AGM

MAGNET VALVES

For Rapid Decompression

The Best Protection For Air Cargo

AGM CONTAINER CONTROLS

Innovative Solutions for Environmental Control

(520) 881-2130
agmcontainer.com
3526 E Ft Lowell Rd Tucson AZ 85716

AIR CARGO AND PRESSURE DIFFERENTIALS

Sensitive technologies, including optics and electronic components, are often shipped in sealed containers to prevent damage from moisture and contaminants.

These sealed containers are subject to pressure variations when they are shipped by air. As an aircraft gains altitude, atmospheric pressure goes down, creating a pressure differential between the inside and the outside of the aircraft. Cargo holds are typically at intermediate pressure, so there is also a pressure difference between the interior and exterior of each container in a cargo hold.

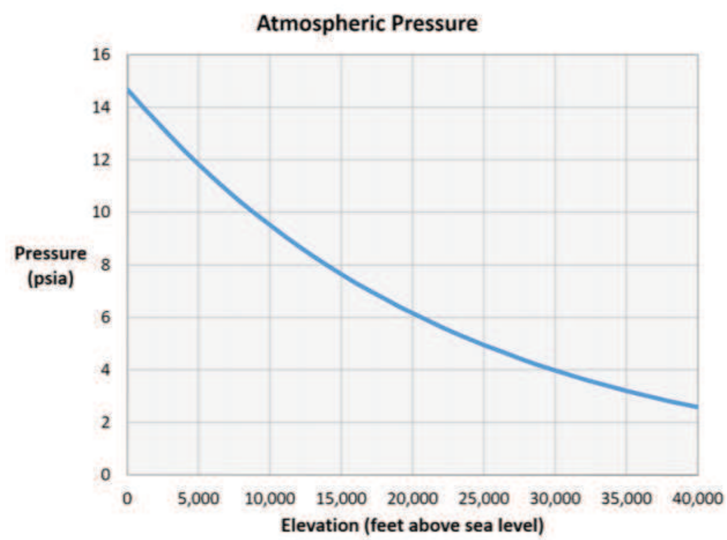


Figure 1: Atmospheric pressure decreases at high altitude.

A sudden drop in pressure in the hold creates a risk of rupture in a cargo container and damage to its contents, to other containers in the hold, to the aircraft itself, and potentially to passengers and crew[1].

[1] On February 24, 1989 United Airlines Flight 811 from Honolulu to Auckland experienced the failure of a cargo door, and the resulting explosive decompression caused the death of nine passengers. [www.ntsb.gov/investigations/AccidentReports/Reports/AAR9202.pdf]

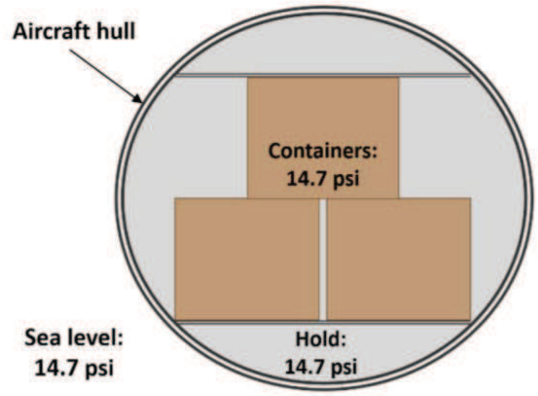


Figure 2: Before takeoff, the pressure in the container is similar to pressures in the hold and outside the aircraft

Figure 2 shows a cross-section of the aircraft hull before taking off. Atmospheric pressure at sea level is typically about 14.7 pounds per square inch. Pressures inside the hull and inside the sealed cargo containers are similar.

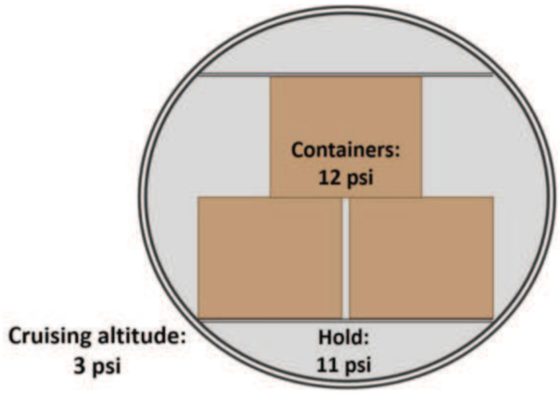


Figure 3: At cruising altitude, container walls are not highly stressed.

Figure 3 shows the aircraft after take-off. Atmospheric pressure may be as low as 3 psi. However, cargo holds are typically pressurized, so the differential from inside cargo containers to the interior of the hold may be small. Additionally, containers are often equipped with spring-actuated breather valves to minimize this pressure differential.

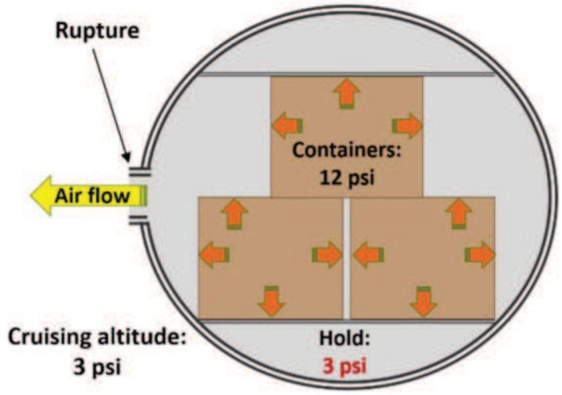


Figure 4: Loss of hold pressure creates high stress on sealed containers.

Figure 4 shows what can happen if there is a rupture or leak in the aircraft hull. The pressure inside the cargo hold may drop to as low as 3 psi, creating a large differential between the interior and exterior of cargo containers.

To mitigate these risks, air must be released from inside the container quickly – typically within 0.5 seconds to 30 seconds.

MAGNET VALVES

AGM Container Controls has developed a new type of valve to solve this problem.

Magnet valves use magnets rather than springs, so they enable higher flow for faster pressure relief than is possible with spring-actuated valves.

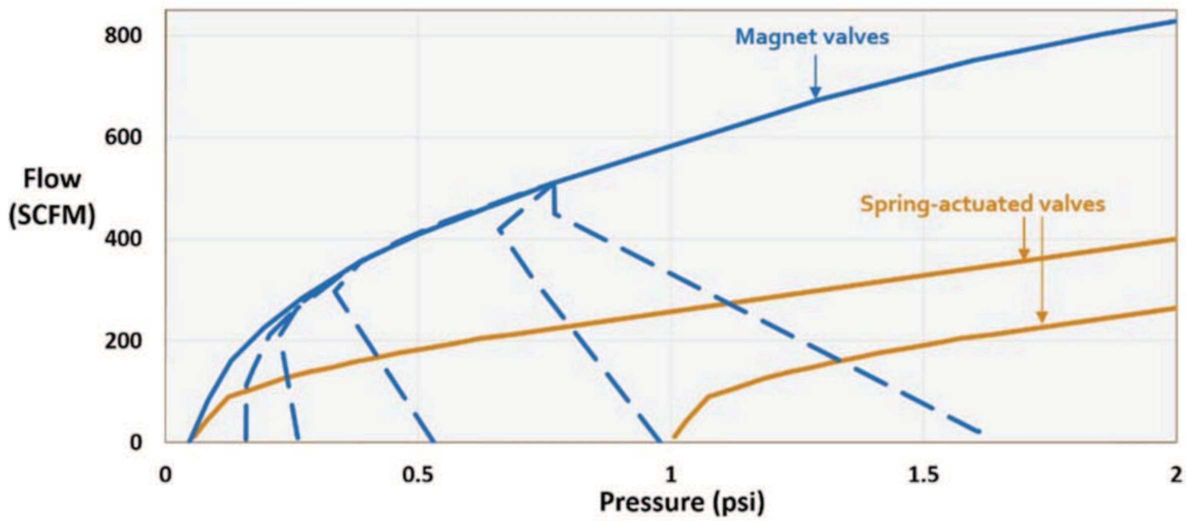
The body of the valve is anodized aluminum; the magnets are nickel-plated neodymium; the seals are silicone rubber; and the valve contains a non-magnetic return spring to close the valve after the pressure differential is reduced.

Figure 5: Magnet Valves

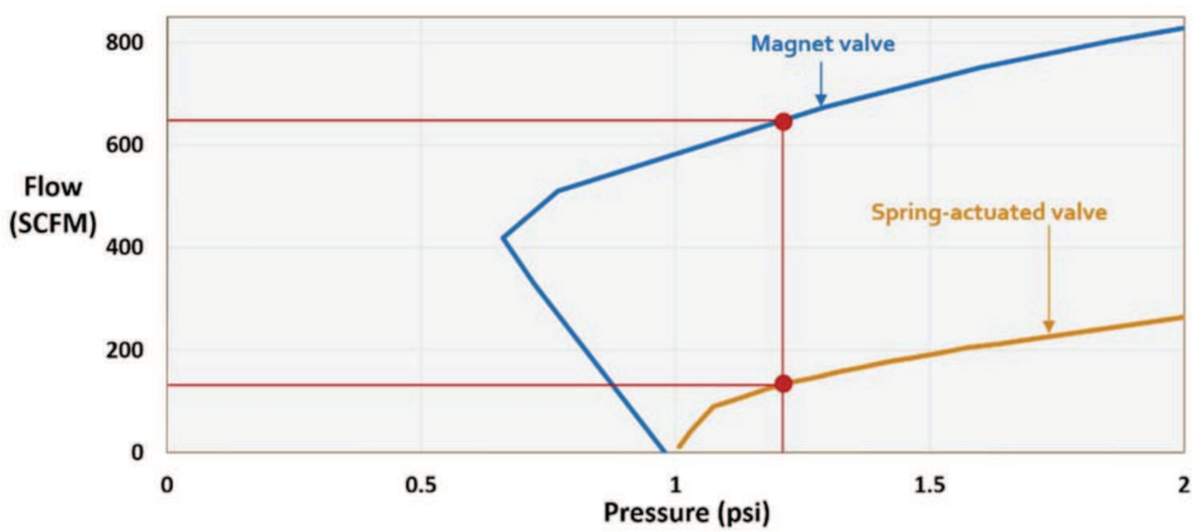
Figure 6: Magnet Valves

The magnets are not strong enough to cause problems for aircraft navigation and control systems.

The attractive force holding two magnets together varies with the inverse-square of the distance between them, so when a magnet valve reaches its release pressure it releases completely very quickly.



The graph above shows flow vs. pressure differential for several models of magnet valves and typical spring-actuated valves.



This graph above isolates one model of magnet valve, compared directly with a spring-actuated valve that has the same release point. The magnet valve shows dramatically higher flow at a given pressure differential.

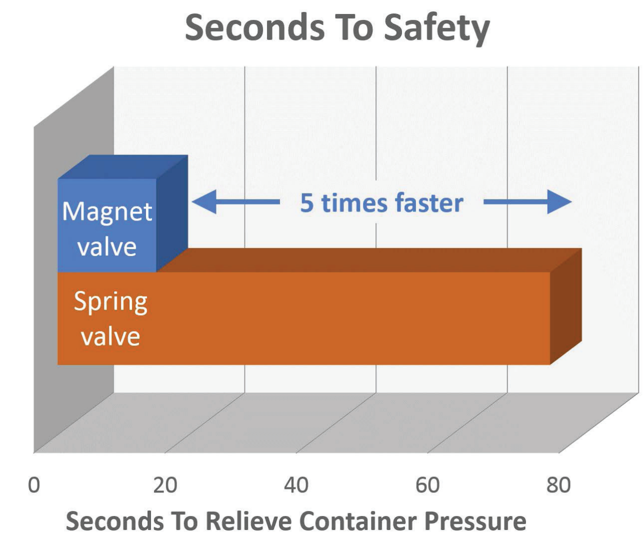


Figure 6: Magnet valves relieve pressure in about one-fifth the time.

Figure 6 compares the pressure relief time for a magnet valve versus a spring-actuated valve. A spring valve typically takes about five times longer to relieve a pressure differential than a magnet valve. The data shown in Figure 6 is for a 200 cubic foot container with a bursting pressure of 1.25 psi and a minimum sealed pressure of 1 psi, with a 4-inch-diameter spring or magnet valve for depressurization from 10.9 psi to 2.73 psi.

AGM

MAGNET VALVES

For Rapid Decompression
The Best Protection For Air Cargo

LEARN MORE ABOUT MAGNET VALVES WITH A
FREE ENGINEERING CONSULTATION, CONTACT:

Jim McCorry
Director of Business Development
520.881.2130. Ext. 2109
jmccorry@agmcontainer.com