

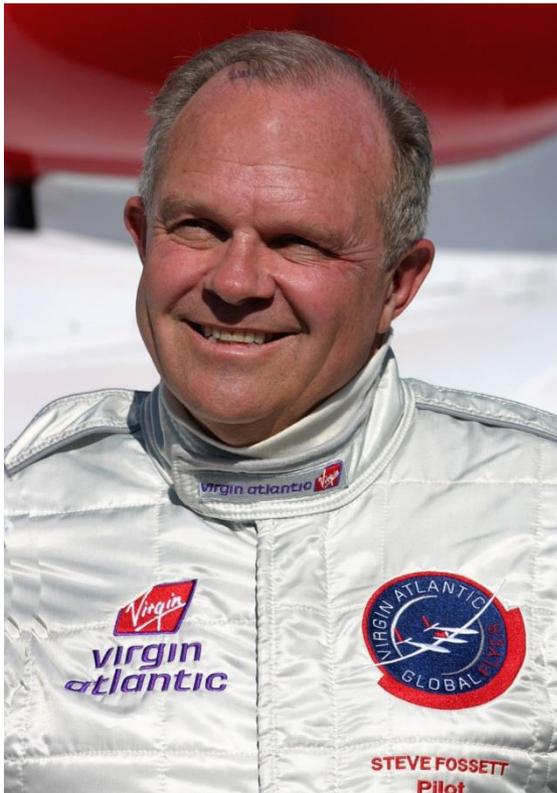
Lew Toulmin, Ph.D.
Cosmos Club, Washington, DC
2009

We will cover six topics

- Background
- Search strategy & organization
- Images of our search
- Achievements
- Closing the case
- Policy recommendations



Background



Steve Fossett was one of the greatest adventurers of all time

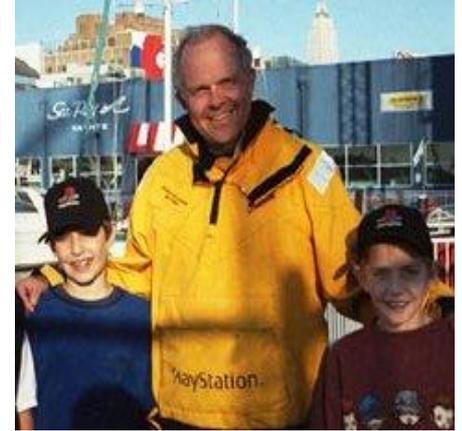
- Swam to Alcatraz in college
- Climbed the highest peaks on 6 of 7 continents
- Completed the Iditarod sled dog race
- Swam the English Channel
- Competed in Le Mans & the Paris—Dakar
- 1st solo balloon circumnavigation; received Explorers Club *Explorers Medal*
- First solo non-stop unrefueled circumnavigation in a plane
- Rolex Yachtsman of the Year
- President of the BSA National Eagle Scout Association
- Holder of 100+ flying, airship and soaring records



**Steve Fossett,
Medalist &
Fellow of the
Explorers Club**

Steve Fossett was remarkable

- A 63 year old adventurer and businessman focused on planning, achievement & success
- Good physical--mental condition
- A “by the book” flier who “kept higher safety margins than most,” but not a “great stick and rudder man”
- Reportedly had reason to be distracted on this flight
- Normally did not fly low, but did on this flight; had abt. 40-100 hrs in this plane over 8-12 months here
- Had climbed in Wassuks & Sierras
- Last seen as shown, saying: “I’m going down the 395 corridor” or “I’m going out to play for awhile”



Steve mysteriously disappeared in September 2007

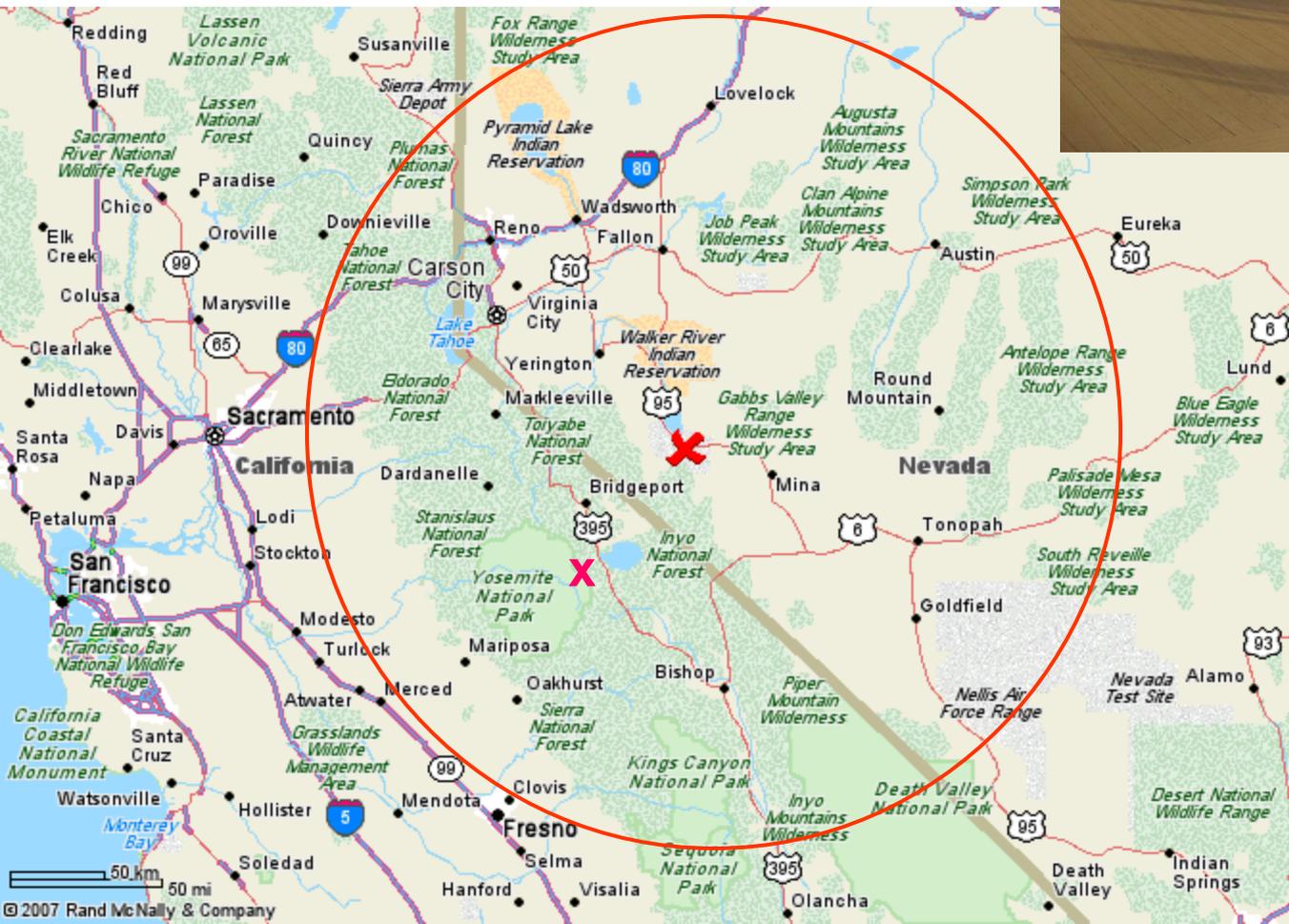
- Departed from the Flying M Ranch, 3 Sept 2007, near Yerington, NV
- Apparently just a recreational flight, NOT searching for site for new land speed record
- Last “confirmed” position abt. 9-11 am, S of Walker Lake and SW of Hawthorne, 30 miles SE of Flying M
- Expected to return to Flying M location, no flight plan (& none required)
- SAR eventually focused on 30-50 mile radius



The maximum search area covered much of the West and over 630,000 sq. miles



The 2007 search area included two states and 20,000 sq. mi.



The close-in search area



**Steve & Peggy
Fossett,
married for
40 years**

← Mono Lake

★
Flying M

Walker Lake

CA

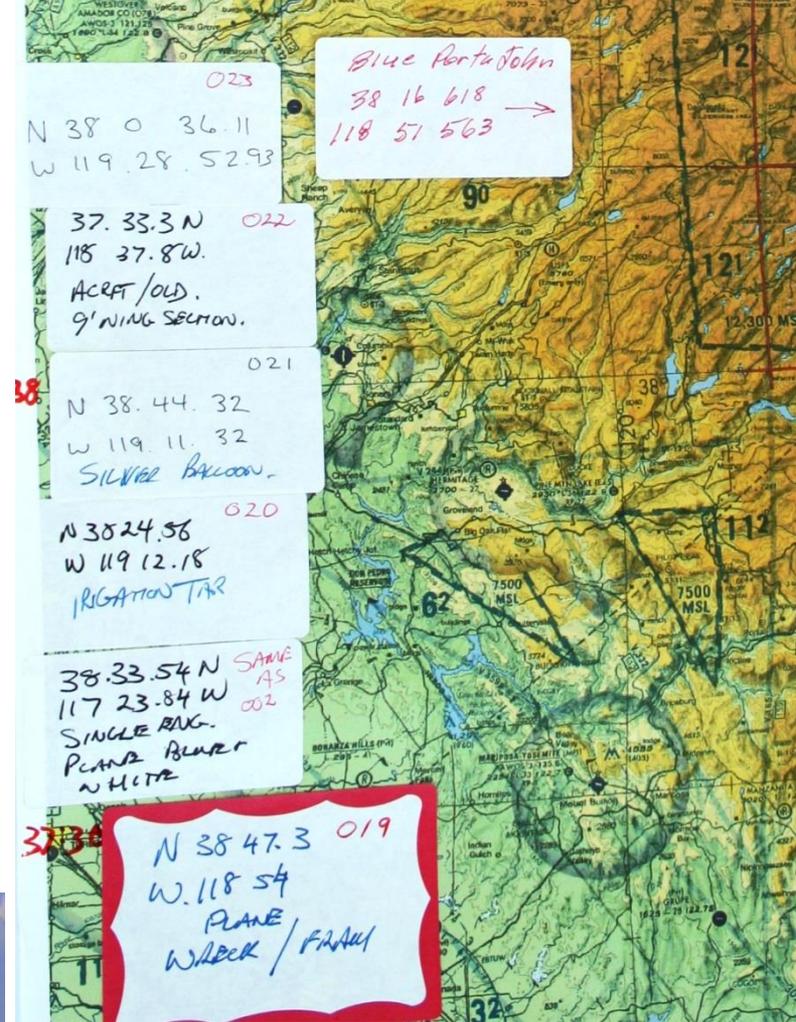
NV



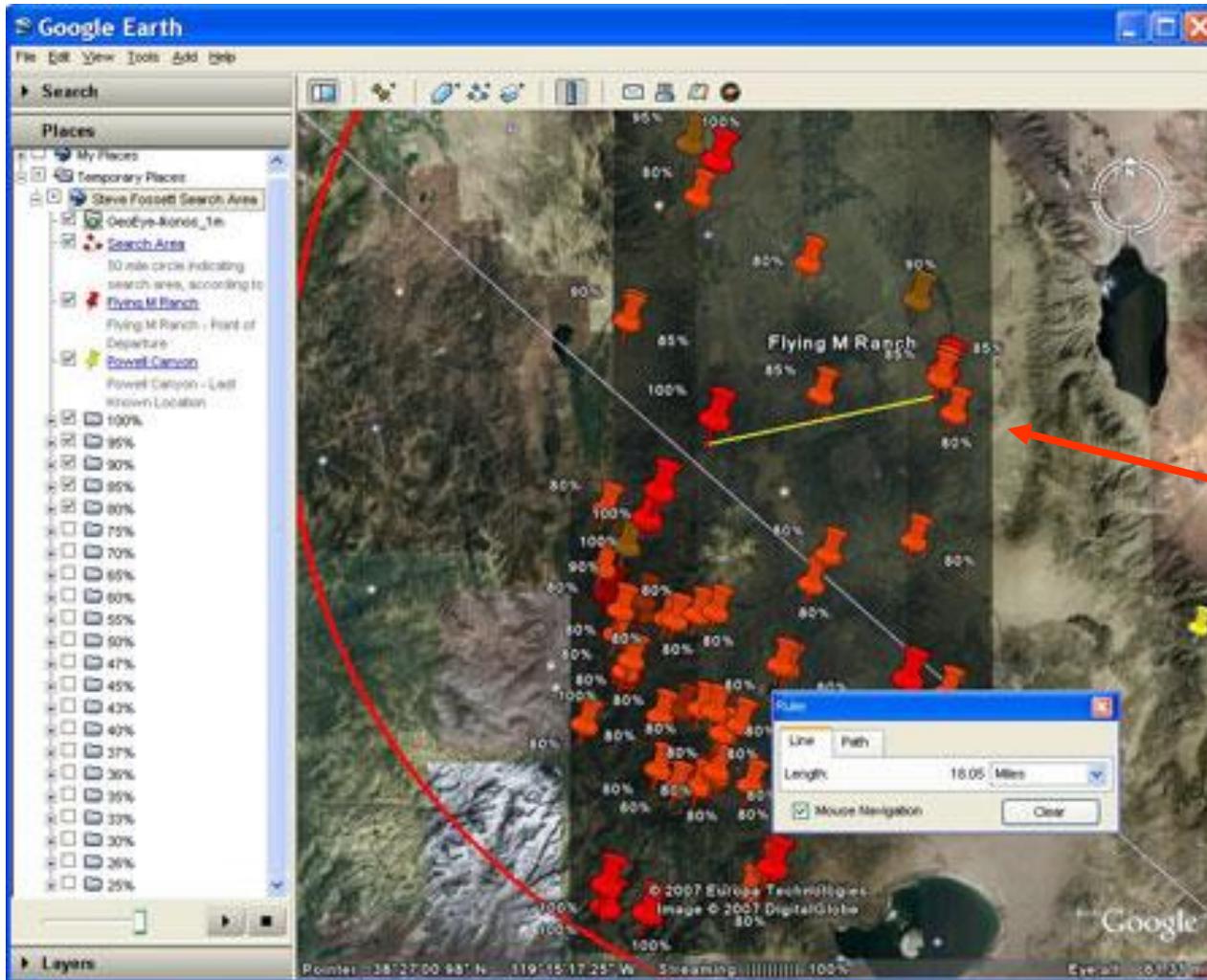
**The terrain
is rugged**

The 2007 search was intense...

- Almost 100% coverage of likely areas from aerial sources
- CAP alone devoted 17,000 hrs., 629 flights with 1774 flying hours
- Supplemented by ground assets using ATVs, horses and foot searches
- Side scan radar has been used in lakes
- Google Earth search sponsored by Amazon.com
- “Unforgiving terrain, high altitude, thick forest...”

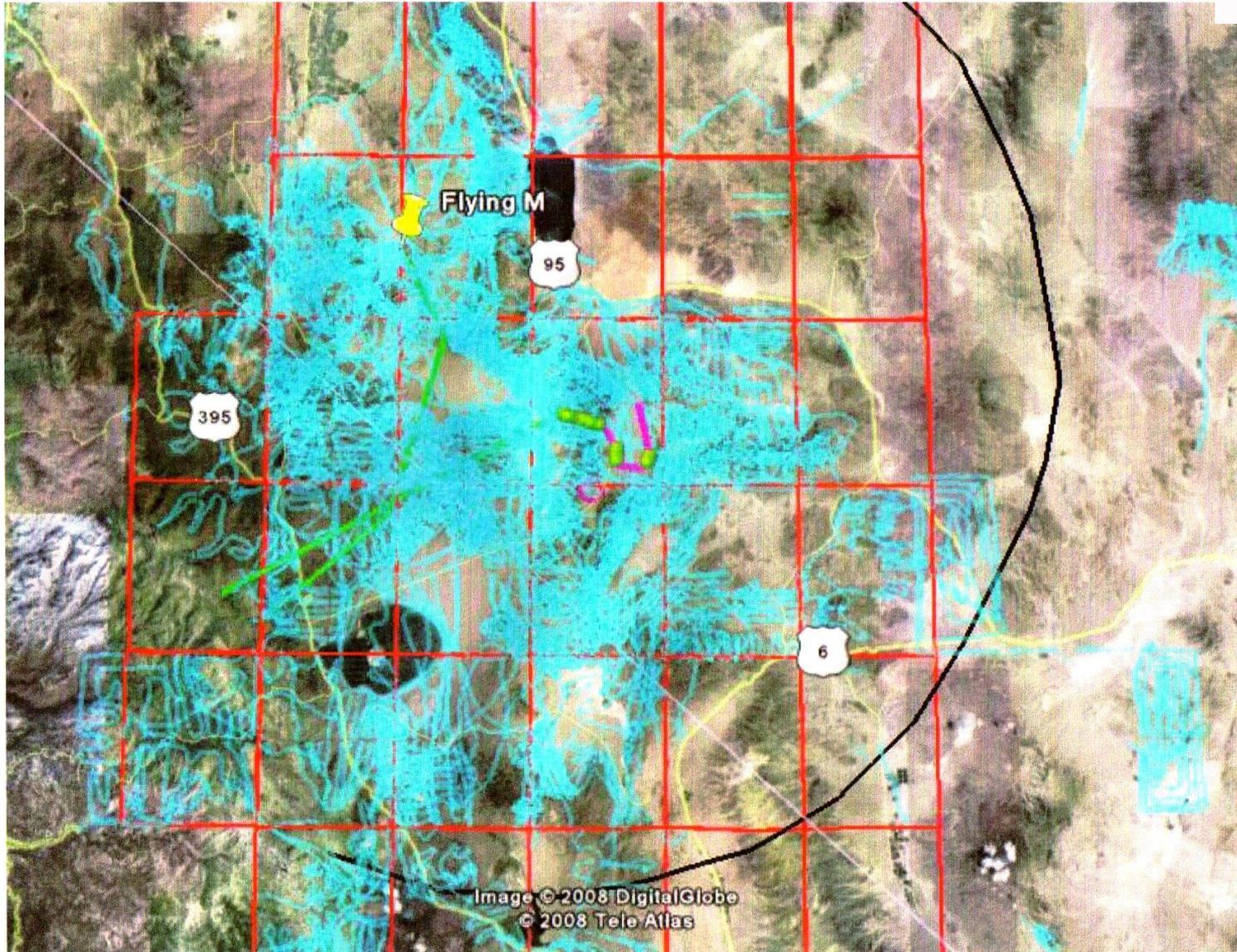


...and involved tens of thousands of hours reviewing Google Earth data



Pins indicate possible leads

The Flying M/Fossett team searched intensively by air

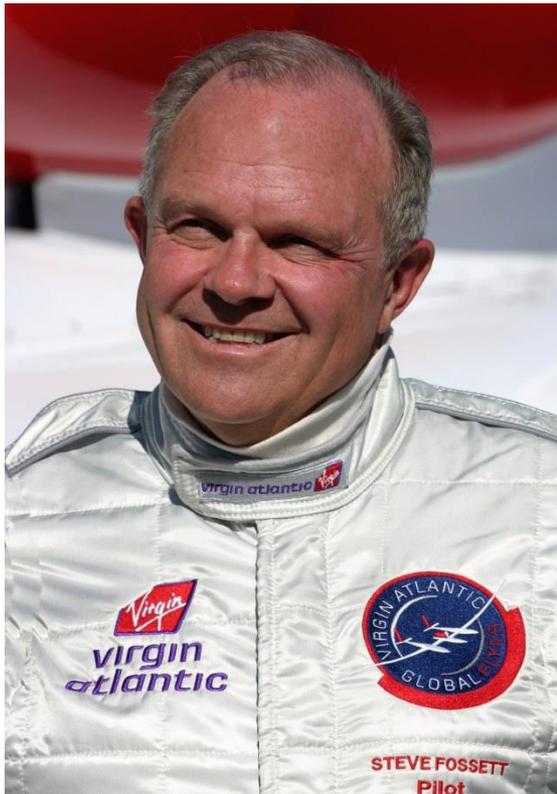


There were some especially difficult areas

- **Mt. Grant range (11,239 ft.) and Walker Lake (4 x 12 miles, 110 ft. deep)**
- **Wilson Canyon (500 ft. cliffs)**
- **Humboldt-Toiyabe National Forest (6.3 million acres, largest in lower 48)**



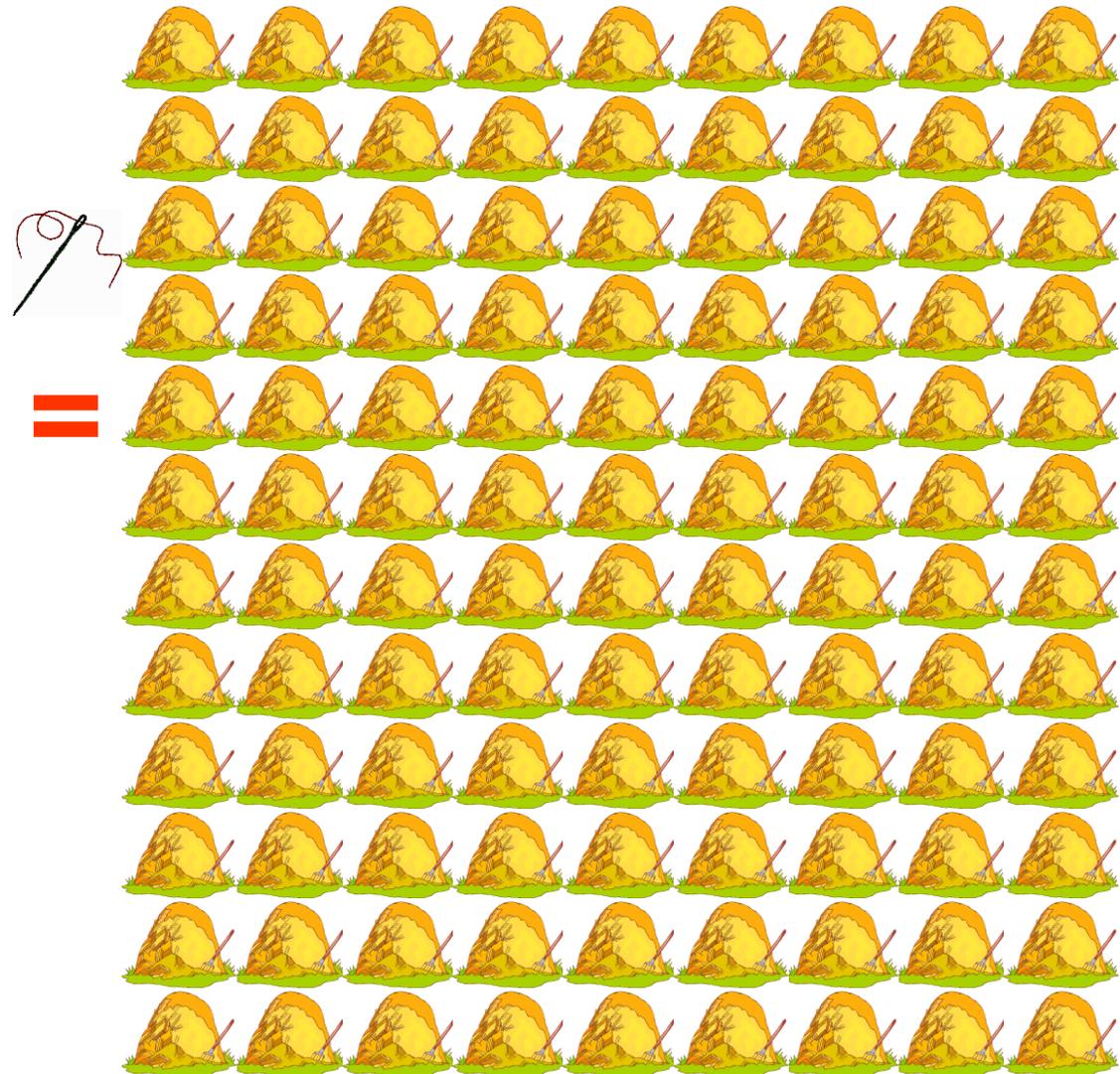
Search Strategy and Organization



Our goal: narrow down the odds



1 plane in 20,000 sq. mi. =
1 needle in **100** haystacks

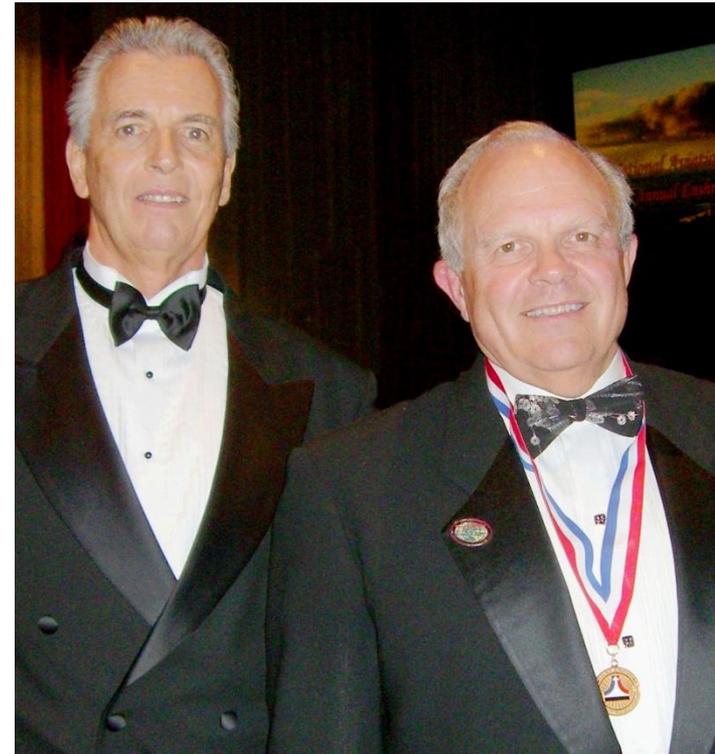


We conducted over 50 interviews

- **Air accident investigator**
- **SF flying partner**
- **Members of Fossett family SAR team**
- **Head of Mineral Co SAR**
- **Head of State of NV search**
- **Other SAR staff**
- **Analytical authors of articles on the case**
- **Known witnesses**
- **Developed new eye witnesses**
- **Etc.**

What we provided was “boots on the ground”

- ✓ Detailed search in difficult terrain: mountains & canyons
- ✓ Team members experienced in SAR, climbing, field craft, emergency mgmt.
- ✓ Able to commit to extensive SAR effort
- ✓ Able to contribute to scientific research & evaluation of SAR techniques



The Target: Steve's plane was a Bellanca Super Decathlon 8KCAB-180

Note "piano key" underside



- Tail number: N240R
- 1 pilot + 1 passenger
- Built 1980
- Wingspan 32 ft.
- Fabric wings
- Note wheels
 - from 6/07 pic
- Loaded wt. 1950 lbs.
- 180 HP Lycoming
- 110 knots cruise speed
- Ceiling 15,800 feet
- Climb: abt 500 ft per min at 6000 ft, 1280 fpm at sea level
- Glide ratio: 8 to 1; med. or "poor"
- Stall speed: 53 mph level, or abt 75 mph in 40 degree bank

It was likely that the wreck was VERY hard to see

**Several knowledgeable respondents who know this plane say:
“If it went in at a steep angle, all that is left is a small crumpled pile
of burnt black metal the size of two washing machines, and a few
girders and control wires.”**



Similar wrecks vary from easy to hard to spot



More actual wrecks, including a Bellanca



Analysis of an identical Bellanca showed few metal parts



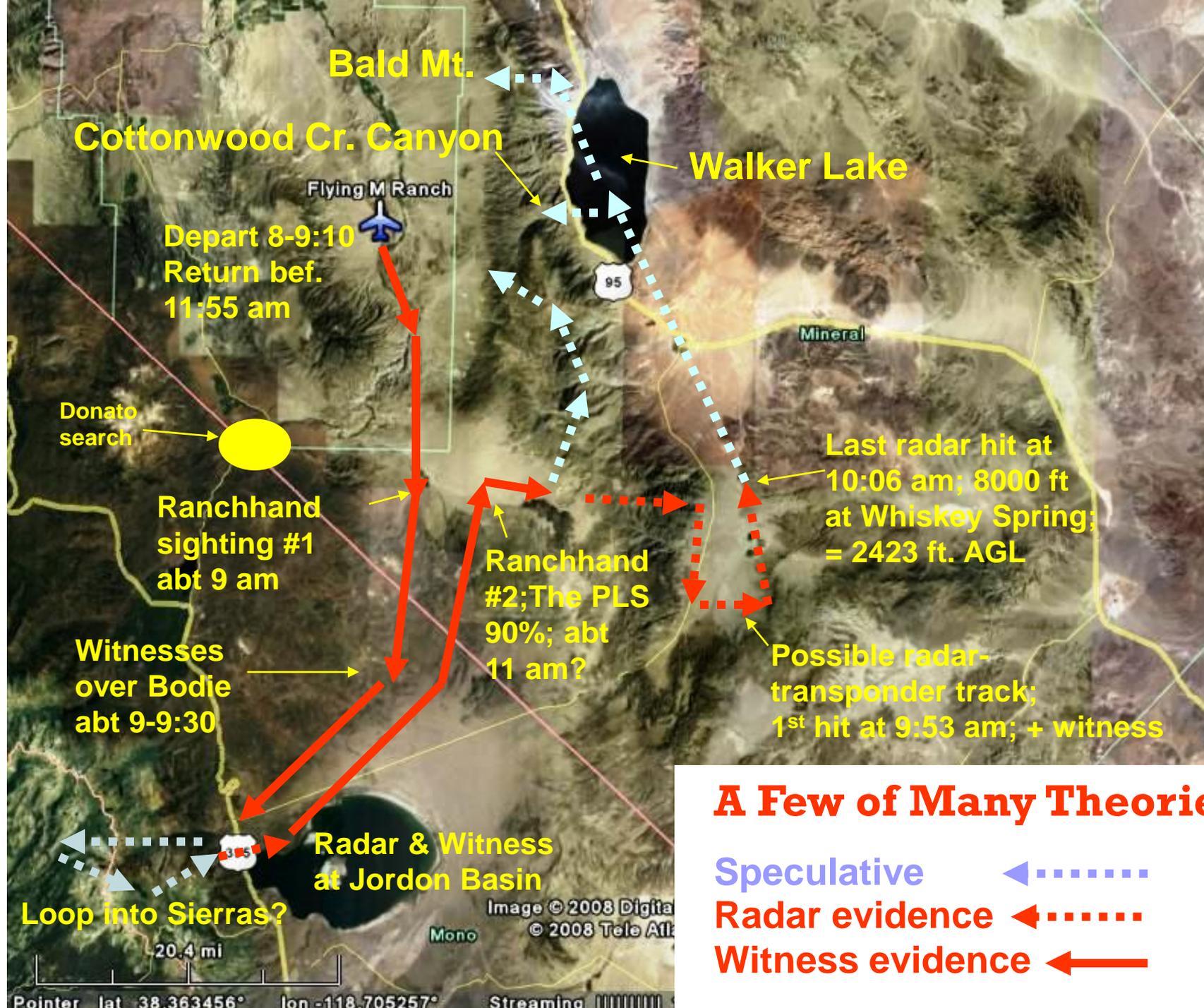
Wing spar now replaced with aluminum I-beam



A model illustrated what the crashed plane might look like



An experienced air accident investigator said: “You could be looking for it, and walk within 50 feet of it, and not see it.”



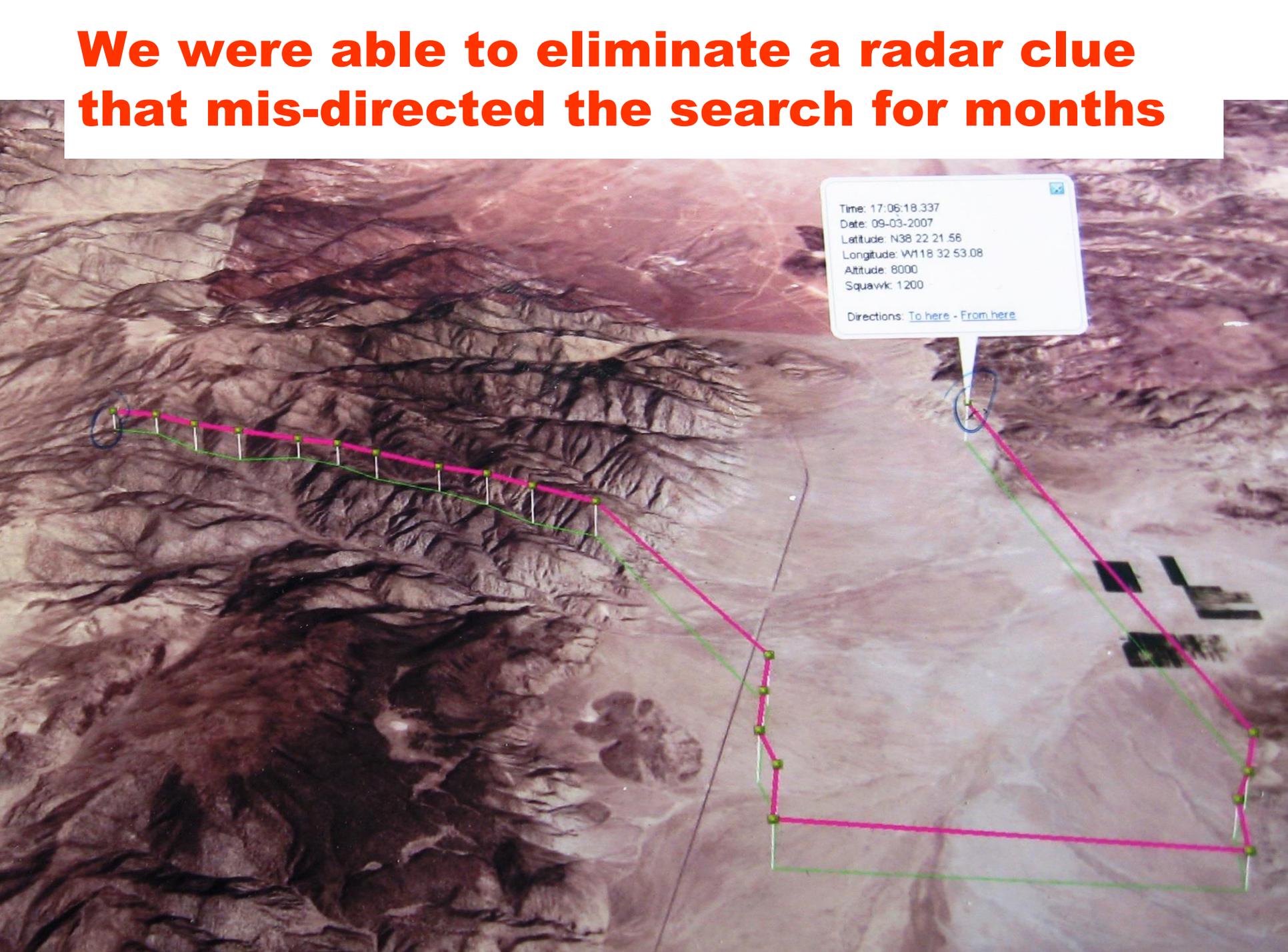
A Few of Many Theories

Speculative ←.....

Radar evidence ←.....

Witness evidence ←

**We were able to eliminate a radar clue
that mis-directed the search for months**

An aerial topographic map showing a rugged, mountainous terrain. A flight path is overlaid on the map, consisting of a pink line with green markers and a green line. The path starts at a point on the left, moves east, then south, then east again, and finally north. A white popup window is positioned over a point on the path, containing flight data. Two blue circles highlight specific points on the path: one at the start on the left and one at the location of the popup on the right.

Time: 17:06:18.337
Date: 09-03-2007
Latitude: N38 22 21.56
Longitude: W118 32 53.08
Altitude: 8000
Squawk: 1200

Directions: [To here](#) - [From here](#)

We focused on a few areas

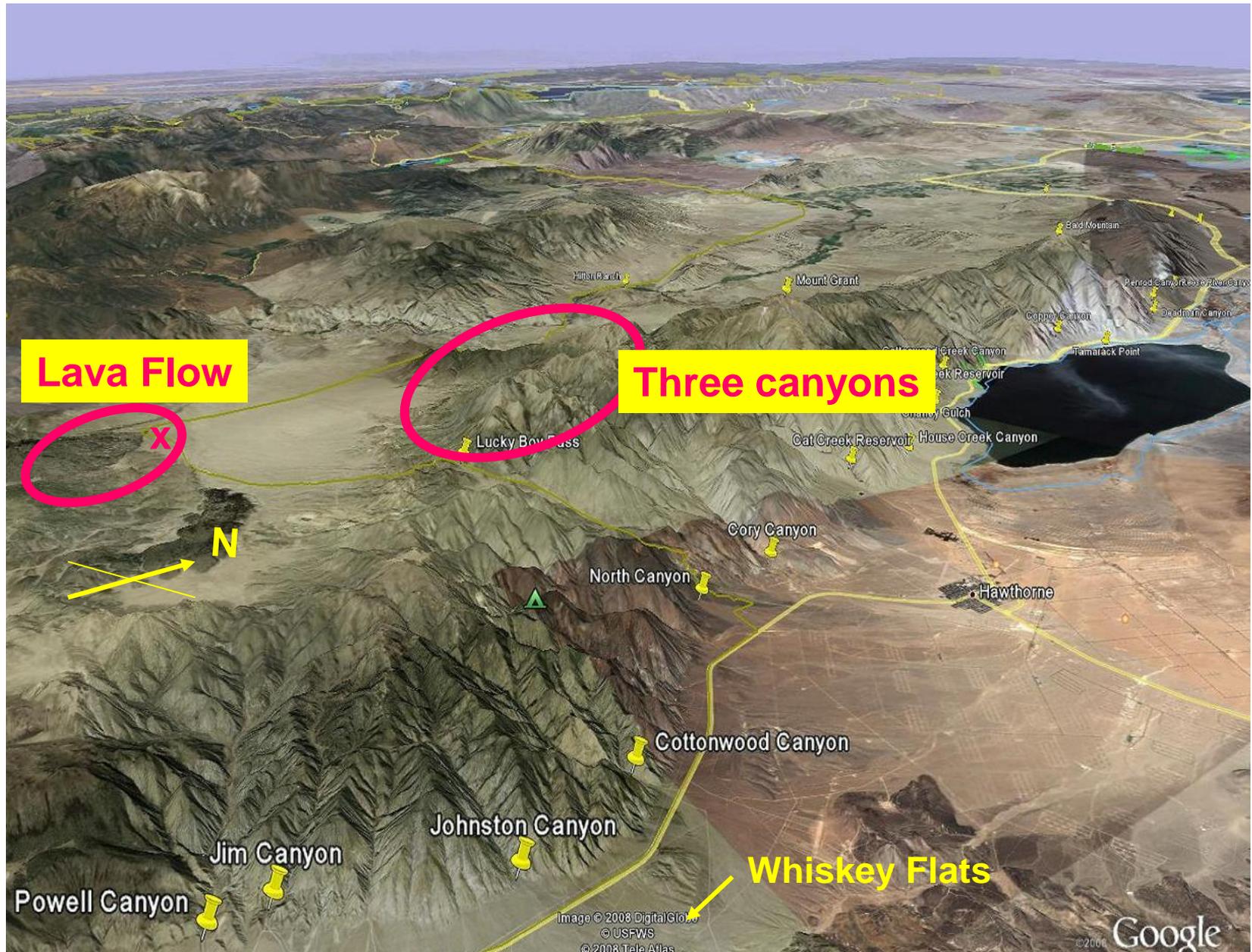
AREA

- Baldwin Canyon
- Lapon Canyon
- Rattlesnake Canyon
- Lava flow

EVIDENCE

- Convincing eyewitness familiar with plane saw it around 11:00 at 9 Mile Ranch
- Head of SF family team
- SAR theory expert
- Air investigator
- Paraglider instructor
- Not well searched by air or ground

Our search areas were SW of Hawthorne NV



The search terrain was varied...



...Our search tactics varied, too



- **Standard sweeps**
- **Climbing**
- **“Leapfrogging”**
- **“Cherry-picking”**
- **Spotting from ridges**



We paid attention to copses of trees— this one swallowed a helo and started the biggest search in NZ history

Figure 1 Location of ZK-HTF



Source: NZ Police

**The helo was not found
for days, altho it was in
the highest probability
area and a flight plan
had been filed....**

Figure 2 Location of ZK-HTF Closer View.



Source: NZ Police

From Dec. to July 2008 there were 4 key people

Bob Atwater
Co-leader



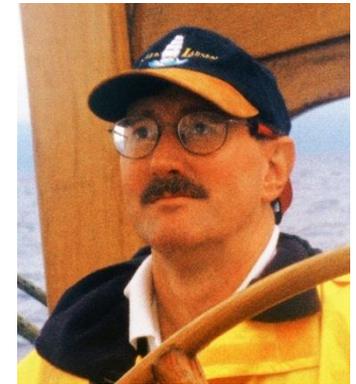
Robert Hyman
Co-leader &
Coordinator



Deb Atwood
Co-leader



Lew Toulmin
Co-leader



- Press liaison
- Family liaison
- BSA liaison

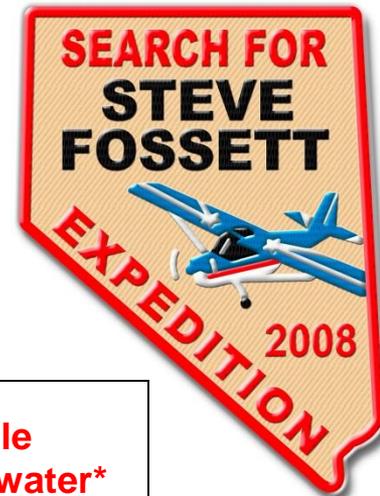
- Recruitment
- Logistics
- Admin
- Finance

- Funding
- Fed liaison
- Congress liaison
- FOIA

- Interviews
- Research
- Reports
- Analysis

Search for Steve Fossett Expedition

We used the Incident Command System



Operations Phase

Expedition Leader
& Incident Cdr.

Robert Hyman*

Leadership Advisory Group
& Exp. Co-leaders

**Bob Atwater* Colleen Keller
Lew Toulmin***

Safety Officer: **Dick Sale**
Liaison Officer: **Bob Atwater***
Info Officer: **Bob Atwater***

Planning

Sec. Chief: **Dick Sale**
Deputies: **Colleen Keller
Lew Toulmin***

Operations

Sec. Chief: **B. Atwater**

Logistics

Section Chief: **John Hyman**
Base Camp Mgr/Comms:
Demi Pulas

Finance/Admin

Section Chief: **Demi Pulas**
Resource: **Robert Hyman**

Strike Team 1
(Vertical)

T.L.: **Mike Ruth**

Strike Team 2
(Vertical)

T.L.: **Calvin Hebert**

Strike Team 3
(Vertical)

T.L.: **Wes
Bunch**

Strike Team 4
(Horizontal)

T.L.: **GG**
Deb Atwood
Chris Killian
Sean McDaniels
Lew Toulmin
Colleen Keller
Jim Thomas
Dwayne McCourt
Demi Pulas
Sallie Shatz

Aerostat Team

T.L.: **Curt
Westergard**
Resources:
**V. Nederhost
P. Vojecek**

Air Support

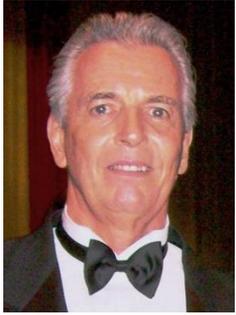
T.L.: **C. Keller**
Resources:
Jim Herd

Climbing Experts

**Rob Duhamell Gary Fisher Paul Rarick Lon Martin
Josh Grossman Wes Bunch Eliel Hindert
Sune Tamm-Buckle**

* = expedition co-leaders during planning phase
R. Hyman = expedition photographer

We had a great team with experience on over 500 SAR missions



**Bob
Atwater
Ex-Dep. Sheriff
SAR expert**



**Colleen Keller
Search Theorist, Pilot
Friends of Fossett**



**Chris Killian,
Located 100
air wrecks**



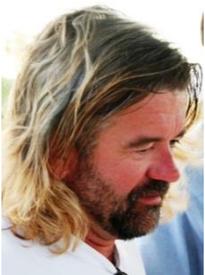
**John Hyman
Logistics expert**



**Lon Martin
Climber,
Ironman**



**Josh Grossman
Explorer, teacher**



**Dwayne
McCourt
Pilot,
Paraglider**



**Rob Duhamell
Technical climber**

More terrific team members



Demi Pulas
Comms expert



Gary Fisher
Mapping expert



Dick Sale
SAR Expert



Sallie Shatz
SAR Expert



Curt Westergard
Aerostat expert,
inventor



Sune Tamm-Buckle, climber,
Antarctic expert



Sean McDaniels,
GIS expert



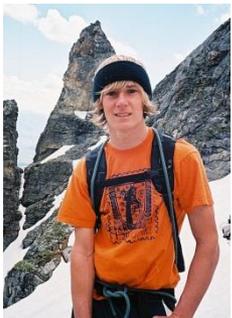
Jim Thomas,
Pilot, Air-
port Mgr



Calvin Herbert
Expert Mt. guide



Wes Bunch
Climbing expert



Eliel Hindert
videographer
climber



Mike Ruth
Prof. Mt.
guide

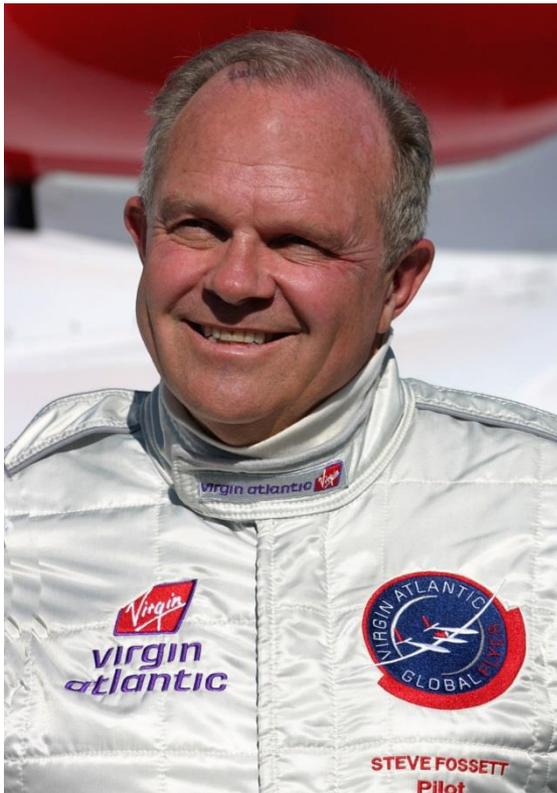


Richard Costello, FoF



Deb Atwood
Policy Expert
Boss
of the **Boss!**

Images of the Search



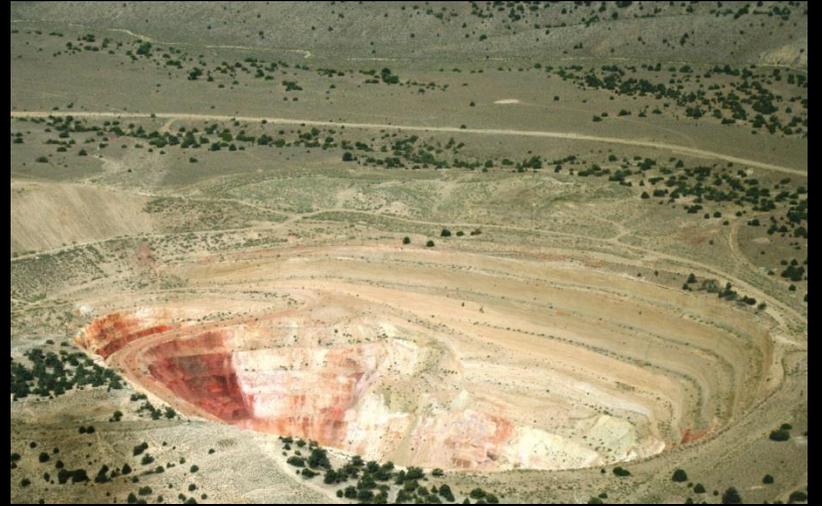


**WHISKEY
FLATS**

RV PARK

SHOWERS RV PARK STORE





























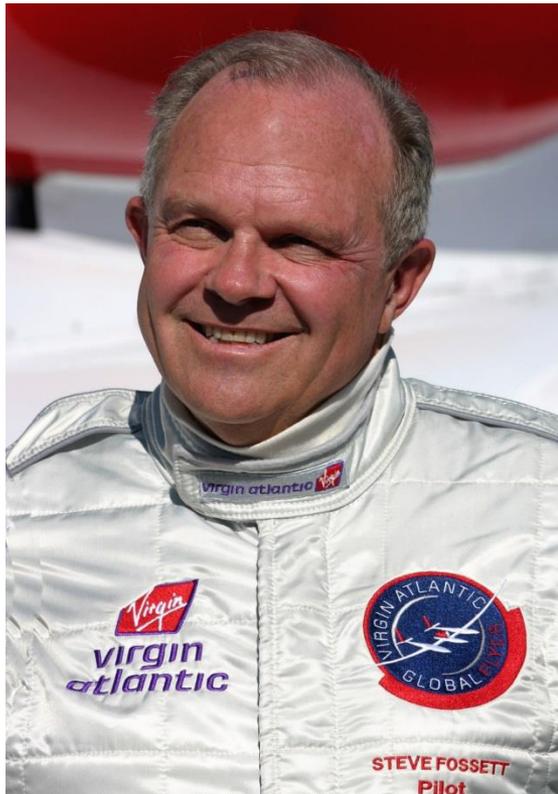








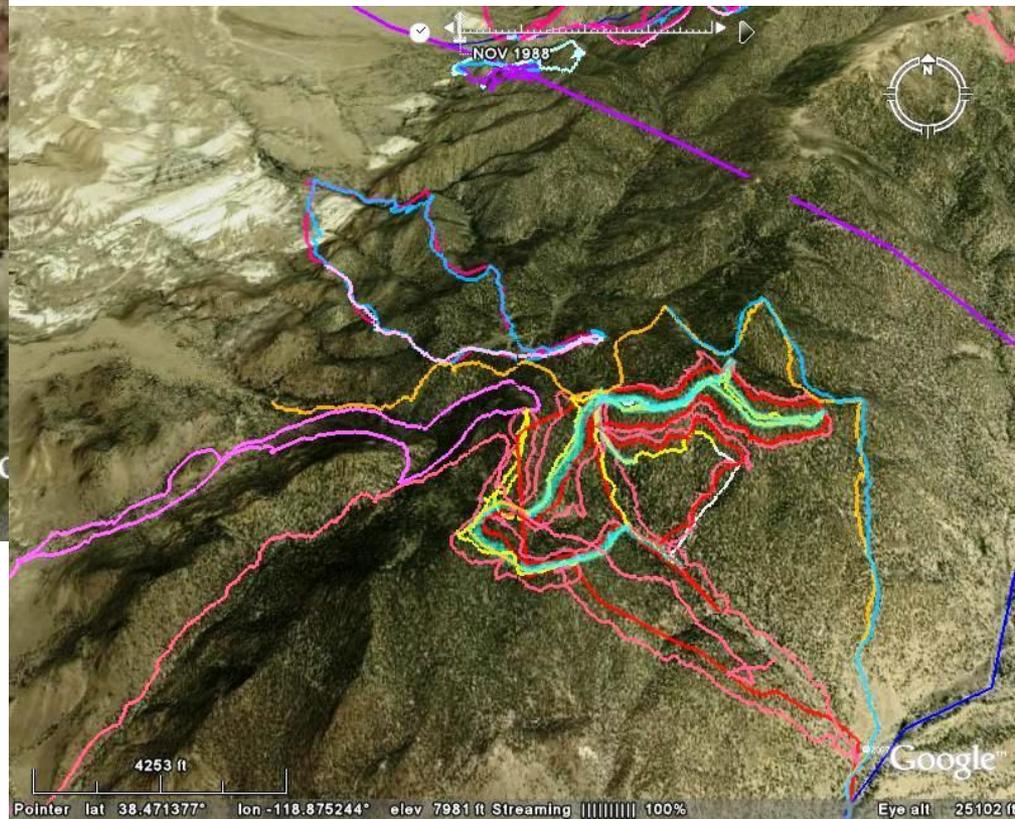
Achievements of the Expedition



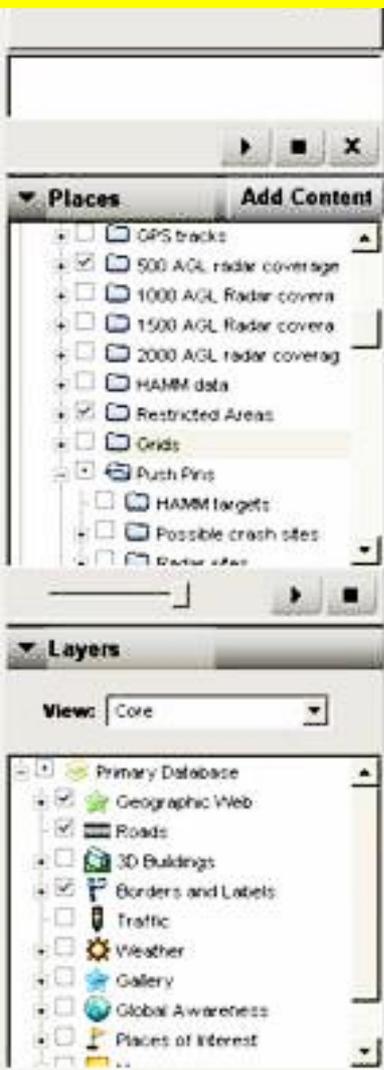
The team delivered a lot of searching

| # | Name | Skill/Task Summary | | Sum |
|------------------|-------------------|----------------------|--|------------|
| 1 | Atwater, Bob | ops, horizontal | 1 1 1 1 1 1 1 1 1 1 | 10 |
| 2 | Atwood, Deb | horizontal | 1 1 1 1 | 4 |
| 3 | Bunch, Wes | climbing | 1 1 1 1 1 1 1 1 | 8 |
| 4 | Costello, Richard | horizontal, pilot | 1 1 | 2 |
| 5 | Duhamell, Rob | climbing | 1 1 1 1 1 1 1 1 1 1 1 1 | 13 |
| 6 | Fisher, Gary | climbing | 1 1 1 1 | 4 |
| 7 | GG | climbing | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 15 |
| 8 | Grossman, Josh | climbing | 1 1 1 1 1 1 1 1 1 1 1 1 | 13 |
| 9 | Hebert, Calvin | climbing | 1 1 1 1 1 1 | 6 |
| 10 | Hindert, Eliel | climbing | 1 1 1 1 1 1 1 | 7 |
| 11 | Hyman, John | logistics, horiz. | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 19 |
| 12 | Hyman, Robert | Exp leader, climb. | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 19 |
| 13 | Keller, Colleen | horizontal, pilot | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 18 |
| 14 | Killian, Chris | horizontal, air obs. | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 19 |
| 15 | Martin, Lon | climbing | 1 1 1 1 1 1 1 | 7 |
| 16 | McCourt, Dwayne | horizontal, pilot | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 14 |
| 17 | McDaniels, Ryan | horizontal | 1 1 | 2 |
| 18 | McDaniels, Sean | horizontal, pilot | 1 1 1 | 4 |
| 19 | Pulas, Demi | comms, cook | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 18 |
| 20 | Ruth, Mike L | climbing | 1 1 1 1 1 1 1 1 1 1 | 9 |
| 21 | Sale, Dick | planning, admin | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 18 |
| 22 | Shatz, Sallie | planning, horizontal | 1 1 1 1 1 | 6 |
| 23 | Tamm-Buckle, Suni | climbing | 1 1 1 1 1 1 | 6 |
| 24 | Thomas, Jim "JT" | horizontal, pilot | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 13 |
| 25 | Toulmin, Lew M | planning, horizontal | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 19 |
| 26 | Westergard, Curt | aerostat, horizontal | 1 1 1 | 3 |
| SUMMATION | | | 0 0 13 14 14 14 14 15 16 15 17 20 17 17 18 19 16 13 10 8 6 | 276 |

We documented our searches of high priority, difficult canyons



The expedition involved numerous scientific disciplines



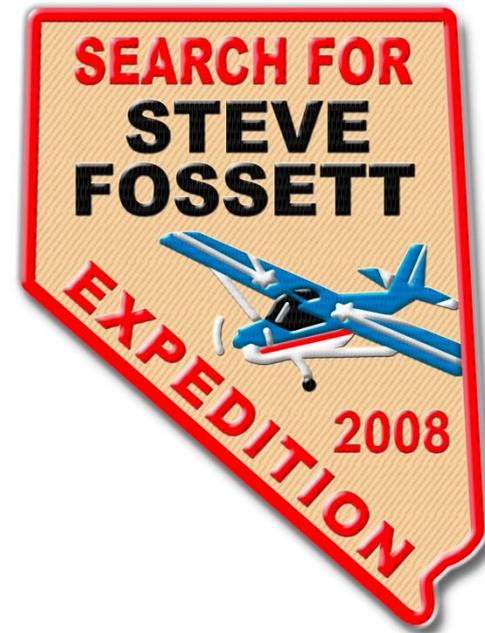
- Fluid dynamics
- Meteorology
- Ornithology
- Aeronautics
- Radar analysis
- Infrared and hyper-spectral analysis
- Air accident investigation
- Computerized mapping

- Software engineering
- Operations research and probability analysis
- Human factors analysis
- Emergency management
- Evaluation techniques
- Cadaver dog analysis
- Communications analysis
- Satellite surveillance & photo interpretation

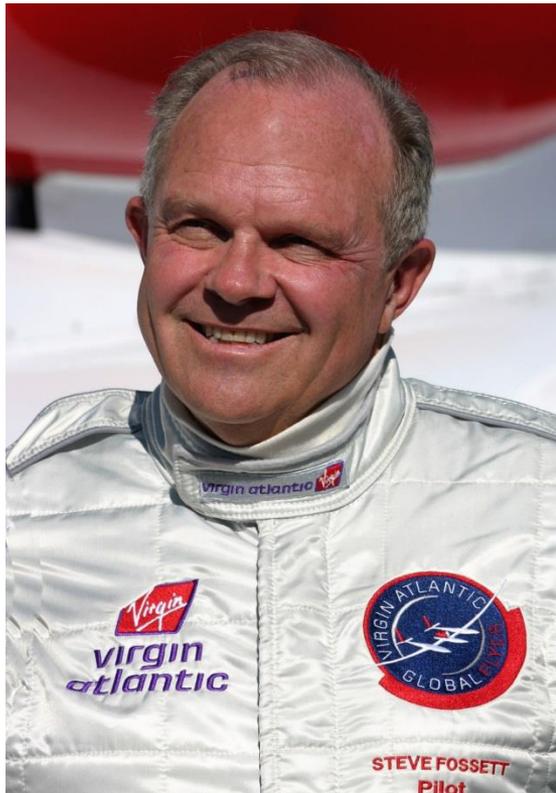


The expedition featured several “firsts”

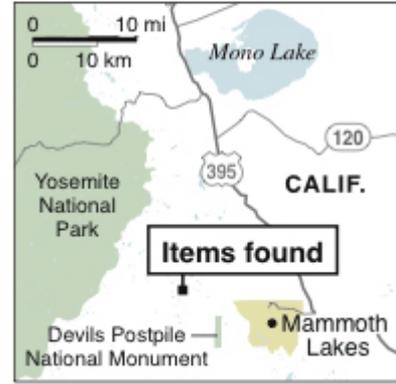
- First search by members of the Explorers Club for a missing EC Medalist
- First scientific analysis of the largest aerial SAR effort in US history
- First use of NASA SAR terrain visualization software on an actual search
- First scientific evaluation of remote “crowd searching” via the Internet



Closing the Case



In Oct 2008 a hiker found 3 of Steve's IDs 60+ miles from where we were looking



The crash was not survivable



The wreck was strewn across a steep hillside

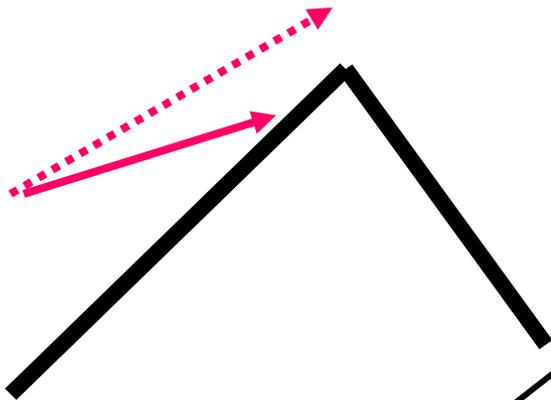


Ironically, the wreck site was in sight of the Mammoth Lakes ski area

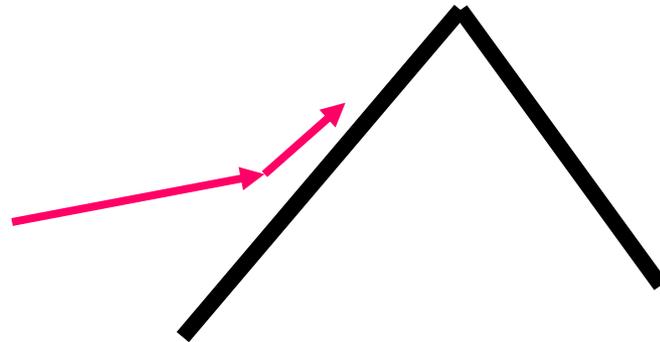


There are two major theories on the cause of the crash...

1. Miscalculation of weather, terrain or “density altitude”



2. Intentional landing in partially cleared area due to engine failure



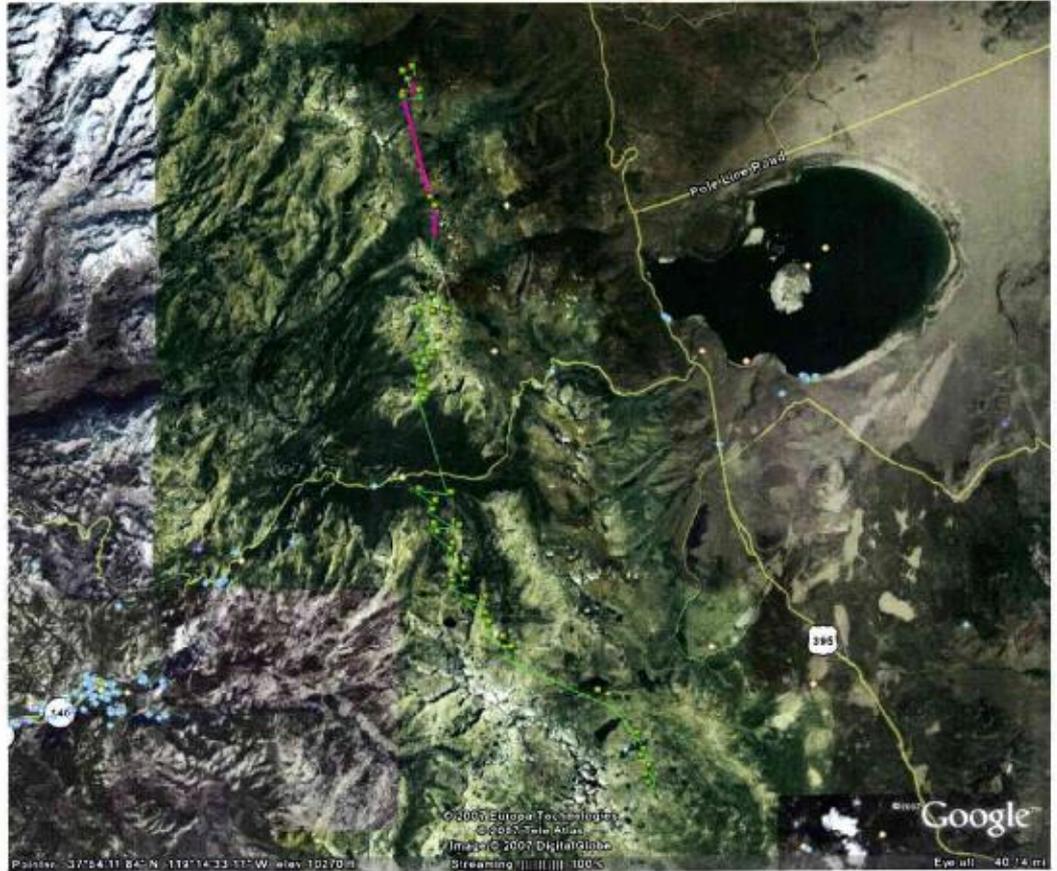
...the NTSB final factual report of 3/5/09 seems to support theory 1

This is how the Discovery Channel visualized the crash



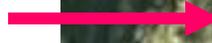
A radar track led to the wreck site, but that area was not searched well—a mistake in the 2007 effort

This track was in the hands of Federal authorities by day 3 of the search, but was ignored



From the radar track it appears that Steve was flying the John Muir Trail, mentioned in his autobiography

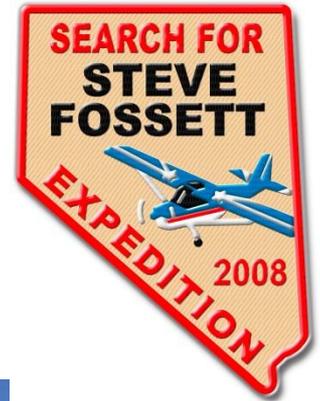
Radar hits:



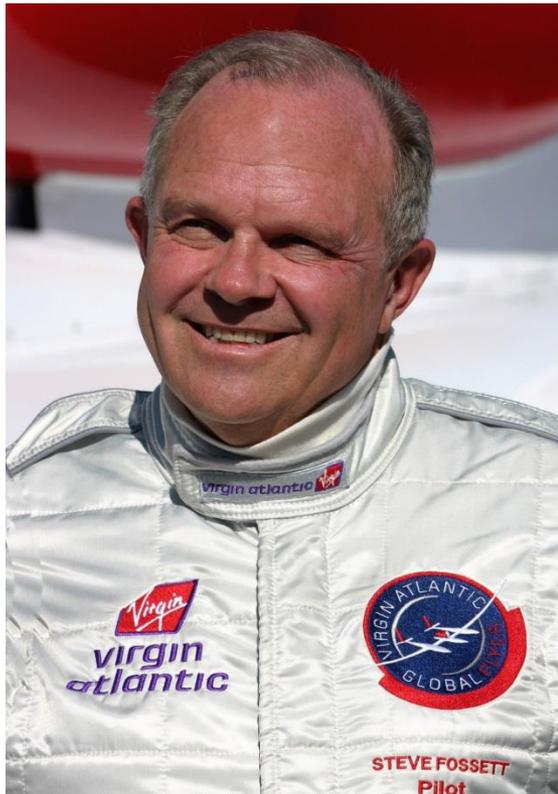
John Muir Trail



A member of our team found more evidence nearby, leading to DNA-testable bone and closing the case

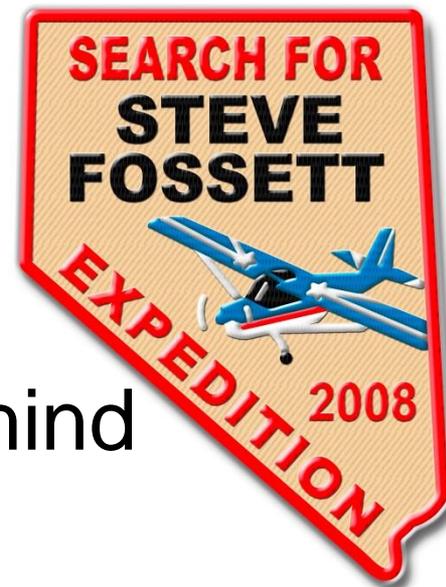


Policy Recommendations



Our policy recommendations are wide ranging

- SAR in the US is 20-30 years behind Canada—why?
- No-one did an “after-action report”
- Coordination with private searchers is non-existent and should be improved
- The FAA didn’t even recognize that an accident occurred!
- CAP and AFRCC should be modernized
- Federal, state and local SAR needs work



We are now a permanent search team...



....and have helped find another missing plane

Missing Arizona Plane Plane with 2 Passengers Missing Since Sept. 24

1966 Cessna 182, tail #N2700Q



On Sunday, Sept. 24, 2006, at 10:43 am, a 1966 Cessna 182, tail# N2700Q (white with brown stripes), departed Deer Valley Airport near Phoenix (DVT) with full fuel tanks and disappeared. Although no flight plan was filed, it is believed the aircraft was headed for Sedona (SEZ) and was expected to return to Deer Valley that same afternoon or evening.

A Civil Air Patrol search was begun the next day but no trace of the plane or its two occupants has been found.



William Westover

There is a high probability that a radar contact that dropped off-screen approximately 9 NM SW of Sedona is the missing plane. Search efforts have been concentrated in this area and as far north as Williams and south to Deer Valley Airport.

The pilot, William Westover, age 54, is a white male, 5 feet 11 inches tall, 230 pounds with whitish grey hair, brown eyes and scars on his left forearm. The passenger, Marcy Randolph, age 43, is a white female, 5 feet 3 inches tall, 115 pounds with blonde hair and green eyes.



Marcy Randolph

A site has been established for the collection of information at: <http://www.n2700q.com>

Anyone having knowledge of this flight or the whereabouts of its occupants is asked to contact Phil Randolph at (602) 678-1911 or email at randolph1email@yahoo.com

Thanks!



Comments or questions?