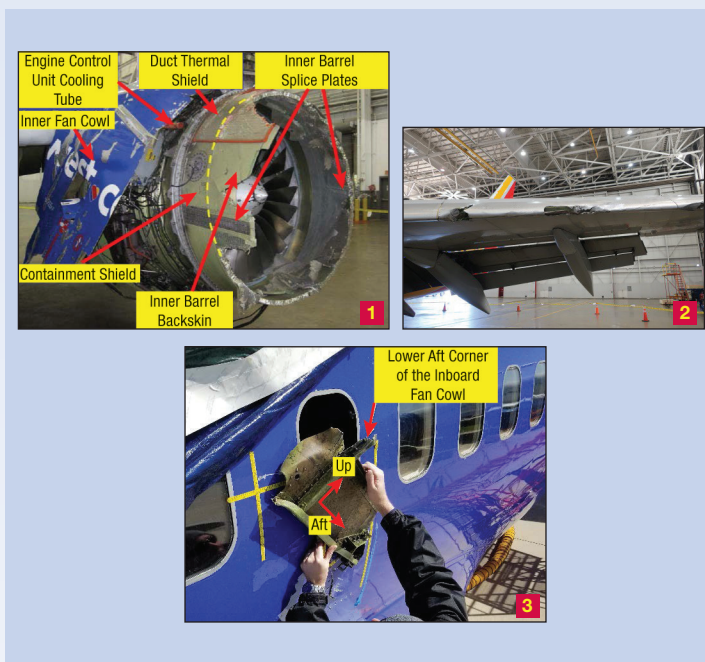


## Energy Is Hazardous, Too

The left engine of a commercial airliner flying from New York City to Dallas failed on April 17, 2018 over eastern Pennsylvania. Fragments of the engine inlet and cowling (Image 1) struck the wing (Image 2) and fuselage, causing significant damage. One passenger window was blown out (Image 3), rapidly depressurizing the passenger cabin. The flight crew conducted an emergency descent and landed at the Philadelphia airport. One passenger was killed and eight others received minor injuries. The preliminary U.S. National Transportation Safety Board (NTSB) report of the incident indicated that one of the engine fan blades had failed and noted the failure characteristics were consistent with metal fatigue.

The fan in a jet engine is a piece of high-speed rotating equipment, and it contains a lot of kinetic energy. If there is a failure, pieces of metal shrapnel can travel a long distance and cause major damage. Many process plants also contain high-speed rotating equipment, such as pumps, compressors, fans, centrifuges, and centrifugal extractors. This equipment is vulnerable to a similar failure. Process safety management systems must identify these hazards and ensure proper design, fabrication, inspection, and maintenance of high-energy equipment.



### Did you know?

We often think of process safety as being about containment and control of hazardous materials. While this is an important part of process safety, control of hazardous energy is also critical. Be aware of some forms of hazardous energy present in your plant, such as:

- kinetic energy from high-speed rotating equipment
- electrical energy
- high pressure from compressed air, high-pressure (HP) steam, and other gases
- high temperature
- potential energy from gravity — a large tank full of liquid can cause major damage even if the liquid is not hazardous. For example, a molasses tank failed in 1919, sending a 15-ft wave of molasses through parts of Boston, killing 21 and injuring over 150 (May 2007 Beacon).

### What can you do?

- Make a list of all of the hazardous energy sources in your plant. Ensure that you and your coworkers understand the operating, inspection, and preventive maintenance systems in place to manage the risk associated with those hazards.
  - Know your role in ensuring that the hazardous energy safeguards in your plant are robust and functioning properly.
  - Many high-speed machines have vibration sensors with alarms or shutdown interlocks. Confirm that these are not bypassed without a temporary management of change (MOC) procedure.
  - If you are responsible for any high-speed rotating equipment, follow specified procedures diligently and report any concerns to management.

**Process safety means controlling both hazardous materials and energy!**

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