man-powered aircraft.

The Pursuit employs the Slider Reefing System.

PURSUIT - 230

PHYSICAL SPECIFICATIONS

Number of Cells	7
Wing Span	21.5 ft.
Wing Chord	10.75 ft.
Wing Area	230 sq. ft.
Suspended Weights (MAX)	300 lbs.
Canopy Material	Harris F-111™ and 1.5 oz./yd.
Airfoil	Lissaman 7808
Line Test Strength	500 lbs. Polyester & 1000 lb. Polyester
Pilot Chute	Must Use Hand Deploy
Launching Device	Deployment Bag

PURSUIT - 215

PHYSICAL SPECIFICATIONS

Number of Cells	7
Wing Span	20.0 ft.
Wing Chord	10.75 ft.
Wing Area	215 sq. ft.
Suspended Weights (MAX)	240 lbs.
Canopy Material	Harris F-111™ and 1.5 oz./yd.
Airfoil	Lissaman 7808
Line Test Strength	500 lbs. Polyester & 1000 lbs. Polyester
Pilot Chute	Must Use Hand Deploy
Launching Device	Deployment Bag

PERFORMANCE SPECIFICATIONS

	RATE OF DESCENT	FORWARD SPEED
Full Glide	15 - 17 fps.	28 - 32 mph
50% Brakes	9 - 11 fps.	14 - 16 mph
100% Brakes	8 - 10 fps.	4 - 6 mph
Flared Landing	-1 - 5 fps.	0 - 5 mph
Glide Ratio (L/D)		3.0 to 1

		180° Turn	360° Turn
Turn Rates	Full Glide	2.5 Sec.	3.4 Sec.
	50% Brakes	2.5 Sec.	4.0 Sec.

***NOTE:** Pursuit 230 & Pursuit 215 performance specifications are virtually identical.

PURSUIT FLIGHT CHARACTERISTICS

Although the Pursuit is a very docile and forgiving parachute, when compared to other ram air canopies, *it still must be emphasized that it is a high performance gliding parachute. In the hands of an inexperienced jumper, or one ignorant of proper handling techniques, it is, by virtue of its high performance, potentially dangerous. It is therefore absolutely imperative that the parachutist possess a working knowledge of flight capabilities and limitations and that he fully understand the handling techniques before jumping one.*

This, on the other hand, is not overly complicated, but since the Pursuit is basically a fabric wing section, a very *basic knowledge of aerodynamics is necessary* in order to better understand the flight and handling characteristics of the vehicle.

As we've previously mentioned, the Pursuit "planes" or glides through the air at about 25-30 miles per hour. It always flies at this speed regardless of wind conditions except when brakes are applied.

This flying speed is called AIR SPEED, and remains constant regardless of whether the parachute is headed upwind, downwind, or crosswind. *The only variation in flying up or downwind is a change in GROUND SPEED,* which is often mistaken for a change in air speed.

Wind only affects GROUND SPEED and has NO EFFECT on AIR SPEED.

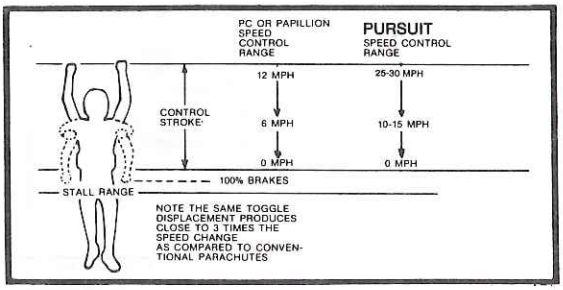
The air speed of the Pursuit is controlled with brakes, using conventional control lines and toggles. It is significant to note that 50% of toggle travel on a conventional parachute such as the Para-Commander or Papillon will reduce air speed by about 6 mph, whereas the same toggle travel on the Pursuit will cause a speed reduction of close to 15 mph.

Unlike other ram air canopies, and even the conventional ones like the Para-Commander and the Papillon, there is almost no surge on deployment, and there is no wind noise at all until after the brakes are released. For those not previously exposed to flight characteristics of ram air canopies, the wind noise created by forward speed can be used as a rough "air-speed indicator". The lack of wind noise can be used as a "stall warning".

Once you have grown accustomed to the canopy, you will no longer even notice the wind noise, and you'll have learned to fly the canopy by feel, and you will have ample stall warning. The Pursuit is a docile canopy and will signal its intentions well in advance. Although the toggle pressure is much lighter than other ram airs, there is still sufficient "feel" to sense canopy reaction such as the shudder that precedes a stall.

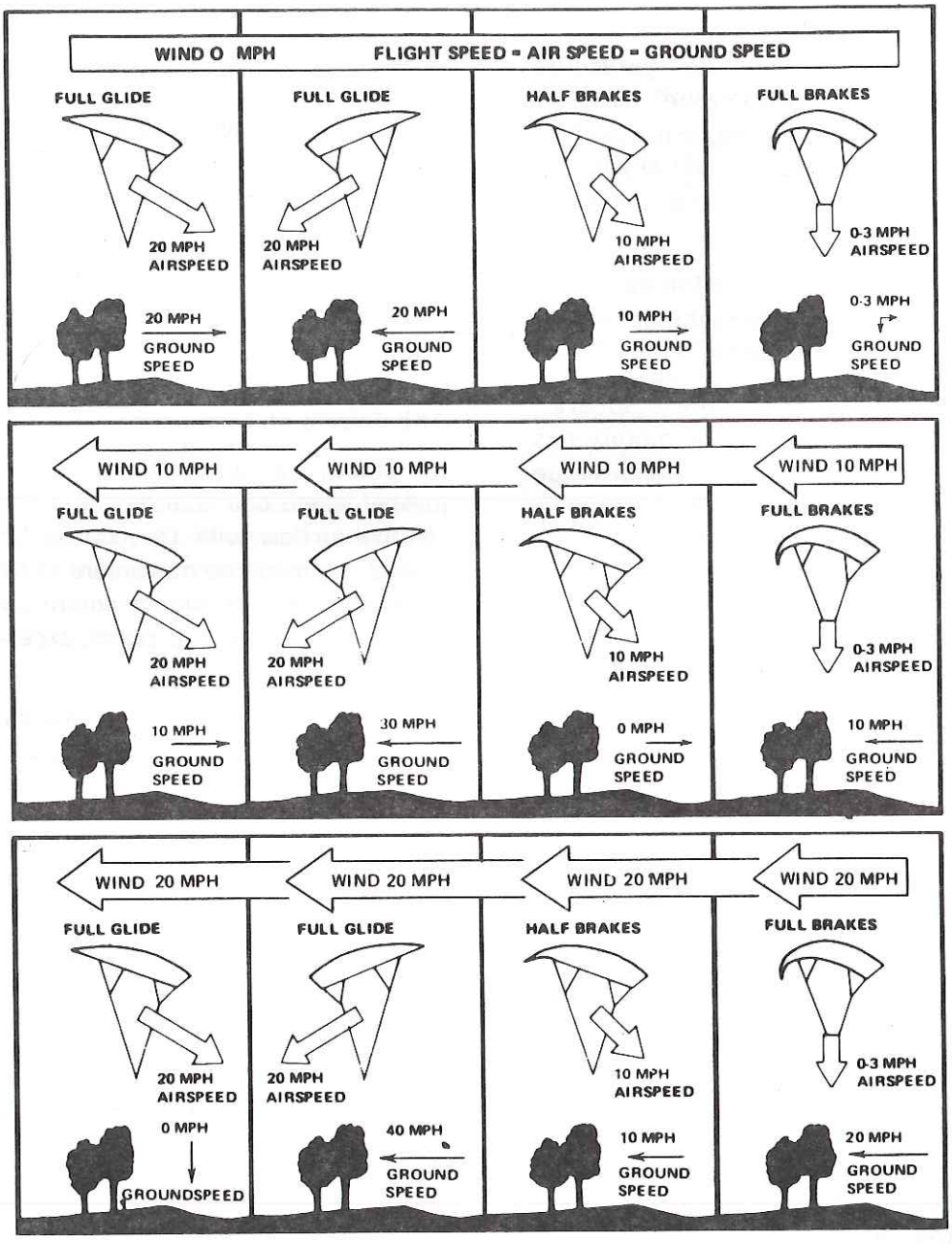
It would be wise to remember that when controlling the canopy's flight, the *rate of control motion* from one position to another is as critical as the relative position of the toggles. As a general rule, all rapid and generous (more than 30%) application of both toggles will cause a rapid decrease in air speed, and the Pursuit will decelerate into the stall range of approximately 0-5 mph air speed. (Depending upon the wind speed, ground speed at this point could still be fairly high.)

Due to the very high penetrating ability of the Pursuit it is often difficult to determine wind direction without the aid of a wind sock, streamer, or smoke on the ground. All landings must be made upwind to minimize ground speed.



The Pursuit has the same control travel as conventional parachutes but controls two to three times the air speed, making any control motion two to three times as effective and sensitive.

GROUND SPEED VS. AIR SPEED



The Pursuit moving with and through a mass of air is much the same as a boat moving with and through a mass of water (river). If a speedboat has a constant speed of 20 mph, this is comparable to the air speed of the Pursuit.

If the boat is in a river flowing at 20 mph, the same conditions exist as if you were jumping the Pursuit in 20 mph winds.

If you point the boat downstream, you would be moving through the water at 20 mph — but your speed relative to the river bank would be 40 mph.

If you turned the boat upstream, you would still be moving at 20 mph but your speed relative to the river bank would now be zero.

Facing the Pursuit into a 20 mph wind would also yield zero ground speed.

TURBULENCE AND RAM AIR PARACHUTES

Introduction

In seven years the ram air parachute progressed from a drop zone curiosity jumped by a few "crazy" people to standard equipment for most experienced skydivers. This is readily apparent if one looks at the sky on any drop zone.

Ram airs are radically different from conventional or round parachutes in all respects, not just appearance.

The rapid acceptance of the "square" parachute by the skydiving community has generated a "mentality gap" or knowledge lag because most skydivers look on a ram air canopy as *just another parachute.*

What we need to do to close or reduce this "mentality gap" is to not look at the ram air canopy as a parachute, but as a "flying machine." We can learn a lot about flying a ram air parachute and the medium we are flying through, the atmosphere, from hang gliders. Hang gliders are even more affected by irregularities and peculiarities of the lower atmosphere than ram air canopies.

The "square" parachute in reality is closer to a hang glider than a parachute of the conventional concept. The difference being that a conventional parachute produces drag and almost no lift and ram air parachutes in full flight generate much more lift than drag.

As the trailing edge is deflected with the control lines, lift is gradually reduced and drag is increased. If this reduction of lift is gradual, the canopy can be slowed to 0 airspeed or vertical descent at which point, it will be generating a lot more drag than lift. If the airflow is allowed to reverse itself, the canopy will stall.

For each airfoil design, there is a range of airflow angles that the canopy can tolerate without either stalling or the airfoil shape being severely distorted due to reduction or elimination of the ram air that pressurizes the canopy. (Fig. 1.) Without ram air pressurization, there is no air foil to generate lift.

As long as the relative wind or airflow over the canopy is within the -10° to about +90° segment, the canopy remains semi-rigid and it retains the airfoil shape. If the airflow over the canopy changes more than +90° or less than -10° the canopy will not fly and will not maintain the airfoil shape. (See Fig. 1.)

The Effects of Turbulence

In steady atmospheric conditions, the jumper alone can change the angle of the relative airflow with the control lines. By steady, we mean no movement of the air we are flying through. Steady conditions do not exist for all practical purposes, except maybe indoors.

It is the "unsteady" atmospheric conditions and how they affect ram air parachutes that this section shall delve into in more detail. Specifically, the movements of air over the ground at angles other than horizontal is what we are concerned with. This turbulent or "unsteady" flow can alter the angle of the relative airflow over the canopy to any angle including those in the danger segment in Fig. 1.

Disturbed airflow or turbulence can cause you to stop descending or even gain altitude, or it can collapse any part or all of your canopy. It can more than double your rate of descent or make your parachute appear to be flying sideways. Extreme turbulence can deflate your canopy completely. See Fig. 2.

If you are flying a ram air parachute, you should have a basic understanding of what turbulence is, how and why it effects your canopy, how to recognize it and how to fly through it.

What is turbulence?

Turbulence is also known as "eddies" or "rotors." Fig. 3. They come in all sizes from less than one inch in diameter to many miles in diameter. The "eddy" sizes that can effect a ram air parachute range from a few feet in diameter to perhaps several hundred feet.

Turbulence, or eddies of the magnitude that can effect a ram air parachute are caused by 1: Solid objects like trees, hills, buildings etc. obstructing the airflow (wind). 2: The static instability of the air, (due to thermal activity). 3: Wind shear, (due to differences in velocity between two layers of air).

Number 3 type turbulence is the least likely to be encountered by skydivers and except in extreme cases, like cold or warm fronts moving through the area, would pose little danger to the ram air jumper.

The number 2 type turbulence is associated with thermal activity, it is caused by the fact that the rising mass of air has momentum. This type of turbulence is very common on sunny days all year round. Most commonly, this type of turbulence is only dangerous to the ram air jumper if it is associated with relatively high winds.

Turbulence that the skydiver should be most concerned with is caused by solid objects obstructing the path of the wind (number 1 above). This type of turbulence is often compounded by turbulence generated by thermal activity.

The factors that affect the intensity of turbulent eddies are wind velocity, density of the air and the shape and size of the obstructions in the path of the wind.

Wind velocity is the most influential and also the most measurable factor. In winds from 0 to 10 MPH, the turbulence generated will not be intense enough to pose serious danger to the jumper. If the winds are 10 to 20 MPH, severe enough turbulence can be generated to cause canopy collapses especially close to the obstruction responsible for the turbulent eddy. If the winds are in excess of 20 MPH, severe turbulence should be expected well down wind of any obstruction. Fig. 3.

The higher the density of the air, the greater the intensity or energy of the turbulent eddy. Cold air is more dense than warm air so turbulent eddies tend to be more forceful in the winter than in the summer. Humid air is less dense than dry air so turbulence will be more powerful at 30% relative humidity than at 80%. Higher field elevations, of course, offer less dense air than sea level, and are, therefore, producing turbulence of lesser intensity.

The shape and size of the objects obstructing wind flow are also very influential in determining the size and intensity of eddies. A large object will generate larger eddies, although not more intense, than smaller ones. A rectangular building with sharp corners will generate eddies at slower wind speeds and generate much more forceful eddies than an igloo-shaped building. Fig. 4.

One can expect more turbulent eddies in the late morning and early afternoons because both thermal activity and wind velocity tend to reach maximum then.

Turbulence and your DZ

How can you tell if dangerous turbulence is present on your DZ?

The *size,* the *terrain* (obstructions) and *wind directions* determine at what *wind speed* your DZ will start generating turbulent eddies of sufficient energy to cause danger to ram air flyers.

By size, we mean the distance from the landing area to the nearest wind flow obstruction such as a tree or trees, buildings, hills etc. on the up wind side.

By terrain, we mean the surface roughness of the DZ such as gentle hills, shrubs and bushes, tall grass, plowed field etc. Wind

direction, of course, determines which obstacles in the flow of the wind around your DZ will be generating the turbulence.

If the winds are in excess of 10 to 15 MPH, a minimum of a 1/4 mile safety zone should be maintained down wind of any hills or large buildings or tall trees.

If the winds are in excess of 20 MPH, even large open DZ's with no wind flow obstructions within a 1/2 mile can have severe turbulence due to thermal activity upwind from the landing area.

A gentle downhill slope with a 1 foot drop for every 10 feet can generate turbulent eddies under certain conditions.

Wind speed is the best and most measurable indicator of turbulence of the type that can be dangerous to the ram air flyer. In general, every DZ is subject to have turbulent eddies present of sufficient intensity to cause momentary deflation of a ram air pressurized parachute if the winds are in excess of 20 MPH and especially if it is gusty. A change of 5 to 10 MPH in the wind velocity within a couple of seconds indicates that the wind flow is turbulent. Of course, if the drop zone is surrounded by trees, the wind speed that can generate strong turbulent eddies will be a lot less.

This does not mean that your canopy will collapse if the wind exceeds 20 MPH, it only means that the *possibility exists.*

Flying with turbulence present:

The lighter the jumper, the more he or she is susceptible to problems associated with turbulence. Lighter jumpers have a lower tolerance for turbulence and should be extra careful when encountering turbulent eddies.

The forces acting upon the canopy are proportional to the rate of change of the wind velocity on the canopy. Therefore, it is more dangerous to fly fast through turbulence than to fly slow. Flying through turbulence should be done at about 30 to 50% brake setting. Too slow may be dangerous also, because the canopy may stall without warning due to a sudden gust.

The reader is encouraged to study turbulence in more detail. An excellent book on the subject is "Hang Gliding and Flying Conditions" by Dennis Pagen. This book is now available from the USPA store. Much of the background of this section was obtained from this book and from other hang gliding publications.

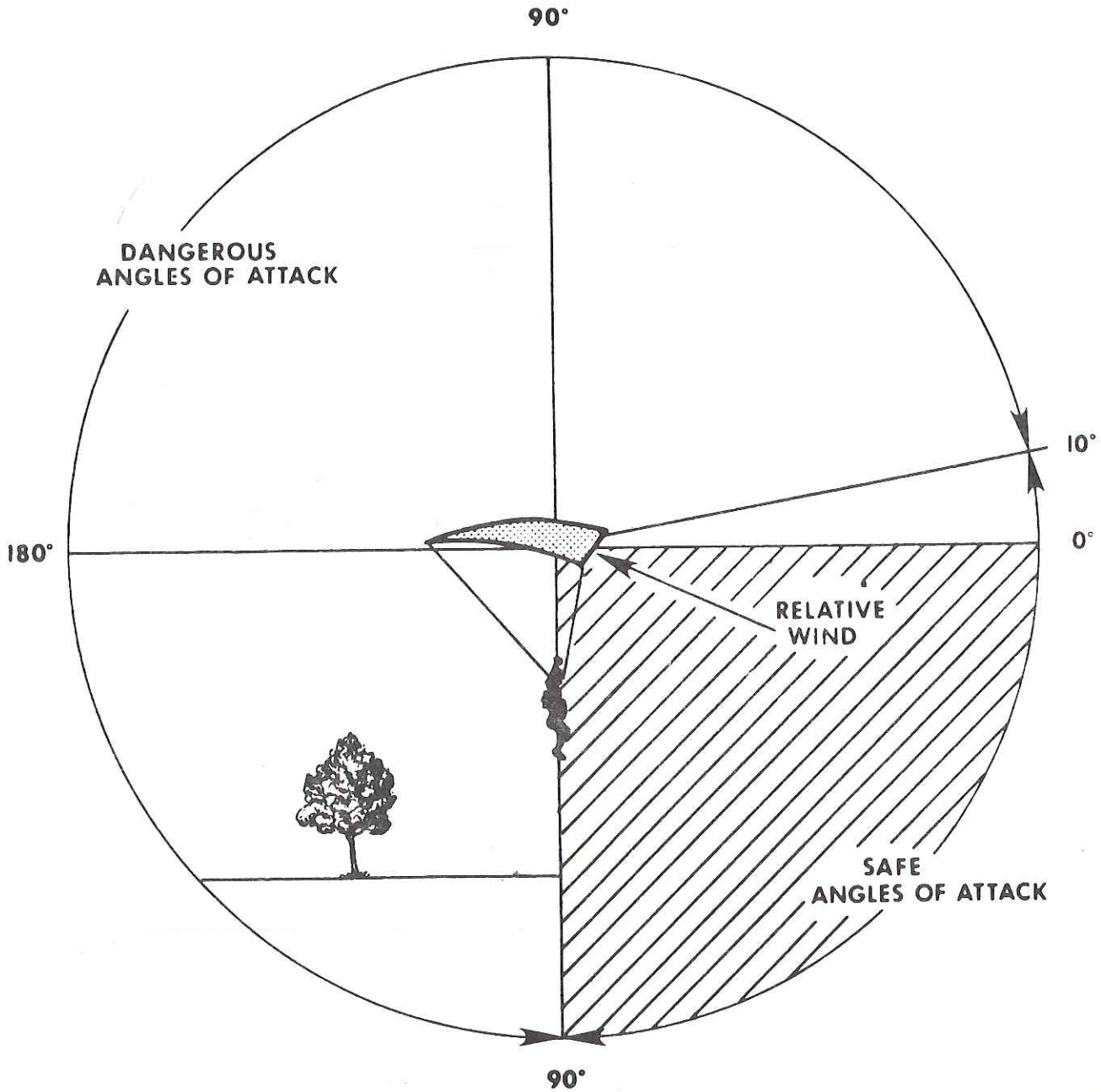

90°
DANGEROUS
ANGLES OF ATTACK
10°
180°
0°
RELATIVE
WIND
SAFE
ANGLES OF ATTACK
90°

Fig. 1

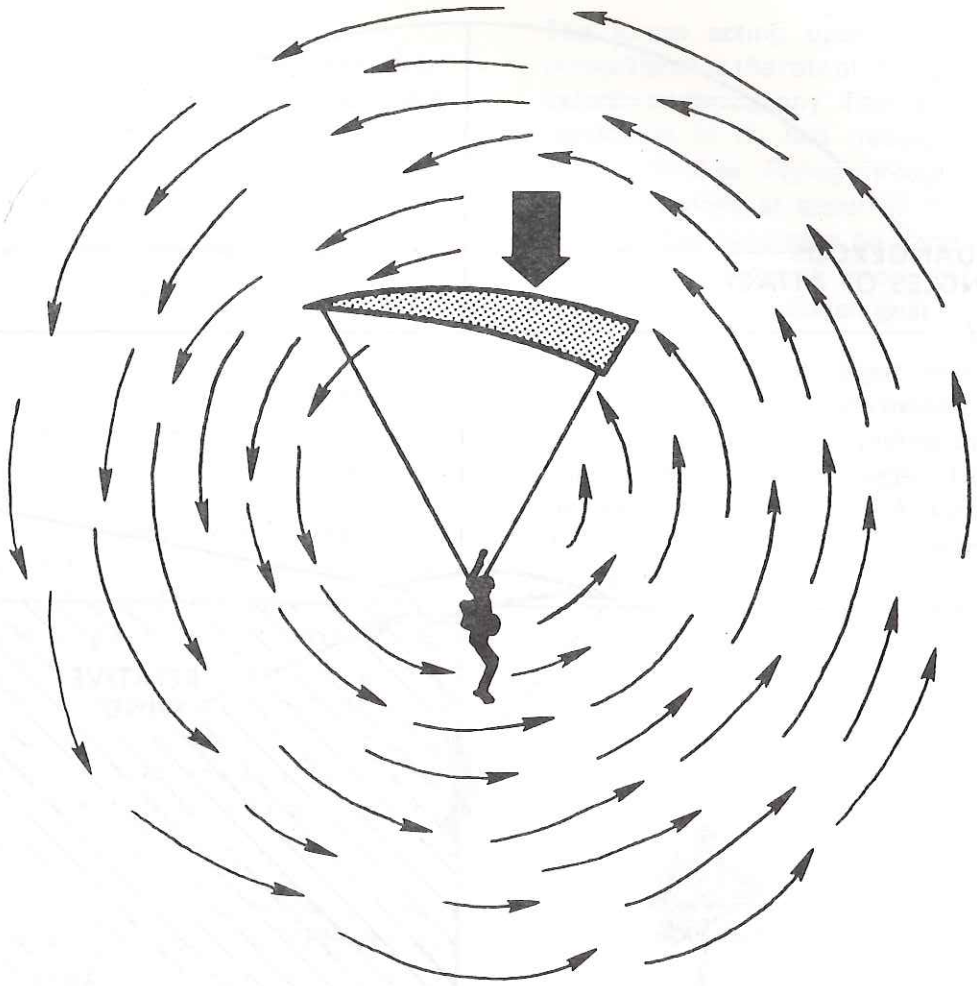


Fig. 2 - EFFECT OF A LARGE TURBULENT EDDY

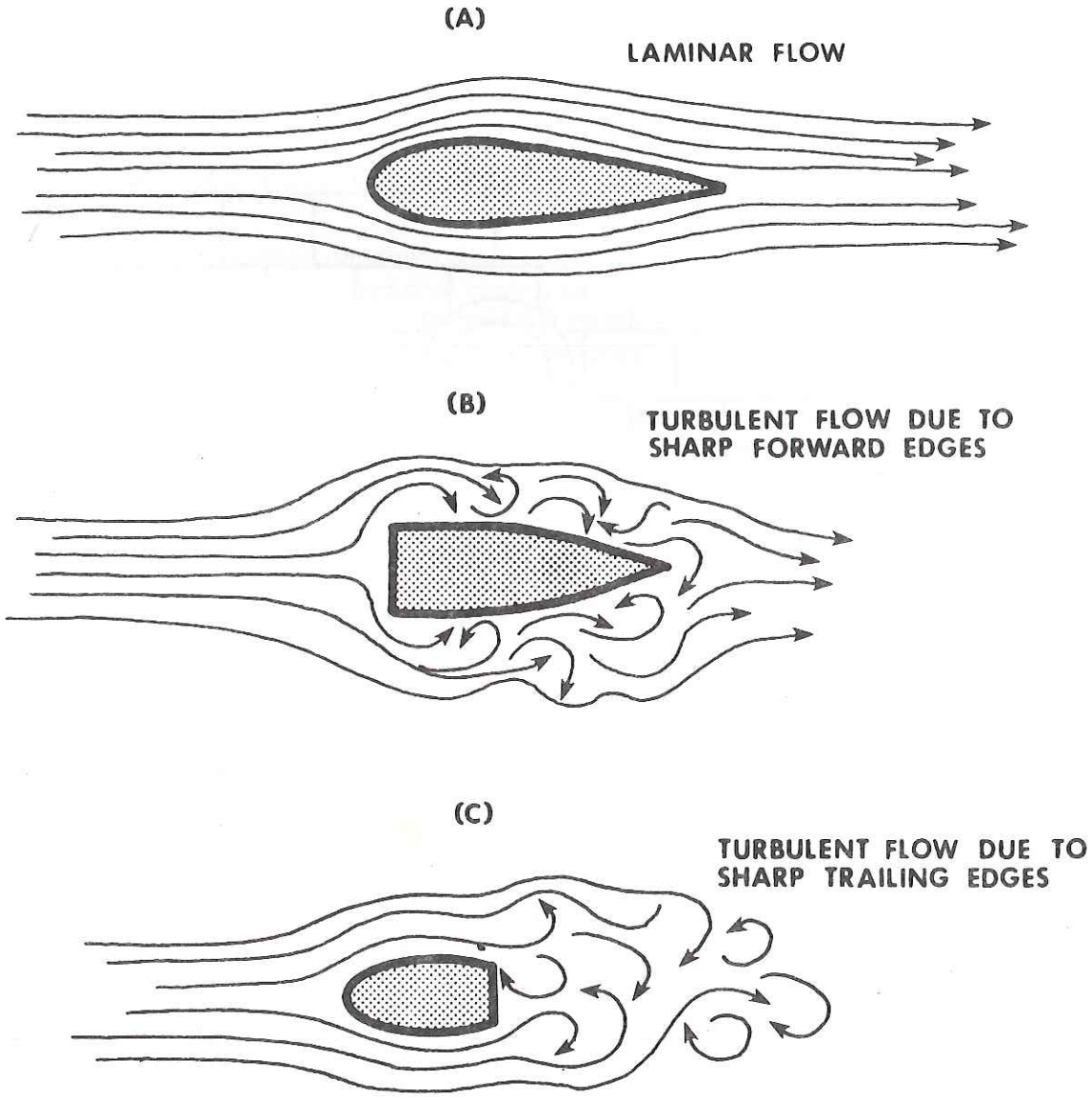


Fig. 3 - WIND FLOW AROUND VARIOUS SHAPES

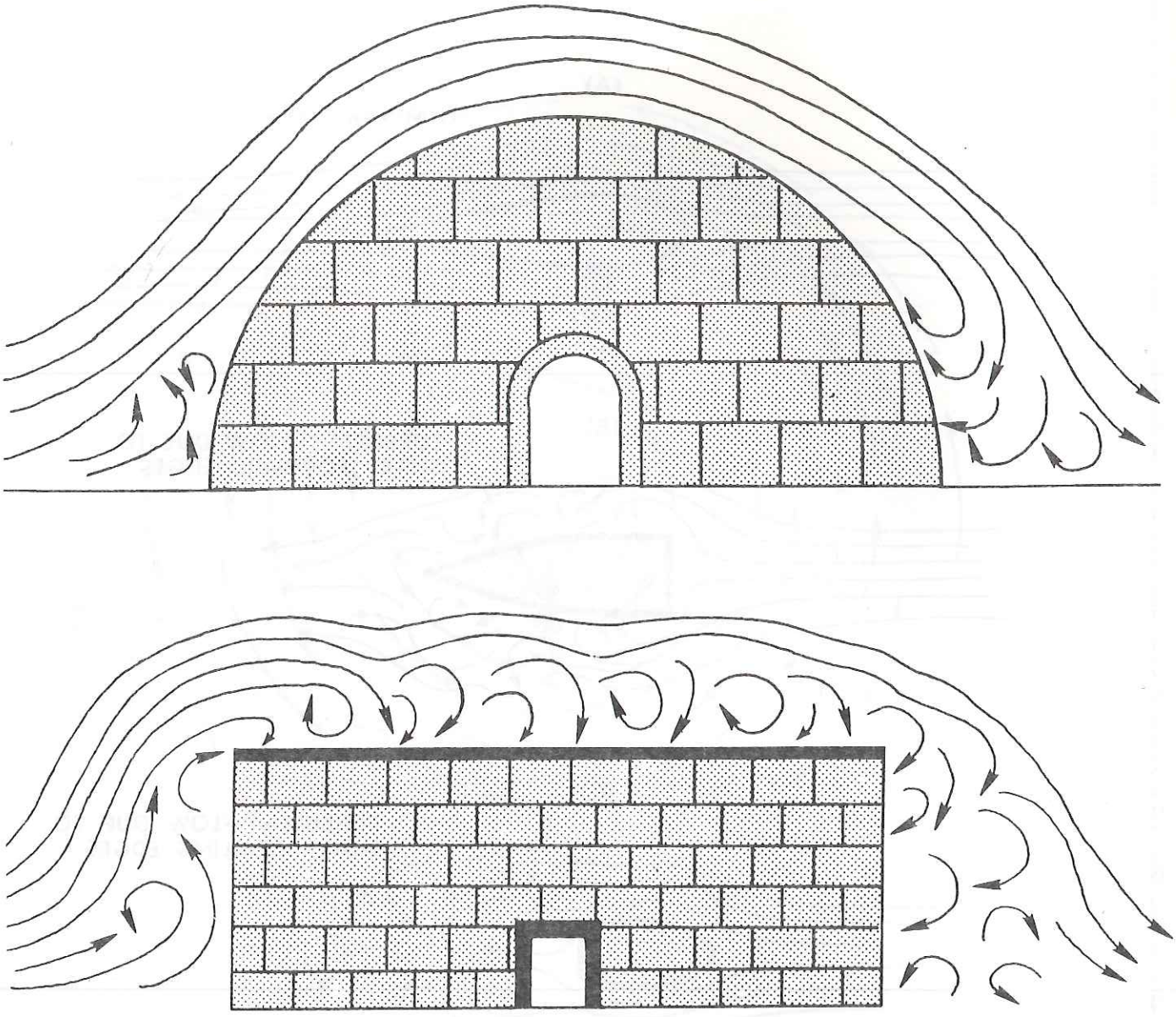
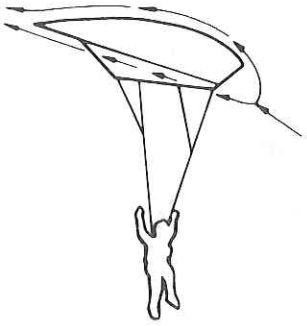


Fig. 4 BUILDINGS WITH SHARP CORNERS GENERATE MORE EDDIES AT LOWER SPEEDS THAN BUILDINGS WITH ROUND SHAPES

MANEUVERING

FULL GLIDE



With toggles up, the Pursuit will glide at about 28-32 mph with a rate of descent of approximately 15-17 fps. and track straight and stable. Bias turns can usually be traced to an uneven harness adjustment.

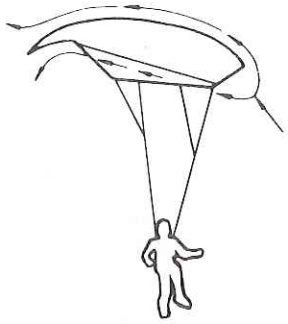
Under certain rough air conditions, the canopy may bounce mildly in full flight in much the same manner as an airplane in turbulence. In turbulent conditions it is best to fly with about 50% brakes to avoid gust induced stall or momentary deflation of the canopy.

Increased penetration can be gained by pulling down the front risers or trim tabs. Directional control can be maintained with the front risers. Since the rate of descent will increase proportionately, it is not advisable to land the Pursuit in "overdrive".

Remember that in the event of a broken control line or when maneuvering immediately after opening, when the deployment brakes are still secured, the rear risers can be used for full directional control.

Acceptable Flight Trim	**The toggles may be adjusted up to 8 inches differentially to maintain straight flight.**

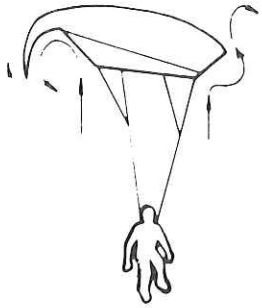
HALF BRAKES



Braking is effected by altering the airflow along the lower surface of the wing. This is accomplished by distorting the trailing edge in much the same manner as flaps on an airplane.

From full glide, depress both toggles slowly to about chest level or slightly below. At this point, forward speed will be 14-16 mph and corresponding rate of descent 9-11 fps.

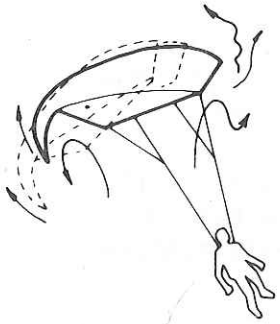
FULL BRAKES



Under normal flight conditions, the fully braked attitude will be reached by depressing both toggles slowly until nearly all the forward speed is reduced. In this mode, the direction of travel will be almost vertical. The forward speed will be around 5 mph or less and the rate of descent about 8-10 fps. Directional stability can be maintained in the 75-100% braked condition.

Further braking will result in sink or mush, which is on the verge of a stall.

STALL — STEADY STATE

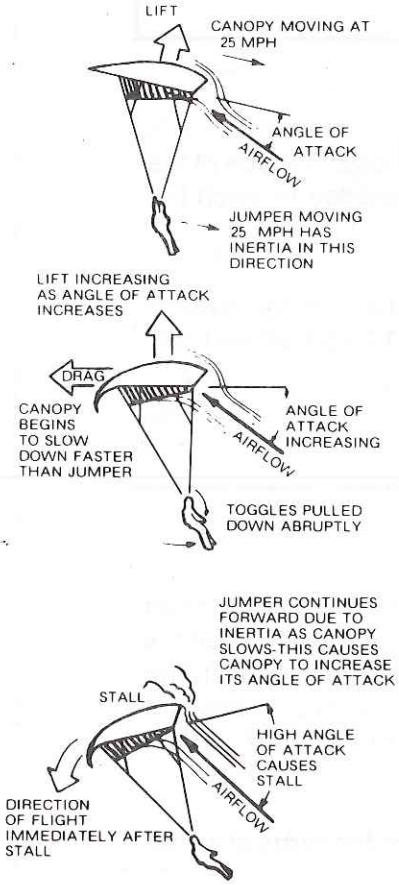


A stall (steady state) can be induced by depressing the toggles slowly to the fully braked position, allowing 3-4 extra inches of of toggle travel past the fully braked position.

In this attitude, the airfoil loses its efficiency as a lifting device. The forward speed goes to zero as the canopy sinks and then gently rocks backwards.

The Pursuit may attempt to fly backwards or turn off to one side. Recovery from this type of stall is accomplished by simply raising the toggles smoothly 6-8 inches to the 75%-80% braked conditions. The Pursuit will accelerate smoothly out of the stall.

CAUTION: Never release the toggles completely or let them up abruptly. If the toggles are released in such a manner, the Pursuit will surge forward.



STALL — DYNAMIC

A dynamic stall is initiated by making an abrupt displacement of the toggles, causing additional drag to be placed on the canopy. The canopy decelerates rapidly, while the jumper, due to his inertia, reacts much more slowly, causing him to swing out, in front of the canopy.

The jumper swings forward, causing an artificial increase in the angle of attack. This new angle yields a high amount of lift for a very short period of time, followed by an abrupt loss of lift or "stall" of the canopy due to the loss of forward air speed. Because the trailing edge has been deflected substantially downward reversing the airflow, the canopy now attempts to fly backwards unless corrective measures are taken.

Recovery from the dynamic stall is properly accomplished by smoothly raising the toggles to the 75%-80% braked position.

Do not let the toggles up any higher than chest level, otherwise the canopy may surge forward. The same conditions exist here as in entering the stall — that is, the canopy will accelerate much faster than the jumper.

Although the Pursuit is a docile parachute, without the violent stall characteristics usually associated with ram air parachutes, it is still recommended to avoid dynamic stalls below 500 feet AGL.

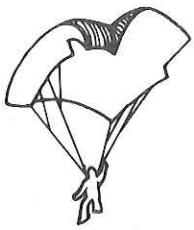
TURNS—FULL GLIDE

Turns from full glide are very responsive, but due to the high forward speed, the turns will encompass a wide arc. These turns are made by depressing either toggle, leaving the other one at the keeper. In this type of turn, the parachute will bank and actually dive, causing the parachute to lose altitude quickly.

The further the toggle is depressed, the steeper the bank angle.

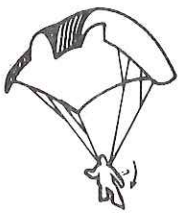
The additional increase in rate of descent is partially due to the loss in lift resulting from the bank angle.

SPIRAL TURNS



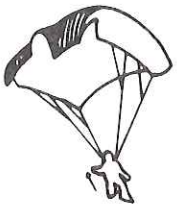
Spiral turns are basically turns from full glide but maintained for more than 360 degrees of rotation. The parachute will begin diving in a spiral. The first turn will be quite fast with a steep bank angle. Both the turn speed and bank angle will increase rapidly if the spiral is maintained.

Increasing the turn rate will cause excessively fast diving speed with a rapid loss of altitude and therefore *should be avoided below 500 feet AGL.*



TURNS—50% BRAKES

Turns from the 50% braked condition are made by further depressing either toggle. Canopy response in this mode is much faster, with minimal banking, resulting in almost flat turns.

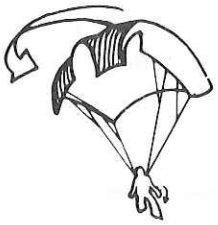


TURNS—75-100% BRAKES

This is the canopy's optimum control range with extremely quick response. When flying in this mode, the jumper should be keenly aware that he is operating *very near the stall range.*

Turns are best made with directional cross control — by slightly raising the opposite toggle. This is done to prevent the canopy from stalling. There is little or no banking and the resulting heading changes are quick and flat.

STALL TURNS



If the Pursuit is flying in the 90-100% brake range and either of the toggles is further depressed, a stall turn will result.

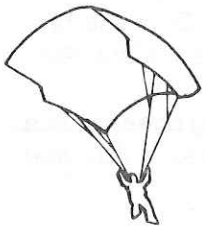
Stall turns produce a very quick, pivoting action, with the stalled side of the canopy flying backwards.

Since the stalled side generates very little lift, the rate of descent will increase.

Stall turns should be *used with extreme caution only.*

FLARED LANDINGS

The flared landing is in essence a carefully controlled dynamic stall, timed so that touchdown occurs during the exact moment of high lift yield during the artificial change in angle of attack. This is just an instant prior to the stall, and the jumper should be extremely careful not to *stall too high.*



Flared landings, like all ram air parachute landings, are made into the wind and should start at an altitude of 10-20 feet, with plenty of room ahead.
Ease both toggles all the way up, allowing the air speed to build up. (A flared landing cannot be accomplished without sufficient air speed.)

At about 10 feet off the ground, slowly depress both toggles downwards, timing the movement to coincide with the 100% brake position at touchdown.

The flared landing, when properly executed, practically eliminates both horizontal and vertical velocities for a short period. If the Pursuit has been slowed down prior to the flare attempt, depressing the toggles further will result in a "sink".

If, on a misjudged flare attempt, the parachute enters a dynamic stall, dynamic stall recovery must be initiated.

CAUTION: Never release the toggles completely or let them up abruptly. If the toggles are released in such a manner, the Pursuit will surge forward.

LANDING

The Pursuit can be safely landed without flaring. On final approach, simply fly the canopy at 50-75% brakes, with final braking increase immediately prior to landing. (All ram air canopy landings are made into the wind.)

This is similar to landing conventional parachutes, and the ground speed will be dependent on the wind velocity.

LANDING APPROACHES

The recommended Pursuit landing approach is one similar to standard aircraft practice. It is a simple procedure consisting of a downward leg, a base leg, and a final approach upwind, towards the target. It is usually difficult visually to gauge variations in altitude accurately, so a reliable altimeter is suggested while under the canopy.

DOWNWIND LEG:

The downwind leg is flown along the wind line, passing the target area at an altitude of between 1000-1500 feet while tracking approximately 400 feet to the side of the target.

Jumpers who are used to downwind approaches on conventional parachutes are usually quite reluctant to overfly the target at an altitude of 1000 feet, but this initial discomfort soon vanishes, although it will still require considerable practice to hit this first "window" — a point between 1000-1500 feet above and 300-400 feet to the side of the target.

Continue the downwind leg to a distance approximately 300-400 feet downwind of the target.

BASE LEG:

At this point, approximately 300-400 feet downwind of the target, begin a gentle 90 degree turn to fly the base leg, across the wind line. This leg is usually flown at 30-60% brakes, depending upon the wind conditions, and the base leg may be either shortened or extended to reach the proper "rotation" altitude.

Under low wind conditions, the base leg is flown to a "rotation point" approximately 400 feet directly downwind of the target and at an altitude of just above 500 feet.

FINAL APPROACH:

Under light wind conditions (0-5 mph), rotation towards the target is made at this point, 400 feet downwind of the target, with a braked turn.

Final rotation must be completed no lower than 500 feet.

On final approach, descent and glide are controlled through proper braking technique in order to bring the jumper down in the designated target area.

Once final rotation is completed, the approach angle must be assessed, and any major control corrections performed immediately, while there is sufficient altitude and distance to the target.

Excess altitude can be traded off by making shallow S-turns back in the "base leg" position. If, on the other hand, more penetration is required, it can be increased by pulling down the front risers or trim tabs to alter the Pursuit's angle of attack. Do not, however, land with the front risers or trim tabs pulled down because the rate of descent will increase proportionately with the increased penetration.

CAUTION: Do not make a sharp or hook turn on final approach and do not attempt a salvage 360 degree turn. The Pursuit loses altitude very rapidly in sharp turns.

LANDING:

On the initial jumps, it is not recommended that the jumper attempt flared landings. A properly executed flared landing requires not only good altitude assessment and good timing, but a feel of the canopy gained only with experience.

Although the Pursuit is docile and forgiving, and does not exhibit the violent stall and recovery characteristics usually associated with ram air canopies, *a flared landing is in essence a dynamic stall, and if performed at too high an altitude, could result in serious injury.*

VARIATIONS ON THE APPROACH:

As stated previously, under light wind conditions, rotation on final approach should be made at a distance 400 feet downwind of the target at an altitude of 500 feet. Depending on the wind conditions, the final approach can be varied from almost vertical to a very flat angle. (The application of brakes will also alter the angle of approach. A very steep approach angle can be achieved through heavy braking, while easing up on the toggles will extend the approach angle.)

Under zero wind conditions, the downwind leg may be extended past the 500 foot distance to permit a longer and flatter final approach.

Under high wind conditions, the downwind leg can be shortened to allow for decreased penetration, or for more consistent accuracy, the normal rotation distance can be maintained, but the rotation altitude increased.

A basic rule is to increase the rotation height by 100 feet for every mile per hour increased wind velocity, starting at 400 feet for 0-5 mph winds.

For winds in excess of 12 mph, rotate no farther downwind than 200 feet from the target and as high as possible. Remember, under high wind conditions the Pursuit can be backed up by applying brakes to decrease the air speed.

CAUTION: In gusty and or turbulent conditions, the Pursuit is best flown with approximately 50% brakes. More than 80% or less than 20% brakes should be avoided. Gust induced stall or momentary deflation of the canopy is possible due to turbulence and/or gusts.

HOW TO ADJUST THE STEERING TOGGLES ON YOUR PARA-FLITE CANOPY

All P.F.I. canopies are set with a standard toggle setting for full flight.

However, because of differences of weight, arm length etc. you may wish to re-set your toggles from the standard setting.

First, jump your canopy to check the toggle setting. Pull both toggles downward and evenly until they are depressed to full arm extension. If you cannot "stall" the canopy at full arm extension you should consider adjusting them.

Take up approximately 2 inches of the steering line at the toggle end. Be careful to take up the same amount at each toggle to allow straight flight in the "toggles up" position. Jump your canopy after this 2 inch adjustment and continue adjusting in 2 inch increments until your canopy stalls just at full arm extension.

When you are satisfied with your toggle setting, trim off the excess line.

NOTE: Always allow plenty of recovery altitude when attempting dynamic stalls (see section on Turbulence & Ram Air Parachutes and maneuvering in this manual).

INDOCTRINATION JUMPS

Initial Pursuit jumps should be oriented towards flight and handling characteristics familiarization.

In spite of the fact that the canopy does not surge on inflation, large star relative work with the Pursuit is not recommended until fully familiar with the parachute. There is no set number of jumps for the familiarization and indoctrination period because the rate of progression is dependent upon individual experience and skill.

The prime measure of successful indoctrination is the individual jumper's personal admission that he is relatively comfortable with the Pursuit in all the various brake modes and flight regimes.

It is recommended that several familiarization jumps be made in light wind conditions with terminal velocity openings at an altitude of 4000-5000 feet. This extended flight time under the canopy will offer the jumper an opportunity to wring out the Pursuit at altitude and to gain a feel for the parachute.

On these jumps, the opening and exits points should be adjusted accordingly, and although all previous spotting techniques still apply, the Pursuit allows a much greater margin of error — to the extent that spotting can be casual. The wise jumper, however will continue to spot for his reserve.

A stable face to earth position must be used for opening. *After opening, do not release the deployment brakes immediately. Practice checking for other traffic until it is second nature, maneuvering, if necessary, with the rear risers.*

Using the rear risers, turn the canopy on a heading towards the target area and check the canopy for proper inflation and slider seating. If the slider is not secured, the cells will not be fully inflated and the canopy will have a tendency to bob or oscillate sideways. Use the rear risers to inflate the canopy and get the slider down.

Do not release the deployment brakes until the slider is near the connector links and the end cells are inflated, as any additional airspeed will hinder this maneuver.

After the slider is properly seated, and the end cells are inflated, the deployment brakes can be released, and the canopy will fly in a stable mode.

On these initial high jumps, make an effort to attempt as many flight maneuvers as possible, instead of merely flying a pattern.

Keep an eye on the target, allowing yourself enough altitude to overfly the target area at approximately 1000 feet.

Fly the base leg and rotate on final with half brakes. The final approach should be flown at 50% brakes, directly on heading. On initial jumps, do not attempt precision accuracy, and do not be overly concerned about landing short or overflying the target. No major canopy corrections should be made on final approach. *Do not forget that the Pursuit loses considerable altitude on banked turns.*

Fly the canopy to the ground carefully applying the brakes the last few feet. The Pursuit is somewhat easier to flare than other PFI canopies due to its high forward speed yet this maneuver requires precision timing. Until one is more experienced, it is far safer to ride the canopy in with brakes.

Considerable practice at flying in deep brakes is essential for good Pursuit familiarity. It is highly desirable to practice stalls and stall recovery on every jump.

PRECAUTIONARY FLIGHT RULES

The Pursuit is a very high performance gliding parachute with unique flight and handling characteristics. The following rules must be clearly understood and followed.

1. It is imperative that the Pursuit jumps be oriented totally towards familiarization. Do not attempt relative work or precision accuracy until at least ten to twenty-five jumps have been completed. It is also not advisable to jump into restricted target areas until completely familiar with the parachute's capabilities.

2. When on final approach, whether attempting precision accuracy or merely landing within a designated area, do not attempt salvage 360 degree turns. Like any other ram air parachute, the Pursuit loses altitude rapidly in tight turns. Sharp turns or hook landings should not be attempted below 200 feet.

3. Partially because of its relative short suspension lines, the Pursuit does not exhibit the abrupt stall characteristics normally associated with ram air parachutes. It is still, however, recommended that all major control corrections be made carefully and smoothly. Large variations in toggle movement should not be made rapidly, otherwise a jumper may experience fast canopy response resulting in unusual or extreme altitude loss.

4. When recovering from either a steady state or dynamic stall, do not release the toggles completely or let up abruptly past 75% brake position. A toggle movement of 4-8 inches above the stall point is sufficient travel for a rapid and controlled stall recovery.

5. Increasing the turn rate beyond the steep spiral range may cause excessively fast diving speeds. Spiral turns should be avoided below 500 feet, even if the intended landing area is a body of water.

6. In gusty or turbulent conditions the Pursuit is best flown with approximately 50% brakes. More than 80% or less than 20% brakes should be avoided. Gust induced stall or momentary deflation of the canopy is possible due to turbulence and or gusts.

7. Under no circumstances should the rigging trim or reefing system be altered without consulting Para-Flite Incorporated. See maintenance section.

8. A close surveillance of other parachutists in the air must always be maintained, especially in large star relative work, canopy collisions are always a potential hazard. Learn to maneuver with the rear risers immediately after opening.

9. In spite of the forgiving stall characteristics of the Pursuit, flared landings must not be initiated above 15 feet. This could result in a dangerous stall. If a flared landing is initiated at too high an altitude, do not panic. Bring both toggles up to the 50% brake position immediately and stabilize the canopy heading into the wind.

10. If after opening you experience difficulty in control due to pilot chute interference with the control or suspension lines, or if you see anything out of the ordinary, do not waste time — consider exercising your emergency procedure immediately.

11. NOTE: The Pursuit's stall point will vary from day to day due to variations in altitude density and atmospheric conditions. It will also vary with different suspended weights. The stall point should be ascertained on each and every jump at a safe altitude.

12. A stable face to earth body position must be used for opening.

CARE AND MAINTENANCE

Although it would be ideal, it is not practical to minutely inspect the Pursuit for wear and damage after each jump. However, the whole system should be regularly examined for signs of wear. Any part of the system requiring maintenance should be marked for later repair and replacement.

NOTE: Check the threaded barrel of the connector links for tightness regularly, but *do not* over tighten.

Pay special attention to the Slider and Deployment Bag. Should any part of the deployment system become frayed or require maintenance, be sure to take care of it before making subsequent jumps.

Repairs: Small holes and tears should be repaired with ripstop stape. Wherever possible put ripstop tape on both sides.

Medium size tears should be repaired by laying a patch over the damaged area and zig-zagging the patch around the edges.

For any major damage consult Para-Flite Inc.

Special attention should be given to the bag. Loose grommets should be replaced immediately. When replacing these parts, make sure they are installed properly.

Replacement parts for the Pursuit may be obtained from Para-Flite Inc.

The slider should also be inspected periodically, especially the grommets. Loose or damaged grommets should be repaired or replaced immediately.

Avoid leaving the canopy unpacked in the sun. The sun's ultra-violet rays are very damaging to nylon. The amount of time that the canopy is exposed to the sun is the deciding factor in how long the canopy will last.

Do not wash the canopy as this can have an adverse effect on porosity. If washing the canopy becomes necessary, do not use soap, and do not put the canopy in a washing machine. Gently rinse the canopy in a tub of lukewarm water instead.

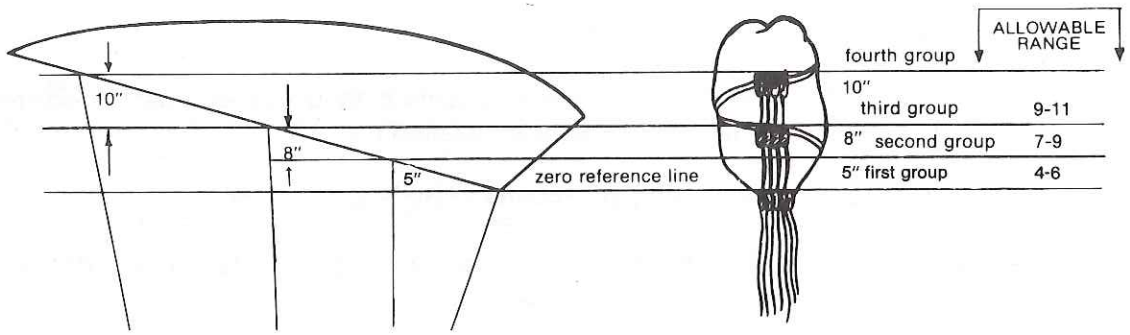
Although the ripstop fabric used in the Pursuit is termed "color fast", it is not advisable to store it, or pack it while damp or wet. It is best to dry the canopy by either hanging, or laying it flat. The colors may run if the canopy is left wet or damp.

PURSUIT FLIGHT TRIM CHECK METHOD

The following information represents the most current method available to establish and/or check the proper "trim" or "rigging" of the Pursuit Model.

1. Arrange all 4 connector links in a vertical stack and anchor them firmly in that position.
2. Check for proper canopy layout and proceed with the first "S" fold.
3. Compare the distance between the first and second groups of suspension line attach points. It should be 5 inches with equal tension applied to each group.
4. Make the second "S" fold.
5. Compare the distance between the second and third groups of suspension line attach points. With equal tension applied to each group, the distance should measure 8 inches.
6. Repeat the procedure for line groups 3 and 4. The distance between the third and fourth group of lines should be 10 inches.

The diagrams below illustrate the method described.



Deployment Brake Setting Check Method

1. Lay the canopy out like you would for packing with all the lines pulled tight.
2. Install the deployment brake loops.
3. Anchor all four connector links together.
4. Find the shortest steering line at the canopy.

   With one steering line in one hand, walk to the "leading edge" of the canopy (front of canopy where the cell openings are), pick up in your free hand one of the suspension lines that are attached at the front of the canopy.

   While holding tension on both lines, compare them in length, the steering line should be 14 inches above the "nose" or "front" suspension line.

Supplementary Packing Instructions for the Pursuit

Pursuit canopies should be packed following the Packing Instructions For Para-Flite Canopies (supplied with all Para-Flite canopies) with the following exceptions:

CAUTION: SPRING LOADED PILOT CHUTE MUST NOT BE USED.

Jump & Pull vs. Terminal Openings

The Pursuit was specifically designed to open *very fast* for minimum altitude loss on jump and pull exits. When a jump and pull exit will be performed, the nose of the Pursuit should be folded *down* or under the canopy. **See Photo #1.**

If a terminal opening is to be performed, the nose should be folded up, or on top of the canopy. To further reduce opening shock on terminal openings the nose should be *rolled tightly* to the A line or first line grouping. **See Photos #2, #3 and #4.**

Pilot Chute Retract System

On opening of the Pursuit, the patented PCR System will automatically retract the hand deploy pilot chute to the tail of the canopy. While the PCR System is very reliable, certain precautions must be taken to insure proper operation and to prevent damage to the system *and* to the canopy.
The bridle line and rings should be inspected every time the Pursuit is packed. Burns on the bridle or canopy can be caused by slack in the bridle or canopy material wrapped or caught in the bridle line or grommets in the deployment bag. It is very important that *all* slack in the bridle is removed and no canopy material is in the vicinity of the PCR System. **See Photo #5.**

Deployment Bag

Unlike conventional squares, the deployment bag for the Pursuit is grommeted directly to the top rear of the canopy. Only a slight packing modification is needed to get the Pursuit into the bag easily and neatly: the *last* 's' fold, when stacking the canopy, should be folded *under* the previous fold. By folding the last 's' fold under, the deployment bag will be in a position to accept the stacked Pursuit the easiest. **See Photos #6, #7, #8 and #9.**

Removing the Slack in the Pilot Chute Bridle

After the canopy has been placed into the deployment bag and secured with the two locking stows, the bridle must be pulled *firmly* to remove *all slack* from the PCR System. You'll know when all the slack has been removed when you can't pull any more bridle out and you'll have approximately 6 to 8 feet of bridle exposed. **See Photo #10.**

Trim Tabs

All Pursuits are supplied with trim tabs manufactured by Para-Flite, Inc. Their operation is quite simple:

1. Grasp the black tension lanyard and pull down to the desired distance. **See Photos #11 and #12.**
2. To release the trim tabs, lift the red release lanyard. **See Photo #13.**

Installing and Routing of Bridle Protector

NOTE: The cloth closing loop must be replaced with an elastic closing loop. If your hand deploy pilot chute is removable, remove it from its bridle and install directly to the end of the Pursuit bridle. If the hand deploy pilot chute is sewn or permanently attached to your bridle, you must either:

1. **Get another hand deploy pilot chute (available through Para-Flite).**
2. **Cut it off and have a loop sewn in so it can attach to the Pursuit bridle.**

1. Take an appropriate length of 1" pile velcro and place it over the hook velcro on the container system. Trim ends at a 45° angle. Sew along top edge so as to form a channel for the bridle line.
2. Route the bridle as normal by rolling back the pile velcro and placing the bridle line in the channel that is formed. Remate the velcro and stow your hand deploy pilot chute in the normal fashion. **See Photos #14 and #15.**

SHOULD YOU HAVE A PULL OUT PILOT CHUTE, SEPARATE THE PILOT CHUTE (AND PIN LANYARD) AND REATTACH TO THE PURSUIT BRIDLE AND USE YOUR RIG AS IS (CLOTH CLOSING LOOP DOES NOT NEED TO BE CHANGED).

Photo #1

Photo #2

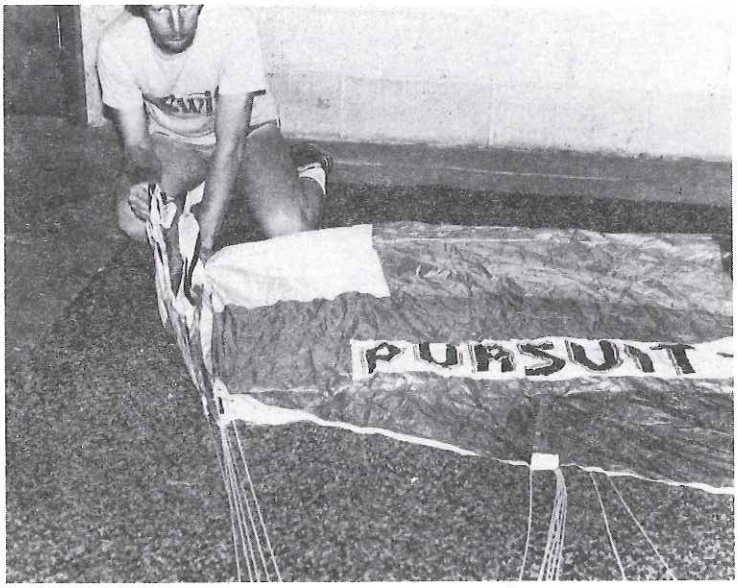


Photo #3

Photo #4

Photo #5

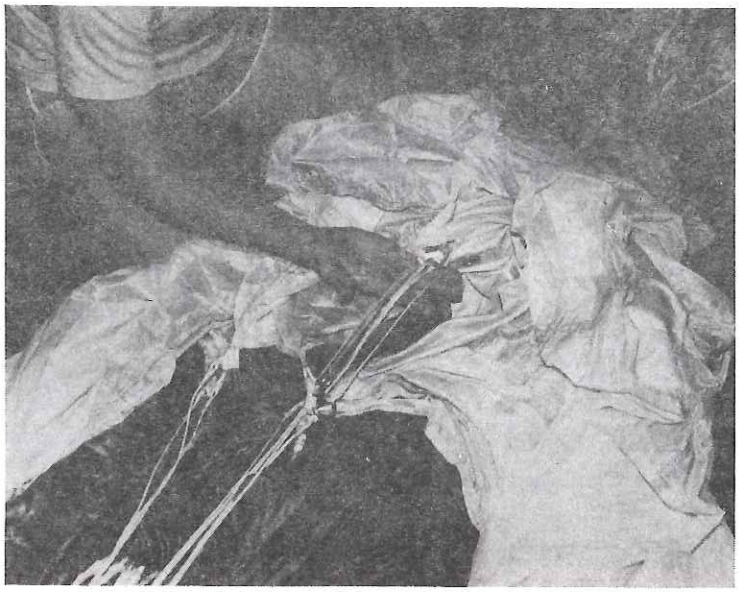


Photo #6

Photo #7

Photo #8

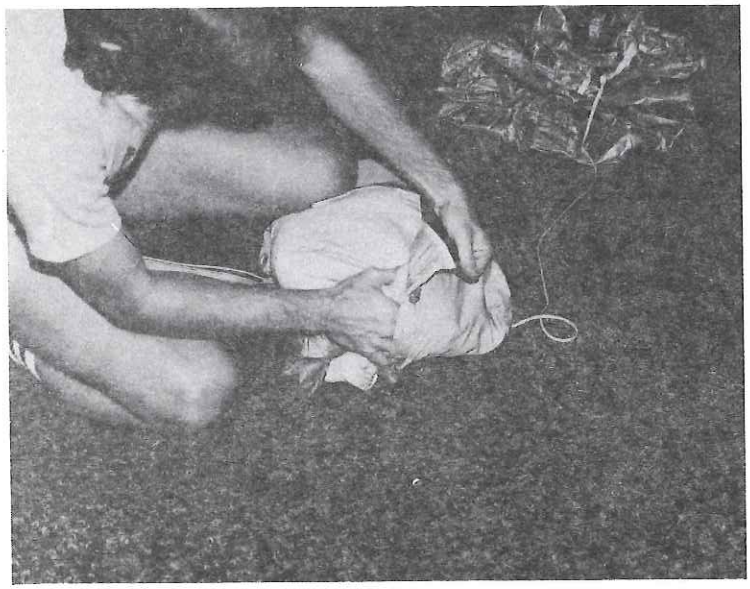


Photo #9

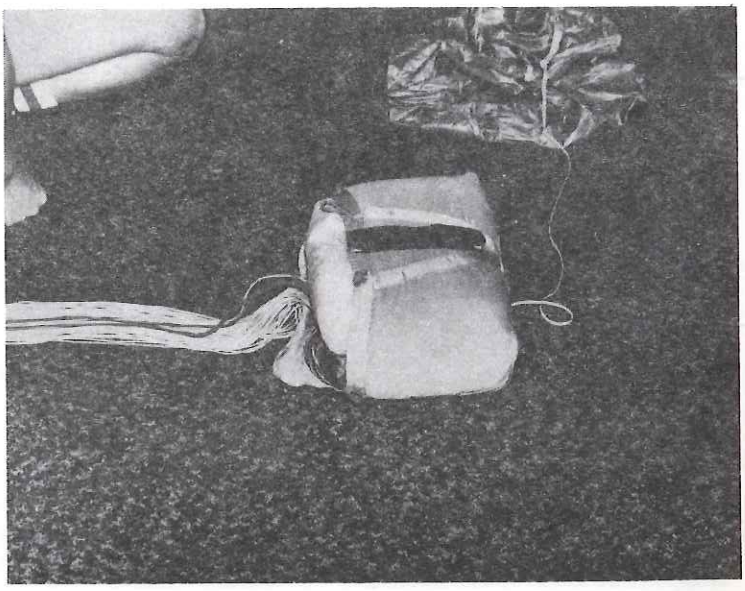


Photo #10

Photo #11

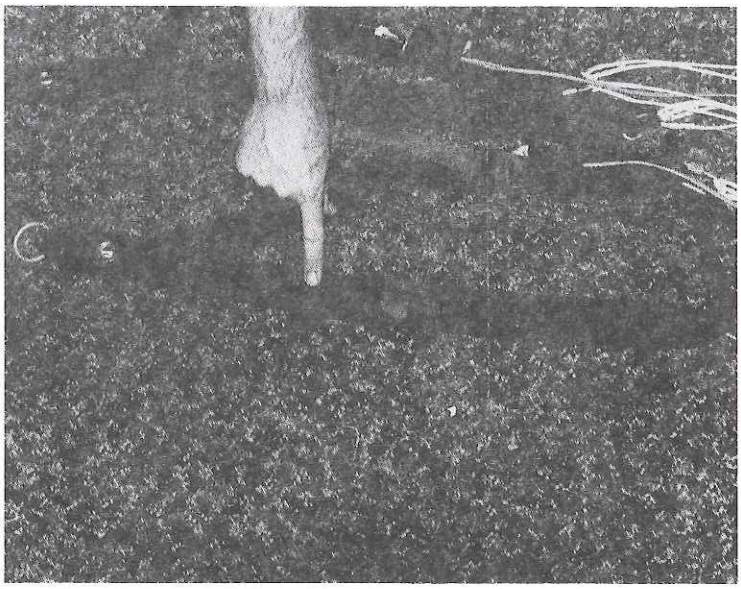


Photo #12

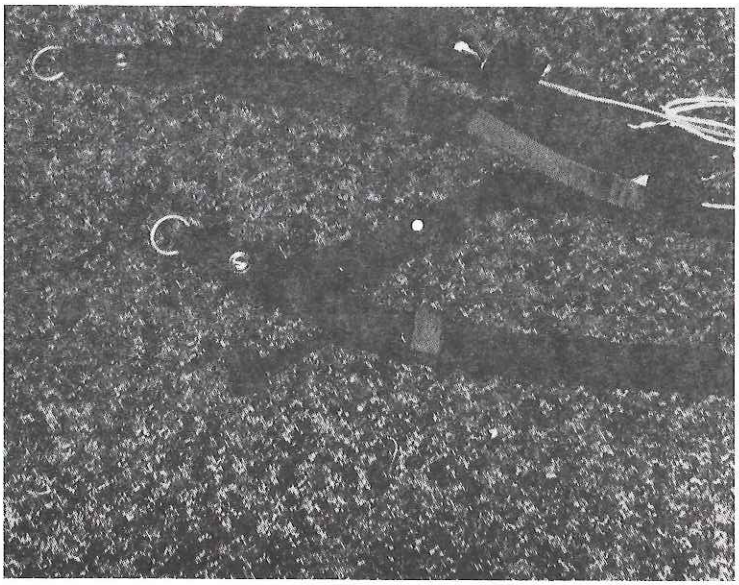
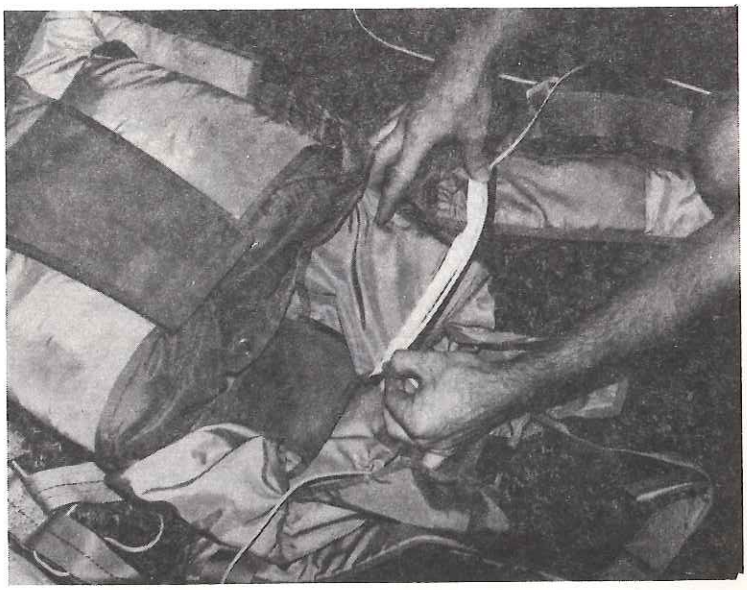


Photo #13

Photo #14

Photo #15



<u>WARNING:</u> — LANYARD (1½ SHOT) CAPEWELLS

Due to the cam action on the Lanyard (1½ shot) canopy release devices, the travel of the spring is not always sufficient to disengage the locking tabs from the slots in the male fitting, thus preventing proper separation in the event of cut-away during emergency procedure. In addition, end play of the male fitting may prevent complete release of the locking tabs, unless they are correctly adjusted. *You must check this adjustment every time you change main canopies or risers or harnesses.*

Insure that proper separation is possible by suspension harness tests, release one side at a time. Adjustment to the locking tabs may be necessary.