The Science Behind Mystery Overboard Passengers And Crew

Whenever a passenger goes overboard on a cruise ship, there is flurry of pro-cruise industry posting across the web. Those postings lean heavily to the notion that it is simply impossible to "fall" overboard on a cruise ship, unless the person is tossed from the ship, jumps over the railing or is clowning around, doing something rather dangerous, such as sitting atop or climbing on the railing. The postings also point to drugs and/or alcohol being involved.

It wasn't until I was adding a new case today of a woman who was of age 64, went over the railing of a cruise ship, fell into the water that was only 65 degrees at the time, in her bath robe, bobbed helplessly in the sea for two hours, with sharks approaching before being rescued, that another theory, with science to back it, came to mind.

I know I have peaked your interest in the amazing story of this senior citizen surviving, against all odds. I will tell you about that story, when I explain how science proves, people really do just fall accidentally overboard.

First, let me explain to you how I knew that science could explain this theory, then I will show you the science.

While staying at our beachfront condo, I had an incident where I was nearly sucked over the railing on our balcony. There was a combination of factors that made this possible, and only luck would make the difference between my being here today to write the story, or ending up in the pool over 80 feet below.

The condo was set up, much like a cruise ship stateroom with balcony. There were sliding glass doors between the balcony and the livingroom. The other side of the livingroom was a narrow opening into a hallway, that lead to the kitchen, the master bedroom and a separate bathroom, all with doors off that main hallway. At the end of the hallway was the front door of the condo.

It was a sunny day, with rather calm winds, and I was on the balcony in the morning sipping my morning brew, when I saw a ship off the horizon. I stood up and looked through my binoculars to see the ship, which turned out to be a shrimping boat. I was NOT leaning over the railing, nor leaning against the railing, simply standing behind it.

It was a very quiet morning, peaceful and I was intently focusing on the shrimp boat, watching the crew work on deck. There was a knock on the front door, which as you remember is at the other end of the condo, directly behind where I was standing on the balcony, at the other end of a narrow hallway. I did not hear that knock on the door, but my husband, at that end of the condo, did hear it, and went to the door to see who it was. Looking through the peep hole in the door, he saw it was the maid arriving and opened the door. That is where everything went wrong.

When he opened the door, it created a wind tunnel that blew right through the condo, without warning. All of sudden I found myself being blown against the railing, nearly losing my balance. I dropped the binoculars and hung on for dear life. That too, turned out to be the wrong thing to do. I will explain later. But, suffice it to say, at the moment my heart was pounding so hard I thought I was going to have a heart attack, and I was shaken to the core after nearly falling over that railing.

While it puzzled me, I knew it had something to do with opening that door, but didn't know the science behind it. That science would play out many more times while we were at the condo, but I was prepared for it from the first time on. You would think, because it was not a windy day, that it would be safe on the balcony. Actually, we found that was untrue.

There were extenuating circumstances that made that particular balcony more dangerous than many others. First, the balcony was on the eighth floor of the building. Second, the condo was a corner unit that had two sides facing the wind. Third, the condo building had only a small space between it, and the next condo building.

On a normal day, with no wind, if I stuck my head over the balcony on the side of the balcony facing the other building, I could have easily been sucked over the balcony railing. I knew early on that was a mistake, and never did it again. The wind, though not really windy at all, would be pushed through the narrow opening of perhaps 30 feet between these two 12 story high buildings.

When that happens, it creates a suction that comes out the other end like a freight train. The higher you are in the building, the stronger that wind is. At ground level, it is hardly noticeable at all. Many times I was in the outdoor spa, at the edge of that opening and hardly noticed any wind at all. But, immediately upon going upstairs, found the wind

upstairs was very strong. On the eighth floor, the wind is wickedly strong, in circumstances you would not normally expect.

It is these varying combination of factors, that can lead one passenger to say it is impossible to simply fall overboard, while the person floating in the sea, knows differently.

Where the cabin is located on a ship, plays a huge role in how much wind passengers will see on their balcony. While a passenger in the middle of the ship, on a lower deck may see no wind at all, a passenger with a suite at the top, at the stern or bow of the ship, could experience the force of a hurricane wind, on a rather calm day.

Obviously, if it is a windy day, the captain will have outdoor areas of the ship roped off, so that passengers do not get blown overboard and passengers would avoid the balcony. But, that is protecting them from the danger, with the least amount of science governing it, and the most amount of common sense that should prevent the accidental overboard.

The Science Behind The Mystery

The science behind this mysterious, and deadly phenomenon is called porosity. It accounts for a phenomenon known as a 'wind tunnel' For steel buildings, such as a cruise ship, research has documented the known problems faced by a massive structure when it comes to damage by wind. The internal damage done, on a day when the wind is rather calm, nothing that would automatically trigger alarm, can be quite severe with items being knocked off shelves and doors slamming violently shut with great force all by themselves.

When wind interacts with a building, both positive and negative (i.e., suction) pressures occur simultaneously. Internal pressure changes occur because of the porosity of the building envelope. Porosity is caused by openings around doors and window frames, and by air infiltration through walls that are not absolutely airtight. A door or window left in the open position also contributes to porosity.

Wind striking an exterior wall exerts a positive pressure on the wall, which forces air through openings and into the interior of the building (this is analogous to blowing up a balloon). At the same time the windward wall is receiving positive pressure, the side and rear walls are receiving negative (suction) pressure; therefore, air within the building is being pulled out at openings in these other walls.

As a result, if the porosity of the windward wall is greater than the combined porosity of the side and rear walls, the interior of the building is **pressurized**. It is this pressurization that when broken, creates a massive suction, that will pull things through a door opening and slam doors.

But if the porosity of the windward wall is less than the combined porosity of the side and rear walls, the interior of the building is depressurized (this is analogous to letting air out of a balloon).

Local pressures, particularly at corners and around obstructions in an otherwise 'smooth' surface, can be significantly higher than the general level.

If you have been on a cruise ship, in your cabin, and had your ears 'pop', that happened when the cabin became pressurized. Those vacume toilets on ships are known to do that, for the exact same reason. They lower the air pressure in the room when you flush them.

As the number of molecules of air around you decreases through pressurization, the air pressure decreases. This causes your ears to pop in order to balance the pressure between the outside and inside of your ear.

Now, couple what we know about porosity, with poor cruise ship design. The ships are designed to best withstand winds hitting the ship as a whole. Where some mistakes are made is in the floor plan of the ship.
Some cabins are positioned in the ship, directly across from other cabins, and the doors into the cabins line up, as do the balcony doors. This situation is ripe for a wind tunnel.

Such MIGHT have been the case of missing passenger Jennifer Ellis-Seitz. Seitz was in cabin #11122, an aft mini suite on the 11th deck of the Norwegian Pearl. That cabin door opens up into an area that is a cross -ship hallway running from leeward to windward, not bow to stern, into the elevator lobby.

On the other side of the elevator lobby, directly across from cabin #11122 is cabin #11622, which is also an aft mini suite. Both suites have sliding doors onto the balcony, which align with the doors into the suites from the bow to stern hallway, from one side of the ship, right to the other side.

If Jennifer had been in her cabin, pressurized at the time, and she opened the door onto her balcony at the same time any number of other things took place in the cabin on the other side of the ship, such as the front door opening or the balcony door opening it could have created a dangerous situation for Jennifer.

It is a possibility that somebody opened a door in cabin #11622 at the exact same time the door opened into Jennifer's cabin, which had been pressurized. That person walked in, and Jennifer was sucked overboard before the person even had a view of the balcony or Jennifer.

Because Jennifer was on deck 11, the problem with tunnel wind is much worst than on some of the lower decks, and would be even worst on higher decks. But, none of the higher decks have cabins subject to this problem. Jennifer had one of two cabins on that ship, that were most likely to have the most severe tunnel wind.

Some cabins on lower decks have the same problem, while others the doors do not directly line up. In the end, a tiny percentage of the cabins are subject to this severe wind tunnel effect, which could explain how so many passengers can't begin to understand how a passenger had simply "fallen" overboard.

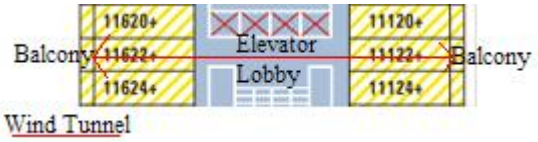
They have never been in a cabin that has the problem, in spite of having cruised 6, 12, 24, 30 times or more. Perhaps some have been in those cabins, but the right (or better worded "wrong") set of circumstances never combined to create a severe wind tunnel.

What Jennifer was wearing at the time of her disappearance could have contributed to the wind tunnel effect. Jennifer was reported to have been wearing a white robe, when she was seen on security video cameras falling from her balcony.

A robe, loose fitting shirt or a loose dress could contribute to the problem acting as a kite, to help the person "wind sail" away. While these items are anchored at the armpits, if they are loose fitting, depending on the cut of the garment they could actually help propel a person over the railing, during a wind tunnel incident as the wind rushed up underneath the back of the garment with great force.

Take a look at many men on ships. It is not uncommon to see them wearing floral print, button down shirts, that are not buttoned up. The

shirt is wide open in the front, only anchored to the body at the arm pits. It sits on the back of the body like a tarp, often seen on windy days flowing behind them, whipping about.



If a woman, or man, had on a robe, that was open at the waist, not tied to the body at the waist, that is one huge tarp to catch the wind, coming at the person's back, across the cabin. The robe would not be ripped off, because the wind pushes the garment up, against the arms and neck, keeping it on the body. In the case of the robe, if pushed hard enough by enough wind, the back of the robe would ultimately end up over the person's head for a moment, but not before it had been airborne, acting as a parasail.

Once the person was in descent to the sea, the force of the fall would push the robe back over the person's head, now blowing around the legs. Even tied at the waist, robes are generally open from the tie down, creating a lot of loose material to be inflated by wind coming from behind.

Passengers on balconies are only aware that wind coming AT them from the outside of the ship, might blow them around, not that the wind coming from BEHIND them from inside the cabin, might blow them over the railing.

There are only two sets of cabins that have this unfortunate poor design on deck 11, both have doors opening into an elevator lobby hallway that runs leeward to windward. Clearly, it a mistake the engineers made when designing the ship. The other set are cabins #11072 and #11572.

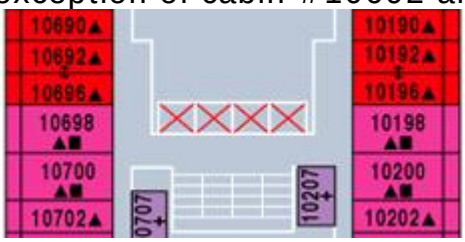
In total, aboard the Norwegian Pearl, there are 10 cabins with doors aligned in a leeward to windward wind tunnel, all with balconies, all that open into an elevator lobby. They are 10094 and 10594, 10028 and 10528, 9100 and 9600. It is the cabins highest on the ship, deck 11 where the Seitz were staying, that would have the strongest wind tunnel.

Cabins near the wind tunnel, perhaps two or three in either direction, would also likely get some effect from the poor design. Such could be the case of missing cruise ship passenger Belinda Clark.

Belinda Clark was sailing aboard the Norwegian Star on October 13, 2006. The ship was also about an hour off the coast of Mexico, when Clark went overboard. Ms. Clark was staying in cabin #10692, which of course in on deck 10, high up on the ship. The similarities between the two cases seems more than a coincidence.

The cabin is located in a bottle-neck, three cabins away from that leeward to windward wind tunnel. But, in the case of cabin #10692, though it is not directly across from another cabin with a straight run of wind, it is positioned at the end of a nook, where the wind coming from the starboard to windward hallway bottle necks, before being narrowed in the bow to stern hallway. When the wind hits that reduced passage, it can be volatile.

Because at that wind tunnel, no doors open in a straight line, any of the ten cabins around that lobby, could be equally affected, with the exception of cabin #10692 and $10192.



These two cabins are at the place the wind hits a wall, and has to make a turn to continue on. That turn, if the door was open, would be right into cabin #10692 or #10192, unlike any of the other cabins near that elevator lobby.

With doors open into cabins and balconies near the elevator, the wind suction can be quite severe.

On cruise ships that have dividers on the sides of the balconies, this design may actually extend the wind tunnel another four or five feet, enhancing the effect.

An engineer might overlook this design flaw, had they never been in the same situation I was in, having actually seen what a suddenly opened door does to a person standing on a balcony under a specified set of circumstances.

It is interesting to note, that in the lab, the wind tunnels manufacturered and used for testing are circular and have smooth

sides. There is a good reason for this. Due to the effects of viscosity, the cross-section of a wind tunnel is typically circular rather than square, because there will be greater flow constriction in the corners of a square tunnel that can make the **flow turbulent**. A circular tunnel provides a much smoother flow.

When this particular set of circumstances takes place, the gut reaction is to grab onto the railing to steady yourself. Which is what I did. The proper thing to do is to crouch down (duck and tuck), so your entire body is being blown against the entire railing, keeping you from falling over. Holding onto the railing as your feet are going over your head, will do little good. But, we are talking about a split second decision, here, not something you have to think about for a moment or two.

I would like to point out, that having a hallway running from leeward to windward, may create one of the largest wind tunnels on the ship, with the exception of those on the outer decks, but the science behind wind tunnels can be rather extreme to any room that has a narrow passage within it and a balcony.

Such would be a long cabin, with a narrow area at the door into the hallway and a balcony sliding glass door. This is enough, under the right conditions to suddenly depressurize the cabin, and create that volatile sucking action.

There are numerous other cases where it was suspected, or learned that a passenger was leaning over the railing, some were vomiting, when they suddenly went overboard. In one case, the man was very tall, a likely candidate for going overboard because his waist was higher than the railing.

In another case, the passenger was a young teen on the balcony vomiting. It is known there were other children in the cabin, one who saw her go overboard. Is it possible that the balcony door was closed, when one of the children opened it to see how the teen was doing, and the short girl was sucked over the railing?

If you have a hard time imagining this concept, think of a pressurized airplane, which is an example of more extreme pressurization, but it serves the purpose of understanding the basic concept. You have all seen the movies with the pressurized planes, in the air, high above the ground. When the cabin door is opened by terrorists or nutballs, what happens?

Everything is sucked out the door, initially. Then while it is windy inside the plane for the duration of the trip, things no longer are being sucked out. A steward flying on a flight to Hawaii experience this when the airliner cracked open producing a hole in the side of the aircraft, pressure was lost, and she was sucked out over the Pacific ocean.

Also needing consideration is the angle in which the wind hits the ship. Winds that come down and then sweep upward, after hitting the ship, can have a strong effect on those standing on balconies, especially those wearing garments like loose robes that act as wind sails. You don't have to be leaning over, crawling over or climbing on a balcony, to be sucked over. What you do need is a set of circumstances, created in poor deck plans, that create the right element for these factors to become deadly.

Now, add drugs or alcohol, which many people have been quick to label as the primary contributing factor, and the gut reaction to the sudden problem is likely to be handled incorrectly, catching the person off-guard, mentally, with slowed reaction to the unfortunate event.

Was the alcohol or drug usage the cause of the accident? No. On the day I was nearly sucked over the condo balcony, I had not been drinking, nor using drugs. In fact, hadn't even had a sip of alcohol in many months and never use recreational drugs. I had been awake since right before sunrise, a time frame of several hours and already drank my first pot of coffee. I was alert as I could be.

If the person had a history of emotional issues, it is easy to say the passenger "jumped", which might be incorrect. Forever more, to that family, their loved one was a "jumper", not a victim of poor cruise ship design. We will never know for sure if the poor design of the ship was the primary contribution factor to Jennifer Ellis-Seitz and Belinda Clark and others going overboard, it is a possibility.

Now, consider if you will another case. Today, I added the case of Margaret Fuller. Mrs. Fuller went overboard on the RMS Windsor Castle on November 1, 1976. The ship was off the coast of Africa at the time, around 8:15 in the morning, with Fuller enjoying the morning in her bath robe (AKA Parasail).

The next thing she knew, she was in the water, and the ship was sailing away from her. At the age of 64, the odds of Fuller surviving in the chilly 65 degree water with gusty air that day was slim to none, just because of her age alone.

Margaret Fuller survived, and lived to tell the story, though she still had no real idea how she ended up overboard. Neither alcohol, recreational drugs, nor horsing around played a part in her going overboard, of that we are sure. My best guess is that robe combined with a wind tunnel when she walked out onto the deck were the two contributing factors.

While I have attempted to run down information on other cabin locations of missing passengers and those who were found dead in the sea, the information is hard to come by. I document in case details where I can, and that is the reason I had some information for this article.

You can come to your own conclusions. I would not avoid those rooms opening out into the elevator lobby because they are always noisy with passengers coming and going at all hours of the day and night. There are far more serious consequences of getting booked into a poorly located cabin.