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# Fiber Optic Sensing System (FOSS)

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# NASA Armstrong's Fiber Optic Sensing System (FOSS)

FOSS is a shape and strain sensing system offering real-time processing and lightweight, flexible, robust operation

The system can be used to determine:

- 2D and 3D shape
- Temperature
- Liquid level
- Pressure
- Loads

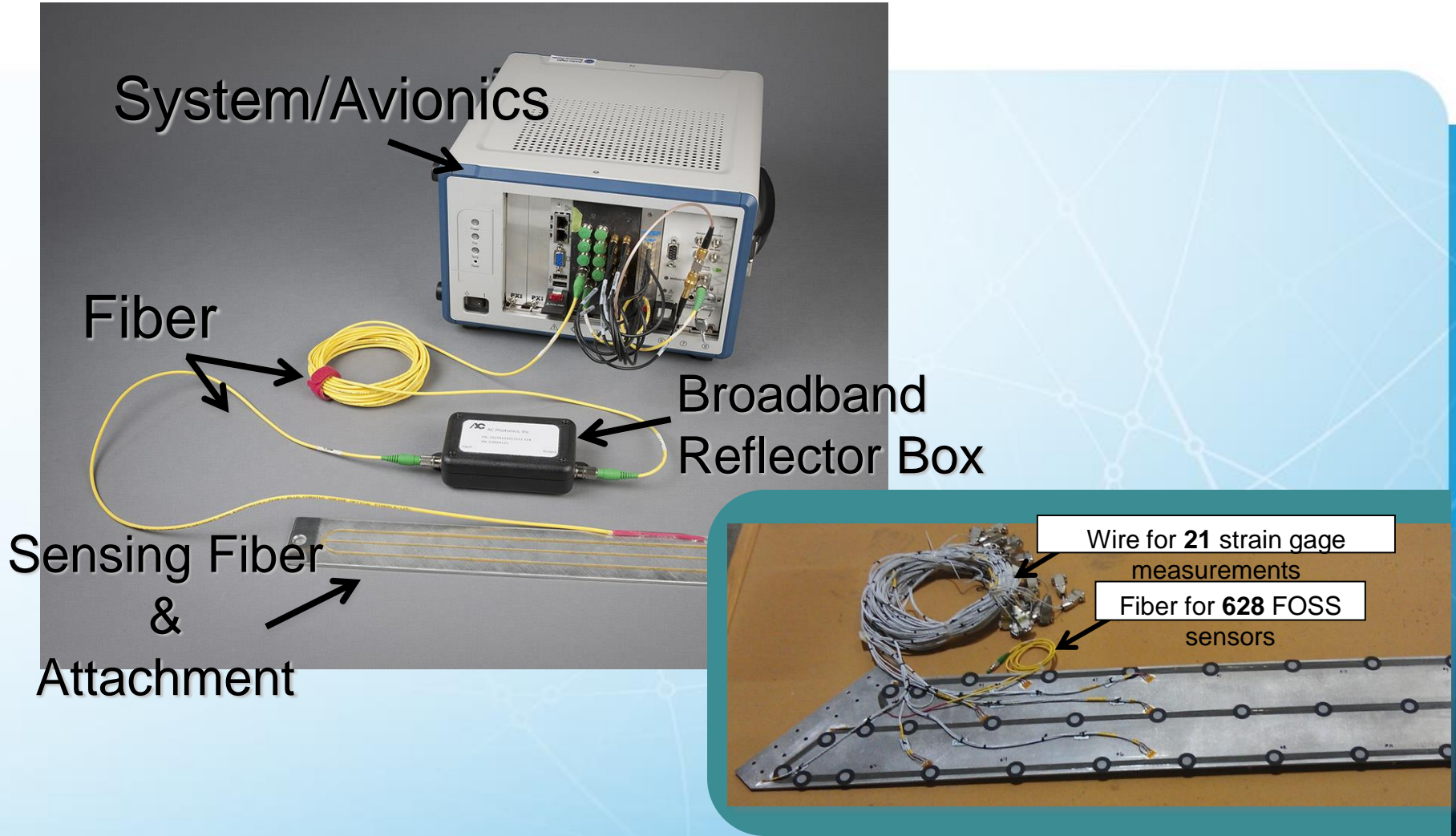


**Parameters can be measured alone or in combination**





# NASA Armstrong's Fiber Optic Sensing System (FOSS)



# NASA Armstrong's Fiber Optic Sensing System (FOSS)

*For the first time ever, real-time strain measurements can be used to:*

- Determine the shape of an aircraft's wing
- Monitor the structural integrity of buildings, off-shore structures, oil rigs and pipelines
- Determine the liquid vs. gas levels in tanks and cryogenic applications
- Ensure precise placement of the tiniest catheters and drilling bits



# NASA Armstrong's Fiber Optic Sensing System (FOSS)

The FOSS approach employs fiber Bragg grating (FBG) sensors and optical frequency domain reflectometry (OFDR) sensing

<b>Traditional Strain Gage</b>	<b>NASA's FOSS Approach</b>
Bulky and heavy	Streamlined, lightweight
One measurement per wire	Thousands of sensors on each hair-like fiber
Standard processing	Real-time, fast simultaneous processing up to 100 scans per second

# Patents and Awards for NASA Armstrong's FOSS

*The FOSS portfolio is owned by NASA Armstrong. It includes 6 patents and 1 patent pending:*

U.S. Patent No.	Title
<b>7,520,176</b>	Method for Real-Time Structure Shape-Sensing
<b>7,715,994</b>	Process for Using Surface Strain Measurements to Obtain Operational Loads for Complex Structures
<b>8,700,358</b>	Method for Reducing the Refresh Rate of Fiber Bragg Grating Sensors
<b>8,970,845</b>	In-Situ Three-Dimensional Shape Rendering from Strain Values Obtained Through Optical Fiber Sensors
<b>8,909,040</b>	Method and Apparatus of Multiplexing and Acquiring Data from Multiple Optical Fibers Using a Single Data Channel of an Optical Frequency-Domain Reflectometry (OFDR) System
<b>9,009,003</b>	Apparatus and Method for Elimination of Polarization-Inducing Fading in Fiber-Optic Sensor System

## Awards

2013 R&D 100  
Award

2014 FLC  
Excellence in  
Technology  
Transfer Award

NASA 2014  
Invention of the  
Year Runner-Up



# Market Size/Impact for NASA Armstrong's FOSS

*Analysts estimate  
that the market for  
fiber optic sensing  
could reach  
\$4 billion by 2017*

Source: ElectroniCast  
(<http://optics.org/news/4/6/17>,  
June 2013 )

FOSS is applicable to many markets, notably:

- Aerospace and aeronautics
- Oil and gas
- Medical/Surgical
- Cryogenic applications
- Wind energy



# Seeking Licensing Partners for NASA Armstrong's FOSS

NASA Armstrong is actively seeking licensing partners for the FOSS technology in key target markets.

*Armstrong strives to make the licensing process simple and offers support to walk you through the process through our Technology Transfer Office.*





# Contact Us to Learn More about NASA Armstrong's FOSS Portfolio

## Technology Transfer Office NASA's Armstrong Flight Research Center

**Go online:**

<http://www.nasa.gov/offices/ipp/centers/dfrc>

**Call:**

661.276.3368

Or visit us today at

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