



If you **Sweat the small stuff** (hazards), **you will never have to sweat the big stuff** (accidents).

Hazards are all around us but we often fail to see them as such after we have lived with them for a time. One little fuel injector clamp on a Piper Navajo was accidentally left off resulting in four people dying while three would be severely injured.

One tire on a DC8 aircraft had low air pressure resulting in 261 people dying.

The airline would cease to exist less than a year later (Read case study of “Death of an Airline” training video at [www.system-safety.com](http://www.system-safety.com)).

Let’s look at the small clamp accident and see if we can determine why this fatal accident occurred.

### **The Company**

The company was owned by an ex-airline pilot who still held a pilot’s license. It was a small charter company that operated a Piper Navajo servicing small towns and companies in the North. The company was in financial difficulties as the owner who also owned a profitable fishing lodge was building a second one and putting all possible spare money into the lodge. The company also owned a deHavilland Beaver and two Cessna 180s on floats. The primary purpose of all aircraft were to service the lodge. Parts for the aircraft were on a “cash only” basis with the owner having to pay for all parts when ordering before they would be shipped.

### **The Aircraft**

The Piper Navajo is a twin reciprocating engine, 10 passenger aircraft. The high time accident aircraft had “seen better days” and was in constant need of repair. Parts could only be obtained with the owner’s approval

### **The DOM**

The AME was nearing the end of his career and loved the wilderness and the challenge of keeping the tired aircraft flying. His only assistance to keep four aircraft flying was two apprentices who lacked knowledge but not enthusiasm. He had been promised experienced help but to date that had not been forthcoming. Thus in the busy summer season, he was forced to work long hours with no days off.

### **The Pilot**

The pilot was a young man who was only there to build up his hours for bigger things. He was a cheerful happy go lucky person who flew well having worked his way up from the float planes to gain twin time. He had received minimal training on the twin from the company owner and was left to learn on his own with minimal supervision. With no guidance he was known to treat the aircraft more like a fighter plane than a passenger aircraft.

### **The Final Flight**

The aircraft landed at the small logging town airstrip where he picked up the town store owner, his wife and their 13 year old son. The store owner asked if his son could sit up front in the co-pilot's seat which had all control's removed. The pilot happily agreed and the wife sat behind the son with the father in the seat behind the pilot. Two other passengers sat right behind them. The father suddenly realized that he had forgot to tell his oldest son, whom would be running the store, about something so he left the aircraft as they were struggling to load a large outboard engine into the aircraft. On returning, he discovered that a late arriving passenger had taken his seat so he sat in the back as they completed loading the baggage and parcels into the aircraft.

The pilot decided not to bother tying the cargo down as it was a short flight and he had experienced no turbulence flying in. Without a weight and balance he knew that the aircraft was likely over gross and could even be a little out of C of G but the aircraft had plenty of power and he had successfully flown worse loads before without a problem.

### **The Flight**

He didn't bother with the preflight check as he glanced at the gauges and took off. Just as he retracted the gear the left engine started to backfire and lose power. His possible thoughts may have been as follows: *"What the %&\*# is going on? The left engine has lost power but it is still turning 1200 rpm and making a lot of noise so I'll let it continue to run as I try to figure out what's wrong. Maybe the power will come back. The manual says that the aircraft can climb at 220 fpm on one engine so I've nothing to worry about. The aircraft's turning left and I want to get this thing back on the ground so I'll let her turn. I'll sure have a story to tell the boys when I get back tonight. My right foot is on the floor and I've got full right aileron but we're still turning. What's going on? I've got full power on the right engine but we're losing airspeed. Now we're descending but I've got the control column full back. This can't be happening. Not to worry; there is the runway straight ahead. Why won't the controls respond like they're supposed to? This is not supposed to happen. My God! We are going to crash!"*

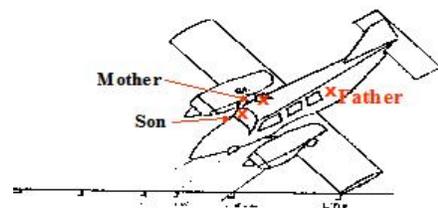
### **The Crash Sequence**

The left wing tip is the first to strike the ground and throws everyone violently to the right as the aircraft swings around the wingtip. The propeller blades from the left engine strike the ground and fold under at the same time as the nose impacts the ground. The nose crushes in as the occupants are now flung forward. The pilot can feel the metal crushing his legs for a moment before the control column crushes the life out of his chest.

The boy is flung to the left and out of the shoulder harness. His head strikes the instrument panel above the throttles which are still both at maximum power and consciousness is instantly lost before he too is killed.

The man sitting behind the pilot now feels the floor of the aircraft crumpling and breaking both of his legs as the spar rotates and pins his broken legs to the floor.

**Accident Diagram**



The wife is sitting further from the initial impact point and has twisted to face the back as baggage strikes her on its journey to the front of the aircraft. The husband and wife's eyes lock briefly in bewilderment.

The man sitting behind her is slumped forward with the outboard engine embedded deep into the back of his seat. His back is broken and he can feel nothing below his waist.

At this time the propeller tips of the right engine begin to touch the ground. The first tip bends forward slightly as it leaves a mark in the ground. The next blade also slices the ground and bends as it pulls forward. The third blade strikes the ground and as it pulls forward it breaks the hub and separates from the hub as it swings around. The released blade swings back and through the side of the fuselage to strike the head of the wife. She is killed instantly as a red blood pattern from her wound sprays the white ceiling above her.

The bent nose of the aircraft slides out of the impact hole and rotates another 170 degrees before coming to a stop.

### **The Aftermath**

For a brief moment everything is absolutely quiet. Then the man with the broken legs begins to scream: *"Someone help me. For God's sake, please, someone help me."* The other survivors in the aircraft begin to moan and move. They are covered in baggage and have numerous injuries but they are alive.

Suddenly a small fire begins under the right engine. Someone yells fire and the survivors begin to untangle themselves and look for the exit.

The husband sees it all and he does not move. It is only when someone from outside opens the door and pulls him out does he respond by saying, *"I'm OK. Please get my family out"*. The fire intensifies quickly and spreads until it silences the screaming of the man with the broken legs.

The boy's dog comes running up and the man holds him as he looks at the burning wreckage that now holds the bodies of his wife and his youngest son.

They take the man with the broken back and the worse injured to the medical clinic in the one ambulance the town has but he refuses to go.

### **What is he thinking as he sits there and looks at the still burning wreckage?**

He is thinking one word. A word that will haunt him the rest of his life.

One that he will recall every morning when he wakes up.

One of the first he will ask the investigators.

One very simple word. ***"WHY?"***

***"Why am I still alive?"***

***"Why me Lord?"***

***"Why them?"***

***"Why my son when he had so much more life to live?"***

***"Why did this happen?"***

That one word deserves an answer.

### **Five Months Earlier**

The number one cylinder on the left engine was low on compression. As he was unable to obtain a replacement cylinder, he removed the cylinder, as he had done hundreds of times in his career and tediously lapped both valves. It really needed a valve grind and

new rings but this would have to do. What with the problems on the other aircraft that he had had to deal with, it was 3 am by the time he got everything back together.

He knew it was booked on a scheduled run at 7 am that morning and if it wasn't ready, there was a good chance they would lose the run to an operator with turbine equipment who wanted in on the territory.

He ran the engine, signed off the paperwork and headed home for some much needed sleep.

### **The Small Clamp**

The next day he noticed a small clamp on his toolbox and wondered where it had come from. He threw it in a toolbox drawer and vowed to take a close look at the engine on the next inspection. After all "IT'S JUST A SMALL CLAMP"



The second look revealed that he needed two clamps but could find only one in his tool box. He contacted the owner to order a clamp but since it was such an insignificant part the owner decided to wait until they needed more parts.

The engine went through two one hundred hour inspections before the accident.

What's the big deal about a small clamp?

That little clamp was one of two that secured the fuel injection line for the number 1 cylinder. Without it, the fuel line vibrated and broke at the worst possible time. When it broke the engine lost all power and would backfire from the super lean mixture in the other cylinders.

It was impossible for the aircraft to continue flying with the drag from this unfeathered engine

What were the causes of this maintenance error and how can it be prevented in the future? Watch for next month's edition for the answers.