JASON Defense Advisory Panel Reports

JASON is an independent scientific advisory group that provides consulting services to the U.S. government on matters of defense science and technology. It was established in 1960.

JASON typically performs most of its work during an annual summer study, and has conducted studies under contract to the Department of Defense, the Department of Energy, the National Nuclear Security Administration, the U.S. Intelligence Community, and the FBI. Approximately half of the resulting JASON reports are unclassified.

A selection of unclassified JASON studies is offered below.

- Consistency of Data Products and Formal Privacy Methods for the 2020 Census, JSR-21-02, January 2022
  JASON was asked to study the impact on census data consistency of adding random noise as a data privacy mechanism.
- An Analysis of Data and Hypotheses Related to the Embassy Incidents, JSR-21-01, October 2021
  JASON was asked to evaluate potential causes of anomalous health incidents in US Embassy personnel. (via NYT)
- Assessment of 2020 Census Data Quality Processes, JSR-20-2N, February 2021
  JASON was asked to comment upon actions Census Bureau might take to strengthen the production and release of metrics to evaluate 2020 Census data quality.
- The Impacts of Large Constellations of Satellites, JSR-20-2H, November 2020
  JASON was asked by NSF and DOE to assess the impact of current and planned large satellite constellations on astronomical observations, and in particular the impact on the Vera Rubin Observatory.
- Electronic Materials Aging, JSR-20-2B, November 2020
  JASON was tasked by NNSA to recommend rapid discovery processes to more effectively uncover electronic material and device aging and failure modes for nuclear weapons.
- Secure Computation for Business Data, JSR-20-2E, November 2020
  The Census Bureau asked JASON to consider the use of secure computation technologies as a way of streamlining the collection and processing of business data used for economic analyses.
- Managing the Risk From COVID-19 During a Return to On-Site University Research, JSR-20-NS1, updated August 25, 2020
  JASON charged itself to assess risks and best practices for restarting university research programs.
- Formal Privacy Methods for the 2020 Census, JSR-19-2F, April 2020
  In preparation for the 2020 decennial census, the Census Bureau asked JASON to examine the scientific validity of the vulnerability that the Census Bureau discovered in its traditional approach to Disclosure Avoidance, the methods used to protect the confidentiality of respondent data.
- Space Assembly (redacted), JSR-19-2J, March 2020
  JASON was asked by the National Reconnaissance Office to study the benefits of

In-Space Assembly and Manufacturing

- Fundamental Research Security, JSR-19-2I, December 2019
  Several incidents in recent years have led to concern that the openness of our academic fundamental research ecosystem is being taken advantage of by other countries. NSF has charged JASON to produce an unclassified report assessing these concerns that can be widely disseminated and discussed in the academic community
- Pit Aging, Letter Report, November 23, 2019, transmitted to Congress, April 6, 2020
  The Statement of Work asks JASON to consider the body of work on plutonium aging since 2006
- Bioweapons, JSR-2019-2D, performed for the Department of Energy, November 2019
- Acoustic Signals and Physiological Effects on U.S. Diplomats in Cuba (redacted), November 2018
  This study concerns a series of events affecting U.S. personnel stationed in Cuba. Some personnel have reported medical symptoms tha are correlated with, and have been by many personnel attributed to, specific sensory phenomena experienced at their residences in Havana. (via Buzzfeed)
- Prospects for Low Cost Fusion Development, JSR-18-011, November 2018
  With the ALPHA program on magneto-inertial fusion nearing completion, ARPA-E asked JASON to assess its accomplishments and the potential of further investments in this field.
- Satellite Performance, 2018
  This report was prepared by JASON for the National Reconnaissance Office. Originally Unclassified/FOUO, it was classified in response to a FOIA request.
- Artificial Intelligence for Health and Health Care, JSR-17-Task-002, December 2017
  HHS asked JASON to consider how AI will shape the future of public health, community health, and health care delivery. We focused on technical capabilities, limitations, and applications that can be realized within the next ten years.
- Perspectives on Research in Artificial Intelligence and Artificial General Intelligence Relevant to DoD, JSR-16-Task-003, January 2017
  AI technologies are of great importance to DoD missions. Defense systems and platforms with varying degrees of autonomy already exist. More importantly, AI is seen as the key enabling technology of a 'Third Offset Strategy' that seeks for the U.S. a unique, asymmetric advantage over near-peer adversaries.
- Low-Enriched Uranium (LEU) for Potential Naval Nuclear Propulsion Application (redacted), JSR-16-Task-013, November 2016
  JASON was asked by the Naval Nuclear Propulsion Program (NNPP) to conduct a technical assessment of a new fuel concept proposed for use in nuclear reactors on U.S. Navy warships. Realizing this potential could enable replacement of highly enriched uranium (HEU) in naval propulsion reactors with low-enriched uranium (LEU), with less impact on reactor size and lifetime than would be the case with today's fuel systems.
- Alternative Futures for the Conduct of the 2030 Census, JSR-16-Task-009, November 2016
  The Census Bureau asked JASON to consider alternative futures for 2030 and to propose a starting point from which the Census Bureau can begin to develop a 2030 strategy.
- Enhanced Capabilities for Subcritical Experiments, JSR-16-Task-011, October 7, 2016
  NNSA commissioned JASON to investigate aspects of the Enhanced Capabilities for Subcritical Experiments program, which is intended to provide a new x-ray radiographic source to diagnose subcritical experiments at U1a at the Nevada

National Security Site.

- Respondent Validation for Non-ID Processing in the 2020 Decennial Census, JSR-15-Task-015, November 2015
  The Census Bureau seeks expert advice to develop methodologies to validate respondents are who they say they are when responding to online questionnaires as well as methodologies to detect and combat fraud.
- Technical Considerations for the Evolving U.S. Nuclear-Weapons Stockpile (Executive Summary), JSR-14-Task-006E, January 2015
  JASON is tasked in the present study to consider questions of possible common-mode failures that could impact effectiveness of active-stockpile segments.
- Arctic Radar (abstract only), JSR-14-Task-003, November 2014
  JASON was tasked to examine scientific and technical issues for the possible use for over-the-horizon radar (OTHR) to surveil the Arctic and sub-Arctic for aircraft and surface ships.
- Data for Individual Health, JSR-14-Task-007, November 2014
  JASON was asked to address how to bridge to a system focused on health of individuals rather than care of individuals.
- Chemical Exposure (executive summary), JSR-14-Task-005, October 2014
  The current study focuses on signatures of human exposure to chemical warfare (CW) agents.
- Open and Crowd-Sourced Data for Treaty Verification, JSR-14-Task-015, October 2014
  This study will examine tools for automated validation of open source information and assess the potential utility of open source data for treaty verification, transparency, and confidence building.
- Subsurface Characterization: Letter Report, JSR-14-Task-013, September 2014
  In response to a request from the Department of Energy, JASON recommends that DOE take a leadership role in the science and technology for improved measurement, characterization, and understanding of the state of stress of engineered subsurface systems in order to address major energy and security challenges of the nation.
- Advanced Propulsion (executive summary), JSR-14-Task-011, August 2014
  JASON studied high specific impulse propulsion systems for in-space orbita1 maneuvers of satellites.
- A Robust Health Data Infrastructure, JSR-13-700, November 2013
  HHS asked JASON to address the nationally significant challenge of developing comprehensive clinical datasets, collected in real world environments and accessible in real time, to support clinical research and to address public health concerns. These datasets could be used to guide clinical research, enhance medical decision-making, and respond quickly to public health challenges.
- Enhanced Geothermal Systems, JSR-13-320, December 2013
  DOE requested this study, identifying a focus on: i) assessment of technologies and approaches for subsurface imaging and characterization so as to be able to validate EGS opportunities, and ii) assessment of approaches toward creating sites for EGS, including science and engineering to enhance permeability and increase the recovery factor.
- Technical Challenges of Exascale Computing, JSR-12-310, April 2013
  This study examines the issues associated with implementing DOE/NNSA computational requirements on emerging exascale architectures. The study also examines the national security implications of failure to execute a DOE Exascale Computing Initiative in the 2020 time frame.

- Compressive Sensing for DoD Sensor Systems, JSR-12-104, November 2012
  JASON was asked to consider how compressed sensing may be applied to Department of Defense systems, emphasizing radar because installations on small platforms can have duty cycles limited by average transmit power.
- JASON B61 Life Extension Program Nuclear Scope Review, August 2012 (via UCS)
- Superconducting Computing (redacted), JSR-11-120, February 12, 2012
  A petascale superconducting general processor should not be pursued. Single Flux Quantum logic is unlikely to provide an implementation that is superior in speed or energy to CMOS technology in the next decade.
- Hydrodynamic and Nuclear Experiments (redacted), JSR-11-340, November 2011
  JASON was asked by the National Nuclear Security Administration (NNSA) to examine the current plans from the NNSA laboratories for hydrodynamic and subcritical experiments and to make recommendations for future efforts.
- Impacts of Severe Space Weather on the Electric Grid, JSR-11-320, November 2011
  This 2011 JASON Summer Study focused on the impact of space weather on the electric grid, seeking to understand 1) the current status of solar observations, warnings, and predictions, 2) the plausibility of Mr. Kappenman's worst-case scenario, 3) how previous solar storms have affected some power grids, and 4) what can be done at reasonable cost to protect our grid.
- Tritium, JSR-11-345, November 2011
  JASON was asked to examine the current state of scientific knowledge and engineering practice on the physical and chemical bases for large-scale tritium breeding.
- Methods for Remote Determination of CO2 Emissions, JSR-10-300, January 2011
  JASON was asked to assess U.S. capabilities for estimating greenhouse gas (GHG) emissions in support of monitoring international agreements.
- The $100 Genome: Implications for the DoD, JSR-10-100, December 2010
  Rapid advances in DNA sequencing and other technologies are ushering in an era of personal genomics. Soon it will be possible for every individual to have access to the complete DNA sequence of his or her genome for a modest cost. JASON was asked to consider the impact of anticipated advances in genome sequencing technology over the next decade, and to assess the relevant operational opportunities and challenges that will be presented by these technologies.
- Science of Cyber-Security, JSR-10-102, November 2010
  JASON was asked by the DoD to examine the theory and practice of cyber-security, and to evaluate whether there are underlying fundamental principles that would make it possible to adopt a more scientific approach.
- MDA Discrimination (unclassified summary), JSR-10-620, August 3, 2010
  This JASON study reports on discrimination techniques, both present and planned, for US ballistic missile defense in the mid-course flight phase of ICBMs and regional missiles.
- North Korea Centrifuge Capabilities (redacted), JSR-09-510, October 2009
  ODNI asked the JASONs to undertake a summer study on the topic of North Korea's technical prowess and ability to construct and operate a uranium enrichment centrifuge capability.
- Rare Events, JSR-09-108, October 2009
  JASON was asked by the Department of Defense (DoD) to conduct an evaluation of the nation's ability to anticipate and assess the risk of rare events. "Rare events" specifically refers to catastrophic terrorist events, including the use of a weapon of mass destruction or other high-profile attacks, where there is sparse (or no) historical

record from which to develop predictive models based on past statistics.

- Lifetime Extension Program (LEP) Executive Summary, JSR-09-334E, September 2009
  JASON was asked to assess the impacts of changes to stockpile warheads incurred from aging and LEPs.
- Microbial Forensics, JSR-08-512, May 2009
  JASON was asked to address the development of a research roadmap that would provide an underpinning for improved microbial forensic capabilities.
- Science and Technology for National Security, JSR-08-146, May 2009
  This study focuses on how best to structure basic research (BA1 or 6.1) within the DoD. The changing national and global context for basic research is reviewed and the rationale for basic research within the DoD is discussed.
- Data Analysis Challenges, JSR-08-142, December 2008
  JASON was asked to recommend ways in which the DOD/IC can handle present and future sensor data in fundamentally different ways, taking into account both the state-of-the-art, the potential for advances in areas such as data structures, the shaping of sensor data for exploitation, as well as methodologies for data discovery. This report examines the challenges associated with the analysis of large data and in particular compares DOD/IC requirements to those of several data intensive fields.
- Quest for Truth: Deception and Intent Detection, JSR-08-143, October 2008
  This report provides an assessment of the potential utility and efficacy of monitoring and assessing human behavioral neurophysiology and verbal and nonverbal communication to determine human intent in a military context.
- High Frequency Gravitational Waves, JSR-08-506, October 2008
  JASON was asked by staff at the National MASINT Committee of ODNI to evaluate the scientific, technological, and national security significance of high frequency gravitational waves (HFGW). Our main conclusions are that the proposed applications of the science of HFGW are fundamentally wrong; that there can be no security threat; and that independent scientific and technical vetting of such hypothetical threats is generally necessary.
- Current Spreading in Long Objects, JSR-08-531, October 2008
  This note derives the distribution of electrical spreading currents along the length of solid conducting objects for which the length substantially exceeds the width.
- DTRA National Ignition Facility, JSR-08-800, September 29, 2008
  JASON was asked to address the utility of the National Ignition Facility (NIF) to the Defense Threat Reduction Agency (DTRA) mission of determining the effects on DoD systems of the X-ray environments produced by nuclear weapons. Many DoD systems, such as re-entry vehicles and satellites, have survivability requirements that cannot presently be tested.
- Human Performance, JSR-07-625, March 2008
  The tasking for this study was to evaluate the potential for adversaries to exploit advances in Human Performance Modification, and thus create a threat to national security. In making this assessment, we were asked to evaluate long-term scenarios. We have thus considered the present state of the art in pharmaceutical intervention in cognition and in brain-computer interfaces, and considered how possible future developments might proceed and be used by adversaries.
- Wind Farms and Radar, JSR-08-125, January 2008
  JASON was asked by the Department of Homeland Security (DHS) to review the current status of the conflict between the ever-growing number of wind-turbine farms and air-security radars that are located within some tens of miles of a turbine farm.

- Synthetic Viruses, JSR-07-508, 2007
- Navy Ship Underwater Shock Prediction and Testing Capability Study, JSR-07-200, October 2007

  Underwater mines have long been a major threat to ships. The most probable threats are non-contact explosions, where a high pressure wave is launched towards the ship. JASON was asked by the Navy to examine the potential role of Modeling and Simulation (M&S;) for certifying ship hardness.
- Reliable Replacement Warhead Executive Summary, JSR-07-336E, September 7, 2007

  NNSA asked JASON to conduct a technical review of the Reliable Replacement Warhead (RRW), with a focus on the LLNL/Sandia design.
- Pit Lifetime, JSR-06-3335, January 11, 2007

  JASON reviewed the nearly-completed assessment of primary-stage "pit" lifetimes due to plutonium aging for nuclear weapon systems in the enduring U.S. stockpile.
- DAHRT, JSR-06-330, October 23, 2006

  JASON has been tasked by the NNSA with a review of progress on the second axis of the DARHT facility at the Los Alamos National Laboratory (LANL). DARHT 2 was declared complete in 2003 but, in subsequent testing, failed to achieve its design goals.
- Engineering Microorganisms for Energy Production, JSR-05-300, June 23, 2006

  JASON was asked by the Office of Biological and Environmental Research of the Department of Energy to assess the possibilities for using microorganisms to produce fuels as a metabolic product, in particular hydrogen or ethanol. We were asked to consider the prospects for achieving such biogenic fuel production in principle and in practice; and what the requirements and fundamental limitations are for achieving viability.
- Reducing DoD Fossil-Fuel Dependence, JSR-06-135, September 2006

  In light of an increasing U.S. dependence on foreign oil, as well as rising fuel costs for the U.S. and the DoD, and implications with regard to national security and national defense, JASON was charged in 2006 by the DDR&E; to assessing pathways to reduce DoD's dependence on fossil fuels.
- Quantifications of Margins and Uncertainties, JSR-04-330, March 23, 2005

  Quantification of Margins and Uncertainties is a formalism for dealing with the reliability of complex technical systems, and the confidence which can be placed in estimates of that reliability. We are specifically concerned with its application to the performance and safety of the nuclear stockpile, because the test moratorium precludes direct experimental verification.
- Emerging Viruses, JSR-05-502, 2005
- BioEngineering, JSR-05-130, 2005
- NIF Ignition, JSR-05-340, June 29, 2005

  JASON was asked by the National Nuclear Security Administration (NNSA) to assess the plan and prospects for achieving inertial confinement fusion (ICF) ignition at the National Ignition Facility (NIF) by 2010, including the use of beryllium targets.
- Tactical Infrasound, JSR-03-520, May 2005 (1.4 MB PDF file)

  JASON was asked to assist the U.S. Army's National Ground Intelligence (NGIC) in finding ways to enhance the effectiveness of infrasound monitoring. In addition, we were also tasked with determining whether infrasound monitoring was likely to provide information of value in other intelligence venues.
- High Performance Biocomputation, JSR-04-300, March 2005 (1.9 MB)

  A study commissioned by the Department of Energy to explore the opportunities

and challenges presented by applying advanced computational power and methodology to problems in the biological sciences.

- Sensors to Support the Soldier, JSR-04-210, February 2005 (1.6 MB)
  The JASON study focused on the following topic areas: squad-level communications; location, navigation, and maps; sensing through walls; countering snipers; and uses for UAVs.
- Horizontal Integration: Broader Access Models for Realizing Information Dominance, JSR-04-132, December 2004
  A new, transaction-based approach to the problem of maintaining information security in a warfighting environment.
- DNA Barcodes and Watermarks, JSR-03-305, June 2004
  This study explored the feasibility of a program to tag genetically the microorganisms used for bioremediation, for the purpose of identification.
- Active Sonar Waveform, JSR-03-200, June 2004 (2.1 MB)
  JASON was tasked to study the recent spate of whale-beaching events which have been linked to sonar exercises. The initial goal of the study was to use the current level of understanding of these events to recommend modifications of the sonar waveform as a mitigation strategy. As we learned about the subject, however, it became clear to us that this is at present an impossible task; we just do not know enough about the damage mechanism and the chain of causation for an engineering solution to the problem.
- The Computational Challenges of Medical Imaging, JSR-03-300, February 2004 (2.1 MB)
  On the role and potential of computational technologies in medical imaging.
- Requirements for ASCI, JSR-03-330, October 2003 (4.5 MB)
  This is the report of the 2003 JASON summer study on the technical requirements for advanced scientific computing and modeling to support the Advanced Simulation and Computing (ASCI) Program of Department of Energy's and National Nuclear Security Administration's Science-based Stockpile Stewardship Program.
- Requirements for ASCI, slide presentation, 2003
- Portable Energy for the Dismounted Soldier, JSR-02-135, June 2003 (4.9 MB)
  Focuses primarily on fuel cells for portable electrical energy production.
- Turbulent Boundary Layer Drag Reduction, JSR-01-135, May 2003 (1.9 MB)
  Explores turbulent boundary-layer drag reduction, needed for transoceanic transport at high speeds.
- High Power Lasers, JSR-02-224, April 2003 (5.3 MB)
  In Summer 2002, JASON undertook a study for the National Nuclear Security Administration of the prospective scientific value of high energy petawatt lasers to the NNSA's Stockpile Stewardship Program .
- Biodetection Architectures, JSR-02-330, February 2003 (1.9 MB)
  JASON considered the essential components and operation of an effective strategy for homeland biodefense based on technologies that are currently available or likely to become available within the next five years. It is not realistic to undertake a nationwide, blanket deployment of biosensors.
- Opportunities at the Intersection of Nanoscience, Biology and Computation, JSR-02-300, November 2002 (5.0 MB)
  Research capabilities in nanoscience, molecular biology and computation have advanced to the point where it is possible to define research activities in which the development of nano-bio systems will support major DOE science goals.
- Atmospheric Radiation Measurement (ARM) Program, JSR-01-315, April 2002 (2.8 MB)
  In 2001, JASON was charged by the U.S. Department of Energy, Office of Health

and Environmental Sciences, to review the DOE Atmospheric Radiation Measurement (ARM) program.

- Non-GPS Methods of Geolocation, JSR-00-105, January 2002 (780 KB)
  JASON was asked to conduct a brainstorming session on the problem of precision (at GPS-like accuracy) geolocation of ground elements by means other than use of GPS satellite transmissions in the usual way.
- Biosensing, JSR-01-100, 2001
- Moletronics II, JSR-00-120, June 2001
  Molecular Electronics and Quantum Computing present very different challenges in the development of their potential for future information technology.
- Biofutures, JSR-00-130, June 2001 (2.6 MB)
  The goal of this 2000 JASON summer study on Biofutures was to explore prospects for computer modeling of cellular biochemical networks and to ask more generally about the role of modeling in biology.
- Spintronics, JSR-99-115, February 2001 (1.4 MB)
- Imaging Infrared Detectors II, JSR-97-500, October 2000
  JASON has been tasked by the Army to review recent progress in infrared detector technology.
- Advantage of Base-Line Redundancy in Sparse Apertures, JSR-2000-551, September 2000 (345 KB)
  A general argument is presented to explain the dependence of observation-time T on sparseness f in observations with sparse apertures.
- Civilian Biodefense, JSR-99-105, 2000
- Space Infrastructure for 2020, JSR-99-125, September 2000 (1.8 MB)
  This report summarizes JASON's 1999 summer study on new approaches to the infrastructure needed for building, launching, powering and servicing earth- orbiting satellites that could be applied to military missions.
- Molecular Electronics: Interfacing the Nano- and Micro-Worlds, JSR-99-120, May 2000 (1.4 MB)
- Power Sources for Ultra Low Power Electronics, JSR-98-130, June 2000 (1.1 MB)
  DARPA asked JASON to examine the issue of power sources for low power electronics with a specific emphasis on the properties of nuclear batteries and integrated power sources combining power and electronics.
- 100 LBS TO Low Earth Orbit (LEO): Small-Payload Launch Options, JSR-98-140, January 2000 (1.5 MB)
  This report examines the options for launching small payloads to Low Earth Orbit (LEO). Various launch options are considered, including single and multi-stage, ground and air launched rockets, as well as the potential advantages of an intermediate air breathing boost stage.
- Data Mining and the Human Genome, JSR-99-310, January 2000 (1.6 MB)
  As genomics research moves from an era of data acquisition to one of both acquisition and interpretation, new methods are required for organizing and prioritizing the data. Powerful data mining techniques have been developed in other fields that, with appropriate modification, could be applied to the biological sciences.
- Primary Performance Margins, JSR-99-305, December 1999 (unclassified introduction)
- System-Level Flight Tests, JSR-98-310, December 1999 (940 KB)
  System-level flight tests are an important part of the overall effort by the United States to maintain confidence in the reliability, safety, and performance of its nuclear deterrent forces.

- Remanufacture (of Nuclear Weapons), JSR-99-300, October 1999
  The reconstitution of DOE remanufacturing takes place within the commitment to Science-Based Stockpile Stewardship (SBSS), and in an environment of the CTBT. The purpose of remanufacture is to maintain a safe and reliable stockpile of nuclear devices, together with their non-nuclear components that constitute a nuclear warhead.
- Army Battlefield Communications, JSR-96-605, September 1999 (3.2 MB)
  The Study Group was asked to access future COTS technologies as to their applicability to Army battlefield communications at the brigade and below levels and to identify research and development efforts needed in implementing the mandate.
- Characterization of Underground Facilities, JSR-97-155, April 1999 (3.0 MB)
  JASON undertook a study at DARPA's request to look for new opportunities for progress in the detection and characterization of UGFs. Part of our charge was to identify the most promising technology areas for investment, emphasizing standoff and covert sensor techniques.
- Nondestructive Evaluation and Self-Monitoring Materials, JSR-98-145, April 1999 (2.0 MB)
- Electro Thermal Chemical Gun Technology Study, JSR-98-600, March 1999
  Electro Thermal Chemical (ETC) gun technology refers to the use of plasma devices in place of traditional chemical ignitors to initiate the burning of high energy propellants in a controlled manner. The goal of ETC gun research and development is to provide higher muzzle velocities and more reliable performance for large bore weapons than is possible with existing gun technology.
- Exploiting the Genome, JSR-98-315, September 1998
  JASON conducted a DOE-sponsored study of the human genome project with special emphasiS on the areas of technology, quality assurance and quality control, and informatics.
- Small Unit Operations, JSR-97-142, June 1998 (6.3 MB)
  DARPA requested a JASON summer study on Small Unit Operations (SUO), with emphasis on the SUO vision of total situational awareness for small ground units, remote commanders and remote weapons systems. The study focused on new technologies and concepts which might lead to a dramatic improvement in battlefield situational awareness.
- Signatures of Aging Revisited, JSR-98-320, March 1998
  A follow-on to the JASON Summer Study on what is known about the aging of critical components in the nuclear weapons stockpile.
- Atmospheric Radiation Enhanced Shortwave Experiment (ARESE), JSR-96-310, February 1998
  This report has been prepared in response to a request by the U.S. Department of Energy to review and assess the data and data processing being undertaken in conjunction with the Atmospheric Radiation Measurement Enhanced Shortwave Experiment (ARESE).
- Insonification for Area Denial, JSR-97-120, January 1998
  This report examines concepts for area denial by use of focused sound sources.
- Signatures of Aging, JSR-97-320, January 1998
  In this study we review what is known about the aging of critical constituents, particularly the high explosives, polymers and metals in the enduring stockpile.
- Advanced Radar Technology for Wide Area Surveillance and Fire Control Quality Tracking, JSR-95-230, January 1998

This report contains the results of the JASON summer study review of the ONR Advanced Capability Initiative to identify and develop advanced technologies needed for new ship and airborne search, tracking and illumination radars that would give ships a more effective self-defense capability against very low altitude cruise missiles and aircraft.

- Counterproliferation, JSR-94-140, January 1998 (3.3 MB)
  This JASON report was prepared in response to a request from the Defense Counterproliferation Initiative to comment on key areas of their program and to suggest the application of new technologies to key problems in the area of counterproliferation.
- Nanoflyer, JSR-97-115, October 1997
  A recent proposal to use electrostatic forces to lift and propel a small airborne vehicle is examined. We show here that although this is permitted by the laws of physics, it is very inefficient, and is limited to low areal loads by the requirement to avoid electric breakdown.
- High Energy Density Explosives, JSR-97-110, October 1997
  A JASON summer study was performed to assess the status of ongoing research programs in the area of energetic materials.
- Human Genome Project, JSR-97-315, October 1997
- Small Scale Propulsion: Fly on the Wall, Cockroach in the Corner, Rat in the Basement, Bird in the Sky, JSR-97-135, September 1997
  This study concerns small vehicles on the battlefield, and in particular their propulsion. These vehicles may fly or travel on the ground by walking, rolling or hopping. Their purpose is to carry, generally covertly, a useful payload to a place inaccessible to man, or too dangerous for men, or in which a man or manned vehicle could not be covert.
- An Unconventional, Highly Multipath-Resistant, Modulation Scheme, JSR-97-160, September 1997
  In the obstructed urban environment, the RF channel between two mobile communicators (whom we will here regard as being pedestrians on foot) is degraded in two distinguishable ways.
- Digital Beam Synthesis (DBS) for a High Capability Opto-Electronic Radar (HICAPOR), JSR-97-230, September 1997
  This JASON study investigates the capabilities of HICAPOR by calculating the antenna beam patterns formed by typical implementations of this concept. A wide variety of para-meter choices are investigated and antenna patterns for HICAPOR are compared with conventional phased array and true time delay techniques of beam formation.
- High Performance Human-Computer Interfaces, JSR-96-130, September 1997
  Human interfaces to the computer have remained fairly crude since the use of teletypes despite the fact that computer, storage and communication performance have continued to improve by many orders of magnitude. How much better can we do?
- Subcritical Experiments, JSR-97-300, March 1997
  The authors reviewed the first two sub-critical experiments (SCEs) planned at the time, called Holog and Rebound, to be performed underground at the Nevada Test Site (NTS).
- Advanced Computing, JSR-94-130, December 1996
  The task of the study was to examine technical issues associated with the design and construction of advanced computers ona twenty year time frame. Focus was on two

topics: superconducting and "single electron" logic, and advanced architecture.

- Use of the Fast Flux Test Facility for Tritium Production, JSR-96-325, October 1996
  This report provides the results of a JASON review of the technical feasibility of using the Department of Energy's (DOE's) Fast Flux Test Facility (FFTF) to generate tritium needed for the enduring United States' nuclear weapons stockpile.
- Quantum Computing, JSR-95-115, July 1996 (4.4 MB)
  An overview and assessment of the rapidly developing field of quantum computing is presented as a result of the 1996 JASON Summer Study. Interest in this field is fueled by the recent discovery by P. Shor of an efficient quantum algorithm for finding the prime factors of large numbers.
- Ultrasound, JSR-95-145, May 1996
  This report deals with the technical issues in ultrasound, both for combat and civilian care.
- Unconventional Systems Integration, JSR-95-120, May 1996
  This report examines some potential near term and long term applications of conventional integration in micro-electro mechanical systems (MEMs).
- Inertial Confinement Fusion (ICF) Review, JSR-96-300, March 1996
  During its 1996 Winter Study JASON reviewed the DOE Inertial Confinement Fusion (ICF) Program. This included the National Ignition Facility (NIF) and proposed studies.
- Atmospheric Radiation Measurement Program (ARM)Summer 1995 Review, JSR-95-315, October 1995
  This report examines the issues of anomalous atmospheric absorption and makes recommendations concerning future directions for the ARM program.
- DNA Computing, JSR-95-116, October 1995
  This report examines the potential and limitations of DNA computing.
- Nuclear Testing: Summary and Conclusions, JSR-95-320, August 1995.
  Examines the experimental and analytic bases for understanding the performance of each of the weapon types that are currently planned to remain in the U.S. enduring nuclear stockpile. Also examines whether continued underground tests at various nuclear yield thresholds would add significantly to confidence in the stockpile in the years ahead.
- Subsurface Science, JSR-94-330, July 1995
  Use of bacteria in subsurface remediation shows great promise. A number of technical problems in the use of bacteria require further investigation.
- Letter report on ARM, JSR-95-317, July 27, 1995
- Letter report on environmental bioremediation, JSR-95-330, July 26, 1995
- SAR, JSR-93-170, April 1995
  This report explores reformulations of the theory of SAR imaging so as to understand how to improve SAR images, structure parallel algorithms and machine architectures and to see what new SAR applications may be possible.
- Microsurveillance of the Urban Battlefield, JSR-95-125, February 1995 (4.7 MB)
  It is widely agreed that urban military operations demand greater 'situational awareness' than now exists. Soldiers need mapping tools to tell them where they are, real time information on what's around the corner and behind walls as well as reliable data links to receive and send orders and intelligence. At the same time, commanders need accurate knowledge of 'what's happening' in the city as a whole.
- Security and Privacy in the NII, JSR-94-150, February 1995
  The JASON study examined technical issues of security and privacy and came to the conclusion that the problems are policy and not technical in nature, That is, the

technology exists to provide security and privacy services on the NIT but that issues of what services and their implementation must be resolved.

- JASON Final Report, JSR-94-105, January 1995
  During the 1994 JASON Summer Study twenty-five study topics were undertaken. Of these studies, twenty-one are included (i.e. summarized) in this report.
- Science Based Stockpile Stewardship, JSR-94-345, November 1994
  In this reoprt JASON analyzes the DOE program and makes specific recommendations regarding it.
- A Preliminary Review of Global CO2 Exchange Between Ocean and Atmosphere, JSR-90-302, March 8, 1993
  This report examines issues concerning the determination of the exchange of CO2 between the ocean and the atmosphere.
- Clouds and Radiation: A Primer, JSR-90-307, February 1993
  This paper addresses a previously unknown complex interdisciplinary process providing a feedback loop which may have major impact on the effect on global climate of the greenhouse gases in the atmosphere.
- Advanced Over-the-Horizon Radar, JSR-90-105, February 1993
  The task of the study was to evaluate DARPA's plans and roles for a proposed experimental test bed facility, which would be a precursor to an eventual operational AOTH system.
- Structural Acoustics: A General Form of Reciprocity Principles in Acoustics, JSR-92-193, January 1993
  A generalized Reciprocity Principle for Acoustics is obtained. By specialization, various principles which appear in the literature are obtained.
- Verification of Dismantlement of Nuclear Warheads and Controls on Nuclear Materials, JSR-92-331, January 1993
  This study addresses the question of verification of future agreements with respect to dismantlement and destruction of nuclear warheads, bans on the production of additional quantities of plutonium (Pu) and highly enriched uranium (HEU) for nuclear weapons and agreements on the end-use or ultimate disposal of special nuclear materials (SNM).
- Self-Focusing Instabilities Induced by Over-The-Horizon (OTH) Radars, JSR-90-107, December 1992
- Drag Reduction by Polymer Additives, JSR-89-720, October 1992
  The 1989 JASON Summer Study on Drag Reduction focused on the physics which underlies methods utilizing polymer studies.
- Acoustic Warfare: Bubble Clouds, JSR-91-113, October 1992
  In this report, we survey the basic ingredients that go into the bubble cloud hypothesis for the enhanced acoustic backscatter seen at high enough frequency and wind speed.
- JASON Global Grid Study, JSR-92-100, July 1992
  An assessment of the emerging global communications grid.
- Global Change and the Dark of the Moon, JSR-91-315, June 1992
  We have considered the possibility of using earthshine to measure the reflectance properties of the earth (albedo and phase function).
- Effective Medium Theory for the Elastic Properties of Composites and Acoustics Applications, JSR-91-112, February 1992
  We derive an effective medium theory that predicts the bulk and shear moduli of composite materials consisting of a matrix materal with soft or hard ellipsoidal inclusions.

- Continuum Approaches for Describing Solid-Gas and Solid-Liquid Flow, JSR-91-310, February 1992
  Two-phase continuum models have been used to describe the multiphase flow properties of solid-gas and solid-liquid mixtures. The approach is limited in that it requires many fitting functions and parameters to be determined empirically, and it does not provide natural explanations for some of the qualitative behavior of solid-fluid flow.
- Persistence in Climate, JSR-91-340, February 1992
  Persistence in weather forecasting is used to describe runs of several days with similar weather characteristics. This general notion of persistence is extended to long term records of climate by examining the scaling properties of the range, maximum minus minimum, of the integral or sum of observed or calculated variable.
- Statistics of Extreme Events with Application to Climate, JSR-90-305, January 1992
  The statistical theory of extreme events is applied to observed global average temperature records and to simplified models of climate. Both hands of records exhibit behavior in the tails of the distribution that would be expected from a random variable having a normal distribution.
- CHAMMP Review, JSR-90-306, January 1992
  CHAMMP (Computer Hardware. Advanced Mathematics and Model Physics) is a new DOE program designed to move climate models from the current generation of supercomputers to massively parallel computers of the future. The general computing goal of CHAMMP is to provide a ten thousandfold increase in computing speed.
- Small Satellites and RPAs in Global-Change Research, Summary and Conclusions, JSR-91-330A, January 1992
  JASON has now conducted two studies on the use of small satellites and remotely-piloted aircraft (RPAs) in global change research, with special reference to the DOE Atmospheric Radiation Measurement (ARM) program and to DARPA's Small Satellite program.
- Small Satellites and RPAs in Global-Change Research, JSR-91-330, January 1992
  This report contains an investigation of those global change science problems that can be addressed by remotely piloted aircraft or by small satellites. including the relationship to the NASA EOS program. New types of measurements that could be made possible by such satellite or aircraft platforms are pointed out.
- Accelerator Production of Tritium (APT), JSR-92-310, January 1992
  This report evaluates the practicality of using particle accelerator technology to start producing the reduced goal quantities of tritium at the delayed start-up date of 2005.
- Issues in Predictability, JSR-90-320, December 1991
  Since the beginning of the greenhouse debate, policy makers have demanded from the scientific community predictions of future climate in limited geographical areas and limited time intervals. Current climate models clearly do not have such capabilities, as is demonstrated by large disagreements among the models of continental size regions. Largely lost in the debate are fundamental questions such as: What is meant by predictability?
- Small Satellites, JSR-91-330-10, August 3, 1991
  How might DoD- and DOE-originated instrument concepts be used in the Global Change Research Program?
- U.S. Special Operations Command, JSR-90-195, March 1991
  This report summarizes the 1990 JASON Summer Study examination of a number

of technical questions raised by the Special Operations Command

- Verification Technology: Unclassified Version, JSR-89-100A, October 1990 (5.7 MB)
  This report examines several technology issues relating to verification of nuclear weapons treaties. These include: non-convertible design of cruise missiles, tags and seals, radiation detection and surveillance.
- Cellular Automata and Parallel Processing for Practical Fluid-Dynamics Problems, JSR-86-303, September 1990
  During the 1986 JASON Summer Study a group of JASONs undertook to examine, under the sponsorship of the Department of Energy and DARPA, the utility of cellular automata in physical science calculations, especially in fluid dynamics.
- Spectra of Surface Waves, JSR-88-130, March 1989
  This document represents notes that I have collected over the past decade describing surface wave spectra.
- Neutrino Detection Primer, JSR-84-105, March 1988 (2 MB)
  This report is intended to provide for non-expert readers a survey of natural and man-made neutrino sources and a critical review of various methods which have been proposed for their detection.
- Artificial Gill, JSR-86-104, November 1986
  A system which would permit an undersea vehicle to extract oxygen from the seawater is intriguing, and may permit the development of very long endurance low velocity undersea vehicles.
- Some Surface Wave Modulation Mechanisms Relating to the JOWIP and SARSEX Observations, May 1986
  Large internal wave amplitudes were observed in the JOWIP and SARSEX experiments. These led to signifioant surtace wave modulations, as observed directly and from radar observations.
- Bispectra, JSR-83-204, January 1985
  This report provides an introduction to bispectral analysis.
- SEASAT III & IV, JSR-84-203, August 1984
  JASON continues its theoretical investigation of understanding the origin of the ship wakes seen by the SEASAT radar. The present effort incorporates the new experimental results from the Georgia Strait and Gulf of Alaska experiments.
- Speech Research, JSR-82-601, May 1984
  The mathematical modeling of speech for such applications as word or speaker recognition has been intensively studied over the past twenty years.
- SEASAT II, JSR-83-203, March 1984
  A brief overview of SEASAT and ship wake characteristics is given. The authors do not believe that the V-shaped wakes seen by the SEASAT satellite are external waves because ship wakes are three to four orders of magnitude too weak to explain the observed radar returns.
- Reversible Logic as a Strategy for Computing, JSR-83-112, January 1984
  During the 1983 Summer Study, a few members of JASON attempted to survey the current status of the reversible logic approach to digital computing.
- Blue-Green Lasers and Electrodeless Flashlamps, JSR-83-101, August 1983
  This paper addresses the questions of combining the technology of moderate pressure electrodeless discharge lamps with the efficiency of a resonantly pumped solid-state laser to achieve an efficient, compact, and reliable blue-green laser.
- FISH RAGU (Fish, Radio-Receiving and Generally Useful), JSN-81-64, August 1981
  The concept of using a 5O kg self-propelled body as a receiver for VLF signals is presented. This "fish" could operate a few meters below che surface and

communicate with a submarine via high frequency acoustics.

- Visible Chemical Lasers, JSR-80-14, December 1980
  In the spring of 1980 DARPA requested that JASON review the present status of research on visible chemical lasers. During the summer of 1980 a JASON committee spoke to a number of scientists with interests in areas related to visible chemical lasers. This report summarizes the most interesting ideas encountered during the summer.
- Tunnel Detection, JSR-79-11, April 1980
  This report investigates the problem of detecting tunnels; it focuses on the characteristics of the propagating medium and on techniques using compressional seismic (P) and electromagnetic (EM) waves propagating between sources and sensors located in boreholes at depths comparable with the tunnel for which one is searching.
- The Long Term Impact of Atmospheric Carbon Dioxide on Climate, JSR-78-07, April 1979
  This report addresses the questions of the sources of atmospheric carbon dioxide, considers distribution of the present carbon dioxide among the atmospheric, oceanic and biospheric reservoir and assesses the impact on climate as reflected by the average ground temperature at each latitude of significant increases in atmospheric carbon dioxide.
- Counter-Rotating Disk Homopolar Generator, JSN-79-03, 1979
- Impact Fusion With a Segmented Rail Gun, 1979
- Magnetic-Gun Igniter for Controlled Thermonuclear Fusion, July 10-12, 1979
- Sonic Boom Report, JSR-78-09, November 1978 (6.6 MB)
  Press reports of "East Coast Mystery Booms" have led to a number of studies of the propagation of shock waves (generated by the SST/Concorde) into the thermosphere [thanks to Todd Lemire for the document]
- JASON Laser Propulsion Study, JSR-77-12, Summer 1977 (5 MB)
  Laser propulsion is an idea that may produce a revolution in space technology. [thanks to Todd Lemire]
- Applied Mathematics, JSR-75-13, April 1976
  We suggest a number of projects tnat would lead to useful and important results.
- Internal Wave-Surface Wave Interactions Revisited, Paper P-853, March 1972
  The interaction of internal waves and surface waves in water is explored in the regions where the effects of the interaction are small.
- Acoustic Backscatter from Microstructure, Paper P-886, December 1971
  The acoustic backscatter from the microstructure in vertical temperature distribution of the ocean is calculated and compared to observed volume backscatter.
- Generation and Airborne Detection of Internal Waves from an Object Moving Through a Stratified Ocean, April 1969
  This study deals with fundamentals in the performance of airborne sensors for detecting the wake in the passage of a submarine through stratified water.
- Project Seesaw, February 1968
  This study reports on a review of the status of theory and experiment relevant to Project SEESAW and makes observations and recommendations about continued work in these two areas.
- Tactical Nuclear Weapons in Southeast Asia, March 1967 (via Nautilus)
  The purpose of this study is to evaluate the military consequences of a U.S. decision to use tactical nuclear weapons in Southeast Asia, under the assumption that the war remains theater-limited and that no strategic exchange occurs.

- Air-Supported Anti-Infiltration Barrier, August 1966
  In this report we discuss a possible air-supported barrier or interdiction zone that would help to isolate the South Vietnam battlefield from North Vietnam.

Related Resources

- Titles of Some JASON Reports, 1960-2022, compiled by Allen Thomson, updated February 2022
- JASON facilities requirements, January 15, 2021
- JASON contract solicitation, January 13, 2021
- JASON 2011 Fall Meeting Program, November 18-19, 2011

- Advisory role of JASON scientific advisory group, National Defense Authorization Act for FY2020, December 20, 2019
- Unsound ASW Bibliography, 1968
- Oral History Transcript - Richard Garwin, by Finn Aaserud, Center for History of Physics, American Institute of Physics, June 24, 1991
- Oral History Transcript - Steven Weinberg, by Finn Aaserud, Center for History of Physics, American Institute of Physics, June 28, 1991
- Oral History Transcript - Dr. Gordon MacDonald, Center for History of Physics, American Institute of Physics, April 16, 1986
- Sound and Light Phenomena: A Study of Historical and Modern Occurrences by Sandra Claflin-Chalton and Gordon J. MacDonald, November 1978
- Comments on Sub-LF SATCOM Technology Development Program, December 1972

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