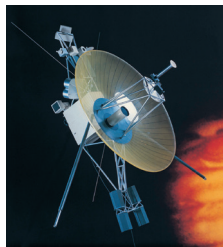


# STATISTICAL SIGNIFICANCE

*Statisticians have developed powerful analysis tools that help keep our nation safe. In national security and defense, not only do these tools help prevent major attacks, but they also handle cyber defense, biosurveillance, military research, military force structure, and environmental research.*

## National Security and Defense

**STATISTICS IN WARTIME:** Statistics has a long tradition of service to the military. In World War II, time-based correlation analysis was used to break Japanese code indicating an imminent major attack on Midway in June 4, 1942. The information allowed Admiral Nimitz to concentrate a carrier force at Midway and repel the attack, ultimately turning the tide of the war in the Pacific theater. Less well-known is the development of forecasting algorithms that improved the ability of artillery to track aircraft, which also saved our ships. More recently, the NSA invented two key statistical methodologies that support their purposes, but also turned the key for critical progress in genomics, disease modeling, and Internet traffic control.



**SATELLITE IMAGERY:**

Satellite imagery is essential for U.S. intelligence operations.

The high-resolution visuals are only possible because of sophisticated statistical methods that de-blur and resolve remote-sensing images by combining information in signals from different spectra. For example, high-resolution visuals allowed the United States to have more accurate estimates of Soviet grain production during the



**Managing Defense Investments**

Statistical analyses have helped Pentagon planners save taxpayer money by identifying where in the development process further investment will yield the highest return. One study showed that strategic investments in the design phase can save 60% to 80% of the operation and support costs, the largest component of life-cycle expense in military systems. While it may seem like common sense in retrospect, it took statistical analysis to untangle the many variables and provide the documentation needed to justify changes in investment management.

Cold War than the Soviet Ministry of Agriculture had. They also enable tracking of weather, deforestation, tsunamis, and other peaceful projects.

**SYSTEM RELIABILITY:** Complex military systems have many failure modes. System failure in one mode can mask downstream failures that would occur for weakness in other modes. Statisticians at Los Alamos National Laboratory have developed new Bayesian methods for reliability assessment in the context of science-based stockpile

stewardship where full system data are currently unattainable. These methods extend to other systems in which destructive testing or extensive testing is prohibitively expensive.

“Statistics Improves Security and Defense” is part of Statistical Significance, a series from the American Statistical Association documenting the contributions of statistics to our country and society. For more in this series, visit [www.amstat.org/outreach/statsig.cfm](http://www.amstat.org/outreach/statsig.cfm). The American Statistical Association is the foremost professional society of statisticians, representing 18,000 scientists in industry, government, and academia: [www.amstat.org](http://www.amstat.org). This Statistical Significance was produced under the supervision of the ASA Section on Defense and National Security.