



Acoustic Hostile Fire Detection

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ShotFinder OV-1

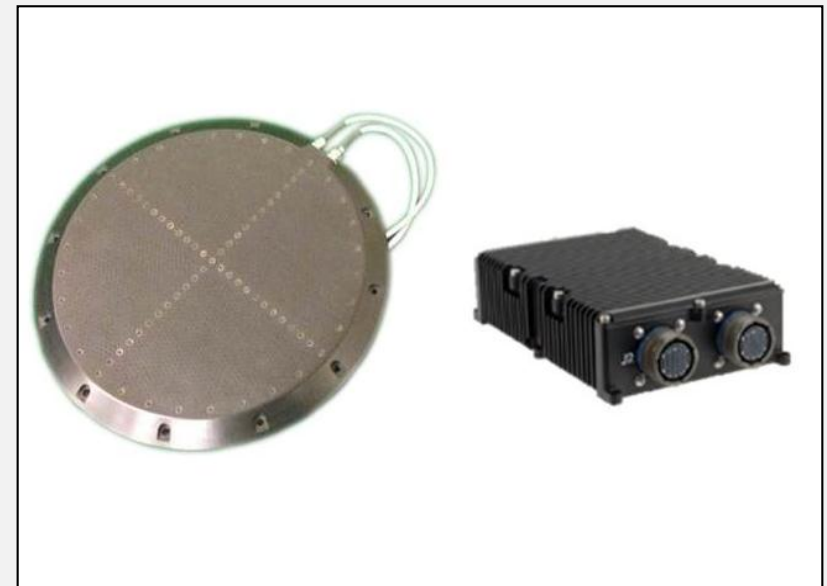


Pd	>94%
FAR	<1/Hour
Accuracy	+/- Clock Code

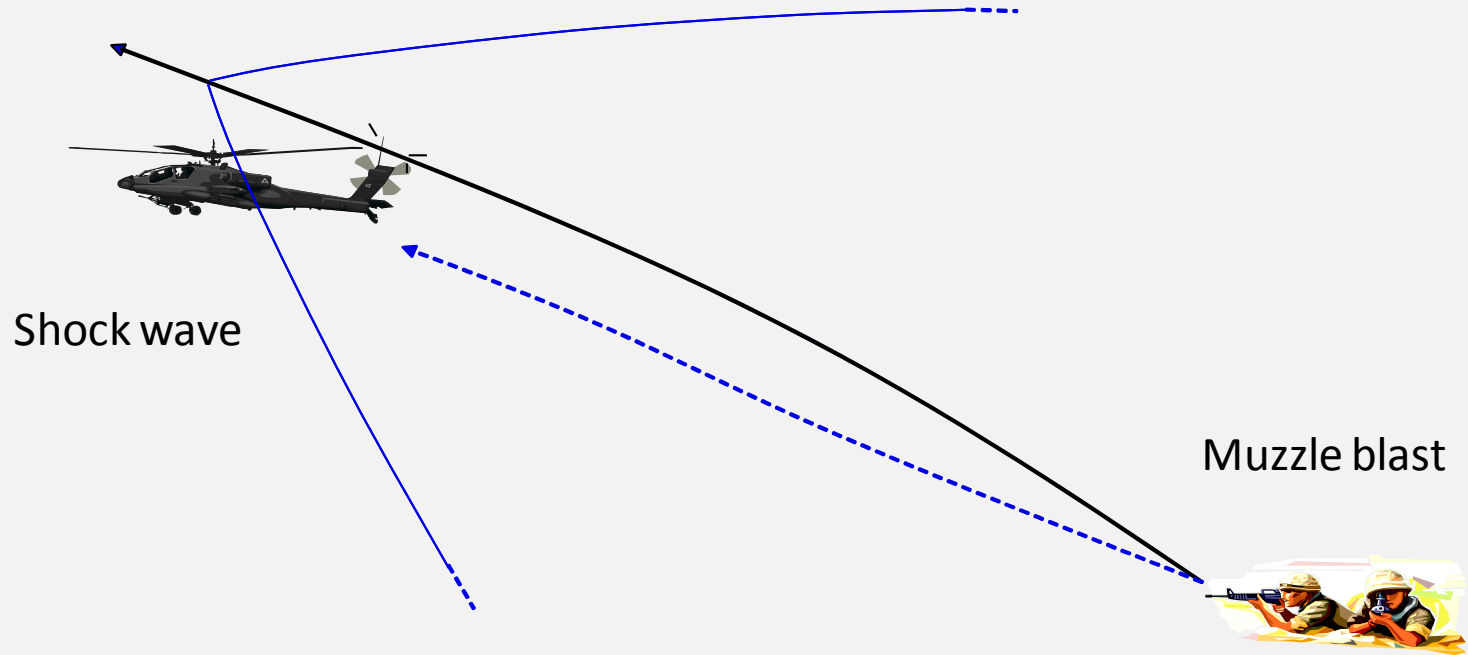


"Gun - Eleven O-Clock"

- Simple ruggedized acoustic sensor fits on helicopter belly
- Hostile attack detection probability exceeding 94% in multiple flight tests
- Quadrant to clock-dial bearing to hostile shooter accuracy
- Low FAR
- Works day or night
- Can work synergistically with EO sensors
- Reliable: Pressure Washable, Extreme Dust, Extreme Heat, Salt Fog, Shock and Vibration

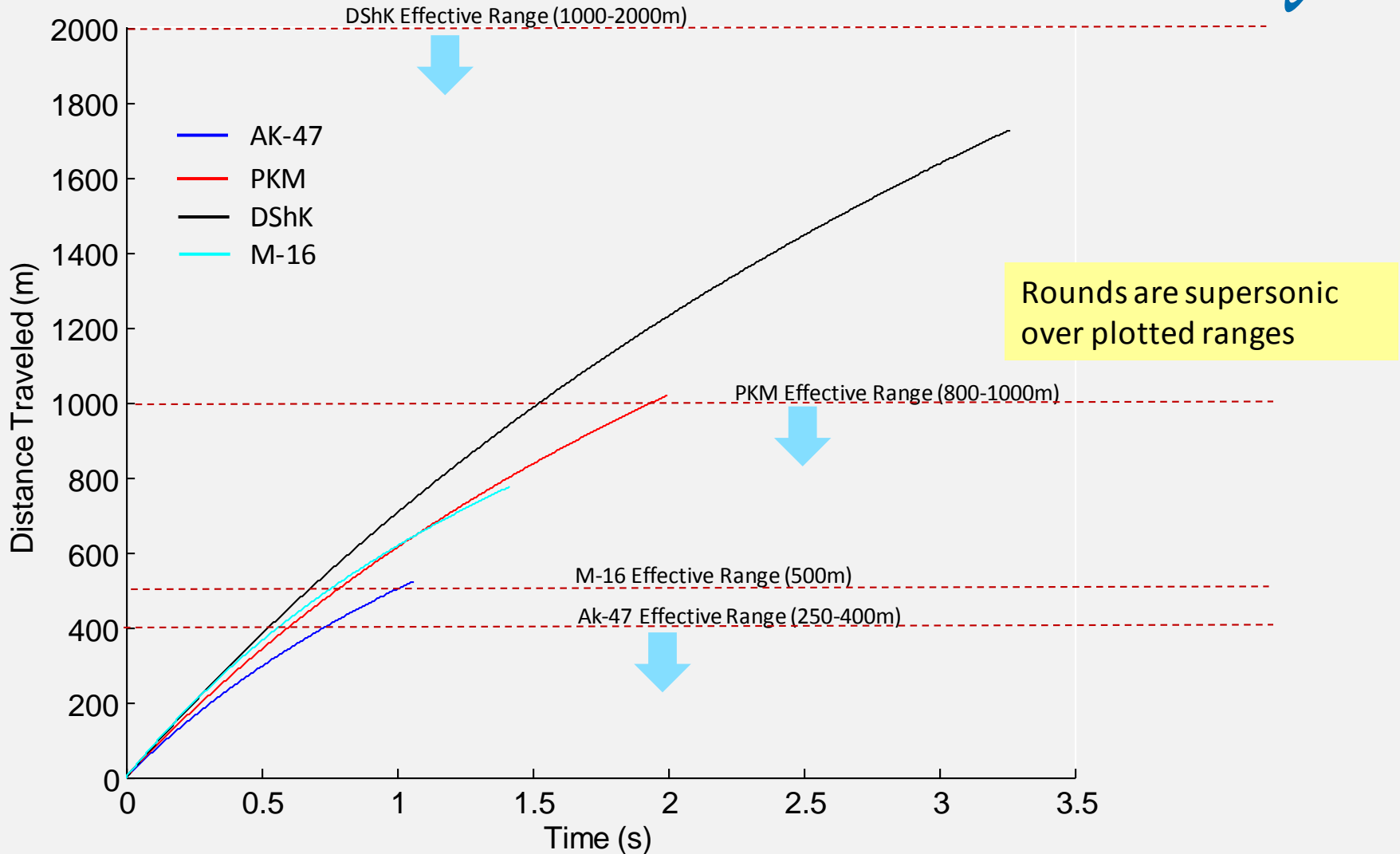


How Does Acoustic HFI Work?



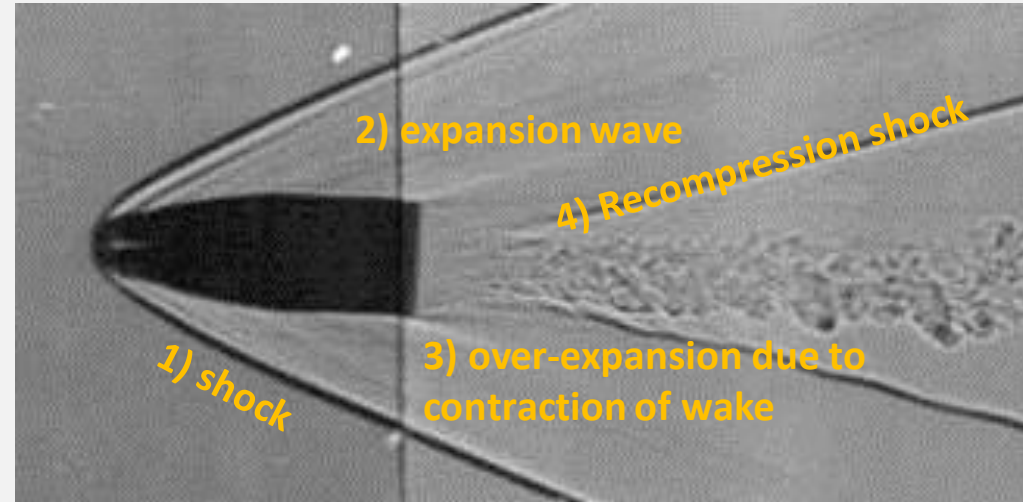
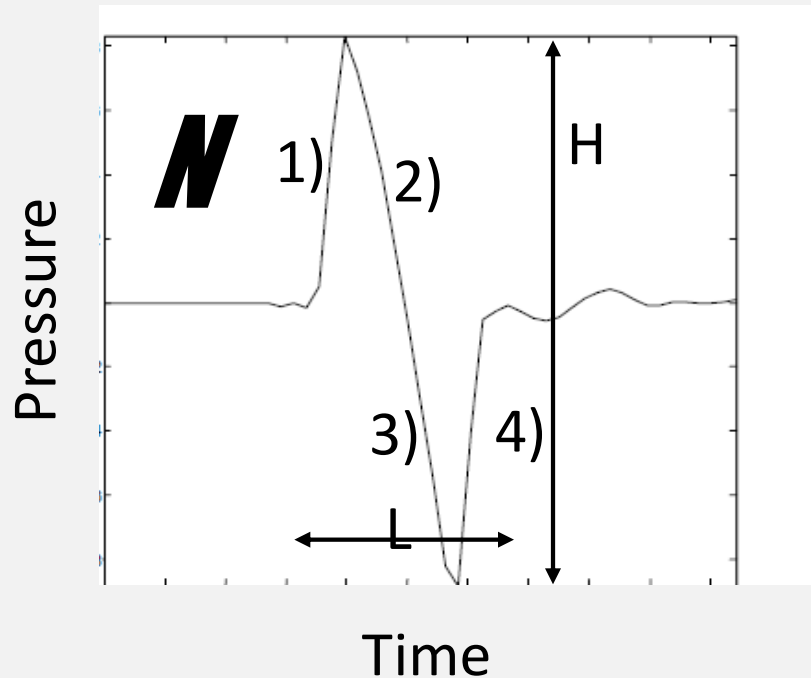
Acoustic sensors detect muzzle blasts and shockwaves from passing bullets

Small Arms are Supersonic Over Most of Their Range



Most successful engagements are well within max. effective weapons' range

Acoustic Signature of a Shock Wave



- The N-wave can be detected over a long distance (>100 meters)
- From the shape of the N-wave it is possible to estimate the bullet aspect ratio, its speed and the distance over which the N-wave traveled.
- In particular it is possible to roughly estimate the miss distance, r



SHOT/FINDER 

Technology Benefits:

- Almost perfect detection of small-arms fire with determination of shooter intent
- No false alarms – N-waves are unique to bullets
- Stand-alone solution or integrated with an EO system
- Angle of Origin (AoO) for all HF threat types
- Water-proof, dust resistant, and environmentally rugged

Demo kit is available to display bullet detection on a moving map

Flow Noise & Vibration Challenges

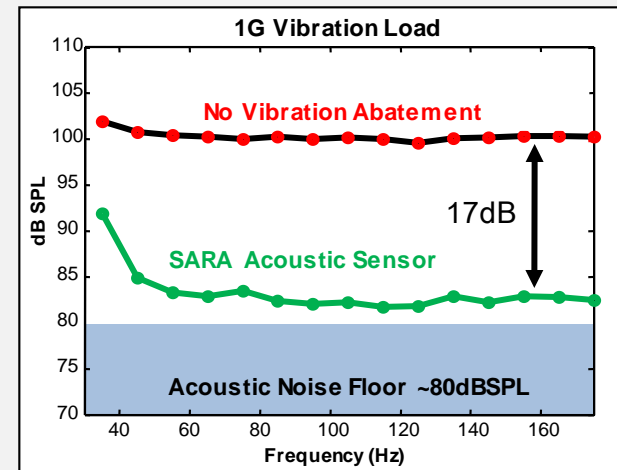
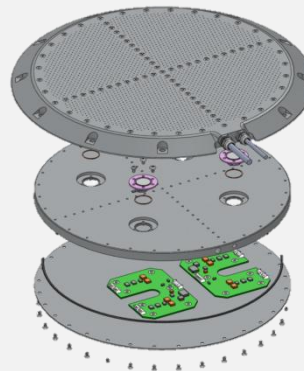
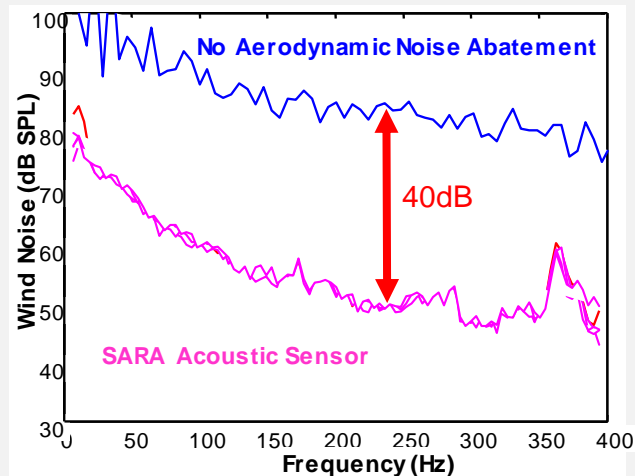


In addition to bullets and muzzle blasts, acoustic sensors also 'hear' noise

- Flow noise/downwash is the preeminent problem for acoustic sensing on moving platforms

Acoustic sensors use microphones, which are affected by vibration

- Vibration on a moving platform is also significant

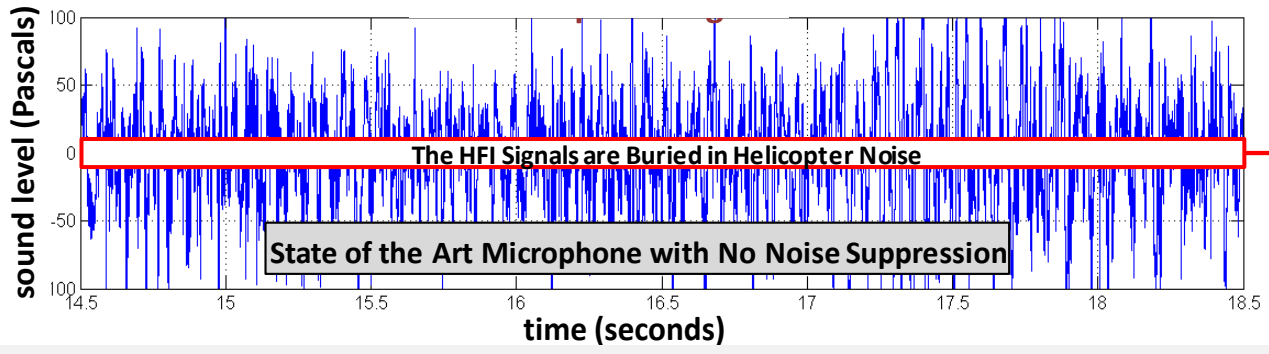


Our solution reduces flow noise and cancels vibration

Flow Noise Reduction – How it Works

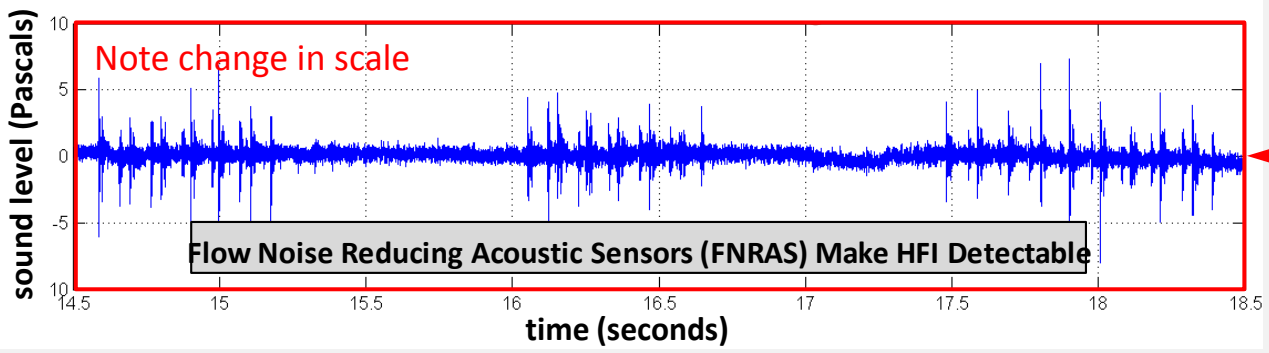


Small-arms fire recordings from a hovering SH-60



State of the Art Microphones:

Too noisy



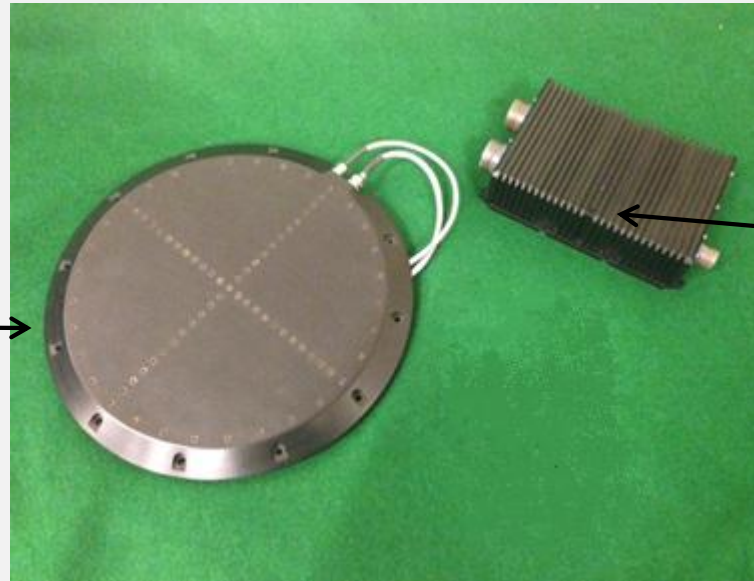
Flow Noise Reducing Acoustics:

Burst fire easily detected

Key ShotFinder Components



ShotFinder
Noise
Reducing
Sensor Array



Acoustic Signal
Acquisition &
Processor

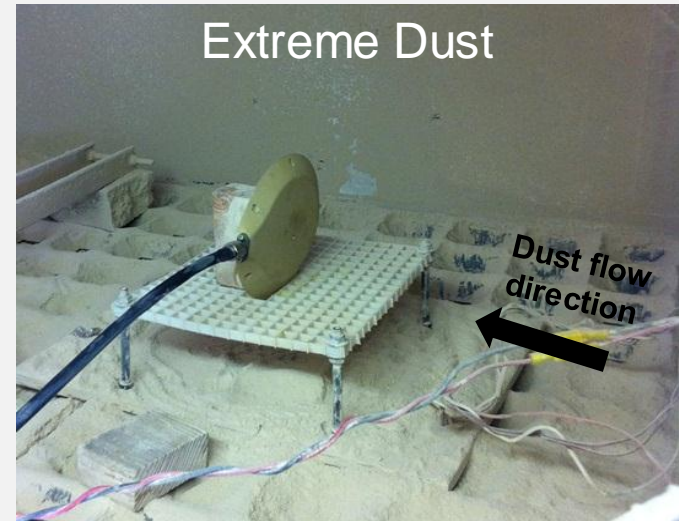
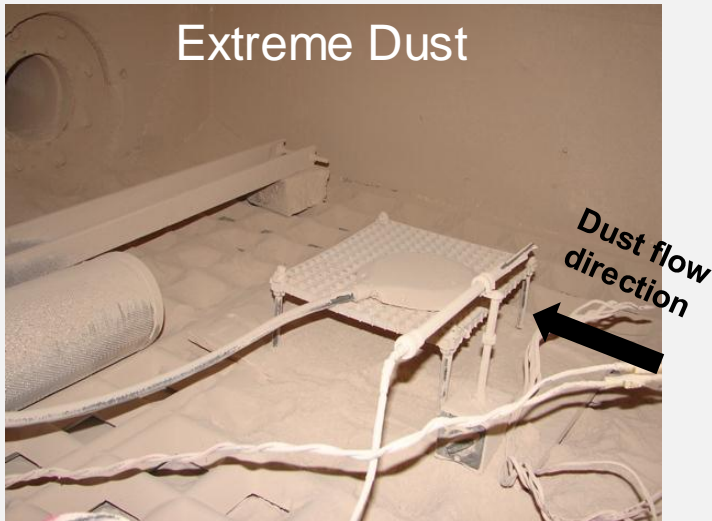


SWaP	Sensor Array	Processor	Total
Size	12"dia.; ½" thick	8.5" x 4.9" x 2.1"	144 in ³ (0.0024m ³)
Weight	3.5 lbs. including cabling	4.5 lbs. including cabling	8.0 lbs. (3.6kg)
Power	4W	50W	54W nominal

Ruggedized System



- Designed and tested for use in extreme environments
- Includes pressure spray washable, sand, dust, temp, salt fog, and others



Through all flight tests ShotFinder has reliably detected bullet N-waves:

- With detection probabilities always exceeding 94%
- Differentiating hostile from non-hostile fires using only N-waves
- Resulting in clock-code accuracy shooter location
- With only one sensor

