

LESSONS FROM A NEAR-DISASTER

What do a nearly catastrophic airplane incident and a software company acquisition that cost the acquirer unanticipated \$millions have in common?

Both resulted from multiple failures and could have been prevented. A Boeing 767 ran out of fuel at 41,000 feet. A software company was acquired although the software required a massive, unanticipated, and expensive overhaul.

Do Diligence® provides a [holistic approach](#) to technology investment evaluations to 1) eliminate surprises and 2) prevent costly mistakes.

What is a holistic approach to technology evaluations?

A combination of deep architecture analysis by experts, comparative source and architecture quality metrics, engineering team and engineering practice assessments.

Why is a holistic approach the only way to ensure acquisition success?

Because it produces actionable information and recommendations about all critical areas that impact technology success; **an analysis impossible with a metrics-only approach.**

Why the 767 near-disaster?

A confluence of factors that, each by itself, would not have been significant.

- Faulty equipment
- A change in responsibility for fueling
- Deficient documentation
- Insufficient training and experience
- Pressure to make up lost time
- Human error

Details Page [2](#)

Why the acquisition debacle?

A series of failures in the technology due diligence process.

- Lack of a technology due diligence methodology
- The pressure to acquire much needed new software
- Insufficient training and experience
- Human error
- Insufficient coordination of activities
- Faulty analysis of the data

Details Page [4](#)

LESSONS FROM A NEAR-DISASTER

AIR CANADA 143 NEAR DISASTER¹

On July 23, 1983 **the engines** on a 3-month old Air Canada 767, valued at \$40M, with a crew of 8, 61 passengers, a fuel capacity of 20,000 US. gallons of A-1 kerosene jet fuel, **abruptly stopped. Eerie Silence!!** - except for the rush of air as the plane glided towards a hoped-for emergency landing.

The reasons behind this near-disaster, chronicled here, are startling, revealing how a confluence of individual occurrences and missteps can lead to a near-catastrophe which could only be prevented by super-human skill and experience.

- The fuel quantity processor (FQP) in the 767 provides the flight crew up-to-second status of the plane's fuel load. It is comprised of 2 independent and redundant operating channels to ensure safety. A hardware malfunction had disabled the entire FQP, though a workaround was devised during the plane's previous stopover that enabled FQP operation, but without the intended redundancy.
- Operating procedures required that information provided by a single, non-redundant FQP channel be confirmed by conducting a "drip" procedure. This process involves using a physical measuring stick, similar to the oil dipstick on a car, to measure the fuel in each of the fuel tanks.
- On the fateful stopover, the plane required refueling. In an attempt to fix the FQP, the responsible mechanic inadvertently disabled the entire system, eliminating the pilot's fuel display.
- Operating procedures still permitted flights to proceed as long as the "drip" procedure was followed. So, although the Captain was concerned about flying without the fuel display, maintenance approval, the pressure to proceed due to an already delayed flight, and confidence in the "drip" procedure overcame his concerns, and he approved the departure.

Now, here's where the story gets interesting.

- On planes prior to the Boeing 767, the English system of measure (Imperial Gallons and pounds) was used to measure quantity and weight on all aircraft. But Canada was moving to the metric system, and Air Canada, as a government-owned airline in 1983, opted to participate in that transition.
- Fuel is measured in weight for flight loading, but is delivered in volume. The ongoing flight called for 22,300 kilograms of fuel total. The fuel truck measured fuel in liters.
- The 3-person flight crew on jet aircraft had been reduced to 2 on the 767, eliminating the flight engineer who was previously responsible for ensuring the proper fuel load. This responsibility had shifted to the maintenance crew.
- Neither the maintenance crew nor the flight crew knew the conversion factor (from liters to kilograms). And, the plane's operating manual had not been updated with that information.

¹ From Freefall, A True Story, by William Hoffer and Marilyn Mona Hoffer. St. Martin's Press, 1989, New York

LESSONS FROM A NEAR-DISASTER

- Without a trusted source for the conversion factor from liters to kilograms, the chief mechanic and the First Officer decided the correct value was 1.77 which is, unfortunately, the multiplier to convert liters to imperial pounds. The proper multiplier to convert liters to kilograms is .8.
- Maintenance measured the remaining fuel in the tanks using the “drip” procedure, and incorrectly calculated the number of liters of added fuel required, which it loaded. With no check from the FQP, the flight departed with too little fuel.

What happened to the plane, its crew, and passengers?

- Luckily, the pilot of this plane, like US Airways Flight 1549 that was piloted to a safe landing on the Hudson River in 2009 by Chesley “Sully” Sullenberger, was also a glider pilot.
- Though unable to reach an operational airport, Canadian Air Traffic Control directed the pilot to an abandoned Royal Canadian Air Force airfield.
- With only one possible attempt, the pilot expertly set the plane down on the runway, where it skidded to a stop before a group of picnickers who were enjoying a barbeque on the far end of the runway.
- The nose gear could not be locked in place without aid of the hydraulic system, which was inoperable without power, so the plane landed on its main gear, then skidded to a stop with its nose on the runway.
- Passengers on the front of the plane walked off. Those on the back had to jump nearly 3 stories to the waiting arms of two able-bodied, hand-picked men who had jumped ahead of them. Though most walked away unscathed, some who jumped were injured.
- Nobody died.
- The plane was salvaged and returned to air service after minimal repairs.

Think this couldn't happen today? On January 5, 2024 a Mid Exit Door (MED) plug blew out on an Alaska Airlines 737 Max causing the rapid-depressurization of the cabin and the plane to return to an emergency landing at Portland (Oregon) Airport. While the causes of this near disaster are still under investigation, it is clear that quality control procedures were missing or unenforced and, based on at least one former Boeing engineer, pressures on all Boeing employees to work faster, especially in light of the 737 Max debacle, were contributing factors. Again, all survived but only through the heroic efforts of the flight crew.

READ ON TO DISCOVER WHY POOR TECHNOLOGY DUE DILIGENCE LED TO A \$MILLIONS ACQUISITION MISTAKE

LESSONS FROM A NEAR-DISASTER

A \$MILLIONS ACQUISITION MISTAKE

A large, public commercial software company, attempting to transition its software to new technology, opted instead to acquire a software company that had developed a modern version. They conducted what appeared to be serious technology due diligence before confirming the acquisition.

But within two weeks of the close of the transaction, it was determined that the software was irretrievably flawed. It was simply not “production ready” in any sense of that term. In fact, it required redesign and redevelopment, a project that took another year of intense management and engineering time and effort.

In the meantime, what had been pre-announced to existing customers as the “next generation” of configuration management software, and which was expected in its first year to improve the company’s valuation by \$.02 to \$.03 per share, instead consumed resources and time and lost new business. The toll was estimated to be in the \$Millions.

The reasons behind this disaster, like the 767 near-disaster, reveal how a confluence of individual occurrences and missteps can lead to a failed outcome which could have been prevented by a tried-and-true, holistic, technology investment evaluation process – **like the one offered by Do Diligence® Partners**. In fact, Do Diligence® Partners and the methodology behind it directly resulted from the analysis of this failed acquisition and the development of a comprehensive technology due diligence process.

This happened even though the acquiring company spent significant time, effort, and money on the due diligence process. Finance and Accounting, Marketing, Sales, Legal, and Human Resources were guided by a 25-page, detailed, Acquisition Procedures document that consisted of detailed checklists for each of these areas. There were no procedures or detailed checklists for **technology due diligence**, although considerable time, effort, and money was expended in this critical area, including the following:

- A technology consultant with experience performing technology due diligence reviewed the software design and implementation and the engineering team responsible for the software.
- A pair of engineers, who had been heavily involved in the failed attempt to build similar software at the acquiring company performed an architecture, design, and code review.
- Results of the technology due diligence were documented and added to the documentation from the due diligence of the other disciplines.

In addition, reference checks were performed with 5 of the subject company’s customers.

What went wrong? In summary here were the issues:

- The due diligence effort was organized and managed by the Chief Marketing Officer, so the focus was much more on how the software should be marketed and sold than “if” the acquisition should be consummated in the first place. The Chief Technology Officer was involved only in a preliminary meeting with the Chief Architect at the subject company, where the discussion focused on features and functionality, rather than quality and reliability.

LESSONS FROM A NEAR-DISASTER

- The technology consultant identified numerous challenges in critical areas of the software. However, based on the preponderance of positive information in other areas, these challenges and his recommendations were ignored during the final review.
- The subject company's Chief Architect presented the architecture, design, and implementation as envisioned, not as implemented. There was no discussion of the technology or feature roadmap to clarify current vs. future features and functionality.
- The engineers who conducted the design and code reviews were experienced engineers but had no experience conducting technology due diligence. This had several specific ramifications.
 - The Chief Architect closely monitored the code review, interjecting often that issues the engineers uncovered were "fixed in the upcoming release," due out imminently. These assertions went unchallenged.
 - The acquiring company engineers themselves frequently dismissed deficiencies identified during their review as evidence of the difficulties they had faced in developing a similar solution.
 - No attempt was made to review the number and severity of the software defects or support tickets.
 - No effort was made to review the company's engineering practices.
- The Chief Marketing Officer conducted reference checks with subject company customers. In the rush to complete these interviews, he focused on having the clients rate the software and their experience with the subject company on a scale of 1 to 5, where 5 is outstanding, rather than discussing, in some detail, their experiences with the software's quality and fitness for purpose. Then, he dismissed ratings of 2-3 as "typical" for an early stage company.
- Having spent two years failing to develop similar technology, the acquiring company was desperate to solve the problem through an acquisition. The prospect of having a solution to this vexing problem clouded their objectivity.
- There was never a meeting of all those who had performed due diligence to discuss their findings and recommendations. Rather, the final decision to proceed was based on executives skimming the significant written materials produced during the technology due diligence process. Like many acquisitions, this one had taken on a life of its own and was not to be derailed by a thorough, objective analysis of the evidence.
- The pressure to move forward with this acquisition was further exacerbated by the fact that the acquiring company had announced that this solution would be available to its customer base following only preliminary meetings and the signing of a Letter of Intent with the subject, but before any of the detailed due diligence was completed.

Following the analysis of the reasons for the failed due diligence process, a new methodology was developed and successfully used in the analysis of the company's future acquisition opportunities. This is the very same methodology that has grown, through constant review, revision, extension, trial-and-error, and client feedback into the holistic technology investment evaluation process used by Do Diligence® Partners today.