Technique	Ultrasound is a technique for detection of air/fluid leaks, electrical shorts and bearing wear in Ground Support Equipment (GSE). Ultrasound is a technique of listening for audible frequencies outside the normal range of human hearing. This differs from ultrasonics, which is the technique of inducing sound frequencies into a medium to measure distance or thickness.
	**Ultrasound Testing** ***An effective technique to determine leaks, shorts and wear in Ground Support Equipment (GSE)***
Benefit	Timely detection and elimination of air/fluid leaks, electrical shorts, and bearing wear will result in substantial cost savings in equipment operation and maintenance. Examples: Elimination of air/fluid leaks would produce savings in power consumption, and equipment wear and tear. Detection and elimination of conditions causing arcing in electrical systems would result in increased system availability and repair time associated with downtime and damage that would have resulted from electrical shorts.
Key Words	Ultrasound, System Failure detection, Cost savings
Application Experience	Automobiles, Power Industry, Hospitals, Aircraft
Technical Rationale	The testing provides cost savings thru detection of leaks in air/fluid systems that are not normally audible. Compressors and fluid pumps may run at above normal requirements to make up for the loss caused by leaks creating unnecessary costs to power the equipment. Bearing problems can be evaluated over a period of time to detect progressive wear by changes in the ultrasound intensity level, thus protecting the bearing from sudden failure. Testing of electrical systems for sounds of arcing is easily accomplished enabling loose connections and openings to be found. Ultrasound testing is one of the least complex and less expensive maintenance detection methods, requiring a hand held detector and associated meter.
Contact Center	**Kennedy Space Center (KSC)**

Ultrasound Testing
Technique AT-10

Ultrasounds, by definition, are beyond the limits of normal human hearing, an operator using a sophisticated detector translates ultrasound signals to the range of human hearing.

Ultrasound detection is the number of times a sound wave cycles from trough to crest. This is expressed in cycles per second and measured in hertz. One kilohertz is 1000 cycles per second. The best human ears can generally hear noises in the range of 20 to about 20,000 Hz (20 kHz). Many ultrasound detectors start at approximately 20 kHz and can work upward to sounds as high as 100 kHz. Operators using the ultrasound instrument can tune to and "hear" what is going on in operating machinery (figure 1).

Fluid and gas systems and other working machinery have constant ultrasound patterns. When a leak occurs, fluid passing through an opening produces turbulence with strong ultrasound frequencies. Changes in the "sound signatures" can readily be recognized as wear in components. An ultrasound detector senses subtle shifts in the signature of a component and pinpoints potential sources of failure before they cause costly damage. The longer wavelengths of lower-pitched sounds easily penetrate solid; yet they slip through minute openings. Ultrasound detectors are used for isolating such leaks.

Operators use lightweight, battery-powered pistol-shaped instruments which can easily be moved from machine to machine. The instrument circuitry translates the high-pitched ultrasounds to those in the human hearing range. Some instruments feature a frequency-adjust dial to provide tuning capability, enabling operators to hear the ultrasounds through headphones and determine their intensity by the definitions registered on an analog meter.

The instrument is used to establish sound patterns, which compared at a later date become useful in locating and diagnosing bearing failure, vacuum and pressure leaks, valve blowby and faulty electrical circuits.

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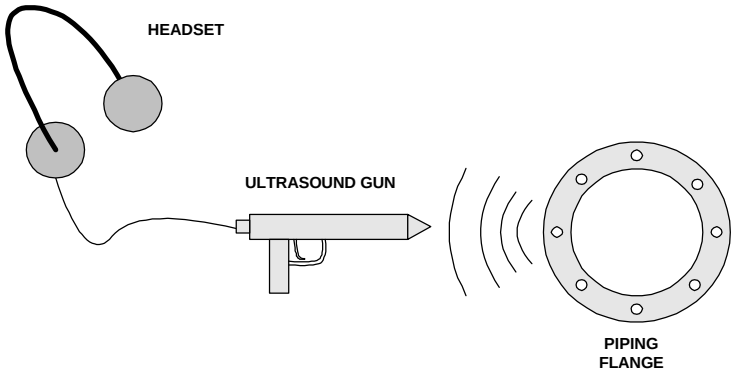

Figure 1. Use of Ultrasound Gun to Detect Leaks in Pipe Flanges