

# SPOT2 Personal Locator Review and Extensive Field Test

**Results of 80 days (750 hours) of field testing of the new SPOT2 in Alaska, the Andes, the Pyrenees, and the Lower 48, including the Sierras and a southwest canyon system.**



Overall Rating: **Highly Recommended**

A satellite tracking device is not essential to the comfort and safety of lightweight backpacking. It falls into that category of "things that give me more enjoyment in backcountry travel" - much like a GPS unit, a digital camera, trekking poles, or pocketknives. Consequently, these sorts of things are subject to more critical review by our editors, peer reviewers, and editorial board. As a further result, to award a device like this Backpacking Light's Highly Recommended Rating is a pretty special thing. The SPOT2 is significantly lighter and smaller than its predecessor. It is also easier to operate and delivers greater message reliability. During 80 days of testing on three continents and in a variety of geographic environments, it delivered 100% of its OK messages. Particularly impressive is its Tracking Mode performance in deep canyons, where it delivered around 90% of Tracking Points each day. This is significant, as the original SPOT1 delivered Tracking Point messages with poor reliability, even with a view of clear sky. In "typical" mountain conditions under open skies, the SPOT2 had a daily Tracking Point message reliability approaching 100%. In summary, the SPOT2 addresses most of the limitations of the original SPOT1 and reflects a mature technology. For features, weight, and price there is currently no device on the market that's comparable - and certainly not as reliable.

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by Alan Dixon and Amy Lauterbach | 2010-11-30 00:10:00-07

## Version Two of SPOT Delivers the Potential of their Technology



The new SPOT2 (right) is almost half the size and weight of its predecessor. It is easier to operate and delivers far greater message reliability, especially in Tracking Mode.

As we reported at the [Press Release of SPOT Satellite GPS Messenger \(SPOT2\)](#) at the 2009 Outdoor Retailer Summer Market, the folks at SPOT addressed many of our suggested improvements to the original SPOT1 in the Generation Two: SPOT Satellite GPS Messenger.

Now, after 80 days (750 hours) of field-testing of the new SPOT2 on three continents, we report improvement in three significant areas:

- **Lighter and Smaller:** 43% lighter (4.16 oz vs. 7.33 oz) and 45% smaller.
- **Improved Reliability:** 100% delivery of all OK messages for 80 days. Near 100% delivery of Tracking Point messages in “typical” mountain conditions, e.g. the Sierras and Andes. And daily delivery of ~90% (or better) of Tracking Point messages in deep canyons or when bushwhacking (vegetation cover).
- **Improved Operation:** Dedicated button and status light for each function and safety covers for Help and SOS buttons make for intuitive operation and easily understood operational status.

In the field, the SPOT2 is easier to use and delivers a much higher proportion of Tracking Point messages than its predecessor. In addition, the Web-based software that supports SPOT is also better and now has a separate social networking site, [SPOT Adventures](#), to share your adventures/data with others. In summary, the combination of the physical SPOT2 unit and supporting software is beginning to look more like a mature technology.

What impressed us most about the SPOT2 was its performance in a difficult transmission situation, a “typical” southern Utah canyon system. On a five-day slickrock canyon backpacking trip, the SPOT2 successfully delivered a daily average of ~90% of Tracking

Point messages. Every OK message made it out. We saw similar message delivery performance on bushwhacking days in Alaska.

## Basic Specifications - SPOT Satellite GPS Messenger (SPOT2)

<b>Weight</b>	4.17 oz, 118 g with batteries - BPL measured (4.8 oz, 137 g with carry case and biner clip)
<b>Size</b>	3.7 x 2.6 x 1.0 inches - 93 x 65 x 25 mm - BPL measured
<b>Batteries</b>	3 AAA - lithium only
<b>MSRP</b>	\$170 (\$150 retail)
<b>Basic Service</b>	\$100 for one year (does not include Tracking Mode)
<b>Tracking Service</b>	\$50 in addition to yearly service
<b>Includes</b>	Armband, case, and carabiner clip

## SPOT2 Improvements Summary



SPOT2 weight.

- 43% lighter - 4.17 oz vs. 7.33 oz, BPL measured with batteries.
- 45% smaller 93 x 65 x 25 mm (3.7 x 2.6 x 1.0 inches) vs. 110 x 70 x 36 mm (4.3 x 2.8 x 1.4 in) 3 AAA batteries decrease size & weight, but operating time is less. BPL field measured Tracking mode 5.0 to 5.8 days (120 to 140 hours). Manufacturer reported Tracking mode, 3.5 to 7 days depending on percentage of sky view.
- Improved GPS performance.
  - GPS upgrade to uBlox AMY-5M chipset. Similar to SiRF and other high performance GPS chips.

- Advanced GPS capabilities - Time-to-First-Fix (TTFF) usually seconds instead of minutes.
- New antenna improves performance in foliage and canopied environments. (BPL note: also deep canyons)
- New Rogers material antenna (Gen 1 was ceramic material).
- Gen 2 increases performance at the horizon. Power same as Gen 1 (.16 Watt) using a proprietary Global Star tuning pattern and spread spectrum.
- Improved user interface.
  - Message-sending LED indicator.
  - GPS acquisition LED indicator.
  - New separate Tracking button.
  - New extra "Custom Message" button that works the same as OK but with different message content and its own email notification list. The addition of the new message improves your ability to communicate your status and intentions to people monitoring your trip.
  - New backlit message function buttons blink when the specific function is engaged.
  - Safety covers over the SOS and Help buttons.
  - Universal communications symbols on buttons.
  - Short SOS instruction placard on the back of the SPOT.
  - Comes with more detailed instructions (Quick Reference Guide) printed on a 2 x 3.5 inch fanfold plasticized card stock.

## **SPOT Concept of Operation - General Overview**

For those unfamiliar with how SPOT operates, please see our review of the original SPOT1, [SPOT Satellite Personal Tracker - Full Review](#).

## **Field Test of SPOT2**

### **Message Delivery Reliability**

As we reported at the press release on SPOT 2:

*Of all Gen 2's improvements... the GPS chipset and improved antenna/transmission matter the most. Only these have the potential to improve the reliability of SPOT's message delivery, especially in areas with tree cover or in deep canyons... It will take some time and field-testing to determine if Gen 2 has significantly improved message delivery reliability over Gen 1.*

We are happy to report that the SPOT2 has made significant improvements.

In our field testing, the SPOT2 has improved the reliability of Tracking Point message delivery - probably our single greatest gripe with the original SPOT1. While not tested as

extensively, the increased reliability in Tracking Points we measured should also translate into a higher reliability in transmitting the OK, Custom, Help, and SOS messages. We had 100% success of transmitting OK messages in our 80 days of testing.

The increased message reliability for SPOT2 is probably due to (listed in order of greatest contribution):

1. A better antenna and antenna tuning pattern,
2. Queuing of the last three Tracking Point locations (even if two Tracking Points are unsent, if the SPOT2 successfully transmits a third Tracking Point, the previous two will also be sent), and
3. An improved GPS chip set.

In “typical” mountain conditions (the Sierras, Andes, and Pyrenees, and the Talkeetnas in Alaska), the SPOT2 had a Tracking Point message reliability approaching 100%.

But what really impressed us about the SPOT2 was its performance in a difficult transmission situation, a “typical” southern Utah canyon system. On a five-day backpacking trip, even in a deep canyon with significant vegetation at times, the SPOT2 successfully delivered 88% of expected Tracking Points (best day was 98%). Every OK message made it out. Even on its worst day, it delivered 83% of Tracking Points. This is more than adequate for your emergency contacts to accurately track your trip.



A plot of our Tracking Points in a southern Utah canyon system. The SPOT2 is surprisingly reliable at transmitting Tracking Points in a deep canyon as indicated by the tightly grouped points with no obvious gaps.

Prior to using the SPOT2 in the Utah, I had warned my emergency contacts to not expect much in the way of Tracking Points due to the depth of the canyons we'd be traveling in. To all our surprise, it was easy to track our progress via the SPOT2 Tracking Points, even in the deep and narrow sections. After this experience, I have confidence that with a little intelligence on selecting a location, that the SPOT2 would successfully get HELP and SOS messages out of many popular southwest canyon backpacking destinations (but probably not very deep slots like Buckskin Gulch).

In Alaska, we averaged more than 90% of the Tracking Points on our bushwhacking days - also not the easiest transmission conditions due to frequently dense vegetation cover.

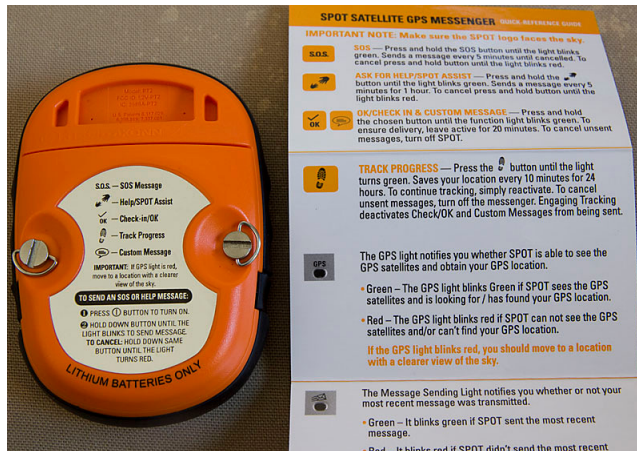
This canyon and bushwhacking data is a bit more impressive because in our field testing we didn't bother to be particularly careful about SPOT2 use:

- We used a lazy person's mounting method: just hanging the SPOT2 vertically off the back of a backpack. (With a fully upward facing mounting method, the SPOT might have delivered a greater percentage of Tracking Points.)
- We weren't particularly fastidious about using the SPOT2, e.g. at rest stops we sometimes put our packs down in a way that partially blocked the SPOT2's sky view for transmission.
- Sometimes we turned the SPOT2 off for a few minutes at a rest stop but didn't record doing this. Thus, at the end of the day, there are a few "missed" Tracking Points that aren't really missed.

The combination of a very deep canyon WITH heavy tree cover was the only time we had significant gaps in Tracking Point transmission. On a three-day trip in coastal California, the SPOT2 had two Tracking Point gaps of approximately an hour. Both were from the bottom of a ~2000 feet deep, narrow canyon with trees. Even so, we had similar daily tracking percentages as on the southern Utah canyon trip, around 90%. Daily tracking percentages on the worst day (the day with the two gaps) was 82% and still more than sufficient to track the trip. Other days it was 90% or better.

## Operation

SPOT2 is a significant improvement in the ease of operation over its predecessor and addresses the majority of our operational gripes with the original SPOT1. Most operations are fairly intuitive and the operational status of the unit easily understood. Each function has its own button, as well as its own status LED. There are also status LEDs for "GPS Fix" and "Message Sending." There is a short SOS/basic instruction placard on the back of the SPOT2, and it ships with more detailed instructions (Quick Reference Guide) printed on a 2 x 3.5 inch fanfold plasticized card stock that is easily carried on the trail. With a new and much faster GPS chipset (acquisition in seconds rather than minutes), the SPOT2 gains a fix much faster and therefore operates much faster than its predecessor. In summary, both Amy and I are satisfied with the basic operation of the SPOT2.



Rear view of the SPOT2 showing SOS/basic instruction placard and the Quick Reference Guide printed on a 2x3.5-inch fanfold plasticized card stock that is easily carried on the trail.

A few functional observations:

- A nice feature of SPOT2 is that if you initiate an OK message when in Tracking Mode, the unit automatically reverts back to Tracking Mode once the OK message is done. (Tip: When you start hiking, first initiate Tracking Mode. Right after that, put the unit in OK mode. When the SPOT2 is done with the OK (20 minutes), it will automatically go into Tracking Mode for the rest of the day.)
- The SPOT2 function buttons need to be depressed fully and for a long time. I usually dug a thumb tip deep into the button cavity and counted to five. This helps prevent accidentally engaging a button (a good thing), at the expense of being incompatible with thick gloves (not good for certain conditions); in cold weather in the Andes, we took our gloves off to press SPOT2 buttons.
- The SPOT2 status LEDs are not easy to read in bright daylight. Sometimes you need to cup your hand over the button lights to create enough shade to see what mode the SPOT2 is in.

## Battery Life

### Battery Life Lithium Claimed by SPOT

*Utilizing fully charged Energizer Ultimate 8x AAA Lithium batteries under the specified usage environments, the following guidelines apply to the anticipated battery life of the SPOT Satellite GPS Messenger:*

Mode	100% clear view of sky	50% clear view of sky
SOS (or Help if reactivated)	~ 6 days	~3 days
Track Progress	~ 7 days	~ 3.5 days
Check-in (OK) or Custom Msg	~ 700 messages	~ 350 messages

*Testing of SPOT under common usage environments has shown that battery performance can be degraded in operating environments where SPOT's GPS must take a longer time to acquire your GPS location, such as trying to send a message indoors or under extreme canopies. For optimal performance, please try and utilize SPOT in locations with a clear view of the sky with the logo side up. SPOT also recommends that you carry extra Energizer Ultimate 8x AAA Lithium batteries.*

## **Battery Life - BPL Field Testing**

Mode	Mixed field conditions/Mixed sky view
Track Progress (lithium batteries)	5.0 to 5.8 days (120 to 140 hours)
Track Progress (alkaline batteries)*	~1.7 days (40 hours) near 100% success <u>+ ~1.7 days (40 hours) degrading success</u> Total of 3.4 days (80 hours)

\*Not a manufacturer approved use. Batteries of unknown expiry date.

## **Battery Life Lithium - BPL Field Testing**

In warm to hot weather in the Pyrenees, one new set of lithium batteries lasted twelve days for a total of 120 hours in Tracking mode, plus twelve OK messages, in total **approximately five days of operation**. This is right between the minimum and maximum operation time claimed by SPOT. Almost perfect delivery of six data points per hour was consistent until the unit shut down completely. The red low-battery warning came on after about nine days (90 hours), however, the unit continued to transmit data successfully until the batteries were completely dead.

In a combination of field testing in Peru finished up with testing outside Alan's home (fairly benign transmission conditions) the SPOT2 lasted **approximately 140 hours in Tracking mode** until exhausted (including two OK messages per hiking day). In combined use in Alaska and a southern Utah canyon system, with a new set of lithium batteries, the red low-battery warning came on after about 100 hours of operation.

## **Battery Life Alkaline - BPL Field Testing (not a Manufacturer approved use!)**

SPOT clearly specifies to only use lithium batteries. However, on a long walk where battery resupply is from small shops (for example on the Haute Route Pyrenees), lithium batteries are not available. As such, Amy used four sets of alkaline batteries over 31 days.

On average, the alkaline batteries gave approximately 40 hours of reliable delivery (at or near six data points per hour) followed by approximately 40 hours of degraded delivery, degrading to as low as 50% success. The red low-battery warning light came on after about 40 hours of use, roughly concurrent with the start of the degraded delivery. When delivery rates were low, the delivery pattern was often to show a couple of hours of data

points at ten minute intervals, followed by a couple of hours with no data points. We cannot substantiate this speculation, but the pattern in the data suggests that when the alkaline batteries were low, delivery would fail if any conditions were not optimal (for example if the device had slipped into a vertical orientation, had less than perfect sky view, or less than optimal satellite configuration), but if the conditions were optimal, then delivery would still be consistently successful. Note: The battery expiry date/freshness was unknown as they were bought from tiny shops in fairly remote locations.

## **Mounting SPOT2 on a Backpack**

The manufacturer recommends a horizontal position for the most reliable message delivery. But the SPOT2 does not come with an effective “out of the box” method to mount the unit horizontally on a backpack. Most attempts to mount the SPOT2 with the *manufacturer supplied mounting hardware (armband strap, or biner-clip)*, or just stuffing the SPOT2 in a pack pocket, result in the unit hanging vertically. While this is not the optimal transmission orientation, it turns out to be less of a problem for SPOT2 than the original SPOT1. Even with a “lazy person’s” vertical mounting, we had a high percentage of successful deliveries from SPOT2 even in difficult situations.



Lazy person's vertical mounting of the SPOT2 used when field testing in a southern Utah

canyon system (biner clipped to top pocket closure strap). While not horizontal, we still had a high percentage of successful deliveries from SPOT2, even in difficult conditions.



**Horizontal mounting:** Amy's SPOT2 in a roughly horizontal position inside the pack. It rests on top of all the gear but under pack's roll top closure (pack is shown from above with closure open). This method works well with roll top closures, common on many lightweight backpacks. Notes: 1) The SPOT2 is tied to a loop inside her pack. It never gets untied, so the only way it could get lost is if the whole pack is lost. 2) She has taped over three of the buttons in order to make absolutely certain they don't get dispatched by mistake.

Amy's under the roll top is only one solution for horizontal mounting on a backpack. We are certain that user ingenuity will devise many more methods for horizontal mounting.

## **Protocols for Our Use - Use and Meaning of SPOT2 Messages**

**Note:** The following use of SPOT2 messages and their meaning is only used as an example. Readers are obviously free to use and interpret SPOT2 messages as they see fit. Alan carries a satellite phone and Amy does not. Therefore, there are some differences in our protocols.

Amy and I have been emergency contacts for each other's trips since well before the advent of the original SPOT1. We both use the SPOT2 and have agreed upon the following interpretations for the four types of SPOT2 messages. Note that we use the Custom Message, Help Message, and SOS Message to indicate increasing severity of problems.

### **Meaning of SPOT2 messages**

**OK** = We are OK and just checking in. Will generally do this starting hiking for the day at the end of the day when we make camp. We may occasionally send an OK at lunch, a summit, or significant point of interest. Also used to indicate that a significant deviation from route or schedules is "OK," and to not worry.

**Alan's Custom Message** = There is something up but it does not require rescue at this point. Start to closely monitor your phones (including mobile), email, trip blog, etc. Somebody is feeling ill, we have an orthopedic issue, terrible weather has set in, or we have significantly changed route or itinerary under duress, etc.

**Amy's Custom Message** = There is something up, but it does not require rescue at this point. Monitor our SPOT locations and messages closely. Illness, injury, bad weather, unexpected ground conditions, etc.

**Help** = We have a problem we cannot solve and require rescue in 24-72 hours. Possible reasons include being lost or non-life-threatening illness/injury that is serious enough that the ailing person should not be left alone while the other goes for help. We are safe and this is not urgent, but we need assistance.

**911** = We have a major problem that requires immediate rescue. Although you won't receive this message, you are on the list to be contacted if it is sent out. (See below). We will not send this message unless we believe there is a serious threat to life or limb.

### **SPOT2 goes dead (no more messages)**

Alan carries a sat phone, and his protocol is this: Start to closely monitor your phones (including mobile), email, trip blog, etc. for messages, calls, and voice mails from our sat phone. Absence of messages from both SPOT2 and sat phone for 24 hours indicates a significant problem, since it is unlikely that both the SPOT2 and the sat phone will fail and that we haven't managed to move into a good transmission area to send out some sort of message.

Amy does not carry a satellite phone, and her protocol is this: If there are no tracks or SPOT2 messages, it does NOT mean that we have a problem. It could be one of many reasons, but you should NOT worry about it. (dead battery, device lost or damaged, etc). In this case revert to protocols used before we started carrying SPOT2: assume all is well until 24 hours after our expected trip completion time, at which point Responsible Party should notify the appropriate agency to initiate SAR.

If the track shows regular progress and/or there are daily OK messages, assume that all is well, even if hikers are off course or out past their planned trip completion time. This would be a normal scenario if a trip is delayed or rerouted due to weather, unexpected on-the-ground conditions, or minor injury/illness.

In the SPOT2 account, the text for the 911 (SOS) message includes the following information:

- Names (and optional – Passport Numbers).
- Ages, medical conditions, allergies, medications.
- “Will initiate 911 (SOS) message only when there is a perceived threat to life or limb for ourselves or somebody we encounter on the trail. (Note: we will NOT initiate 911 for non-urgent request for help.)”
- Planned itinerary and dates.
- Local emergency phone numbers or the area were hiking: Forest Service, Park Service, BLM, local Search and Rescue Organization, local sheriff, etc.
- Full contact information for the Responsible Parties/Emergency Contacts (names, addresses, cell/work/home phone numbers, email addresses).

The SPOT2 user leaves their login/password information with the Responsible Party/Emergency Contact, in case there are any problems with the account.

Pre-trip, the SPOT2 user sends tests for all four types of messages, OK, Tracking, Custom, and Help to all Responsible Parties/Emergency Contacts and makes sure they receive all email and text notifications, and that all messages show up on the Web tracking page.

## **Suggestions for Improvement**

- We’re still waiting for some sort of display on a SPOT2. We’d love to at least get our GPS coordinates from the unit. And while the new status LEDs are an improvement, even a one line alpha-numeric LCD display would give greater understating of the unit’s operational status.
- Increase the queue of Tracking Points to six - a full hours worth. This would be useful for SPOT2 units operated in canyons and/or heavy tree cover.
- Smart management of Tracking Points when going from OK back to Tracking mode: Usually the first OK message attempt is successful, but the SPOT2 continues in OK mode for another 20 minutes before returning to tracking mode. This usually leaves a 20 minute or so gap between OK and the next Tracking

- Point. The Web interface could convert subsequent OK points, sent in the 20 minutes after the first OK delivery, into Tracking Points.
- Devise a simple and reliable way to mount the SPOT2 horizontally on a backpack.
  - To be a bit greener, we'd like to see the SPOT2 have the option to be compatible with NiMH rechargeable batteries, even if the operational life with NiMH batteries was a bit shorter than lithium batteries.

*Disclosure: The manufacturer provided this product to the author and/or Backpacking Light at no charge, and the author/BPL has/will return this product to the manufacturer upon completion of the review period of one year. The author/Backpacking Light has no obligation to review this product to the manufacturer under the terms of this agreement.*

### **Citation**

"SPOT2 Personal Locator Review and Extensive Field Test," by Alan Dixon and Amy Lauterbach. *BackpackingLight.com* (ISSN 1537-0364).  
[http://backpackinglight.com/cgi-bin/backpackinglight/spot2\\_personal\\_locator\\_review.html](http://backpackinglight.com/cgi-bin/backpackinglight/spot2_personal_locator_review.html), 2010-11-30 00:10:00-07.