

Unintended Consequences

by Terry Hardy



Ethan Allen

On October 2, 2005, the ship *Ethan Allen*, carrying 47 passengers and one operator, capsized while on a cruise of Lake George, New York. Twenty passengers died in the accident. The National Transportation Safety Board (NTSB) determined that the probable cause of the capsizing was that the *Ethan Allen* was unstable in the rough waters that day. When the ship had made a sharp turn, the waves and the involuntary shifting of the passengers due to the boat's motion led to the overturning of the ship. The ship was unstable, according to the NTSB, because it carried more people than it should have.

The NTSB noted that the ship's stability had not been reassessed after it had been modified, and that there had not been a requirement to do a reassessment. The *Ethan Allen* had been modified to include an all-wood canopy with Plexiglas windows. This modification reduced the calculated stability limit from 50 people as allowed per the certificate of inspection to 14 with the canopy, according to calculations performed after the accident. Therefore, the vessel was carrying 34 people more than it should have been, according to the NTSB, which also stated that, "The combination of too many passengers, as permitted by the *Ethan Allen's* inappropriate certificate of inspection, and the use of an out-of-date average weight standard for passengers on public vessels resulted in the *Ethan Allen* carrying a load that significantly reduced its stability, which made it more susceptible to capsizing on the day of the accident." The NTSB further stated that, "Although U.S. Coast Guard regulations and New York State guidance to vessel owners did not contain clear requirements pertaining to testing after modifications, the *Double Dolphin/Ethan Allen* should have undergone a stability reassessment after each canopy installation and modification" [Ref. 1].

Lesson Learned: Early tests or analyses on a system may not be valid once the system or operation has changed.

References

1. National Transportation Safety Board. "Capsizing of New York State-Certificated Vessel *Ethan Allen*, Lake George, New York, October 2, 2005," Marine Accident Report NTSB/MAR-06/03, July 25, 2006.
2. U.S. Federal Bureau of Investigation, press release November 24, 2014 <http://www.fbi.gov/portland/press-releases/2014/former-carson-helicopter-vice-president-pleads-guilty-to-conspiring-to-defraud-the-united-states-forest-service>.

As shown by this accident, failure to perform additional tests or analyses following changes may mask significant risks. Organizations should not assume that a single test is enough to assure that risks are acceptable.

UPDATE

In the last "Unintended Consequences" article (*Journal of System Safety*, Fall 2014), I discussed the crash of a U.S. Forest Service helicopter. In that article, I addressed items that require further clarification and correction, as pointed out by Sikorsky Aircraft Corporation.

First, I mistakenly used the term "the manufacturer" where I should have used the term "Carson Helicopters, the operator, service provider and rotor blade manufacturer." Sikorsky, the original helicopter manufacturer, had no role in the improper calculations that contributed to this accident, according to the NTSB report. I regret any misunderstanding this may have caused.

In addition, there may have been some confusion over the terms "models" and "simulations." I use the definitions from NASA-STD-7009, NASA Standard for Models and Simulations. According to this standard, a model is a physical, mathematical or otherwise logical representation of a system, entity, phenomenon or process. A *model* is often implemented in software, but it does not necessarily have to be. So a hand calculation can be a model, as long as there are inputs, outputs and algorithms. A *simulation* is the imitation of the characteristics of a system, entity, phenomenon or process using a computational model. The simulation generally refers to the software implementation of a model, according to NASA-STD-7009. In this case, the "model" used by the pilots was a calculation of weight and balance using paper forms, with input from performance charts contained in the Rotorcraft Flight Manual. And, as stated by Sikorsky in a memo dated November 5, 2014 in response to this article, the only analytical models and simulations conducted by Sikorsky were

after the accident and under the direction and supervision of the NTSB to help in its investigation.

The “Lesson Learned” section of this article, as in all my articles, was intended to be a broad statement of a particular point of importance to the International System Safety Society; the accident is meant to provide context. Not everything in the “Lesson Learned” section applies to the particular accident discussed, as was the case here. For example, there were no simulations referred to in this particular incident. There are other accident examples that could have been used to illustrate the “lesson learned” discussed in this article.

It should be noted that criminal charges were brought by the U.S. attorney in this particular accident. The overestimation of performance resulted in alleged criminal acts on the part of the operator, Carson Helicopters. As a result, key operator executives were indicted on charges of falsifying information, including actual aircraft empty weights and engine power charts, and allegedly overestimating emergency power available. The operator also allegedly allowed the use of an unapproved torque available calculation, in spite of prohibitions against its use. Two Carson employees both pleaded guilty and are awaiting sentencing in Federal Court in Oregon, and U.S. Attorney Amanda Marshall said on November 24, 2014 that,

“This is a particularly important case. Submitting false information about helicopter payload capabilities in the bid process both defrauded the Forest Service and created a reckless risk of harm to those who used the information in firefighting operations. This includes those who were relying on the false information when a Carson helicopter crashed near Weaverville, California on August 5, 2008, killing nine and seriously injuring four others” [Ref. 2].

Finally, please note that while I try to be as accurate as possible in these articles, there will always be the possibility of mistakes and misinterpretations. I certainly do not have all the information about a particular accident, and additional sources could provide new details. Additionally, trying to summarize a complex accident in a paragraph or two almost certainly means that key facts will not always be discussed. Therefore, the reader should never consider these short descriptions to be the ultimate source of information about the accidents, and they should look for material beyond what is written here. I appreciate efforts by the International System Safety Society, and in this case, Sikorsky, in providing additional information on these incidents. I believe that by discussing these accidents and incidents, including any clarifications and alternate viewpoints, we gain further understanding that can help improve our discipline. ●