

NCSA Cross Country Soaring Seminar #6

"Off Field Landings"

Karl Tiefert

May 5, 1994 Palo Alto, CA

The following are notes from the sixth seminar in a series on cross country soaring. This presentation was given by Karl Tiefert. This series was organized by Peter Deane of NCSA. This presentation is the last in the spring series. The seminars may continue in the fall of '94.

These notes were recorded by Steve Philipson. Additions, corrections and clarifications are welcome and *requested*. For further information contact Steve via e-mail at stevep@shell.portal.com or (415) 964-1428, or Peter Deane at cpedsc@pablo.nsc.com or (415) 964-2797.

Subject: Off Field Landings

Some people use this definition....

Any landing that you can walk away from is a good landing.

Considering the price of today's airplanes and the cost of repairs, a redefinition would be appropriate. Joking aside, when I'm asked to talk about off-field landings, it's actually something to be avoided. If we had to make one then we didn't accomplish what we wanted to do. But, things can happen. Our objective, which was to make a successful cross country flight, has to change to making a successful off-field landing. Last time we talked about preparation, preventive action, and contingent action, and this time I'll approach it in a similar manner.

General "Hints", Preventive & Contingent Actions

Always stay within gliding distance of a landing site.

Each landing must be a spot landing.

Practice "spot landings."

Know the landing characteristics of your airplane.

Become "expert" in assessing wind direction /speed.

Become "expert" in estimating altitude.

A minimum landing field is about 150 by 400 feet.

Practice spot landings -- even if your spoilers are effective, use both spoilers and slip. Practice spot landings at your home field. No matter what our level experience we all need to practice spot landings. After the off-season, even at my level of experience I need to practice landings before I'd feel comfortable flying in a contest. Instructors should insist upon it. After each landing we should critique our performance.

A really good thing is to have a powered glider so that you can get experience in simulated landings (low approaches). It's also good to practice actual off field landings. If you've got your own ship you can walk a landing site, coordinate a retrieve, and actually land off airport.

Really knowing the landing characteristics of your aircraft: do you really know how slow you can bring it in. If you don't practice, you won't really know.

Become an expert in assessing the wind speed / distance. Look at lakes, trees leaves. From your flight planning you should get general info. You might be able to get info from ATIS broadcasts. You can make nice coordinated 360 degree turns and time your drift.

Under normal weather conditions on a soaring day, consider the life cycle of the day. In the morning as soon as the thermals start, we have adiabatic lift and there's upslope wind no matter what the prevailing direction. At the end of the day when the slopes cool off, the wind can change within half an hour to an hour of sunset, and afterward the wind will be down the valley. You have to assess the effect of these winds when you're flying -- where is the right position to fly relative to the topography. Flying down a valley in the evening, it's best to fly down the center of the valley -- the air flows down the slopes creating downdrafts, and can flow up the center creating updrafts.

We talked last time about the importance of staying away from thunderstorms. I highly recommend staying away from thunderstorm conditions. They can be really nasty. It's best to just fly another day. Read as much as you can about them before you attempt to fly in such conditions.

Assess the possibility of turbulence in the lee of obstacles. Especially on final approach, such turbulence can really mess things up.

Become expert at assessing altitude. The altimeter may be one our least reliable instruments. We might set the altimeter in the morning, but the

pressure can change significantly over the course of the day. Some people are really good at estimating altitude, but there are some tricks to it.

Look down at 45 degrees to the side, and then look straight down. The distance from below you to the point on the ground at 45 degrees is equal to your altitude. You should be able to judge your altitude to within 2-300 hundred feet. Practice whenever you've got a working altimeter.

Landing sites: Use the coloring of the ground to select an off field landing site. The color varies depending on where you are, but generally plowed ground is brownish. A brown field is generally a freshly cultivated field. Also think of the time of year and whether it's likely to be plowed or whatever. Light green is probably freshly planted and not likely to be high. Lush green is probably a high crop and will likely not allow a successful landing, i.e. the glider will probably be damaged. If a field has different shades of color, it's probably not flat.

Take your sectional to an experienced cross country pilot and ask if they have preferred off-field landing sites. Make notes about what they have to say about the various sites right on the map.

It's a necessity to get out of your car and visit potential landing sites. Every time you can't fly, really walk the fields from both directions. It's often the case that one side is fine but an approach from the other side has lots of obstacles and may not be suitable. Mark those features on your map.

IDEAL LANDING SITES

- airports
- duster strips
- personally verified sites
- dry lakes (be sure they are dry!)
- cultivated fields (low crop)
- harvested fields

Dry lakes sometimes look very nice from the air but the surface can be so soft that it doesn't support the weight of the glider. This can rip off your gear doors. Talk to the locals about how safe are the local dry lakes. Cultivated fields have many hidden dangers -- water irrigation lines and equipment can be very nasty. Harvested fields can be very good but also can have holes from rodents. You can drop a wheel into one and that can be very damaging. Also, farmers can cut the crops just above the level of the irrigation pipes. This can be very damaging to the fuselage.

Peter Deane asked about landing on circularly cultivated alfalfa fields. These should be OK for aircraft with T-tails, but you have to be very careful about the irrigation pipes which are elevated. Those are like insurmountable obstacles.

It is very important to come to a complete stop with your wings horizontal. This was very heavily emphasized in Europe where I learned to fly. One would be very heavily criticized if you let a wing down at all before stopping. If you do that in an alfalfa field you might easily break your fuselage. Curt noted that the depth of ruts in alfalfa fields is quite deep. Crop depths of two and a half feet are also common.

LESS THAN IDEAL LANDING SITES

Roads

Cultivated fields with high crops

Meadows and range land

A road can be as good as any airport. *But* you have to watch for embankments. An embankment can be higher than your wing tips and this can be very damaging. There are also snow stakes to watch out for.

[Karl described a bad experience of his near a dry lake and highway 385 near Mono Lake. He ran into strong down conditions in rain. A friend had described a section of road as an excellent place to land.] "I was less than a foot off the road when this snow stake appeared. I didn't have enough speed to do anything any more. I tried to lift the wing, but it didn't work. The wing tip hit the stake, it rotated the aircraft around, and I ended up in a ditch. It was a very unpleasant experience." [The sheriff who he talked to later said that the suitability of the road for landing had also been recognized by others, including drug runners who were making transfers from it. So the locals decided to put in snow stakes to keep them from landing there.] "They did this during the summer, between the time that my friend had last seen the field and when I landed there."

I generally fly a fairly low downwind. From an airplane, you can't see any wires, so look for poles. Be assured that if there are poles, there are also wires.

Meadows and range land. Why is what looks like very nice land from the air is being used for range land? It's typically not good enough for cultivation. There are rocks, boulders, ditches... unless you've walked that area, you really don't want to land there. Also note that cows are very dangerous to hit and can trample on or eat parts of the glider.

Problem Areas

steep slope (uphill landing)
landing along a slope
obstacles in approach (early recognized / surprise)
short fields
plowed fields (not raked and smoothed)
high crop (wheat, corn)
trees
water

On a steep slope, you'll need to approach 15-20 knots faster than normal to make the flare to up hill on the steep slope. Also be prepared to stop the glider rapidly to keep from rolling backwards -- you can't just get out like at the glider field.

Sloped landings -- you've got to match the bank angle to the slope. This is very difficult and catching a wing tip can be very bad.

If you see obstacles early, you can plan for them with high approaches, slips, etc. You always want to be prepared for surprises -- things that totally escaped your attention through the entire approach. You might detect things that you were totally unaware of from before. Use the available altitude and increase your speed so that you can jump over the obstacles. The objective is to get into ground effect and use the performance improvement. You have to get very low -- 5 to 8 feet -- for this to help.

Short fields. Sometimes fields which look plenty long enough have a nasty habit of making themselves shorter because of a tailwind. The keys are low energy, come in to one side (not down the middle), and as soon as you are rolling, bring the tail up (prevents you from breaking the fuselage) and intentionally ground loop.

Plowed fields can be very rough. You might want to consider landing with the gear up. You might get some scratches, but that's better than tearing off the gear. This is even for landings aligned with furrows. The clumps of earth along the furrows can be very damaging to exposed gear and doors. There may be recommendations to this effect in the owner's handbook for the glider. Whenever you are very concerned about the surface it may be advisable to leave the gear up. The glider will slide over holes and ditches, but with the gear out you're likely to see lots of damage.

It's amazing how much damage you can do in fractions of a second and how many hours it takes to fix them. This correlation really bugs me. The

more experience one has with this, the more careful one becomes.

High crops -- corn fields, the glider just disappears and can't be seen except from overhead. You use the top of the crop as the reference (landing) plane. Try to hold the ship off and land at minimum energy and you drop into the corn. The leading edge of the wing will break a hell of a lot of the forward momentum. The damage will likely be negligible. In the modern fiberglass ships we have the advantage of the T-tail. In the old days the horizontal stab would often get taken right off.

If you should get into the miserable condition of there being nothing but trees, you should probably take the same approach as for high crops, but there are no guarantees. At that point the issue is your own survival. Sometimes the aircraft only gets minor damage.

If you get a helicopter retrieve, insist that the helicopter bring your trailer. After getting the glider out of the tree, land, put it in the trailer, and then helicopter the box out.

Water -- I'd prefer water over trees any time. I'd highly recommend leaving the gear up. Come in with low speed/ minimum energy. Stay relatively close to the shoreline, parallel to the shoreline. Don't approach the shoreline at 90 degrees as coming in too fast could be very bad (you might fly on to shore). Some people recommend landing gear down to keep the aircraft from submarining. You might want to consider getting out of your parachute straps while still in the air, but re-buckle your seatbelts before landing. That parachute can really be a sea anchor.

Sage brush -- I would not recommend it whatsoever. Protect yourself -- the stuff is extremely resilient and tough. Don't try to save the ship; save yourself. Consider them to be trees. The soft, low energy approach is what you want to have. Sage brush is nice to look at but not in a landing approach.

Landing

Below 2000 ft AGL, have one or more sites selected.

At 1500 ft AGL know where to land.

Make sure all water is dumped (landing checklist).

Use all you skills to stay up!

Try for a radio relay.

600-800 ft AGL is the decision altitude (know exactly which approach you're going to fly).

As you get to that decision height, look for all the things that can be obstacles.

Always fly a pattern.

Remember, obstructions will add to the landing distance!

Don't change your mind in the last moment.

Land with minimum energy!

Stop your sailplane ASAP!

Flying a pattern gives you the opportunity to view the landing site from all sides. Look for poles, potential wires, fences, any sort of obstacles.

An obstruction will add about 10 times it's height to the landing distance. You've got to clear the obstruction with some margin, so a 60 foot obstruction that you clear at 75-80 feet can easily add 10x or 600 feet.

Flying a base leg can really help you see the wind direction and strength. Be conservative in spacing your base leg from the field. Sometimes you can hit large downdrafts on final.

Don't try to change your mind at the last moment. This can cause you to do something dumb.

On the landing, minimum energy is important, but on the other hand, a little extra speed can help you deal with surprises, but not significantly more than your normal approach speed.

Don't underestimate the stress you will be under during an off field landing. You must fly the approach clean -- the yaw string centered, the nose below the horizon. It is absolutely critical that you not stall / spin. It's understandable that it happens -- it's a very stressful situation. On the last part of the final, reduce the speed with spoilers and/or slip. land with minimum energy in a true spot landing.

Ditches up to one and a half to two feet wide have been successfully crossed by landing with the gear up.

I don't generally recommend using the wheel brake for an on airport landing, but during and off field landing, you want to bring the aircraft to a stop as soon as possible so use maximum braking force. This is not the time to be saving the brakes.

For people who are inexperienced, you should land in the middle (from left to right) of the landing site. It might be attractive to land to one side to make the retrieve shorter, but 5-10 minutes of extra hauling is no comparison to catching a wing tip.

After Landing

Assess if there's damage to you or the aircraft.

Determine your exact position.

Try for a radio relay.

Secure the sailplane.

Be friendly!

Speak to the property owner.

Introduce yourself, explain why you're there.

Ask for a telephone.

Call your contact (position, status, Tel. number where you're calling from!).

Have your landing card signed (for contests and badges).

Stay with your sailplane!

Try for a radio relay at frequent intervals.

Keep your radio on!

If you're not sure where you are, ask! You're not the first to land out and not know where. Securing the aircraft is important. Use the plastic bags you carry to put dirt and rocks in and put them on the wing. It's very bad to land successfully and have the ship damaged afterwards.

You may be in a bad mood from landing out, but shape up and be friendly. Consider yourself an ambassador of soaring. I've never had any bad experiences, but some people have. I think it's very dependent on the initial contact.

Call your crew, give them as much info as to how to reach you and find you. Don't forget to leave a number and how you can be reached. Sometimes something happens to the crew, so it's helpful if they can call you to let you know why they are delayed.

Getting the landing card signed is important for badge and record flights, so get it done.

This may be the time that you have to use your emergency kit. If you don't have one, you might find that you'll really want one next time.

Stay with the glider -- distances can be very deceiving. It's much easier to find than you are, and it provides shade and shelter.

Keep the radio on. Watch for airliners flying overhead and call on 121.5. Also, try listening on flight service frequencies so that you can hear people calling for weather and call them when they're on frequency.

SUMMARY

Keep a landing site within gliding distance.
Make each landing a spot landing.
Become expert in: wind direction / speed, altitude.
Walk potential landing sites.
Practice off-field landings.
Be prepared for "problem areas."
Look out for wires!
Importance of landing pattern
"Best behavior" after landing
Emergency kit
Buy dinner for your crew.

[Carl noted that he's made about 25-30 off field landings and has had damage on 3. On one, there was no way that it could have been avoided (the snow stake story), and on one other he might have been able to avoid it. This makes the point that there is some risk involved.]

This is the last presentation in NCSA's Cross Country Soaring Seminar series for the Spring of 1994. Additional sessions may be held in the fall and in future years. These seminars will be announced in "the Buzzard" (the newsletter of the NCSA) and possibly in other soaring publications.

Jan 19

Henry Combs

FIG. 3

Jan 1989

EMERGENCY CROSS WIND LANDING

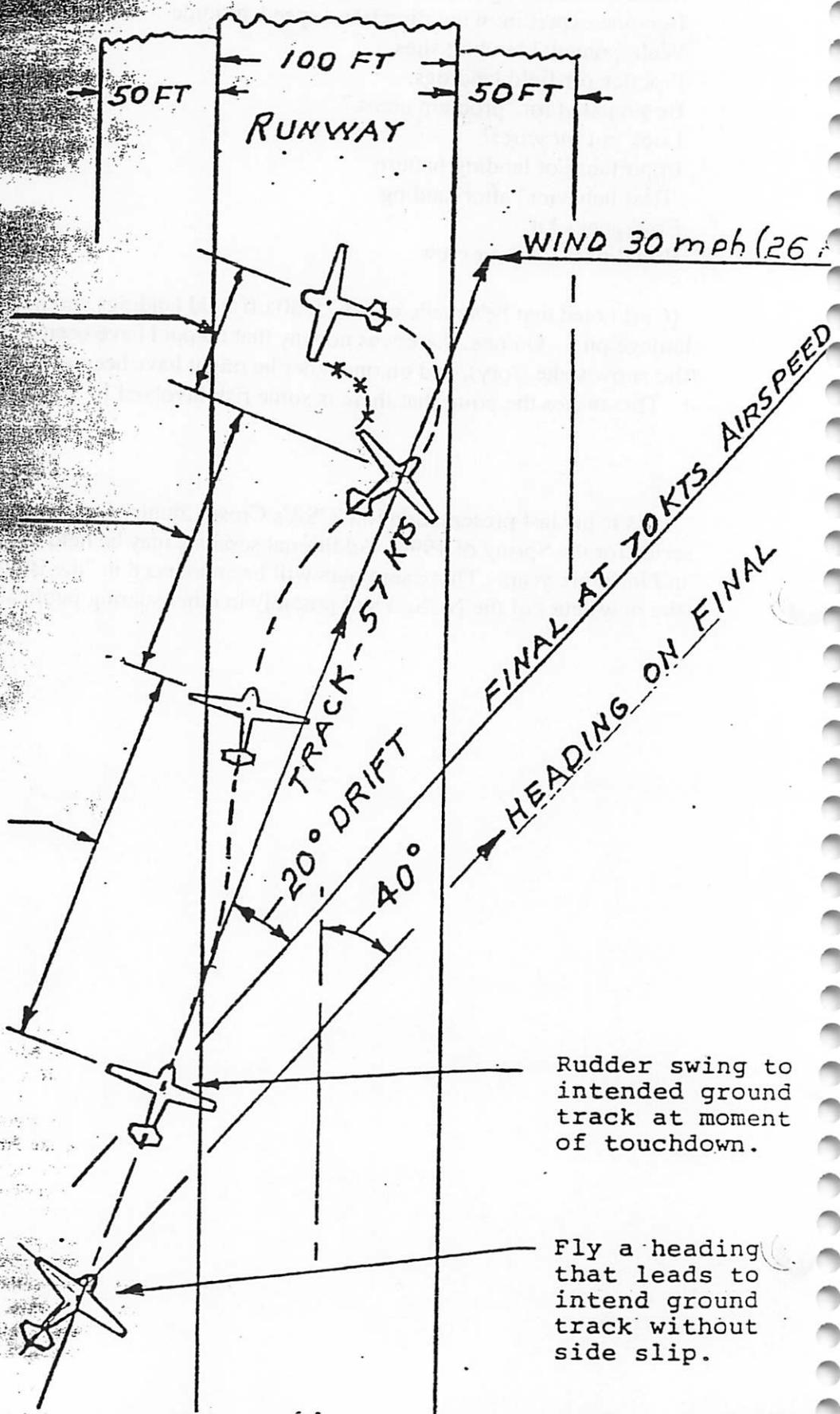
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WIND

LUCK OR JUDGEMENT?

Considerations When Faced With a Field Outlanding

by Lou Frank

This is it; no more lift, you're not going to get back up, you're not going to get back - and no known safe landing strip within gliding distance! Will this be your first outlanding? If not, when did you last complete a successful field landing?

The pilot on his first cross-country flight has a nagging doubt about his ability to cope with an unplanned outlanding, and how much will luck play a part if, and when, faced with landing in a strange field.

The experienced pilot is no more immune to the luck factor than the beginner—and maybe shares some of his apprehension. The downside of higher and higher glider performance is that the likelihood of an outlanding on a cross-country task—once almost a certainty—is minimal (given adequate pilot judgement and skill for the task).

So practice, without which no skill can be kept sharp, is almost non-existent; while the probability of landing out is much reduced, the possibility of serious consequences is much higher. Statistically, outlanding accidents involving experienced pilots outnumber those of first-time cross country pilots on a one-to-one basis—'pressonitus' no doubt playing a role!

The pilot venturing forth on his first cross country attempt should have prepared a plan that—if adhered to—will always ensure he is within safe gliding distance to a known safe haven—including pattern height. Despite this essential planning, the novice pilot invariably has an understandable (but rarely voiced) fear that the 'profile' will fail; "...what if the wind changes or strengthens....supposing I get lost...?" Then what? What indeed!

As an experienced contest pilot, often pushing the limits of your ability and the performance of your glider, how well do you remember the elementary guidelines you followed ten or twenty years ago when your crew was well used to hauling you out of strange fields? 'Use it or lose it' is true of all skills, and a skill unpracticed soon becomes redundant—a situation that can be ill-afforded in this case.

So here are a few guidelines to help the beginner, and perhaps remind the pundit, on how to make the best out of a failed task by improving the judgement, and relying less on luck!

TERRAIN

Common sense dictates that no pilot should fly at an altitude agl which precludes a glide to a safe landing area if no lift is found. A 'safe area' means reason-

ably flat countryside which offers a selection of landing fields. On a cross country task it, is of course, quite possible to traverse unlandable country sticking to this 'stay alive' principle. The less than obvious trap is the height which—if conditions deteriorate—getting to a safe area becomes problematical; "...the clouds ahead look pretty good—should I press on or chicken out...?" There are no old and bold pilots; mark your map with the minimum altitude required to get to safe terrain—and run for it when the altimeter shows that altitude!

So the first rule for beginners and experts alike, is to ensure that you are in reach of a landable area at all times. The beginner should ensure he is over landable terrain by at least 2000' at all times. The expert may cut it finer, weighing the risk against his experience.

FIELD SELECTION

Now comes the tricky part—picking the field. The best way of going about this is to follow a logical sequence based upon common sense. This will lessen the workload, and ensure that all vital factors are covered.

SIZE

The easiest thing to discern from

height is the size of possible fields—how does it compare with your home airfield at this height? Go for the biggest, but remember that you are only going to be using quite a small width to land on, so a relatively narrow field into wind is just as good as a wide one. If at this stage you need to carry out a wider search, then carry out the search downwind if this is viable—you will cover more ground and increase the possibilities.

What obstructions present themselves on the approach? A row of 50' trees on the approach boundary will reduce a 1000' field to half the landable length. Wires are impossible to detect, but the poles supporting them can be spotted if looked for; look for more than one to determine where the wires are, and if the approach boundary is alongside a road then assume there are wires.

Beware the trap of convenience, particularly the more experienced pilot, who, when presented with the choice of a large, safe field may select a more difficult one because it is nearer to a road or civilization—only to later curse his decision as he surveys his broken glider.

SURFACE

Clearly, the largest field available may not be landable in terms of the surface, but the nature of this is more difficult to discern at height than size. However, we are discussing field landings, which assumes that man has played a role in utilizing the land (deserts and wastelands are a more dangerous ball game, and do not come within the scope of these guidelines). Human intervention with nature generally follows one of two paths; agriculture (crops of one kind or another) or raising cattle for beef or milk. Knowledge of which type of production is prevalent in your area is key information for the pilot faced with an outlanding. Farmers who are glider pilots have a distinct advantage over us lesser mortals inasmuch as they are not only aware of the crops that abound in a given area, but also know the state of cultivation for the particular time of year. If you are fortunate enough to have such a person in your club, time spent with him discussing such subject matter can be well worth a beer! Short of this, keeping an observant eye open when traveling the countryside will provide much useful information when it comes to deciding upon the surface of the field you are considering landing in.

VARIOMETERS, INSTRUMENTS, RADIOS, OXYGEN SYSTEMS, PARACHUTES, BAROGRAPHS

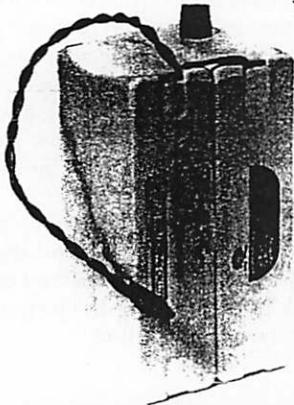


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At certain times of the year, it is often difficult to determine the difference between, say, some cereal crop and pasture—the shades of green may be very similar! However, some clues may be obtained by comparison. For instance, you may see cattle browsing in a nearby field of identical green to the one you plan to land in; it's a safe bet that the latter is grass!

Not that grass pastures are all that reliable; it might just be that the surface is too rugged for a tractor to plow, which is the reason that many pilots prefer to land in a plowed field or young crop. If a tractor can negotiate it, the glider should survive landing along the furrows.

Small wire fences—sometimes electrified if in cattle field—are very difficult to see until on final approach, and can come as a nasty shock in more ways than one! A line across your selected field dividing different shade of color should be treated with much caution; such wires have been known to cut through a canopy like cheese. In some countries gliders are fitted with steel guides across the top of the canopy to protect the pilot.

SLOPE

This is probably the most difficult aspect to detect above the height of 1000'—if you can see it from 2000' forget it and look elsewhere! While not easy to spot, there are clues to look for; is there a river or stream close by? Areas adjacent to these will certainly not slope up to them, but could have steep slopes toward them. Are there any road or railway cuttings or bridges in the vicin-

ity that give an indication of possible slope? While it is quite possible to land up quite steep slopes (with due precautions), it is definitely a no-no to attempt a downhill landing, you'll never touch down; don't even think of it!

Although slope, like surface, should be a consideration throughout the selection process, this aspect should be especially concentrated on during the latter stage—particularly when at pattern height, when it may still be possible to modify the plan. One of the advantages of carrying out an orthodox pattern when landing in a strange field is that the oblique view of the selected field when downwind will quickly betray any slope; circling above it will tell you nothing.

Patterns and approaches into strange

HAVE YOU BEEN LEFT OUT?

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fields is a subject in itself, not covered in these guidelines; first pick your field! Descending from 2000', the selection of field is a process of elimination and decision-making, often difficult when faced with several choices. By 1500', you should have narrowed your choice to one or two, and a final commitment made at no less than 1000'—you must decide before a field comes up and hits you!

So much for the theory, but we said earlier that a lack of practice is a major contributor to outlanding accidents. How can we obtain this practice, short of the real thing? If your club has a motor glider, or a two-place towplane (or has access to one), you can get all the practice you need. Many clubs in Europe (and possibly in the States) carry out regular training using such aircraft. By simply throttling back the engine (to simulate particular L/D of glider) at 2000' over a landable area, the 'trainee' selects what he believes to be a suitable field, using the foregoing guidelines, and carries out a pattern and approach into it. When it is clear that the mission has been accomplished, the throttle is opened and the exercise is completed. Power pilots will recognize this as standard training procedure for engine failure.

This simple orientation into field selection has averted many field landing accidents in Europe and elsewhere, and the expense is far outweighed by the potential saving in repairs and peace of mind.

So there you have it; first the 'area', then the three 'S's: SIZE—SURFACE—SLOPE. Consideration of these key factors will improve your judgement, lessen your reliance on luck, and above all, enhance your chances of a safe and damage free field landing. HAPPY LANDINGS!

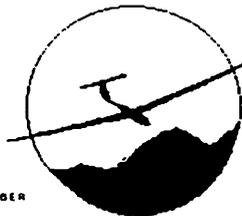
REFERENCE

Lou Frank is an ex-Chief Flying Instructor, and Senior Regional Examiner with the British Gliding Association. He has been gliding for over thirty years, and gained his Gold Badge with two Diamonds in England. He holds a CFI(G) and Private Pilot (Airplane) Certificate, and is currently instructing at the National Soaring Foundation at Hobbs.

Over the years he has carried out in excess of a hundred field landings—not all of them successful, he says! He believes that 95 percent of all field landing accidents could be avoided by following these simple guidelines. ■

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6. Flashlight (10)
7. Survival knife/tool (9)
8. Waterproof matches (9)
9. Nylon cord or rope (8)
10. Food (fruit, power bars, etc.) (8)
11. Cellular phone (8)
12. Money (credit cards, cash, coins) (5)
13. Sunscreen (5)
14. Ziplock/plastic bags (5)
15. Whistle (5)
16. Signal flares (4)
17. Writing pen and paper (4)
18. Handheld GPS (4)
19. Tiedown kit (4)
20. List of phone numbers (airports, other) (4)
21. Spare reading glasses (3)
22. Compass (3)
23. Canopy cover as blanket (3)
24. Heat pack (additional first aid) (3)
25. Highway map of area (3)
26. Strobe light (3)
27. Weak link kit (3)
28. Wire saw (3)
29. Insect repellent (2)
30. Bandanna or towel (2)
31. Smoke marker (2)
32. Spare batteries for flashlight, GPS or other equipment (2)
33. Chemical light stick (2)
34. VHF radio (2)
35. Landout cards (2)
36. Tampex (2)
37. Fishing kit (2)
38. Contact lens kit (2)
39. Oral hydration salts (2)
40. Butane lighter (1)
41. Toilet paper (1)
42. Mylar sleeping bag (1)
43. Small roll of duct tape (1)
44. Book to read (Adventure story) (1)
45. ELT (1)
46. Insurance information (1)
47. Wing tape (1)
48. Hand gun (1)
49. Turnpoint book (1)
50. Survival book (1)
51. Spare fuses for avionics (1)
52. Adult diaper (1)
53. Gloves (1)
54. Cell phone to aircraft battery connect-

- ing cord (1)
55. VHF handheld radio to aircraft antenna connecting cord (1)
56. Garbage bags to be used as tiedown weights when filled with earth (1)
57. Tin drinking cup (1)
58. Safety pins (1)
59. Extra hat (1)
60. Water purification tablets (1)
61. Red flashing LED bike light (1)
62. 4x4 inch high reflecting life vest material (1)
63. Nylon pants (1)
64. Kite for signaling (1)

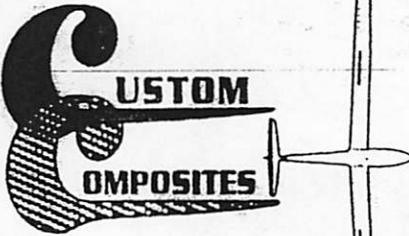
While this list may not be conclusive, it does represent an interesting profile of what your fellow-pilots think is important, or not so important to them. For the most part, the focus seems to be on staying warm, first aid, hydration, and signaling for help; certainly important aspects of landout survival. What really surprised me however, is the spread on all the items. I would have thought more pilots would carry a whistle, signal flares, compass, tiedown kit, and weak link. Take a minute to see how many items you have in your kit or what you could add to this list.

In one of my questions, I asked for personal tips. Here are a few responses: *Pete Alexander*: "Have a landout kit at all times, you never know when you will need it....extra water is essential." *Doug Lent*: "I carry a bandanna for several reasons. It makes a good wash cloth/towel and can be used for first-aid. It also provides excellent protection from the sun when worn around the neck." "Smoke canisters can be great for marking your location, they are inexpensive and can be purchased at West Marine outlets." *Kempton Izuno*: "I'm a firm believer in knapsacks, my 4 hour, 11 mile walk out at Tonopah would have been much different if I had to handhold my survival kit." "Radio Shack has a very cool strobe light for around \$12 dollars. It's small and claims to last 8-10 hours. I think it's much better than a flare." *Pam Sutton*: "On flights into remote areas, I carry a 9mm pistol. I don't keep it loaded

while in flight. I think carrying it is good protection for remote landouts, but wouldn't recommend it to anyone who didn't already know how to use one. *Karol Hines*: "I carry a tool to remove my horizontal stabilizer. If it's windy, removing the stabilizer can be a big safety advantage." *Ty White*: "Alex Burnette suggests taking several garbage bags. These can be filled with small stones or dirt and used as anchors for tiedowns. I once spent 45 minutes in a pasture trying to find a stone big enough to use to pound my tiedown stakes — the garbage bags would have been perfect." *Debbie Kutch*: "Consider tampons for your first aid kit instead of gauze. They are sterile and absorbent, and don't take up much room." *Carl Herold*: "You need a minimum kit for all flights. Wear good walking shoes, carry cash, coins, and credit cards — and don't forget phone numbers." *Ray Gimmy*: "Thanks for asking about landout kits. During my inventory, I found many of my items are out of date and need replacing....Would you believe I forgot to include fishing line for my hooks!"

When asked about what might be added to their kits for next season, the responses included: Handheld GPS, ELT with mic input, matches, more first aid supplies, power cable for cell phone to aircraft battery,

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APPENDIX E.

HIGH DESERT CROSS COUNTRY EQUIPMENT CHECK LIST

GLIDER:	PILOT:	CREW MEMBER AND CAR:
<p>Current 100 hr/Annual Inspection Clean canopy Canopy cover Good ventilation OXYGEN bottle - full/on Barograph - smoked/sealed/on batteries charged Spare weak links Tie down kit Current sectionals & road maps Current chute repack Preflight- equipment - flight instruments - hookup - controls - sailplane - T.E. & Pitot probes Survival kit: - flashlight-good batteries - flares - emergency water - knife - salt tablets - food, candy - walking boots - compass - rope - signal mirror - first aid kit - warm clothes - phone coins - money</p>	<p>ASI NEVADA CREW BOOK FAI Observer Retrieve phone numbers(s) Weather forecast Tie-on shoes Stocking cap Scarf Gloves Heavy socks Road maps and Sectionals FAI paperwork Current SSA Soaring Directory Don't use lip balm No sinus blocks Have all equipment prepared Preflight glider Turn on barograph Sunglasses Suntan lotion with sun block Notch barograph at release Know wave, ARSA, and TCAs Preplan intended flight Know retrieve phone number Have backup retrieve phone BE NICE TO YOUR CREW - a good meal on the retrieve back Let the crew do the crewing Find your own field</p>	<p>ASI NEVADA CREWING BOOK Two person crew desirable Weather forecast Road Maps and Sectional charts Radio and radio log book Water jug Jacks(2) & lug wrench Tire chains - steel or plastic Towing rope Flashlight - good batteries Flares (3 min.) Money & credit cards Pencils Warm clothes - boots Spare tires (2), for car & trailer Shovel Gas can - check for leaks First aid kit Waterless soap Food Matches Good batteries Trailer wheels greased Tool kit, Fan belt Anti-freeze Stay on paved roads Use regular gas above 4000' msl Know use of radio Know backup retrieve phone Have Restricted FCC License Flight plan briefing by pilot</p>
<p>FAI Observer Turnpoint Camera and film Flight FAI declaration</p>	<p>OXYGEN: No flow indicator back pressure Have spare mask(s) No high/low pressure leaks Current bottles and regulators Regulator easily reachable in flight Understand OX systems Check oxygen flow & pressure prior to takeoff Take off with full bottles Take off with full bottles Take off with mask on wave tows Have backup system over 18,000 Ft msl. Bail out systems Special O2 adapters for filling bottles</p>	

Sierra Survival

It may not be nice to fool with Mother Nature

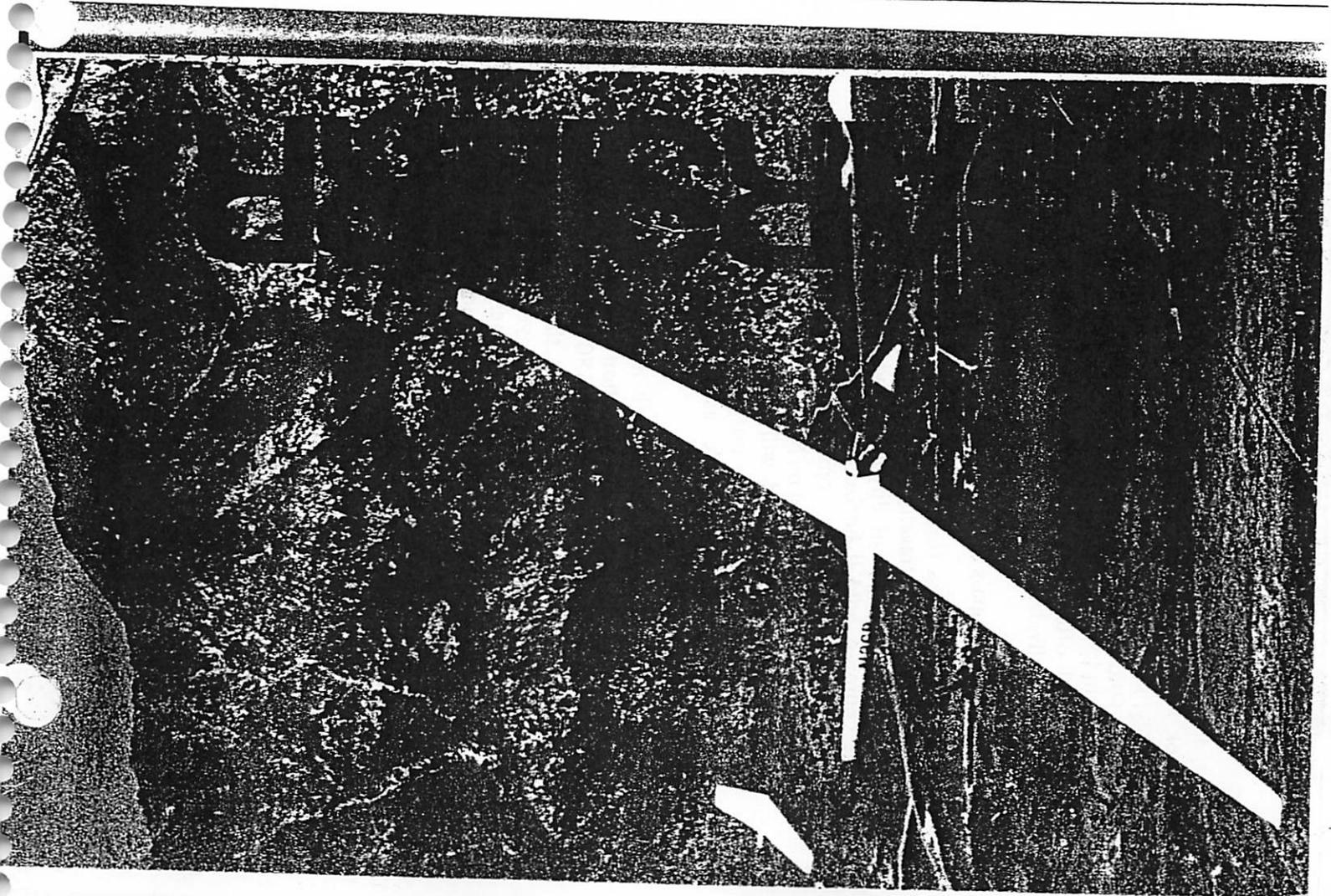
by JOHN JOSS

Don't misunderstand. Soaring in the Sierra can be the most fabulous experience for the soaring pilot. High and cool under a booming cloud street, climbing ahead at redline for that Diamond in the sky, is one of the great moments in soaring that can come to you. It can come in the Sierra when everything is going right, and the elements and terrain are cooperating. But in soaring, as with life, what goes up must come down, and some of the territory in the Sierra Nevada is, candidly, brutal. Mountains and deserts are the staple, habitation is scattered, population negligible; telephones rare.

Whenever you go out for big distance in the Sierra, be ready to fend for yourself. And make sure that your bird and tow vehicle are equipped (see separate chapter) to guarantee survival either for you and bird, or for your crew and vehicle coming after you. If in doubt, stay with your downed sailplane or stalled vehicle, keep cool, and realize that your pre-arranged 'flight plan', known to friends, will result in rapid search.

Direction finding in the Sierra

How often have you awakened in a strange area to feel disoriented? Relax! The sun rises in the east and sets in the west, regardless of your first impressions. Stand with the morning sun on your right or the evening sun on your left



and you will be facing North. When you arrive in the Sierra, look around carefully. Study the land masses, and fix basic geography and directions in your mind. While driving or flying continue the practice of fixing direction and of looking all around. Basic orientation and fundamental geography, correlated often with road map and/or sectional, will pay handsome dividends.

--Use your compass

A good compass (one with a protected face is best) is a must for flying or traveling in the Sierra. Check it out while making mental note of directions and geography. To orient the compass, hold it horizontally so that the needle swings freely. When the needle comes to rest, rotate the compass body so that the needle rest on North. Remember that you are seeing *magnetic* north and will vary from true north. The local declination constant is on your sectional. Avoid iron or steel your car, for example, as they will cause incorrect readings.

To use your compass, orient it, then determine the reading to a distant landmark in the direction you want to go. To return, orient the compass, subtract 180° from the outgoing reading, and move in the direction of the calculated 'back sight.' This will not necessarily return you to your exact original location, but if you made your mental notes before leaving, having kept some idea of how far and how fast you have traveled out, you will be on familiar ground in due course upon returning. This is true on the ground and in the air, with due allowance for crosswind where your sailplane heading is concerned.

--Use your watch

Your watch will tell you approximate sun time, not daylight saving time. Hold your watch horizontal and point the hour hand at the sun. South will be half way between the hour hand and the 12 in the acute angle of the hands. On cloudy days a stick held upright on the center of the watch will often cast a faint shadow. Align the shadow over the

hour hand, and North will be halfway through the acute angle between the shadow and the 12.

--Use the stars

The only star that appears stationary is Polaris, the North Star. Learn to recognize it, the Pointers and other star arrangements that will guide your eye to the North Star. Examine the sky each night for some time before going into the Sierra. This acquaintance will give one a sense of confidence for night travel if it becomes necessary. Take into account that the night sky, at a given hour each night, will have shifted a little, as well as appearing to rotate during the night. When traveling use a star close to the horizon as a guide, but remember that the earth rotates 15° every hour, so that you must adjust or use a new guide every 10 minutes or so in order to maintain an intended direction.

--Use shadow

Select an object at least three feet high that casts a shadow with a well-defined projection. Mark the shadow tip—wait 10 to 15 minutes and again mark the shadow tip. A line drawn from the first mark through the second mark will point East. Effective from about 9 a.m. to 3 p.m.

--Use nature

Moss on trees will grow mostly on the north and northeast sides of the trunks. Check several trees to get a good average direction reading. Evergreen firs generally point toward the rising sun, approximately east. The plane on top of the barrel cactus slants usually toward the southwest. At noon shadows point north.

Navigational hazards

The heat and high evaporation rate of the Sierra mountain and desert areas cause mirages. The varying density distribution of the layers of hot air, usually close to the earth's surface, causes light rays to reach you along several paths, causing distorted, multiple, or sometimes inverted images.

These 'heat waves' hamper your vision, making it difficult to determine distance or objects. Objects or landmarks may seem to change shape, disappear, or appear similar. Another desert mirage is the 'false dawn,' which seems to make the sun rise in the west. Ground haze is another problem—a layer of warm, dusty air close to the ground that hampers and distorts vision.

Shelter

Shelter is essential for protection from sun and heat when you land. Use whatever natural shade you can find, such as a cave, a rock ledge or wall of a dry stream bed. A dry canyon in the desert is a dangerous camping ground because of cloud-bursts that might cause flash floods that sweep along a dry valley in the form of a wall of water. Don't use the inside of the sailplane for shelter in the daytime as it will get too hot. Get under the shade of a wing if you have no other shelter.

A good shade shelter can be made by tying a parachute to the wing, leaving the lower edge at least two feet from the ground for air circulation. Make sure the sailplane is secured and the wings securely tied down to prevent movement during wind storms. If the sailplane is not available, make a shelter using your parachute. Two layers of cloth, separated by several inches, will be cooler than a single thickness. At night, desert temperatures may drop to freezing and heavy rains may sometimes occur. If possible, use the inside of the sailplane as protection from rain and cold.

Signals

--smoke

The best signal is a fire—a big, bright one at night, a smoky one by day. Try to make black smoke if the country is light colored, white smoke if the country is dark. Maintain plenty of fuel to give the appropriate signal. Build signal fires on the highest point you can find near to your shade or shelter. If fuel is plentiful, two fires some distance apart are better than one—three fires in a triangle denote HELP! There is a lot of

Beautiful, but unobtainable (can you reach those cr.?)



air travel in the Sierra likely to see your signals and your ship (if it is in one piece).

-mirrors

The signal mirror is an excellent device for attracting attention, particularly of aircraft. Get one at military or camping equipment stores. Directions are included. It is a 2-faced metallic mirror with a hole in the center. If necessary you can improvise one from a can lid that is shiny on both sides. To use, hold the mirror about three inches in front of your face, and sight through the hole on the object you are trying to signal. Move the mirror so that the light spot on your face, which you can see in reflection, disappears in the hole in the mirror, while still maintaining sight of the plane, etc., through the hole. On a clear day ground signals may be transmitted for 10 miles, signals to aircraft at even greater distance.

-other signals

Aluminum foil is an excellent signaling material. Other ground signs may be made of piled brush, rocks, tree branches, stomped-down snow, etc. Make large characters running north and south to cast the best shadow. Pilots should be familiar with these basic signals:

I	- Need Doctor	↑	- Going This Way
II	- Need Medicine	LL	- All is Well
X	- Unable to Proceed	N	- No
F	- Need Food/Water	Y	- Yes
∞	- Need Firearms	JL	- Not Understood
K	- Which Way?	□	- Need Map-Compass

Sound signals are the least effective. Three of whatever sound you can make denotes 'Distress'. A 'thunderer' type whistle is recommended as an easy way to make a lot of noise. Blowing across the mouth of an empty large-caliber bottle or cartridge case makes a distinctive sound. If you have a firearm, shoot once, wait 10 seconds and fire twice more about 5 seconds apart. The first will attract attention and the second and third will give direction. If there is no answer save your

ammunition. Sound carries best during the early evening quiet just before dark.

CLOTHING AND EQUIPMENT

Clothing requirements vary considerably with the season and the environment. Take necessary clothing in your ship or tow vehicle. For the hot desert as well as the cockpit, lightweight and light-colored clothing that covers the whole body is best. Long trousers and long sleeves protect from the sun, help prevent dehydration, and protect you against insects, abrasions and lacerations by rocks and brush. They also tend to reduce infections caused by these injuries. Headgear should provide all-around shade as well as eye shade your soaring hat is best. Shoes should be lightweight but sturdy, and should protect the ankles. Remember thorns and spines make walking a problem. Woolen socks are recommended, and spare socks should always be carried. Gloves are helpful to protect hands from spines and thorns when handling brush and firewood.

Winter clothing requirements vary with the altitudes at which you are flying. Keeping dry is important—the 'layer' system is best. Several light garments are easily carried and are more versatile in varying temperatures than one heavy one, and will keep you warmer. They should be selected for size, keeping in mind that other clothing may be placed over or under them. A lightweight, water repellent wind-breaker should be available to wear alone or over the layers. A coat style is best as it will protect the hips. Headgear should shade the eyes and some provision should be made to protect the ears, earflaps in the headgear are probably best and are always available. I wear a watchcap when wave soaring. Footgear should be sturdy, protect the ankles, and be water repellent. Remember, those wool-lined flying boots will probably come off if you have to bail out—I prefer 'waffle stompers', well laced. In winter it is important to keep the feet dry to help prevent 'trench foot' and frost bite. Damp socks can be carried inside the shirt front against the body to dry them out. Newspapers make excellent insulators to keep cold out and body heat in.

Survival Kit

Kits are outlined in many writings on survival, and some 'ready made' ones are available for pilots. The following items are listed in order of importance. There is obviously a limit to how much you can carry in the ship, but if you are heading out into the boonies . . . Detailed use is omitted here, but learn to use and practice with each item BEFORE you need it for survival:

- Water (see quantity recommendations below)
- Chap lipstick (do not use if you are flying with oxygen)
- Zinc ointment
- Cap with sun visor, or tennis hat with dark-colored inside brim
- Dark glasses
- Knife: a good, small 'Boy Scout' type is best.
- Matches: 12 or more, strike anywhere, waterproofed by coating with paraffin, beeswax, fingernail polish, etc.
- A small magnetic compass (learn to use it)
- A 'thunderer' whistle—carry it on a line around your neck
- A small metal signaling mirror
- A small magnifying lens to start fires and help remove small splines or splinters
- A large-eyed needle for first aid and sewing. Coat with silicone grease to prevent rust
- Cobbler's linen thread (hundred feet or more, 8 strand, to set snares, build shelter, repair or improvise clothing, etc.)
- Nylon chiffon (piece about a yard square, bright orange color, for signaling, for straining dirty water, or as a face covering during sand or dust storms)

- Aluminum foil (about five feet of the 12-inch, heavy-duty type, signaling, a reflector for fire or candle, to make a cooking pot or a drinking cup)
- Water purification tablets—10 or more—Iodine-type tablets are probably best (seal carefully in plastic foodwrap to keep dry)
- Toy balloons: three or four of the large, heavy, bright orange-colored ones, for emergency water containers or signaling (wrap in plastic food wrap to preserve)
- Candle stub for light or to help start fires while consuming matches
- A single-edged razor blade. This handy first aid tool should be left in its original package, to prevent rusting.
- Pencil stub, to assist rescue parties by leaving notes
- Cigarette papers—book of these for writing notes, or to leave as trail markers (put rocks on them!)
- Adhesive tape (about 2 feet, 1-inch wide, primarily for first aid—bandaids are handy, too. Replace every few months)
- Fish hooks in five assorted sizes, to use with a little bait to snare birds, etc.
- Box of nails—about five, blunted and bent to hook shape, to be used as snare triggers.
- Flint and steel fire starter, made by attaching a lighter flint to the end of a small, sturdy stick. Wrap a length of cobbler's linen around the stick. To make a fire, fuzz the end of the linen, position the fuzz at the flint and strike against steel. The fuzz will catch the spark and can be blown into a flame. Practice with it. A cigarette lighter will provide sparks. Do not depend on having fluid in it when you need it—ordinary lighter wick will not flame when dry.

All the above items except water can be fitted into a tobacco tin, a bandaid box or a similar-sized plastic box and

be ready to go at any time. Check it occasionally to be sure that all items are there and in good condition.

Other items that you should carry are: a sharp belt knife, good current road and sectional maps of the area, thirty or more feet of nylon parachute shroud line, canteen, a watch, a snake-bite kit, a firearm and ammunition, and such other items which may be small and useful. Consider carrying your gear in a small rucksack or pack you can carry in the cockpit, then place over your shoulders. Weight thus carried is less tiring than if carried in pockets or hung on the belt. You can sit on the pack. It also affords a safer method of carrying items such as the belt knife, hatchet, etc., and lessen the chances of injury in case you fall.

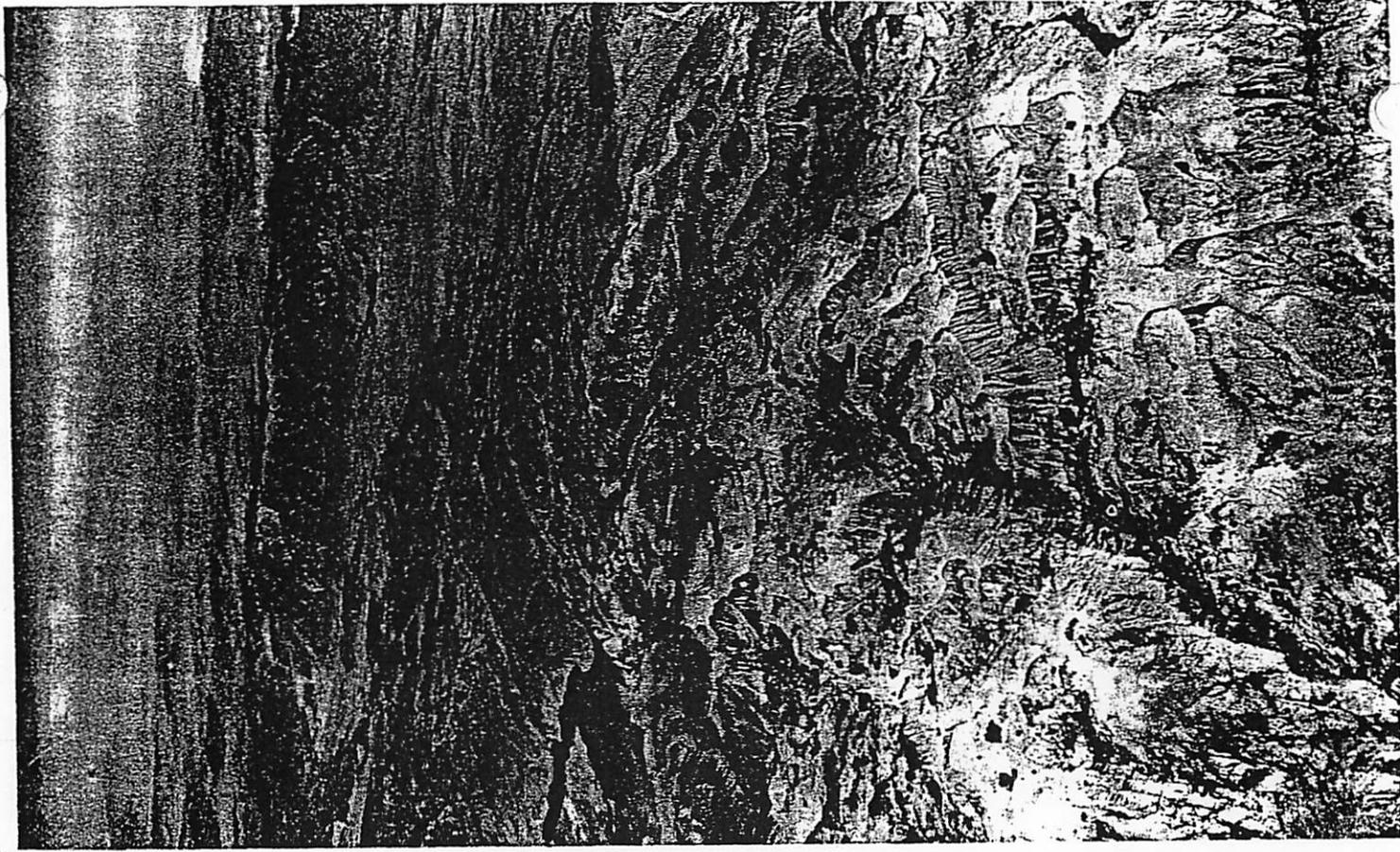
HEALTH

You must protect your health and well being, and prevent fatigue and injury. First, medical assistance may be some time and distance away; second, Sierra conditions are usually different and distinct from your everyday living. The desert is usually a healthy environment due to dryness, lack of human and animal wastes, and the sterilizing effect of the hot sun. Higher elevations also present an environment conducive to good health, since most human disease is transmitted through respiratory action or contact. So your immediate bodily needs will be your first consideration.

If you are walking or active, wear sun glasses to protect your eyes from glare. Even though the glare may not seem to bother you, it will impair distant vision and will retard night adaptation. If you lose your glasses, for example, in exiting the bird at altitude, make an eyeshade by slitting a piece of paper, cardboard or cloth. Charcoal or soot around the eyes also helps. Use chapstick or grease on lips and nostrils, but never when using oxygen. Do not 'lick' your lips if they are dry, as this will hasten splitting.

While on the desert or in snow, wear sun glasses to protect your eyes from glare. Even though the glare may not seem to bother you, it will impair distant vision and will retard night adaptation. If you lose your glasses, for example, in exiting the bird at altitude, make an eyeshade by slitting a piece of paper, cardboard or cloth. Charcoal or soot around the eyes also helps. Use chapstick or grease on lips and nostrils, but never when using oxygen. Do not 'lick' your lips if they are dry, as this will hasten splitting.

The Whites, from 70,000 feet, looking Northeast



Change socks regularly even though you must change to used socks. Sunning and aeration of socks and underclothing have a marked freshening value. Do not remove your clothing in an attempt to keep cool. This will only hasten dehydration, as will sitting on the hot ground.

Exposure to the sun can be dangerous, and can cause three primary kinds of heat problems:

Heat Cramps. Usually, the first warning of heat exhaustion is cramps in the legs or stomach muscles. For relief, rest. If available, take salt tablets dissolved in water.

Heat Exhaustion. The usual symptoms are that the person will become flushed, then pale, sweat heavily, have moist cool skin and may become delirious or unconscious. For relief, lie in the shade, flat on your back. Take salt tablets dissolved in water. Keep wrapped up and take warm liquids if available.

Heat Stroke. Heat stroke may come on suddenly. The face becomes red, hot and dry. All sweating stops. There is a severe headache, pulse is fast and strong. Unconsciousness may result. For relief, try to cool off, loosen clothing and lie down in the shade if any is available. Cool yourself by saturating your body and clothing with water and/or by fanning. Don't take stimulants.

In winter, do not sit down if your clothing is damp or you have been perspiring, unless you have additional clothing or a fire. If you have neither, walk slowly around a tree or in a circle where ground is level and footing good until you dry out.

Do not travel in storms. Mark your direction of travel and find shelter. Dust and snow storms can be seen before their arrival. If on foot, lie down with your back to the wind. Cover your head with a cloth to keep dust out of your eyes, nose, mouth and ears. If driving, stop and get off the road as far as possible to avoid collision. Turn out lights and turn on emergency flashers. Back vehicle into the wind to prevent sand pitting of windshield. In some areas of the Sierra, low vehicles and trailers can be blown off the road on wave days with high winds.

Other Dangers

Keep sand and fleas out of your shoes. Stop often to shake them out.

Ticks are numerous in some areas. Protect yourself against them.

You may encounter spiders and numerous scorpions. Shake out clothing and shoes before you put them on. Poisonous snakes may also be encountered. Heavy shoes, boondockers, or flight boots give some protection against them. Tread around your proposed campsite to locate any that may be hiding.

In a survival situation, everything you do, each motion you make and each step you take must be preceded by the thought: "Am I safe in doing this?"

WATER

Lack of water and exposure to the sun will kill you. To prolong your life, read and understand these comments.

WATER REQUIREMENT CHARTS

(from "The Physiology of Man in the Desert"
by Adolph & Associates)

Number of Days of Expected Survival in the Desert. No Walking at All:

Available water per man, U.S. Quarts	0	1	2	4	10	20
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Max. daily shade temp. F. Days of expected survival

120 degrees	2	2	2	2.5	3	4.5
110	3	3	3.5	4	5	7
100	5	5.5	6	7	9.6	13.5
90	7	8	9	10.5	15	23
80	9	10	11	13	19	29
70	10	11	12	14	20.5	32
60	10	11	12	14	21	32
50	10	11	12	14.5	21	32

Number of Days of Expected Survival in the Desert, Walking at Night until Exhausted and Resting Thereafter:

Available water per man, U.S. Quarts	0	1	2	4	10
Max. daily shade temp. F.	Days of expected survival				
120 degrees	1	2	2	2.5	3
110	2	2	2.5	3	3.5
100	3	3.5	3.5	4.5	5.5
90	5	5.5	5.5	6.5	8
80	7	7.5	8	9.5	11.5
70	7.5	8	9	10.5	13.5
60	8	8.5	9	11	14
50	8	8.5	9	11	14

The importance of temperature reduction to the survivor is highlighted by the following: Temperature 120°, water available 2 quarts, days of expected survival 2; reduce the temperature to 100° and 2 quarts of water will extend your life expectancy THREE TIMES. This importance to a potential survivor cannot be overemphasized. Night travel, or better, NO TRAVEL is stressed.

Quick Tips to Find Water

When looking for water along sandy beaches of desert lakes, dig a hole in the first depression behind the first sand dune. Stop digging when you hit wet sand. If you dig deeper, you may strike salt water. If you find damp sand, dig a hole and wait for water to seep into it. In other places pick the lowest point between sand dunes and dig down 3 to 6 feet. If sand becomes damp, keep digging until you hit water.

In a sand-dune belt, search between the outermost dunes of the area rather than in the middle.

Look for dry stream beds. Dig at the lowest point on the outside of a bed in the stream or channel.

In mud flats, during winter, you may find wet mud at the lowest point. Wring the mud out in a piece of cloth to get water; but don't drink it if it is salty or soapy tasting.

Look for water holes and wells along trails or paths. Small water holes in dried-out stream beds and low places, known to local ranchers, prospectors, etc., are often covered. Search for them carefully.

Scoop out a hole, line the bottom with a piece of canvas and fill the basin with pebbles taken from a foot or more underneath the surface. Dew may collect on the rocks and trickle down into the canvas. Collect the water early in the morning. Dew may collect on exposed metal or fiberglass surfaces of your aircraft, covers of tin cans, stones or small desert plants. Drain dew into cups or mop up with cloth.

Water may be obtained from the roots of some desert plants that have their roots near the surface. Cactus-like or succulent plants provide a good source. However, do not drink from cactus-like plants that have a milky sap.

The actions of birds and animals give good clues for locating water. The sounds of birds chirping in a semi-arid brush country often means that water is near. Flocks of birds will circle over a water hole in the dry deserts. Runways and trails of animals may also lead to water.

REMEMBER TO PURIFY ALL WATER OBTAINED FROM THE ABOVE MENTIONED SOURCES. If possible, boil the water for 10 minutes. If water purification tablets are available, use one per canteen of water. If you have iodine, use two drops per canteen of water.

FOOD

-Animals

Animals are scarce in the Sierra. Their presence will depend upon water and vegetation. The most common animals are small rodents, snakes and lizards. Caution should be exercised with snakes and lizards as there are many poisonous types in this area.

-Plants

Many desert plants look dry and unappetizing, but start out by testing all the soft parts and digging to find the roots

of the trees and scrubs. Then peel off the bark. You may find some soft material that is edible and water may drip from the cut root surface. Next, try all the soft parts above the ground—flowers, fruit, seeds and young shoots. Thick fleshy plants will offer the best source of food and water. You will find mesquite or catclaw in this area. The beans of these plants are unusually bitter, but prolonged soaking will make them edible. The prickly pear is native to this area and the fruits of this plant is edible. For the most tender desert plants, search in places where ground water is close to the surface.

This chapter is not intended to alarm you. It is intended to save your life. The Sierra is hostile to the ill-planned, poorly prepared flyer or traveller and many lives have been lost—most unnecessarily.

INTRODUCTION TO
CROSS - COUNTRY SOARING

This publication does not offer any new, brilliant strategies, nor does it reveal any deep guarded secrets. All the material presented here has previously been presented in other publications and used by glider pilots for many years.

This is merely an effort to present the very basics in one booklet for the aspiring cross-country pilot.



KAI GERTSEN

FEBRUARY 1999

OFF-AIRPORT LANDINGS

Although you may not deliberately set-off cross country, an off-airport landing is always a possibility when flying a sailplane. When flying locally, there is always the potential for misjudging wind velocity or encountering excessive sink. Selecting a field and landing safely while there is still adequate altitude to do so, is much safer than attempting to stretch a glide to the airport with marginal altitude.

Unquestionably, landings at the home airport are the safest, but with proper preparation, off-airport landing can be done with an acceptable level of safety.

PREPARATION

Proficiency can only be acquired through practice and mental preparation. Most of the skills needed for successful off-airport landings can be practiced without straying beyond gliding distance from the home airport.

By contemplating various situations which may be encountered when facing an out-landing such as, type of surface, slope, obstructions, etc., and envisioning the correct action, we can get ourselves mentally prepared.

THINKING AHEAD

Your mind must always be ahead of the sailplane. "If the present course is maintained and the present conditions (sink rate, ground speed, etc.,) persist, where will you be half, one, and two minutes from now?"

OBJECTIVE

To never scratch your sailplane.

REMEMBER

Luck plays a very small part in successful off-airport landings.

Failed off-airport landings are 99% pilot error.

WIND DIRECTION AND STRENGTH

- Check wind direction periodically during any flight.
- Drift when thermalling is a good indication of wind direction and strength.
- Smoke is the best indicator.
- Pond or lake surface. A wind shadow (calm area) will be next to the upwind shore.
- Drift of cloud shadows across the terrain. Keep in mind that there can be a difference between surface and altitude wind direction.
- When ridge flying:
 - The wind in the valley between two ridges will be parallel with the valley.
 - When hunting on a ridge, hawks tend to hover directly into the wind. Making an excellent weather vane.
- Waves in high crops, grass or trees.
- Flags or Laundry.

SELECTION ALTITUDE

- Use visual judgment - not altimeter.
- Be conscious of the terrain at all times.
- Look for a group of fields when down to 2000 ft. AGL
- If spotting a high tension wire pylon, look for the others. You want to be sure you know where they are.
- A field must be selected by 1000 ft.
- Once a field has been selected, stick to it. This is not the time for indecision. From 1000 ft. you only have about one (1) minute until it is time to start the pattern.
- Once a field has been selected, you can consider it your field of operation and look for lift, but be sure you can reach the I.P. with proper altitude.

SLOPE OF FIELD

- When evaluating a field, never fly directly above it as this makes it impossible to detect any slope. The field should be viewed at an angle of about 30° from horizontal.
- Any detectable slope is too steep for a down-hill landing.
- A creek can be expected to be at the lowest local elevation.

- Railway tracks are generally level.
- If there is any slope at all - land up-hill.

During an up-hill landing it is crucial to pick-up extra speed on final so as to be able to fly up-hill, parallel to the ground, prior to flaring. You must avoid flaring into the hill. What makes this maneuver even more challenging is that a nasty illusion comes into play. When looking at an up-hill slope on final, you will get a strong impression that the glider is more nose down than it is. Be sure to monitor the airspeed indicator diligently.

- Landing across a slope is not advisable.

If there is room enough and the wind is not too strong, land out-of-wind and up-hill. If you must land on a cross-slope, keep in mind that the glider simply will not fly straight with one wing down. If you make a standard approach, with a straight final, you will most certainly experience a vigorous ground loop. The only hope is to approach the field in a turn to match the slope. The touch-down must be carefully planned at a point just before reaching the top of the trajectory so as to avoid going down hill.

CROP/SURFACE

- Do not rely on small private airports, unless there is one you have checked out in advance. The width of the mowed runway is often only wide enough for a tricycle landing gear and too narrow for a 50 ft. wing span. A mowed hay field is generally a better choice.
- A freshly mowed hay field (without haystacks) should be your first choice .
- Low crops may be O.K. - land parallel with the furrows between the plants.
- Cultivated fields (raked) or freshly seeded fields may be soft.
- Plowed fields with deep furrows should be one of your last choices-in other words, when desperate.
- High crops should also be avoided. If you can see wind waving the crop, it is too high. If you must land in high crop, pretend the top of the crop to be ground level and flare accordingly.
- Fields with animals grazing is likely not to be cultivated, and too rough for a successful landing. Also, horses are unpredictable and may get excited. Cows are curious, difficult to keep away from the sailplane and likes to eat it.

FIELD SIZE

- As discussed earlier - small private airports are long enough but many are too narrow.
- Telephone poles are an excellent means of judging the length of a field as they generally are about 100 ft. apart.
- If there are no obstructions on the approach, 500-ft. may be adequate. However, if there are 70 ft. high trees, you will need about 1000 ft. and if your speed control is less than perfect you may need more.
- Visual Illusions:
 - △ narrow field will appear to be longer than it is.
 - △ wide field will appear to be shorter than it is.
 - △ if you have been low for awhile, the fields will appear to be bigger.
- Adequate field size depends on:
 - Slope
 - Wind direction and strength
 - Obstructions
 - Type of surface
 - Type of sailplane
 - Level of skill and experience
- If there is a lot of wind and turbulence you must maintain plenty of speed throughout the pattern, right down to the hold-off. Consequently, you will need a little longer field than you normally would.

PATTERN AND APPROACH

- If possible avoid making the approach over tall obstructions.
- Wires - The invisible foe. You will not see them soon enough to react. There are likely to be wires between:
 - Two poles
 - A pole and a group of trees
 - A road and a house
 - Over any roadPretend a wire is there, then plan and fly the approach accordingly. If planning to fly under the wire, don't forget there could be a wire half way up the poles.

If you must make your final approach over high tension power lines be sure to allow for the smaller wire, which may not be visible, about 15 ft. above the power cables.

- If landing on a hill when the wind is 15 kts. or more, expect plenty of turbulence. If approaching a hill from the down-wind side, expect strong sink at the brow, and keep the base leg close in and the final short.
- Use a standard pattern - this is important. Don't do anything fancy just because no one is watching. The pattern can be either right-hand or left-hand, whatever is optimum, pending wind direction and terrain.
- Same as always, be sure you have extra speed in the pattern, plus additional speed as dictated by wind and turbulence. Do not confuse a low energy landing with a pattern flown at minimum airspeed. Also, remember that well banked turns are safer than gently banked turns.
- Be careful not to start the downwind leg too high - it should not be above 600 ft.. You need to scrutinize the field for rocks, holes, etc., and select the touch-down spot. Also, maintain proper distance during the down-wind leg so as not to crowd the turn onto final.
- The final leg should be long enough to allow for unhurried minor corrections. Don't rush the pattern.
- If wind velocity is minimal, it may be better to land down-wind in a quality field than into the wind in a marginal field. Also, it may be advantageous to land down-wind to avoid approaching over tall obstructions.
- If the field is small and the surface is suitable, a landing diagonally across the field will add considerable landing area. In a field 300 ft. wide and 450 ft., long, a diagonal path will add approximately 100 ft.. Be sure to "clock" the pattern around to match the direction of the approach.
- Retrieve convenience should never be considered when selecting a field.

There are enough terrain features to cope with as it is.

If the farmer can get his equipment into the field to cultivate it, you can get the sailplane out.

Waging a potential unsuccessful landing versus a cumbersome retrieve is a poor gamble. Even a ten hour retrieve is insignificant compared with damage to the sailplane.

Always pick the best field, irregardless of convenience of roads, gates, restaurants, bars, etc. (the only exception to this is when flying in thinly populated sections of the country, such as the south west.)

- Although a standard pattern is important we must also be flexible. E.g. if, while on the down-wind leg you notice the field has an undulating surface with waves perhaps 50 - 100 ft. apart and say 20 ft. high, align diagonally

with the field. The prudent thing to do, irregardless of wind direction, will be to clock the pattern around such that you will be landing in line with and on top of one of the crests.

- If the sailplane is equipped with a retractable wheel, don't forget to lower it. This should be done at the same place in the pattern as you normally do, e.g. when entering the down wind leg.

LANDING

- After selecting a specific touch-down and roll-out area, do not change your mind.
- Single strand wire fences are difficult to see and can be deadly. Plan every approach as if there is a fence on all borders.
- Never land across a boarder of two different crops.
- Good speed control is imperative. Excessive speed on final will add considerable distance required for landing and roll-out. The objective is to touch down precisely on the spot selected while on the down-wind leg, at minimum speed. As the amount of energy is proportional to the velocity squared - if 50 MPH is the correct speed, then 60 MPH is 44% too much.
- Always use complete flare-out on every landing. If landing in high crop, be sure to flare completely above the top of the crop as if the top were the ground, as mentioned previously.
- Immediately after touch-down, apply brake to shorten roll-out. The longer distance you roll, the greater are the possibilities of encountering rocks and holes. So don't be clever and roll up to the gate for convenience. It may not be as convenient as you think.
- Supposing, as you are about to flare, you realize that you forgot to lower the gear. The safest option may be to leave it retracted. Attempting to extend the gear at that point in time can easily lead to pilot induced oscillations and a hard landing. If this occurs before you manage to get the gear down and locked, you will be susceptible to injury. On the other hand, a smooth and gentle landing with the gear up is likely to cause very little damage, if any.

WHAT YOU DON'T KNOW CAN'T HURT
YOU. UNLESS YOU'RE STILL ALIVE.

Alex Ayres

AFTER-LANDING

- Keep in mind that you are trespassing.
- If landing in a field with crop next to a busy road, try to keep spectators out of the field as they can cause considerably more damage to the crop than your landing.
- Always contact the owner of the field if possible.
- If there may be a question of crop damage, take pictures of the landing path to defend any potential insurance claim.
- Be sure to ask the owner of the field for the best way of getting the sailplane out and to get his permission before driving the car and trailer into the field.
- Prior to making the phone call, write down the directions to be sure they are complete and clear. Also, it is crucial to include the telephone number of the people you are with - enabling the crew to contact you in case they have any problems.
- At first the farmer may very well view you as a rich city playboy who has landed his expensive toy on his humble plot of land with complete disregard for other people's property. Here are some suggestions as to how you may conduct yourself to win him over:

Be polite and courteous. Be sure to show appreciation for all his help including the use of his phone and don't forget to pay for the call.

Impress upon him how fortunate you were that his field was there, enabling you to avoid a crash, and how happy you are not to have caused any damage.

Emphasize how, in these rare emergencies, we always strive to avoid landing in any kind of crop.

Show an interest in his farm. Ask questions and talk less about yourself.

Take pictures of him, his family and kids next to the glider.

Don't forget to get his address so you can mail him copies of the pictures and perhaps a soaring calendar at Christmas to show your gratitude.

Remember - you are an ambassador for the soaring movement. The manner in which you conduct yourself will be a reflection on all glider pilots.

A discourteous pilot will make a lasting impression on the locals, and future visiting glider pilots will be treated accordingly. You may have had a bad day but don't take it out on the farmer.

- Finally, some practical hints for the more serious cross-country pilot for whom off-airport landings are a somewhat frequent experience:

Keep a small knapsack stowed in the glider - it comes in real handy for carrying all miscellaneous items such as turn point cameras, etc. Many pilots have returned to the ship, after making the phone call, to find such items missing.

Carry a wet sponge in a plastic bag for wiping the bugs off the ship while waiting for the crew. This leaves that much less to do after they get there.

PRACTICE

Off-airport landings require many skills. Skills are acquired through practice. Our problem is how do we achieve proficiency without crashing now and again in the beginning. Fortunately, most of the skills essential to successful off-airport landings can be practiced without actually going cross-country. The following maneuvers should be practiced by anyone aspiring to fly cross-country.

- **Get to know the performance of your sailplane.**

Most pilots tend to underestimate the area within reach from any given altitude. As previously stated, a well planned off-airport landing is better than trying to stretch the glide home with marginal altitude. On the other hand, it does not make sense to needlessly land out if there is enough altitude to reach the airport in safety. However, it is impossible to make the correct decision unless you know the performance of the glider. Remember, the optimum airspeed is seldom the speed for the best glide ratio. To cover the maximum distance the airspeed needs to be increased if facing a headwind, and a slower airspeed will get you further if going downwind. Also, don't forget to speed up when going through sink and to slow-up in decreased sink or lift.

Knowing the performance of the sailplane you are flying when going cross-country is of course essential to enable you to cross unlandable patches of terrain and to be sure that your selected potential landing sites are within reach.

- **Always practice precision patterns.**

There is never any reason to start a pattern with excess altitude. An attitude of indifference in this regard will not get you in trouble at home. But when going into a farmers field, a down wind leg initiated too soon and too high can lead to trouble.

- **Patterns without reference to the altimeter.**

As frequently as possible enter and fly your patterns without reference to the altimeter. When it's time to come down, while still at 2000 ft. or

higher, tape a piece of cardboard over the altimeter. This is a well-worth-while exercise as when the time comes for the real thing, you can be sure you will have no idea as to how high the ground is, and the altimeter will be of no use.

- **Lessen your dependence on the airspeed indicator.**

When the time comes to make an approach into a strange field there will be many other things requiring your attention.

- **Precision landings.**

Do not be satisfied with anything less than precision landings on every flight. Strive for perfection in speed control and spot-landing.

- **Complete flare.**

Complete flare with minimum touch down speed must be practiced on every landing. If flying an SGS 2-33, do not get into the habit of pushing the stick forward to stop. These habits have a nasty tendency to subconsciously come to the surface when we are intensely concentrating on something else and don't need them.

- **Land at some other location on the airport.**

Whenever the traffic allows, land at some other location on the airport. Doing a few of these before setting off into the unknown is well worth it. It gives you the opportunity to experience a pattern over different ground features than you are accustomed to.

- **Evaluate fields while driving.**

Don't let the drive to the airport go to waste. Although the vantage point is not quite right, it is still worth while to contemplate potential scenarios, e.g. which field would be better, what would be the best approach, etc..

By practicing as many of the skills as possible and simulating as many of the various conditions which may be encountered when landing "out", as possible, we can significantly reduce the stress and work load when faced with the real thing.

EMERGENCY PROCEDURES

- **Landing in lakes.**

If there are no fields in sight, lakes are preferable. Land parallel with the shore and with the gear down. Tests have shown less tendency to tuck-under if the gear is down.

- **Landing in woods.**

If a landing in the woods is unavoidable, never pick a clearing with stumps. Select a large tree with a full crown. Set a normal pattern, be sure to approach the tree into wind, then stall, nose high into the crown.

- **Collision avoidance.**

If, with the sailplane on the ground and rolling, it becomes obvious that it cannot be stopped in time to avoid colliding with a fence, ditch or other obstacles - an intentional ground loop may be a better alternative. But delay it as long as possible. Also, moving the stick forward at the same time as applying ailerons may lift the tail sufficiently to avoid breaking the fuselage.

- **No room for roll-out.**

If the landing area does not provide for any roll-out, and the glider must be stopped immediately upon touch-down, it may be advisable to stall it in from about three (3) feet. If the glider is fitted with retractable gear, be absolutely sure that it is down and locked.

- **Rocky terrain.**

If the terrain is totally unsuitable for landing e.g. boulders, rocks, etc., you may reduce the risk of severe injuries by side slipping into the ground as the wing will absorb most of the energy.

Obviously we cannot practice any of these emergencies, but we can be mentally prepared. By envisioning any and all eventualities and pre-planning the optimum way of dealing with them, we can significantly increase our chances of keeping our skin intact. The prime objective is to maintain control of the sailplane, not matter what the circumstances.

I HAVE KNOWN A GREAT MANY
TROUBLES, BUT MOST OF THEM
NEVER HAPPENED.

Mark Twain