S&R Primer - Step I: Determine the Search Area

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In her thesis, Helen Wollan reminds us of the steps to follow in a Search:"Search operations are generally completed in the following steps: determining the area to be searched, performing a quick search of the most likely areas, searching the area using search patterns, and finally using area saturation to completely explore the area."

Assumptions – First set

1) Steve Fossett had 4 hours of fuel
2) The Citabria flies at 128 mph (cruise endurance)
3) He flies by conservative rules and will land with 1 hour of fuel in this tanks
4) Three hours will therefore carry him to a maximum distance of some 190 miles from takeoff ((3 x 128)/2)
5) He took off from the Hilton Ranch to look for dry lake beds for his record attempt over land, and most dry lake beds are to the East. (See Google Earth area pic above...)
6) Assuming he therefore flew East, he would have to return with a strong headwind of some 20 knots. (he either knows this, or sees this as he heads East)
7) So he only flies 150 miles out.
8) A circle with a radius of 150 miles has an area (r2) of some 70,000 sq miles is now our primary assumption.

Assumptions – Second set

1) The area to the East of the Hilton Ranch is the most likely area where he went to.
2) Let us take 3/4 of the above circle OUT of the search area, since we don’t believe he flew WEST, NORTH or SOUTH (there are few dry lake beds of interest...)
3) This leaves a cone, with an area of 17,600 miles which is Northeast, East, and Southeast of the Hilton Ranch.
4) This cone extends beyond Tonopah, (up to Nye County, NV) and covers several important dry lake beds.

Assumptions – Third Set

1) The wind that day was from the SW, and was blowing at some 20 knots at 10,000 ft.
2) The aircraft had a winsgspar AD in its past.
3) The worst rotor and turbulence that day would be on the lee side of the mountains, that is, on the East side of any ranges. (Pilot peak, East if Mina, as an example)

Assumptions - Fourth Set

1) Steve wanted to set a record of some 800 mph.
2) A rocket dragster takes some 3.58 secs to reach almost 400mph.
3) So let's assume that he was planning on a 10 second run, plus 10 more to stop. (These are rough numbers but I just an order of magnitude approximation on the size of the dry lake bed...)
4) At 800 mph 4 miles are covered in 20 seconds. But since he only reaches that speed before he begins to decelerate, he will probably need a dry lake bed with some 3-3.5 miles of usable terrain.

Conclusions:
1) The preferred search area is probably 17,600 miles with a cone from the Hilton Ranch that extends NE, E, and SE and ends 150 miles from it.
2) A grid needs to be drawn for this area.
3) Preference (see sector probabilities in Helen Wollan's thesis) needs to be given to areas which are on the lee side of ranges AND near a dry lake bed that is at 3.5 miles in diameter. (Example - dry lake bed, East of Pilot Peak, near Mina)
4) Other recommendations from Helen Wollan’s article on Search and Rescue must be implemented immediately by any club pilots participating in private searches.