SAFETY FIRST

The guest columnist for the Online Bulletin "Safety First" column this quarter is a member of the Human Factors and Safety Committee and former committee chair, Dr. R. C. Thompson. Enjoy his humor while simultaneously making the necessary safety points!
Warren V. DeHaan, OD
Committee Chair

PLAN TO FLY A NIGHT VISUAL APPROACH TO A LIGHTED AIRPORT SURROUNDED BY DARK TERRAIN? RECIPE FOR DISASTER

By R. C. Thompson MD
The Flying Physicians Association
Human Factors and Safety Committee

I LOVE MY AIRPORT!

Let's look a bit more closely at this enviable situation. You live in a wonderful, natural, un-spoiled location, with few neighbors, fair weather, lots of land or water nearby, and with its own airfield just a few miles away out of town.

Like, for example:

Perhaps these surroundings are a bit too dry and dusty for you?

Prefer a "sea breeze from time to time, and some "wave" action? Here is just the spot:

Or do you want to be near some higher ground, in case a tsunami should head your way?

No problem:

Too close to the town on the right? Or is the town too close to sea level? No Problem.

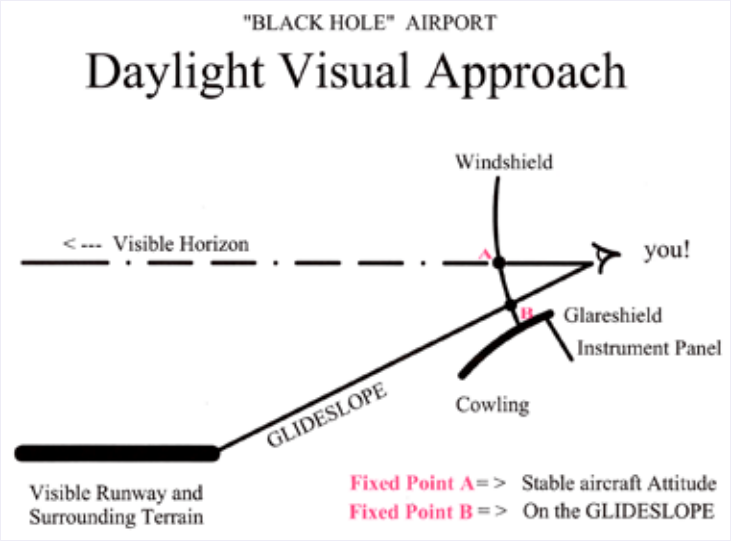
We've got just the place!

These are great places to live, or visit, but there is one possible problem you may want to consider. There is nothing around them that would be visible on a dark night.

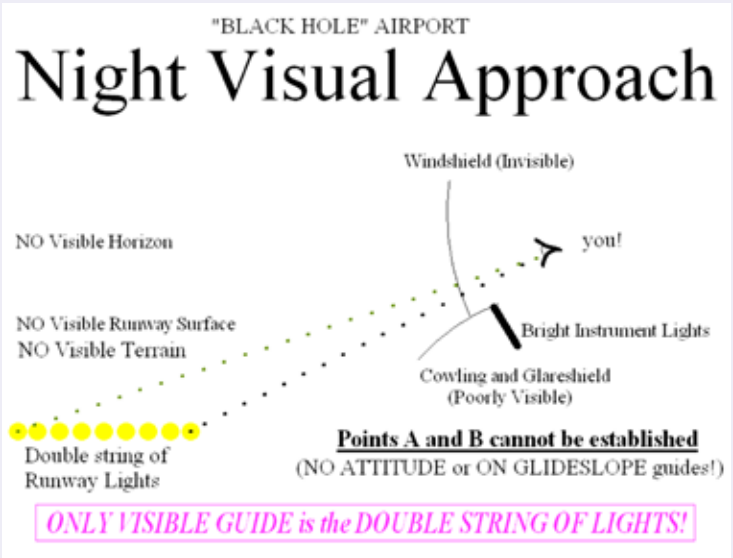
Let's say the ILS (if there ever was one?!) is out of service, the VASI died last year, and you are headed home. But, remember, there are always

strong headwinds when you REALLY want to get home. You say, “Always?” “Yep, Always.” You say “always?” I say “Well, Always for me, at least”. So you then re-calculate, and realize that it will be well after dark when you will arrive. Then you remember that the runway has excellent lights and you breathe a sigh of relief – the weather is good, but no moon - and you will be able to see the lights from miles away. Piece of Cake!

Hold on, - not so fast! Check out the next two diagrams showing the differences between day and night visual approaches.



We’ve all learned the importance of a “stabilized approach”, where we hold aircraft Attitude and Rate of Descent (power) constant, so that the touchdown point remains straight ahead and at the same height in the windshield. A stable Attitude causes the horizon also to remain at the same height in the windshield. Ride ‘em both to touchdown (or the flare), and you’re home. But what about at night, when there is no moon or visible terrain surrounding the runway area?

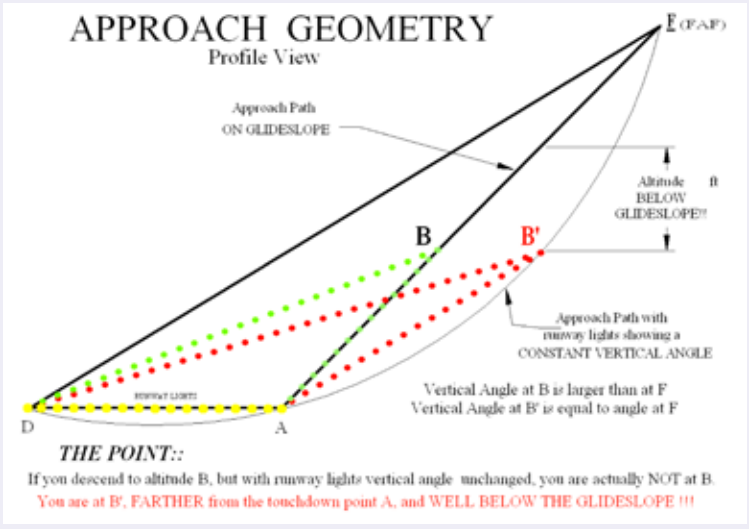


What can you use to maintain a “stabilized approach” now? All you can see is the vertical double string of lights along the runway edges. When you first start your approach from a known spot, the lights look “about right”, judging from your prior experience. Here’s the problem: research and simulator testing has shown that nearly always the pilot in this situation psychologically begins to try to “keep the vertical light string looking about the same from top to bottom” while continuing the approach.

IF YOU ACTUALLY ACCOMPLISH THAT, YOU WILL SURELY CRASH BEFORE YOU REACH THE APPROACH END OF THE RUNWAY!

Here’s why.

This is a simplified view of what happens as you continue the approach.



If you start at the final approach fix (really the initial visual approach starting point) at 1000 ft AGL, and check out the vertical angle formed by the twin runway light strings, you get some number, like 5 degrees (the angle at point F in the above drawing). If you then lower your altitude by, say 400 feet, and then figure out where you have to be to again get the 5 degrees number, you will find that the result is point B’ shown above. If you continue this process over and over for all the different altitudes from 1000 ft AGL to ground level, you get the arc of a circle shown above.

THE POINT IS:
If the vertical angle of the lights stays the same, i.e., the lights look “about the same”, then you are flying the CIRCULAR ARC, not the GLIDESLOPE;
You will fly WAY BELOW THE GLIDESLOPE!

What then about Obstacles sticking up from the ground?

Every airport runway in this country has approach and departure designed obstacle clearance surfaces (OCS) extending from the runway starting at the runway ends (or else 200 feet before the runway end) and sloping upward at a specific rate, usually 34 to 1 for a runway with a 3 degree descent angle instrument approach. The slope is steeper for non-precision instrument runways, and may be steeper yet for VFR only or Daytime only runways (as steep as 15 to 1, which for departure requires a climb rate of 500 feet per nautical mile to be safe. For you twin drivers, is your single engine climb rate that good, if you must continue a takeoff after an engine failure?) Sometimes obstacles may legally extend above these basic surfaces under certain specified conditions. But always, trees, buildings, hills, towers on hills, church steeples, etc., fill up the space beneath the OCS in the direction of the extended centerline.

By flying the ARC you will quite likely hit something; the CIRCULAR ARC in nearly all cases cuts down through the Obstacle Clearance Slope, sometimes by hundreds of feet, and often at a point miles away from the runway!

I have a couple of recommendations that have grown out of all this study and calculations that I did to determine what is happening in these difficult night approaches.

SUGGESTIONS for the AIRPORT

I am here to say that either a continuously operating ILS or a VASI, or even better, both, should be at every such "black hole" airport. Period. I don't want to hear any arguments!

SUGGESTIONS to the VFR Pilot

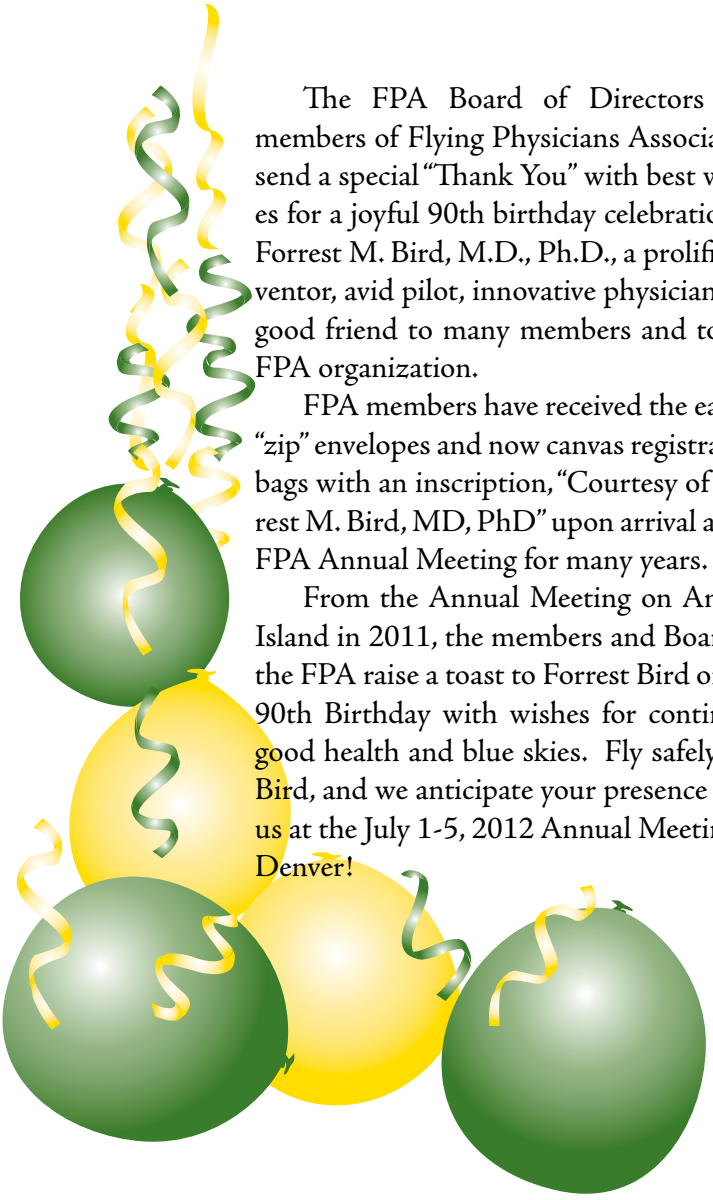
If you plan a straight in approach, use your GPS to determine distances, and work out in advance what your altitude should be when you are 5, 4, 3, 2, and 1 nautical mile from the touchdown point. Alternatively, fly all the way to the runway at a safe altitude, circle down to pattern altitude, enter the pattern and land (circle to land maneuver). If you have lost your electrical system, and can't see anything inside the cockpit, go somewhere else that's lit up like a Christmas tree, and enjoy the visual! You DO have a handheld, don't you?

References:
Thompson, Robert C.(2010) 'The "Black Hole" Night Visual Approach: Calculated Approach Paths Resulting From Flying a Constant Visual Vertical Angle to Level and Upslope Runways, The International Journal of Aviation Psychology, 20: 1, p59 - 73

Birthday Greetings

TO HONORARY FPA MEMBER,

FORREST BIRD, MD, PHD



The FPA Board of Directors and members of Flying Physicians Association send a special "Thank You" with best wishes for a joyful 90th birthday celebration to Forrest M. Bird, M.D., Ph.D., a prolific inventor, avid pilot, innovative physician and good friend to many members and to the FPA organization.

FPA members have received the earlier "zip" envelopes and now canvas registration bags with an inscription, "Courtesy of Forrest M. Bird, MD, PhD" upon arrival at the FPA Annual Meeting for many years.

From the Annual Meeting on Amelia Island in 2011, the members and Board of the FPA raise a toast to Forrest Bird on his 90th Birthday with wishes for continued good health and blue skies. Fly safely, Dr. Bird, and we anticipate your presence with us at the July 1-5, 2012 Annual Meeting in Denver!