



# MiniSAR Radar

## FACT SHEET

### Miniature Synthetic Aperture Radar

At any size/weight, the image quality and resolution demonstrated by Sandia SARs remains unequaled. MiniSAR fills a void in current remote sensing technology by providing unprecedented image quality and resolution while achieving a 4 to 5x reduction in size, weight, and cost. MiniSAR gives small UAVs the ability to see through smoke, dust, clouds, heavy rain and night. Similarly, the MiniSAR sensor has broad application to all-weather, precision guided weapons. MiniSAR is an in-development program; the initial version has been flight tested, with sample image products shown below.



### Mission

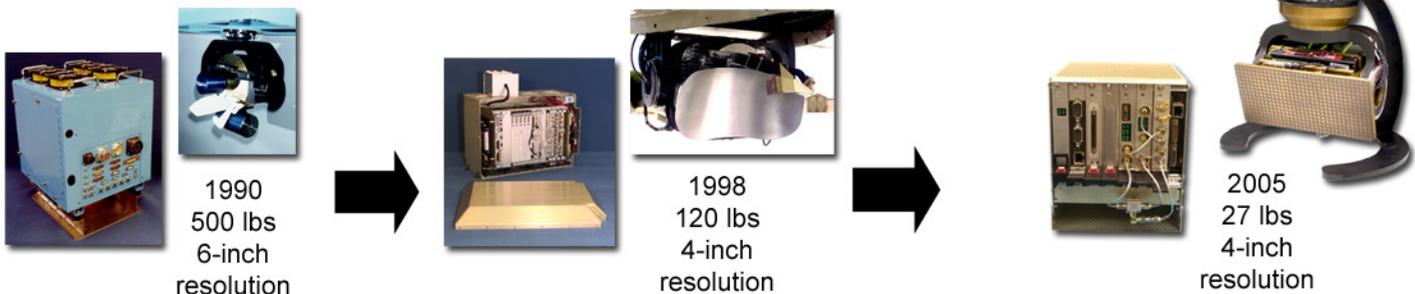
Sandia's MiniSAR program emphasizes the following applications and program goals:

- Reconnaissance from small UAVs (15 to 50 lb payload)
- Affordability (sensor 1/3 platform cost)
- All weather precision guidance sensor (SAR and/or Vertical-SAR modes); relative target coordinates
- Basic Mode: Spotlight SAR (to 4-inch resolution)
- Future Advanced Modes: Sandia's proven Stripmap SAR, GMTI, CCD (coherent change detection), and stereo SAR
- Multi-sensor fusion possible on medium-sized UAVs



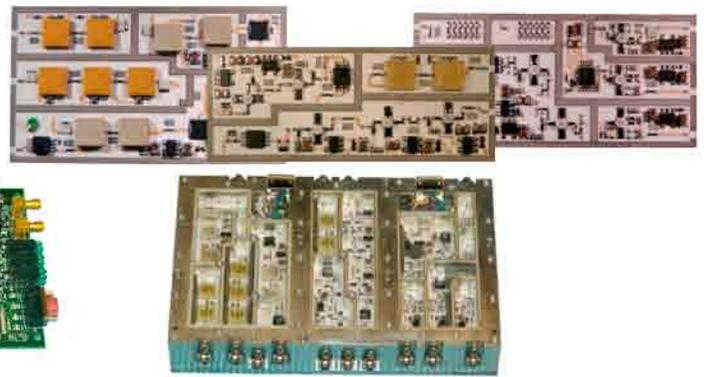
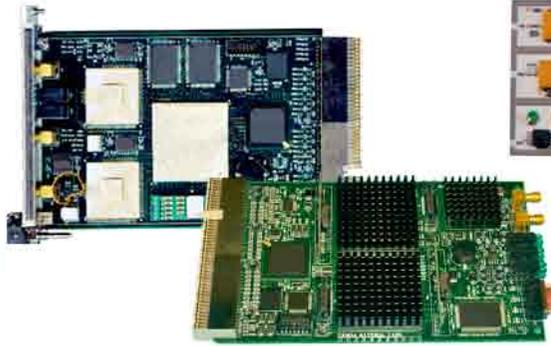
### Experience

For two decades Sandia has been shrinking SAR size and increasing performance. Sandia systems are best known for their fine resolution (4-inch), high quality imagery (<-20dB multiplicative noise ratio), and real-time image formation. MiniSAR is a revolutionary step forward in this long tradition.



Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy under contract DE-AC04-94AL85000.





## Subsystems/Technologies

As with previous systems, Sandia designed and developed all major component assemblies of MiniSAR:

- **Gimbal:** 6 lb., two-axis, inertially stable
- **Antenna:** ultra-broadband, ultra-lightweight microstrip array antenna (3 GHz BW at Ku-band)
- **RF Module:** up/down-converter with buried filters realized in multi-layer LTCC
- **Waveform synthesizer:** 3U, cPCI, FPGA-based, quadrature outputs (1.2 GHz clock, agile, programmable)
- **Digital Receiver (pre-processor):** 3U, cPCI, FPGA-based (1.2 GHz clock, 300 MHz IF input, digital I/Q demodulation, agile range/azimuth filtering)
- **MiniSAR also utilizes significant Sandia expertise in embedded processing, image formation algorithms, and motion measurement/compensation**



**Antenna/Gimbal  
Miniaturization**

**Image Quality  
Resolution**

**Radar Electronics  
Miniaturization**



## Performance/Specifications

Specification	Value	Notes/Comments
Weight	Radar electronics assembly (REA): 9 lbs Antenna/gimbal assembly (AGA): 17 lbs System total: 27 lbs with cables	Follow-on version will be 18 lbs
Size	REA: $\approx$ 7-inch cube AGA: $\approx$ 10-inch cube	
Frequency	16.8 GHz	Readily extensible to X/Ka-bands
Resolution	4-inch minimum	Spotlight mode, real-time
Range	10 km @ 4-inch resolution 15 km @ 1-foot resolution 23 km @ 12-inch resolution	Other range/weight tradeoffs 35 km with 31.5 lb AGA 5 km with 7 lb AGA
Tx power	60 W	
Modes	Spotlight	Stripmap, GMTI, CCD (follow-on)