BASEics

by

BASE #3

PREFACE

This guide is written for the skydiver interested in BASE jumping. (BASE is the acronym for Building, Antenna/Tower, Span, Earth.) It is not meant to be the final word in BASE; rather, as a whole, it is intended to share [illegible] knowledge of BASE [illegible] jumpers seriously pursuing BASE activities will supplement this knowledge with research and discussion with other BASE jumpers, along with updating information. Conscientious and responsible preparation allows more opportunity for enjoyment of the experience.

This guide does not advocate illegal, harmful, or dangerous jumps. BASE jumpers are expected to respectfully protect others' lives, property, freedom, and rights. Any concepts expressed or implied herein, whether correct or incorrect, are taken and used by the reader at his own risk and responsibility.

"Common sense is only part of an uncommon activity."

— BASE #3

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CHAPTER 1

THE CHARACTER OF BASE JUMPING

BASE jumping is a unique and rewarding experience. It offers a natural combination of beauty, participation, and education that is not found in any other activity. In a 3 to 12-second freefall, a jumper can discover the personality of an object on its own terms. To instantly experience a huge object gives new perspective to its relationship to man — a more intimate respect and enjoyment of existence on a grander scale.

BASE jumping's two major differences from standard skydiving are also its main attractions:

1. The first 2 seconds of freefall starting from rest.
2. Falling relative to the side of a fixed object.

In pursuit of these experiences, particular types of objects prove more challenging than others. The recommended approach is from simplest to most complex, or generally:

Span
Earth
Antenna/Tower
Building

The order is dictated by the negotiability of potential hazards. For example, if a canopy opens backwards, facing underneath a bridge, there is usually no danger of a collision, whereas there is with the side of a building. Similarly, an undercut cliff usually affords more leeway than a building or tower. Nevertheless, objects' peculiarities often increase or decrease their degree of difficulty. This necessitates individual consideration of every object and the conditions under which it can be jumped.

Not only must the physical demands of a jump be prepared for, but also the mental demands. Exhaustive study should be done beforehand of the site, the gear, and the jumper himself. Some of the general questions that need to be answered are:

1. Is the site conducive to BASE jumping — sheer enough with a good launch point and landing area?
2. What is necessary to get to the launch point and back from the landing area?
3. What are potential hazards; how can they be corrected for?
4. Have contingency plans been made for weather or injury emergencies?
5. Has gear been chosen according to site specifications? Is it in perfect condition?
6. Will the canopy open consistently and on-heading?
7. Do the jumper's ability and experience meet the site's requirements?
8. Are the jumper's motives good?

All responses should be in the affirmative and fully understood, but the last two questions can only be answered by the jumper himself. It is the individual's responsibility to constantly assess the situation he is placing himself in, to avoid compromising [illegible]

CHAPTER 2

BASE SITES

Typically, the four BASE categories have the following distinguishing features:

Building —
(a) man-made structure
(b) usually intended for occupation along its full extension
(c) represented geometrically by a vertical plane

Antenna/Tower —
(a) pinnacle-shaped
(b) with or without guys
(c) represented geometrically by a vertical line

Span —
(a) extends over water or land
(b) clear air space beneath
(c) represented geometrically by a horizontal line

Earth —
(a) naturally formed
(b) unoccupied
(c) represented by any of the geometric properties mentioned above

Each category has particular conditions to be prepared for in getting to the launch point and from the landing area. The jumper needs to be well-versed in the equipment and procedures necessary to comfortably make the curcuit.

2-1 BUILDINGS

Building launch points are physically easily accessible. If the structure is complete, it is usually just a matter of taking the elevator or stairs to the top, having access to the roof. However, many of the larger buildings have secure roofs, and most building codes require stairs to have self-closing, self-latching metal fire doors. Normally, it is against fire regulations to prop the doors open, and when they close, the only exits are the ground floor exit and a roof access, which is frequently an alarm-activating door.

Buildings under construction usually have partially-lit or unlit stairwells with open access to each floor. Closer to the uncompleted top, the stairs may go through various stages of completion — from formed concrete to bare metal to temporary wooden construction ladders. Most construction sites are hardhat areas, and everything should be left as it is found.

Equipment —
old gloves for dust and grease
flashlight at night
sweater, windbreaker, or light jacket for roof

Ascent time —
about 2 floors per minute or 700 feet per half hour

2-2 ANTENNAS/TOWERS

Antenna/tower launch points are usually the most strenuous to get to. Most are on transmitting or receiving radio or television towers. Of these, the TV and FM radio usually have their electrified antennas mounted high on top of the tower. Top-mounted antennas are very common, but many towers also have a number of side-mounted antennas – microwave dishes, telephone horns, large-mesh UHF cylinders, and others. Generally, it is recommended to stay at least 20 feet from transmitters.

AM radio towers may also have side-mounts, including side-mounted FM antennas. But, unlike FM radio towers, the AM tower is the AM antenna, so the entire structure itself is electrified. It is held above the ground by a large insulator usually made of highly-glazed ceramic.

Contact with powered antennas should be avoided. This includes both the entire AM radio tower structure and antennas mounted on top of TV and FM towers. Depending upon voltage and grounding, contact can be fatal, and, like moving in front of antennas, under certain circumstances it can also interfere with transmission or reception.

Besides antennas, waveguides also carry electricity. Waveguides are hollow tubes that conduct high-frequency waves to and from antennas. The most common are rectangular or circular in cross section and made of metal. The waves should be confined to the tube interior, but with age the tubes can crack and leak electromagnetic radiation.

Most radio and TV antenna towers have full-length access ladders which vary in size and structural integrity and are usually mounted inside the structure. Climbing is less fatiguing if the body is kept close to the ladder and most of the work is done by the legs. While most people do not get banged-up knees, smaller climbers can get sore forearms from scraping as they reach around the ladder for a backhand grip.

Tower climbers must be both physically and mentally prepared for the ascent. Though the ladder is usually located within the structure, concentrating on every handhold and foothold can be mentally draining, especially considering potential problems should the climber slip. The number of rest stops needed varies with the individual, and some climbers, frequently standing on a crossbeam to the side of the ladder, take short stops as often as every 15 feet. Most climbers, however, rest about every 50 feet and pace themselves.

Most larger antenna towers have platforms at 100 to 200-foot increments. These platforms are excellent for regrouping and resting while helping other climbers squeeze their gear through sometimes narrow access hatchways. The openings are sometimes closed by a hinged grating that needs to be pushed open from below and lowered shut from above, while some gratings are locked closed.

Tower climbing should be done only in good weather and preferably during an antenna tower's non-operational hours. Fog or rain makes metal ladders slippery, and cold metal can be very hard on bare hands. It is better not to climb at all in wet conditions, and to altogether avoid towers during electrical storms.

The wind gradually increases with altitude, sometimes reaching about 50 miles per hour at the top of a 1,000-foot tower, even though it may be calm on the ground. For this reason, to prevent accidental canopy release, main and reserve pins are sometimes temporarily taped or tied closed and blatant reminders, such as red ribbons, extended out of the closure. The tape or tie must be removed before the jump.

Equipment —

good-gripping gloves for dirty, greasy, slippery ladders
long-sleeved arm protection for climb
windbreaker or jacket for top

Not recommended —

use of possibly unmaintained elevators
ascending anything that possibly cannot be descended

Ascent time —

about 700 feet per hour
(About half of that is rest time.)

2-3 SPANS

Span launch points are relatively easily accessible. Most domes have catwalks that lead to the exit point, while most bridge launch points can be either walked or driven to. In most states, it is illegal to stop a vehicle on a bridge or to walk across a bridge that has no pedestrian walkway. However, even if prior special arrangements are made, it is still necessary to be cautious with traffic by walking well off to the side or by using vehicle hazard lights. Other drivers are sometimes easily startled, so, unless appropriate, as little time as possible should be spent on the bridge.

Bridge-walk days are an especially good time for BASE jumping activities. A number of large, popular bridges hold bridge-walk days at least once each year. At that time, one lane or side is usually closed to vehicular traffic and opened to pedestrians. This makes getting to the launch point often a simple matter of becoming the unwitting leader of a small parade of curious onlookers.

Generally, spectators can be taken in stride and are very cooperative. However, upon exit of any jumper, the crowd immediately surges forward with great pressure, filling in every gap that provides a view over the railing. For this reason, when it comes time to mount the launch point, the jumpers or crowd-control officials should direct spectators to stand to the side of the launch area instead of directly behind it. This direction will need to be repeated before each jump, and no one should mount the railing unless he is prepared to exit at the same time as the jumper.

Getting back from the landing area is a matter of arranging transportation out of the valley or walking uphill back to the top. There should be contingency plans for emergency transport. If a water landing is possible, floatation gear should be used, and arrangements should be made for immediate boat pick-up and carrying wet, heavy gear.

2-4 EARTH

Earth launch points usually take the most time to get to. While some of the lower ones are a short walk from major roads, most of the high ones call for a considerable amount of hiking. Of all BASE jumps, the earth-type jumps are the most likely to require some sort of non-jumping support crew — driver, equipment carrier, or communications personnel. Also, an overnight stay is commonly involved.

Travelling miles on foot to an earth launch point requires a certain amount of hiking and camping ability from every individual. Since the "pre-jump exposure time" is usually greater than for the other three object categories, extra attention needs to be given to planning and coordination, environmental conditions, and familiarity with hiking and camping equipment and procedures. Physical or mental unpreparedness is as likely to be revealed during a hike and overnight as it is during

Proper preparation leads to more enjoyment of the experience. The following items are among those that should be checked:

Weather —
Lightning is especially dangerous in high and exposed areas, near metal, and underneath tall exposed objects.

Wildlife —
Check for seasonal habitats of bears, mosquitoes, endangered species, and others. Pay serious attention to food-storage suggestions and temporarily prohibited areas; most are designed to prevent loss of equipment or life.

Trails —
Be aware of all trails in the area, where they lead, and how steep they are. Check trail conditions, closings, frequency of travel, and frequency of pack trains.

Water —
Available drinking water may be dried up even though it is shown on a map. Check on seasonal availability and possible contamination from pack train crossings, upstream campsites, or stagnation.

Permits and Registration —
Many areas require Backcountry Use Permits for overnight trips. Use of Voluntary Registration Cards is recommended and can serve to initiate immediate search operations if necessary. Applicable permits and registration should be filled out accurately. (See the following two pages for a sample Voluntary Registration Card from Yosemite National Park.)

The above items may need to be checked for more than one altitude or geographic area. Often, many questions can be answered by nearby administrators — park officials, outdoor activity organizations, naturalists, or land owners.

All equipment taken on an overnight hike to the launch point should be in fine working condition. Following are some items that should not be overlooked for each person:

Hiking and Camping:
topographic map — showing clearings and areas of dense vegetation
proper footgear
water — Quart containers are popular.
toilet tissue
sleeping bag
flashlight
waterproof matches or firestarter
lightweight food and mixes
plastic bag — for garbage
knife
line
toiletries — including sunscreen and lip balm
extra socks
raingear — including plastic bag to pack jump equipment in

VOLUNTARY REGISTRATION CARD

PLEASE CIRCLE ONE: (DAY HIKING) (BACKPACKING) (SKIING) (SNOWSHOEING) (CLIMBING) (OTHER _____)

NAME: Last _____ First _____ Int. _____

PERMANENT ADDRESS: _____

CITY: _____ STATE: _____ ZIP: _____

PHONE: Home ( ) _____ Business ( ) _____

DATE OF BIRTH: _____ AGE: _____ SEX _____ WT. _____ HT. _____

ADDRESS WHILE STAYING IN PARK: _____

CAMPGROUND _____ SITE #: _____

OTHER _____ ROOM #: _____

DESTINATION AFTER LEAVING PARK: _____

ADDRESS: _____ PHONE: _____

CITY: _____ STATE: _____ ZIP: _____

DEPARTURE DATE	NAME OF TRAILHEAD IN	RETURN DATE	NAME OF TRAILHEAD OUT

EXACT TRAIL/ROUTE DESCRIPTION INCLUDING OVERNIGHT CAMPS/BIVOUAC

_____

_____

_____

_____

DID YOU GET A WILDERNESS PERMIT? _____ WHERE? _____

YOUR VEHICLE DESCRIPTION: YEAR _____ MAKE _____ TYPE _____

LICENSE # _____ STATE _____ COLOR _____

EXACT LOCATION PARKED _____

PREVIOUS EXPERIENCE: _____

_____

_____

_____

_____

* GPO: 1981-790-901

PERMIT CONDITIONS

You must sign in promptly within a few hours, upon completion o termination of your trip or climb. Failure to do so is in violation of 3 CFR, 2.6 B-3 "Registration systems" and will result in court action. Mor important, failure to sign in results in the initiation of a search operation

Closing your trip card is easily done by returning to or telephoning th place of issuance, between 8:00 a.m. and 5:00 p.m. daily. Summe hours may extend these times, so check before you leave on your trip.

For any overnight trip into the backcountry, a wilderness permit i needed **in addition** to this voluntary registration card.

REGISTRATION AND CHECK OUT LOCATIONS

VALLEY VISITOR CENTER ..... (209) 372-4461 Ext. 32
(24 hour phone number)
BADGER PASS RANGER STATION ..... (209) 372-4232 (Winter)
TUOLUMNE VISITOR CENTER ..... (209) 372-4383 (Summe
WAWONA RANGER STATION ..... (209) 375-6321
BIG OAK FLAT RANGER STATION ..... (209) 379-2626 or
(209) 379-2225

ARTY MEMBERS

AME	ADDRESS	CITY	STATE	PHONE #

N CASE OF EMERGENCY NOTIFY:

AME: Last First Int.

DDRESS: _____

ITY: _____ STATE _____ ZIP _____

HONE: Home( ) Business ( )

OUR SIGNATURE _____

SSUING RANGER'S SIGNATURE _____

ATE: _____ TIME: _____

EQUIPMENT IN MY POSSESSION:

- ___ MATCHES
- ___ COMPASS
- ___ MAPS
- ___ LITTER BAG
- ___ FLASHLIGHT
- ___ WHISTLE
- ___ CLIMBING ROPE
- ___ NUTS/PINS
- ___ FOUL/COLD WEATHER GEAR
- ___ EXTRA CLOTHING
- ___ SKIIS
- ___ FIRST AID KIT
- ___ WATER BOTTLE
- ___ REPAIR MATERIAL
- ___ EXTRA BATTERIES
- ___ FIRE STARTER
- ___ SLEEPING BAG
- ___ HAMMER
- ___ ICE AXE/CRAMPONS
- ___ SNOWSHOES
- ___ AVALANCHE CORD
- ___ TENT
- ___ STOVE
- ___ FOOD

RETURN DATA

ATE RETURNED: _____ TIME: _____

LACE: _____ HOW DID PERSON CHECK IN? _____

ANGER CHECKING PERSON IN: _____

Jumping:
- parachute rig
- rubber bands
- pull-up cord
- gloves

Aids:
- emergency blanket — resembles aluminum foil, fits in palm of hand when folded, disposable, not a "space" blanket
- compass
- whistle
- some paper money
- first aid kit — and knowledge of its use

Desirables:
- pad and pencil — for rate-of-travel notes
- wristwatch
- small still camera

Before embarking on a hike, everyone concerned with the group should be well-informed. Following are some questions that should be resolved:

1. Where are vehicles and keys to be left?
2. Does the support crew know the exact itinerary of the hikers and jumpers and how long to wait before notifying search personnel?
3. Does at least one of the hikers know the trails well?

4. Equipment-wise and ability-wise, is each hiker independent of the others in case of accidental separation from the group?
5. Have water containers been filled? Where can they be refilled along the trail?
6. Have periodic rest stops been designated along the trail for regrouping?
7. Have arrangements been made to pack out everything that is packed in?
8. Under what conditions will jumps be aborted or postponed — weather, injury, other? How will the support crew know?

Upon arrival at the launch site, extra caution should be used in setting up camp. Equipment should be put where it cannot roll or be blown off the edge, and badly weathered rocks or unstable areas near the edge should be avoided. If a fire is to be built, it is best to use a pre-established fire ring in an appropriate site far away from the edge.

Frequently, non-jumpers hike along to carry equipment back that is not flown down by the jumpers. The carrier's load usually proves to be heavier and more cumbersome for the return hike. Therefore, each carrier should not be expected to carry back more than two jumpers' equipment, or about 40 pounds.

The more the jumpers fly down, the faster the carriers can return. Generally, novice hikers tend to carry in more clothes and food than they can use, creating extra weight. Jumpers can stuff small items into pockets and pouches, and extra clothes fit well in the space between the rig and the back.

Depending on the nature of the site, getting back from the landing area can be less or more difficult than getting to the launch point. If the travel distance or time is considerable, the jumpers should either fly down the equipment they will need or have part of their support crew waiting with gear for them. Also, if the landing area is remote, jumpers should have some means of communicating with a launch site crew.

Hiking time — about 2 horizontal miles per hour
plus 1 hour for each 1,000 feet of elevation gain

CHAPTER 3

BASE PREPARATION

BASE preparation starts with the assessment of a site's jumpability and ends when the jumper is safely on solid ground. In between are the ultimate thrill of the jump and the knowledge and understanding that makes the jump safe and successful.

Research, packing, practicing, timing, exiting, flying, and landing are all integral parts of any BASE jump. Understanding each of these leads to more opportunity, more development, and more fun.

3-1 ALTITUDE

Altitude can be measured in a number of different ways. The three most common are:

1. Previous measurements from surveys or construction specifications
2. Direct measurements
3. Calculated measurements by object-drop

Surveys and construction specifications are the most accurate and include:

1. Geological survey benchmark altitudes — shown on topographic maps
2. "Obstruction" altitudes — shown on aviation sectional charts
3. Construction measurements — entire structure altitude or standard floor or level heights

When determining the height of radio or TV towers, paint and lighting can also be helpful. Depending on the height and aircraft use of the location, the tower may be unpainted, painted gray or green for environmental aesthetics, or painted aircraft-surface orange and white. The latter is very common for high towers and has two major requirements:

1. The top and bottom sections must both be orange.
2. The maximum height is 100 feet per colored section, and there must be 7 color bands.

The following antenna tower lighting requirements may also be helpful:

Tower Height (feet)	Flasher Levels (H = Tower Height)	Obstruction-light Levels (H = Tower Height)
through 150	none required	H
over 150 - 300	H	1/2H
300 - 450	H	1/3H 2/3H
450 - 600	1/2H H	1/4H 3/4H
600 - 750	2/5H H	1/5H 3/5H 4/5H
750 - 900	1/3H 2/3H H	1/6H 1/2H 5/6H
900 - 1050	2/7H 4/7H H	1/7H 3/7H 5/7H 6/7H
1050 - 1200	1/4H 1/2H 3/4H H	1/8H 3/8H 5/8H 7/8H
1200 - 1350	2/9H 4/9H 2/3H H	1/9H 1/3H 5/9H 7/9H 8/9H
1350 - 1500	1/5H 2/5H 3/5H 4/5H H	1/10H 3/10H 1/2H 7/10H 9/10H

Direct measurements are often taken when previous measurements are unavailable or need to be supplemented. Many lower objects can be measured "tape measure style" with a non-elastic tape, rope, or pole that is marked in precise increments. Higher objects, however, are more easily measured with an accurate altimeter, especially where triangulation is not practical.

Object-drop measurements are both popular and simple. An object is dropped from the edge of the launch point, and the seconds are counted until it hits the ground. Then, using the proper acceleration formula, the time is used to calculate the altitude. Following are some important procedures for taking object-drop measurements:

1. Drop only in unpopulous areas where safe and no damage will be done below.
2. Use a chunk of rock or a similarly-weighted chunk of indigenous or retrievable material. The chunk should be at least a large handful and not flake-shaped.
3. Hold the object at the launch point's edge and drop it straight down. If there are obstructions below, the object can be lightly tossed outward.
4. Time the seconds the object takes to hit the ground from release. Preferably, impact is timed visually rather than audibly.
5. Make a few drops, and take the average time.
6. Using the correct acceleration formula, calculate the altitude from the launch point to the point of impact.

The following table may also be helpful in altitude approximations:

DISTANCE FALLEN IN FREE FALL STABLE SPREAD POSITION

This table is computed for Free Fall in the Stable Spread (Face to Earth) position for an opening altitude of 2500 feet above drop zone and for average summer temperatures and pressure conditions.

CAUTION: The rate of descent increases with (1) other body position, (2) higher temperatures, (3) lower pressure (e.g. higher field elevation). Use this table with extreme caution at field elevations over 1000 feet, especially during long delays. Always add 200 feet extra for each 1,000 feet of field elevation.

Distance Fallen Per Second up to Terminal Velocity

Sec	Dist
1	16
2	46
3	76
4	104
5	124
6	138
7	148
8	156
9	163
10	167
11	171
12	174

Distance Fallen in Free Fall Stable Spread Position
Cumulative Distance in Feet

Sec	Dist	Sec	Dist	Sec	Dist	Sec	Dist	Sec	Dist
1	16	13	1657	25	3745	37	5833	49	7921
2	62	14	1831	26	3919	38	6007	50	8095
3	138	15	2005	27	4093	39	6181	51	8269
4	242	16	2179	28	4267	40	6355	52	8443
5	366	17	2353	29	4441	41	6529	53	8617
6	504	18	2527	30	4615	42	6703	54	8791
7	652	19	2701	31	4789	43	6877	55	8965
8	808	20	2875	32	4963	44	7051	56	9139
9	971	21	3049	33	5137	45	7225	57	9313
10	1138	22	3223	34	5311	46	7399	58	9487
11	1309	23	3397	35	5485	47	7573	59	9661
12	1483	24	3571	36	5659	48	7747	60	9835

HOW TO CALCULATE JUMP ALTITUDE FOR DELAYED JUMPS

1. Select length of delay.
2. Find distance fallen in free fall in this time from table.
3. Add 2500 feet for opening altitude.
4. The total is your jump altitude above the ground where you set altimeter.
5. Remember to check that the aircraft altimeter is set for field elevation on takeoff.

3-2 JUMPABILITY

Jumpability of a site is determined largely by what would obstruct the path of a falling BASE jumper; the objective is for the jumper's trajectory to take him clear of any obstacles. Generally, jumpability of buildings, spans, and towers is straightforward since they are usually sheer-sided or have clear air space beneath. Earth launch points, however, take more research to identify.

Preferred sites are overhung or at least sheer, and object-drops are commonly used to identify suitable launch points. Using the same general procedures as before, hold the object at the edge of the intended launch point and let it drop straight down. It should fall without touching anything until well past the intended canopy opening altitude. If not, a more overhung site should be sought. Usually, the farther the object falls away from the side, the more overhung the site is.

In addition to straight down drops, objects are frequently very lightly tossed off the edge. This serves to approximate the additional horizontal momentum of a good exit that would help carry a jumper away from the wall.

3-3 WINDS

Winds are a major factor in the jumpability of a site. Suitable direction and intensity can be used to the jumper's advantage, but undesirable wind conditions alone can cancel jumping from an otherwise fine launch point. Site conditions are observed at different times of the day to discover when the winds are best for jumping, and wind indicators are strategically placed.

Thermals and eddies can cause adverse wind conditions. Since thermals are common when the sun unevenly heats the earth's surface, early-morning and early evening hours are usually the most calm. Eddies are common on the downwind side of solid objects or where wind flows around obstructions and should always be avoided.

3-4 LAUNCH POINTS

Launch points are generally located where jumping conditions optimize safety. They are chosen where there is the best combination of:

Altitude
Downwind exit with safe wind currents
Unobstructed freefall
Off-heading allowances for canopy openings
Forgiving landing area in case of malfunction

All weather and site conditions should be used to the maximum advantage of the jumper. Some of the preferred conditions are:

Building —
downwind corner exit with more clear, stable air than a downwind side

Antenna tower —
downwind exit between guys but not when the wind blows down a guy

Span —
exit over safest part of river

Earth —
exit where most overhung

3-5 LANDING AREAS

Landing areas are selected well before a jump. Both primary and alternate sites are chosen, and consideration is also given to emergency landing areas. Every jumper should thoroughly examine the site and note all obstacles, including:

Overhead wires and support cables
Posts and fences
Drop-offs and pot holes
Obstacles hidden in high grass
Rocks, trees, waterways, and water currents
Vehicular traffic

Also, fragile or easily damaged areas should be avoided.

The landing area should be observed preferably under the same conditions and at the same time of day the site is to be jumped. Wind currents should not be excessive or turbulent, and if no wind indicators are set up, natural indicators should be noted — trees, flags, smoke, water surfaces, and so on.

3-6 SUPPORT CREWS

Support crews help transport equipment and jumpers and sometimes serve as a communication base. Specifically, they can:

1. Provide jumpers with last-minute landing site conditions via radio or visual signals
2. Direct safe landings, especially near traffic
3. Quickly get help in case of an emergency

A well-informed and efficient support crew is valuable both before and after a jump.

Support crews are especially recommended for difficult sites or conditions, particularly if the landing site is not visible from the launch point. If water landings are possible, each jumper should have someone ready to immediately assist him out of the water, ideally with a boat.

CHAPTER 4

BASE GEAR

When a BASE jumper leaps off an object, he relies on his abilities and his gear to get him safely to the landing area. Selection and preparation of that gear can determine the success or failure of the jump.

For this reason, every BASE jumper should painstakingly choose and test gear that can be relied upon. Even the minutest details of jump preparation deserve special attention.

4-1 CANOPIES

Steerable main and reserve canopies are selected to match the jumper's experience level and to allow a soft enough landing at the site's altitude. For both the main and reserve, the glide ratio should be great enough to reach the landing area with leftover altitude; forward speed should exceed the wind speed enough to avoid obstacles. All canopy openings should be consistently reliable, straight, and fast enough for the site conditions.

Steering line toggles should stow securely to the risers, generally with mating Velcro. Otherwise, premature brake release could result from jouncing to the launch point. Often, lines and brake stows are rechecked under optimum conditions just before the jump to make sure they are still in place.

4-2 HARNESS/CONTAINERS

Sizing of the harness and container must be appropriate for the equipment being put into them. Containers that are too tight could hinder proper, timely canopy deployment, especially at lower speeds, while containers that are too loose would allow excessive slop within.

Harnesses must fit exactly, and the shoulder straps should not be unusually loose either before or after opening. The chest strap should be secured well to prevent the shoulder straps from slipping in case of a head-down or tracking opening position.

4-3 DEPLOYMENT METHODS

Standard canopy deployment requires level to head-high body position. The five common deployment methods are:

Static-line
Ripcord
Hand-held
Throw-out
Pull-out

The static-line deployment is the best for controlling main-canopy opening altitude. The jumper exits head-high with the static line to his side or directly behind him where it cannot snag around his feet or other objects, and assuming no knots get into the static line, its length determines the beginning of deployment.

Most frequently, the static line is securely attached by 100-pound breakcord to the top of a strong, fast-opening, high-drag pilot chute, but sometimes an assistant simply holds the jumper's pilot chute at the exit point until it is pulled out of his hand when the canopy opens. Alternatively, free-bag static-line systems are used; here, the bag is not

Ripcord, throw-out, and pull-out are the three most popular deployment methods used in standard sky diving. But for BASE jumping, they all share a common drawback: The jumper must reach in with one hand to release the pilot chute. This takes additional time and could compromise body position. Therefore, the ripcord, throw-out, and pull-out deployments are usually only used for BASE jumps higher than 1,000 feet. By deployment time, these higher jumps are much like regular sky dives.

Lower altitudes require BASE jumpers to be able to release the pilot chute on the first attempt. But exiting a BASE site with the hand already on the release is *not* recommended; it causes an improper exit that usually flips the jumper onto his side or back. And on short-delay jumps, the position is usually uncorrectable before canopy deployment. Therefore, the hand-held pilot chute is the most commonly used method of deployment for jumps under 1,000 feet.

BASE jumpers should be familiar with the hand-held deployment method, especially since it is almost exclusively recommended for first-time freefall BASE jumpers. Even jumpers who usually use pull-out systems choose to change or convert them to hand-held for most BASE jumping.

The hand-held deployment procedure is very simple. The pilot chute is pulled from its pouch just before exit and held in the hand. The jumper exits, and at deployment time, he only needs to let go of the pilot chute. In this manner, the jumper can maintain perfect, stable form from exit through opening and still have excellent control of canopy deployment. Nevertheless, there are still certain procedures that should be adhered to:

1. Fold the pilot chute so that it will catch air and unfold quickly when released, but not before.
2. Gather excess bridle cord into the hand so that it cannot catch on anything, but leave enough slack to prevent the container from being accidentally pulled open when exiting in a spread-eagle position. Make sure the bridle cord does not wrap around the pilot chute to keep it from opening.
3. Keep all bridle cord behind the arm when exiting so that it cannot snag and cause a pilot chute in-tow.

4-4 PILOT CHUTES

Simple, fully-enclosed pilot chutes are recommended. Some ribbed pilot chutes can too easily be turned inside out so that they will not open, and collapsible Canopy Relative Work pilot chutes are not recommendable for BASE jumps. A pilot chute that will not work if it is forgotten to be "armed" is a source of problems.

Specialized fast-opening, high-drag, 52-inch diameter pilot chutes, available from Para-Innovators, are ideal for most BASE jumps. Though standard 30-inch pilot chutes are most frequently used for jumps over 1,000 feet, the 52-inch pilot chutes are better suited for lower jumps.

Since snatch force is very important, the bridle length from the base of the pilot chute to the container closure should be about 9 feet. This will help the pilot chute stay out of the jumper's burble. Also, the flat tape type bridle is more popular than the braided-line type since it exhibits less of a tendency to whip and wrap around things during the jump.

4-5 EMERGENCY RELEASES

The cutaway and reserve handles and leg and chest straps are all forms of emergency releases. However, if a site is not high enough for a cutaway, that release should not be used. In fact, sometimes the main risers are cross-connected or tied securely to the rig to prevent accidental cutaway. But square reserves are not used in no-cutaway situations, and if a water landing is possible, cutaway ability should be retained.

The reserve is usually deployed if the main canopy does not open, or as soon as an unclearable malfunction occurs, or right after a cutaway. Generally, single-point cutaway-reserve handles are not recommended for two reasons:

1. It is usually harder just to deploy the reserve.
2. It is harder to stage cutaway and reserve deployment, especially in spinning malfunctions.

Also, leg and chest straps should be easily removable. Notably, in the case of a water landing, quick-release leg straps are desirable, while thread-through leg straps are clearly undesirable. All emergency releases need to be quick and reliable.

4-6 MISCELLANEOUS GEAR

Jumpsuits, goggles, and altimeters are not necessary for most BASE jumps and are even undesirable for certain types. Even helmets are sometimes undesirable. Usually, unless major tracking is involved, jumpsuits are just extra weight and bulk, and altimeters cannot be used anyway. But if having them makes the BASE jumper more comfortable, they are often worth their weight.

For possible water landings, floatation gear and hook knives are used. Floatation should be well-placed so as not to hinder an emergency release of the canopy or harness, while hook knives are mounted high for easy access in the water.

Use of automatic openers is not recommended for BASE jumping, and a jumper who relies on one is not ready for BASE jumping.

4-7 TESTING GEAR

Generally, BASE jumpers should use gear that they are familiar with, comfortable with, and confident in. Using standard sky diving procedures, the entire rig should be tested, especially the main canopy's opening characteristics. Hot air balloon jumps are excellent for testing since they closely approximate BASE conditions. However, a series of standard sky dives suffices to answer the most important questions:

1. Does the main caonpy open reliably and consistently on-heading, or should a different type of canopy, round or square, be chosen to meet the site requirements?
2. Do the glide ratio and forward speed meet the BASE site requirements?
3. Do the jumper's ability and accuracy meet the BASE site requirements?
4. Can good rear-riser turns be initiated immediately upon opening?

4-8 PACKING

Packing a canopy for a BASE jump is done in a variety of perfectly acceptable ways, but whichever one is chosen must be thoroughly tested for suitability with the rest of the selected equipment. Generally, the only pack jobs considered are those which open straight, reliably, and fairly quickly. For lower BASE jumps, standard procedures that are used to slow down openings are not used. These include rolling, folding the nose back, and rubber banding the slider. Otherwise, BASE pack jobs cover a wide range, including:

Perfect factory packs with bag-stowed or tray-stowed lines
Perfect reserve packs
Refined forms of trash packs

As long as a pack job passes its reliability tests and meets the BASE site requirements, it should be fine.

The slider is packed down only for BASE jumps with delays of less than 4 seconds, usually objects below 1,000 feet. When stowed down, the slider is normally secured at the connector links so that it cannot move back up the lines during opening, but only rarely is the slider removed since that slightly changes the canopy's aspect ratio, the flight characteristics, and the harness fit over the shoulders.

When the slider is left down, there is great pressure on the canopy and lines during opening, especially at the tail, and the canopy opens not only fast but rather violently. Usually, it surges forward as the nose tucks under towards the back and the tail rises just for an instant. Then, it stables out.

Freefall delays longer than 3 seconds can result in broken steering lines or canopy damage, and lines not packed taut may encourage line-whip and line-over malfunctions. Factors encouraging excessive slider-down delays are:

Bad body position
Insufficient pilot chute size
Insufficient bridle length

Packing slider-up usually adds about 180 feet to a BASE jump opening.

The final pack job for any BASE jump should be done under optimum conditions:

Good lighting
Good, clean, flat packing area
No wind
Dry canopy

Since this is the last chance to check the canopy before the jump, everything should be carefully examined. Some things to look for and take care of are:

Damage to canopy or seams
Objects inside cells
Fraying, discoloring, or crystallizing lines, especially brakes
Line discontinuity
Slider damage
Loose or cracked connector links
Excessive wear

If any major changes or repairs are made, the canopy should be tested again before the BASE jump.

Packing meticulously, as if for a one-chute jump, it is not unusual for a BASE pack job to take up to an hour. The jumper should be confident that the canopy will open straight and with no line twists. A good pack job makes a confident jumper who can have more fun.

4-9 DIRT-DIVING

Dirt-diving is done well before the jump and gone over again just before the launch. All procedures should be reviewed, including exit and emergency procedures. One common dirt-diving error is to release a hand-held pilot chute on exit instead of after the proper delay. But with practice everything should fall into place until the dirt-dive can be done perfectly every time without hesitation.

CHAPTER 5

THE BASE JUMP

Every BASE jump should be done with someone along who knows the jump plan and timetable and can help in case of an emergency. Also, someone who has made the jump before can be an invaluable jumpmaster. But in the final analysis, it is the jumper himself who is wholly responsible for his own safety; he must be sure that he is both mentally and physically prepared and that the jump conditions are suitable. Anytime up until exit, every jumper has the opportunity and right to change his mind about jumping.

When at the launch site and preparing for the jump, the final preparations must be done by all of the jumpers. Making sure all temporary pack closures are removed, they should check each other's gear and dirt-dives and determine the exit order. Then, they should collectively check the last-minute wind direction and intensity to make sure that it is neither too strong nor in a potentially hazardous direction. This is the time when one thing out of place or one adverse condition could postpone or cancel the jump.

Conditions are checked with the support crew, and wind indicators at and around the landing site are consulted. Also, wind conditions from the launch point to the bottom are checked. This can be done with a wind drift indicator or something less formal — spit. Even though it probably cannot be seen all the way to the ground, it is an excellent indicator of initial wind direction and intensity.

When conditions are good, the jumper gets ready to exit. The hand-held pilot chute is prepared; often, Velcro or snaps that could cause hang-ups are released; sometimes, the rig is "armed" by pulling the curved pin part of the way out. As he gets into exit position, the jumper is careful not to catch his bridle cord or prematurely open his rig.

At this point, many jumpers find it helpful to give an audible count. This is normal for multiple exits, but for single exits it is often just to make the jumper feel at ease. When the count is given, the jumper exits and follows these procedures:

1. With a good push and looking towards the horizon, the jumper exits up and out in a head-high, hard-arch, knees slightly bent, spread-eagle position. A short running start makes it easier to exit stably and get better distance from the object. But a dive or head-down exit usually causes the jumper to flip over.
2. On exit, the jumper starts counting the seconds of freefall. Before he reaches his opening count or altitude, he should stable out and start tracking away from obstacles. Otherwise, he may be forced to open in an unsafe position.
3. The jumper should not kick or flail. In the still air, moving can have no redeeming effect until almost the fourth second.
4. After the first couple of seconds, the jumper begins to track away from the object. Actually, the track does not significantly take hold for a few seconds, but the horizontal momentum from a good exit push keeps the jumper moving away from the object in the meantime.

5. If the jumper has unwittingly let go of his standard hand-held pilot chute on exit, it usually just bobbles above his back until about the third second, when there is enough air speed to snatch the pilot chute away.
6. The jumper continues to count and enjoy the jump until he must open. He should open well away from the object and other jumpers and high enough to get to the landing area with some extra altitude. If he plans to be able to correct for problems or use a reserve if necessary, he should also allow enough altitude for that.
7. When the jumper reaches his opening altitude, throwing out the pilot chute and retaining stable, even body position, he deploys his main canopy.
8. Immediately upon opening, the jumper looks up to see which way the canopy is flying. If it needs to be turned away from the object, he immediately uses both hands to initiate a rear-riser turn, even if it needs to be through line twists. Risers, lines, and weight-shift can all be employed to turn the canopy.
9. When the canopy faces away from all obstacles, the brakes are finally released, and the jumper heads for the landing site.
10. If any turbulence is encountered, the jumper flys through it using partial brakes.
11. On the way to the landing area, the jumper checks wind velocity and direction and obstacles. Then, he sets up for landing, taking into consideration the site's altitude above sea level. The higher the altitude, the higher the jumper should flare for landing.
12. The jumper lands. If it is a water landing, the jumper should land as close to the shore as is safe. Flotation gear can be inflated and preparations made to release gear as necessary. Without getting entangled in lines, the jumper or a helper grabs the apex or tail of the canopy or pulls in on one of the lines to prevent an anchor effect before the jumper gets out of the water.

Each BASE object presents its jumper with a unique view which imparts an intimate and poignant experience of that object. From exit through the first second of freefall, the jumper takes in the surroundings of the object. Then, towards the second second of fall, gravity pulls the jumper from the head-high position into a prone position.

There, in the silence of a new time frame, the jumper watches as the object begins to past slowly beneath his feet. Quickly, the object picks up speed, and the jumper is thrown back into the immediate sense of time of a standard skydive. The object rushes by, the jumper veers off, and the intimacy of the jump fades away. Wherever the canopy opens, the jumper stops, and the jumper is pulled back into normality. The size of the object is put back into perspective, and the jumper descends back down to the ground. But the experience will always exist for the jumper to recall, relive, and learn from.