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Lightning



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[Predicting East Coast Sea Breeze Initiated Convection Near Cape Canaveral, Florida](#) 1998 59 pages

Authors: [Johnathan L. Kelly](#); [AIR FORCE INST OF TECH WRIGHT-PATTERSONAFB OH](#)

... were indicated. This left 120 days on which only the ECSB affected the area. These days were categorized according to convective activity using NEXRAD reflectivity data and **lightning** data. The categories were: days when no cells formed along the sea breeze front (NCD), days when cells formed but no cloud-to-ground **lightning** (CGL) occurred (CD), and days when cells formed and developed into thunderstorms with CGL (LD). Our primary goal was to determine whether one could discriminate between ...

**Full Text**

[F/A-18 Replacement Umbilical Qualification Testing](#) Mar 24, 2000 30 pages

Authors: [Susan Jahan](#); [Greg Miller](#); [NAVAL AIR WARFARE CENTER AIRCRAFT DIV PATUXENT RIVER MD](#)

This report discusses the F/A-18 umbilical qualification testing. Topics discussed are the qualification test program, **lightning** test requirement, **lightning** zone and test parameters, pass/fair criteria, captive carriage tests, static pull tests, and ejection tests.

**Full Text**

[Specification of UV, Visible, and Infrared Emission Spectra of Sprites and Blue Jets](#) Jan 18, 2002 6 pages

Authors: [Timothy F. Bell](#); [STANFORD UNIV CA SPACE TELECOMMUNICATIONS AND RADIOSCIENCE LAB](#)

During the period of performance Stanford University constructed a VLF/ELF receiver to measure the VLF/ELF electromagnetic and quasi-electrostatic fields produced by **lightning** during Sprite and Blue Jet events, and deployed this instrument in the field to make such measurements. The data acquired in the field was used to characterized the electromagnetic and quasi-electrostatic fields produced by **lightning** during Sprite and Blue Jet events.

**Full Text**

[NEW MATERIAL ON THE DEVELOPMENT OF A NEGATIVE SPARK AND ITS COMPARISON TO LIGHTNING](#) Dec 17, 1962 12 pages

Authors: [I. S. STEKOL'NIKOV](#); [A. V. SHKILEV](#); [JOINT PUBLICATIONS RESEARCH SERVICE ARLINGTON VA](#)

**Full Text**

[PROPOSAL FOR TEST PROGRAM TO EVALUATE ELECTRICAL BONDING OF ASSEMBLIES UTILIZING ENVIRONMENTAL SEALING](#) Jun 1, 1965 32 pages

Authors: [B. E. Montgomery](#); [LOCKHEED-GEORGIA CO MARIETTA](#)

This report describes a program that will: (1) determine the effects of environmental sealing on electrical current flow and electrical bonding of the test specimens; (2) determine the effect on current flow and note any differences between specimens when simulated **lightning** strikes are discharged through the test specimens; (3) compare the observed test results in order to determine if the proposed corrosion protection is detrimental to electrical bonding.

**Full Text**

[A NEW MODEL FOR 'IMPULSIVE' PHENOMENA: APPLICATION TO ATMOSPHERIC- NOISE COMMUNICATION CHANNELS](#) Aug 1966 179 pages

Authors: [Harry M. Hall](#); [STANFORD UNIV CA STANFORD ELECTRONICS LABS](#)

The work is concerned with the development and application of an analytical model for atmospheric noise, which is radio noise originating in **lightning** discharges. The generalized 't' model resulting from our approach is in good agreement with measured data and describes the received atmospheric noise  $y(t)$  as  $y(t) = a(t) n(t)$ , where  $n(t)$  is a narrowband gaussian process and  $a(t)$  is a slowly varying random process, independent of  $n(t)$ , that 'modulates'  $n(t)$ . The detection of known signals in additive generalized 't' noise is considered, and the receiver that minimizes the probability of error ...

**Full Text**

[GLOBAL ELECTRICAL CURRENTS](#) Oct 1969 41 pages

Authors: [Willis L. Webb](#); [ARMY ELECTRONICS COMMAND WHITE SANDS MISSILE RANGE NM ATMOSPHERIC SCIENCES LAB](#)

... potential distribution in the lower ionosphere. Asymmetries in these hemispheric potential distributions result in exospheric current flows in low L-shells, and larger differences in potential produced by dynamo return current flows in high magnetic latitudes result in strong currents through high L-shells between auroral zones. Vertical

**Full Text** thunderstorm currents with their associated **lightning** discharges effectively connect the earth to a low potential region of the dynamo circuit and thus supply the earth with an average negative charge which motivates a leakage tropospheric electrical circuit.

**A Center for the Description of Environmental Conditions. Weather Phenomena** Dec 1970 160 pages  
 Authors: [William L. Hughes](#); [Paul A. McCollum](#); [K. Shanmugam](#); [Emmett J. Pybus](#); [OKLAHOMA STATE UNIV STILLWATER SCHOOL OF ELECTRICAL ENGINEERING](#)

... Hills, South Dakota; Greeley, Colorado and Las Cruces - White Sands, New Mexico. The doctoral dissertations have been written using Themis spheric data. The first paper derived a theory of computer learning in which the teacher is considered to be both perfect and another, more general case, where the teacher is imperfect. The second paper derived a theoretical computer model for describing various **lightning** strokes. The third paper describes the spectral power density content of the sampled spherics. Spheric stroke rate is shown to strongly correlate with the rate of growth of a convective cell.

**Full Text**

**The Effects of High Intensity Electrical Currents on Advanced Composite Materials.** Mar 21, 1972 148 pages  
 Authors: [A. P. Penton](#); [J. L. Perry](#); [K. J. Lloyd](#); [PHILCO-FORD CORP NEWPORT BEACH CALIF AERONUTRONIC DIV](#)

The objective of this program was to perform a research study to investigate high intensity electric current flow of such magnitude and waveform as might result from **lightning** strikes, and to characterize the resulting degradation in advanced composites and to investigate means of providing internal protection from such damage. The approach followed in the program essentially involved the selection of representative high modulus boron and graphite filaments (epoxy reinforced) composites and the exposure of those composites to precisely controlled electrical current flow. Necessary electrical, ...

**Full Text**

**Atmospheric Electricity and the Apollo Series.** Jun 1972 90 pages  
 Authors: [Joseph E. Nanevicz](#); [Edward T. Pierce](#); [Arthur L. Whiston](#); [STANFORD RESEARCH INST MENLO PARK CALIF](#)

... measurements were made during the launches of Apollo 13 and 14 in an effort to better define the electrical characteristics of a large launch vehicle. Of particular concern was the effective electrical length of the vehicle and plume since this parameter markedly affects the likelihood of a **lightning** stroke being triggered by a launch during disturbed weather conditions. Since no instrumentation could be carried aboard the launch vehicle, the experiments were confined to LF radio noise and electrostatic-field measurements on the ground in the vicinity of the launch pad. The philosophy of the ...

**Full Text**

**Investigation of Cloud and Precipitation Physics by Radar.** Mar 1, 1972 38 pages  
 Authors: [J. S. Marshall](#); [MCGILL UNIV MONTREAL \(QUEBEC\) STORMY WEATHER GROUP](#)

... , compliments the standard PPI display with detail and conformity to the true pattern in small areas. The technique of pulse compression was devised and employed in selected weather situations. A body of microwave attenuation statistics was accumulated from AZLOR records of severe storms. Data were accumulated and analyzed to relate precipitation seen by radar to cloud seen by photography. Radio-located **lightning** flashes were related to precipitation by radar. A new technique was explored to extrapolate radar precipitation measurements to the surface for comparison with rain gauges. (Author)

**Full Text**

**INTERIM REPORT NO. 3, JULY 1964 THROUGH MARCH 1966** Oct 15, 1966 138 pages  
 Authors: [Darrell C. Rasmussen](#); [GEOTECH GARLAND TX](#)

... used. Several equipment modifications were incorporated into standard system configuration. These modifications included the installation of remote centering and free-period adjustment units on all long-period seismometers, the installation of one experimental multiconductor cable system and one prototype **lightning** protection system, the replacement of the tape transport supply motors with a viscous brake type of supply unit, and the installation and integration of telemetry equipment in the LASA and TFSO extended Array observatories. The established equipment and seismogram evaluation ...

**Full Text**

**Feasibility of Isolating Vulnerable Equipment of the Electric Power System from Sources of EMP** Mar 1978 102 pages  
 Authors: [E. K. Stanek](#); [EMERGENCY ELECTRIC POWER ADMINISTRATION WASHINGTON DC](#)

... equipment in the distribution system from sources of EMP. This would not only reduce the number of failures of equipment in the distribution system (and hence system faults), but would also configure the system in a more secure state with respect to electromechanical stability. Problems associated with the transition from the normal system state to the new operating state and the restoration of service to loads after the attach are discussed. The report also contains information on the development of a new **lightning** arrester design that has better EMP characteristics than existing designs.

**Full Text**

**Investigation of Magnetic Field Phenomena in the Ionosphere** Jan 1979 33 pages  
 Authors: [John F. Devane](#); [Edward A. Johnson](#); [WESTON OBSERVATORY MA](#)

This report summarizes the work in maintaining a network of geomagnetic observatories designed to collect and digitally transmit variations of the geomagnetic field. **Lightning** protection was designed and installed on the induction coil magnetometers. Power supplies of the fluxgate magnetometers were updated, scale changes modified, cooling capacity increased. New temperature control of trailers installed. The changing total field component is traced over the past five years and a method of calibrating the fluxgate magnetometer is outlined.

**Full Text**

**Advanced Scout Helicopter (ASH) Fly-by-Wire Flight Control System Preliminary Design. Volume I. System Design and Analysis.** Mar 1981 152 pages  
 Authors: [Bruce L. McManus](#); [Kenneth H. Landis](#); [BOEING VERTOL CO PHILADELPHIA PA](#)

... advanced flight control concepts to the anticipated Advanced Scout Helicopter (ASH). The study compares the advanced concept systems with a dual mechanical flight control system in the following areas: handling qualities, reliability, maintainability, availability, durability, survivability, EMP/EMI/lightning tolerance, cost, and weight. The candidate vehicle for the study was the Medium Utility Transport (MUT) as defined in document USAAMRDL-TR-75-56A (gross weight 9,544 lb and useful payload 960 lb). The selected fly-by-optics and fly-by-wire candidates employ triplex in-line monitoring for ...

[Full Text](#)

[Unification of Electromagnetic Specifications and Standards. Part 2.](#)

Feb 28, 1983 78 pages

[Recommendations for Revisions of Existing Practices](#)

Authors: [W. Graf](#); [J. M. Hamm](#); [E. F. Vance](#); [SRI INTERNATIONAL MENLO PARK CA](#)

... ones identified in the review are discussed in this report. Analysis was supported by laboratory experiments in the areas of grounding techniques, cable shield terminations, and aperture coupling. Extensive discussions are included on the allocation of protection and methods of incorporating it in specifications for EMP, lightning, and other external sources. Areas that need further research are identified, including the need to characterize system-generated interference, and the issue of generalized standards and design guidelines. An appendix on bounding aperture coupling is also included.

[Full Text](#)

[Effects of Continuous Operations \(CONOPS\) on Soldier and Unit Performance: Review of the Literature and Strategies for Sustaining the Soldier in CONOPS](#)

Apr 1987 50 pages

Authors: [Gregory L. Belenky](#); [Gerald P. Krueger](#); [Thomas J. Balkin](#); [Donald B. Headley](#); [Robert E. Solick](#); [WALTER REED ARMY INST OF RESEARCH WASHINGTON DC DEPT OF BEHAVIORAL BIOLOGY](#)

... of optimum alertness. Also covered are short descriptions of soldier sustained. The second chapter contains a detailed list of human factors principles and recommendations for sustaining performance of soldiers in continuous operations (CONOPS) and includes coverage of topics like: training and preparation for CONOPS; sleep scheduling, recovery sleep concepts, work/rest scheduling, naps and sleep discipline, sleep-inducing drugs for use in long range deployments, alertness sustaining drugs for use in CONOPS, lightning the soldier's load, nutrition, and physical fitness for military tasks.

[Full Text](#)

[Equipment Test Methods for Externally Produced Electromagnetic Transients. Issue 2](#)

Jul 1987 35 pages

Authors: [R. A. Hobbs](#); [ROYAL AIRCRAFT ESTABLISHMENT FARNBOROUGH \(ENGLAND\)](#)

This memorandum assesses the effect of electromagnetic pulse and lightning strike produced transients to aircraft systems. It details suitable tests for the simulation of these effects and should be used to form the basis of any future aircraft project transient specifications.

[Full Text](#)

[Annual Review of Progress in Applied Computational Electromagnetics \(4th\), Held in Monterey, California on March 22-24, 1988](#)

Mar 24, 1988 615 pages

Authors: [NAVAL POSTGRADUATE SCHOOL MONTEREY CA](#)

Partial Contents: A Finite Element Analysis of Lightning Induced Maxwell Current Densities; Transient Electromagnetic Coupling To A Cavity with Metallic Walls; Finite Element Computer Programs for Microstrip, Waveguides and Cavities; A Time-Domain Differential Solver For Electromagnetic Scattering Problems; A High Frequency Reformulation of the FDTD Algorithm in Generalized Coordinates; Using Impedance Matrix Frequency Derivatives for Estimating Broadband Transfer Functions; The MAFIA Approach to Solving Maxwell's Equations in Three Dimensions; Numerical Integration Schemes In Calculating the ...

[Full Text](#)

[Minutes of the Explosives Safety Seminar \(23rd\) Held at Atlanta, Georgia on 9-11 August 1988. Volume 2](#)

Aug 1988 1195 pages

Authors: [DEPARTMENT OF DEFENSE EXPLOSIVES SAFETY BOARD ALEXANDRIA VA](#)

... Walls/Doors/Valves; Underground Explosion Effects - External Airblast; Explosives Shipping - Transportation Safety and Port Licensing; Explosives Safety Management; Underground Explosion Effects - Model Tests and Soil/Rock Effects; Chemical Risk and Protection of Workers; Full-Scale Explosives Storage Test; Fire Protection - Protective Clothing and System Response; Protective Construction Designs - Computer Models; Chemical Hazard Analysis Prediction; Hazard Classification; Test Cell and Explosion Containment Designs; Protective Construction Design; and Lightning and Static Electricity. (aw)

[Full Text](#)

[Comparison of the RF Frequency Spectra of HEMP and Lightning](#)

Mar 1, 1991 47 pages

Authors: [Martin A. Uman](#); [FLORIDA UNIV GAINESVILLE DEPT OF ELECTRICAL ENGINEERING](#)

Cloud pulses are much more common than these earlier studies indicate. Our spectra of the largest overhead cloud pulses are nearly parallel to but significantly below the HEMP spectrum from 1MHz to 50 MHz, while obtained from lightning tens of kilometer offshore over salt water show faster relative decay with increasing frequency, are significantly below ours between 10 and 50MHz, and are about equal to ours between 3 and 10 MHz. The shortest rise time to initial peak value of overhead lightning pulses are of the order of 0.3 micro sec. A broader bandwidth system than that used would allow ...

[Full Text](#)

[Minutes of the Explosives Safety Seminar \(24th\) Held in St. Louis, Missouri on 28-30 August 1990. Volume 1](#)

Aug 30, 1990 1202 pages

Authors: [DEPARTMENT OF DEFENSE EXPLOSIVES SAFETY BOARD ALEXANDRIA VA](#)

Session topics covered in this volume include: Quantity-distance assessments; Structural concepts and design; Insensitive munitions; Explosives disposal; Structural predictions; Explosives demolition disposal; Lightning protection; Explosion hazard ranges; Explosives facility design considerations; Hazard classifications; and Explosives waste management.

[Full Text](#)

[Minutes of the Explosives Safety Seminar \(24th\) Held in St. Louis, Missouri on 28-30 August 1990. Volume 2](#)

Aug 30, 1990 1331 pages

Authors: [DEPARTMENT OF DEFENSE EXPLOSIVES SAFETY BOARD ALEXANDRIA VA](#)

[Full Text](#)

Session topics covered in this volume include: Klotz Club underground testing; Liquid explosion hazards; Explosion propagation tests; Explosion hazards reduction; **Lightning** protection; Accidents; Explosion containment; Unexploded ordnance clearance; Debris hazards; Site plans and surveys; Explosives manufacturing considerations; Space vehicle explosive hazards; Concrete response testing; Far-field airblast effects; Fragment hazards.

[Thunderstorm Forecast Study for Eglin AFB, FL](#)

Mar 1993 48 pages

Authors: [Daniel Cornell](#); [AIR FORCE ENVIRONMENTAL TECHNICAL APPLICATIONS CENTER SCOTT AFB IL](#)

[Full Text](#)

... report describes the evaluation of an empirical technique (WINNDEX) for predicting air-mass thunderstorms at Eglin AFB, FL. Results showed that the WINNDEX objective forecast technique had a Heidke skill score of .18 in predicting thunderstorm activity on the Eglin Range complex. A discriminant analysis model was developed that improved this skill to .32 in predicting the occurrence of thunderstorms during four 3-hour periods beginning at 1200Z. The study demonstrates the utility of USAFETAC's **lightning** database in developing and verifying a thunderstorm forecast model for remote locations.

[Studies of Enhanced Radar Backscatter](#)

Jun 14, 1993 18 pages

Authors: [Min-Chang Lee](#); [MASSACHUSETTS INST OF TECH CAMBRIDGE PLASMA FUSION CENTER](#)

[Full Text](#)

... 1 October 1991, Dr Min-Chang Lee and his students at MIT and Boston Univ., have conducted experimental and theoretical research aimed at investigating ionospheric plasma disturbances which can significantly affect radio wave propagation from satellite communications systems. His efforts have developed a theory to explain reflectivity of radio waves from **lightning** induced plasmas. In addition, his research has focused on enhanced radar backscatter, source mechanisms for generating symmetric lower hybrid sidebands in the upper ionosphere, and the characteristics of the HF enhanced plasma lines.

[Federal Fire Management: Limited Progress in Restarting the Prescribed Fire Program](#)

Dec 1990 15 pages

Authors: [GENERAL ACCOUNTING OFFICE WASHINGTON DC RESOURCES COMMUNITY AND ECONOMIC DEVELOPMENT DIV](#)

[Full Text](#)

... on federal wildlands, you asked us to evaluate the federal government's fire management program. During that season, severe wildland fires burned many parts of the western United States. The most publicized of these fires occurred in and around Yellowstone National Park, where fires started by **lightning** early in the fire season were allowed to burn, under a policy permitting 'prescribed natural fires.' When several of the fires later became wildfires, burning out of control, a public controversy ensued. This prompted the government to suspend the prescribed fire program and the Secretaries of ...

[Catalog of Absolutely Calibrated, Range Normalized, Wideband, Electric Field Waveforms from Triggered Lightning Flashes in Florida](#)

Jun 22, 1993 106 pages

Authors: [Yataka Izumi](#); [John C. Willett](#); [PHILLIPS LAB EDWARDS AFB CA](#)

[Full Text](#)

During the summer of 1987, a rocket-triggered-lightning program was conducted at the NASA Kennedy Space Center, Florida. The rocket triggering was performed from two trigger platforms - one over water and the other over land. The propagation paths from the two sites were almost entirely over brackish water. This report presents waveform plots of the electric-field time derivative, the electric field, and the high-frequency spectral density at 5 MHz.

[Advances in Infrared Instrumentation](#)

Jun 19, 1992 84 pages

Authors: [Wallace K. Wong](#); [James J. Guregian](#); [Holger Luther](#); [SSG INC WALTHAM MA](#)

[Full Text](#)

The goal of this project is to develop an IR spectrometer concept for spectral measurement of randomly occurring optical events for differentiation of man-made versus naturally occurring phenomenon such as **lightning**. Pulsewidth as short as 10 microseconds makes standard Michelson interferometer unsuitable. SSG investigated optical concepts with no moving parts by detection of a spatially extended optical fringe pattern with a linear detector array. Visible breadboard interferometer of Tilted Michelson and Common Path Triangle configurations were assembled and demonstrated successfully. We ...

[NPSNET: Environmental Effects for a Real-Time Virtual World Battlefield Simulator](#)

Sep 23, 1993 87 pages

Authors: [Daniel P. Corbin](#); [NAVAL POSTGRADUATE SCHOOL MONTEREY CA DEPT OF COMPUTER SCIENCE](#)

[Full Text](#)

... computationally cheap enough to be used in real-time applications. It is the lack of environmental effects, usable in interactive simulations, that we attempt to solve. This thesis focuses on creating a library of visually realistic environmental effects for NPSNET that includes smoke, flames, clouds, **lightning**, the passage of time and night observation devices. The algorithms were initially derived from physical models, but were found to be too computationally intensive to be used in a real-time application. Thus, it was necessary to simplify the model by depending mainly on visual realism ...

[Multiparameter Radar and Aircraft Based Studies of Microphysical, Kinematic and Electrical Structure of Convective Clouds during CaPE](#)

Mar 31, 1994 37 pages

Authors: [V. N. Bringi](#); [COLORADO STATE UNIV FORT COLLINS DEPT OF ELECTRICAL ENGINEERING](#)

... ) with vertical air motion from dual-Doppler wind synthesis (UAH). The cellular evolution starts with a warm rain phase where updrafts and a very low concentration of large drops dominate the cloud. As the supercooled drops rise in the updraft they freeze and acquire a water-coat possibly by collisions with other liquid drops. The multi-

**Full Text** parameter radar signatures clearly identify this mixed-phase zone. The cloud thereafter gets electrified which may intensify to produce **lightning** depending on cloud vertical growth, and generation of updraft/ downdrafts. Radar, Electric field, Microphysics.

[Applied Computational Electromagnetics Society Journal, Volume 9, Number 2](#) 1994 188 pages

Authors: [A. Konrad](#); [J. D. Lavers](#); [NAVAL POSTGRADUATE SCHOOL MONTEREY CA](#)

... Relations for Time-Domain and Static Electromagnetic Field Problems; The Application of the Finite Element Method in Design of Electric Motors; Three Methods for Evaluation of Frequency-Dependent Resistances and Inductances of Multiconductor Transmission Lines; Numerical Solutions of Wave Propagation in Dispersive and Lossy Transmission Lines; An Improved Network Model for Eddy Current Problems; The Finite Difference Method in Magnetic Field Problems; and A Case Study Comparing the Lossy Wave Equation to the Continuity Equation in Modeling Late-time Fields Associated with **Lightning**.

**Full Text**

[Waveform Bounding and Combination Techniques for Direct Drive Testing](#) 1994 8 pages

Authors: [Samuel Frazier](#); [Edward Parimuha](#); [Murali Tummala](#); [Thomas F. Winnenberg](#); [NAVAL AIR WARFARE CENTER AIRCRAFT DIV PATUXENT RIVER MD](#)

This paper presents various methods to combine a set of measured test signals into a composite signal. The composite signal represents the set of measured test signals by retaining the significant attributes of the original set of measured test data. The composite waveforms are generated to obtain rigorous direct drive waveforms used during aircraft **lightning** and EMP assessments. Here we propose two techniques and a hybrid method to synthesize the composite waveforms

**Full Text**

[Potential Replacements for Solvents that are Ozone Depleting Substances](#) Sep 1994 33 pages

Authors: [Lyn E. Fletcher](#); [DEFENCE SCIENCE AND TECHNOLOGY ORGANIZATION MELBOURNE \(AUSTRALIA\)](#)

... global drop in stratospheric ozone has prompted the banning of CFC-113 and 1,1, 1-trichloroethane, which are common solvents used for degreasing and cleaning electronic components. The Royal Australian Navy uses these substances in a variety of applications and has initiated a replacement program. Two applications, cleaning baluns after **lightning** strikes and cleaning electrical motors have been selected as priorities under this program. This paper assesses the suitability of various solvents for these applications. Solvents, Solubility, Terpene blends, Chlorohydrocarbons, Hydrocarbon blends

**Full Text**

[Hyperbolic Direction Finding with Sferics of Transatlantic Origin](#) Apr 1962 32 pages

Authors: [E. A. Lewis](#); [R. B. Harvey](#); [J. E. Rasmussen](#); [AIR FORCE CAMBRIDGE RESEARCH LABS HANSCOM AFB MA](#)

... area, connected by wide-band data links so that microsecond differences in pulse arrival time can be measured. The hyperbolic directions can be determined from the time differences. In a series of coordinated runs, individual sferics originating in western Europe were observed by both the New England net and the sferics net of the British Meteorological Office. The BMO furnished the geographic coordinates of the **lightning** strokes so that measurements of position could be compared. Tabulated results for 150 sferics show an average absolute deviation from the mean of only 31 nautical miles.

**Full Text**

[Electromagnetic Effects Requirements for Systems](#) Oct 4, 1993 63 pages

Authors: [DEPARTMENT OF THE AIR FORCE WASHINGTON DC](#)

This standard establishes requirements, verification criteria, and contractor tasks for electromagnetic effects protection of airborne, ground, and support systems. These effects include electromagnetic compatibility, electromagnetic interference, **lightning**, static electricity, radio frequency compatibility, electromagnetic pulse, electrical bonding, and grounding.

**Full Text**

[Cathodic Protection System Inspection 5](#) Feb 1994 6 pages

Authors: [Jim Jenkins](#); [Dan Polly](#); [NAVAL FACILITIES ENGINEERING SERVICE CENTER PORT HUENEME CA](#)

The rectifier is the heart of an impressed current cathodic protection system. As it is subject to many adverse conditions including power surges, **lightning** strikes, vandalism, physical damage, and deterioration from atmospheric exposure, frequent inspections of rectifiers are vital to keeping an impressed current system operating so that it can provide nearly continuous protection of the underground, or submerged structures that are being protected. (jg)

**Full Text**

[Brigades: Building Blocks for Force XXI](#) Apr 18, 1995 136 pages

Authors: [John A. Bonin](#); [ARMY WAR COLL CARLISLE BARRACKS PA](#)

... opportune time to revisit this echelon. Thus this paper explores an organizational level that has recently been eliminated from the active force structure - the separate brigade and the heavy separate brigade in particular. The study first traces the operational and organizational history of separate brigades focusing on several key units such as Wilder's **Lightning** Brigade, the China Relief Expedition, Task Force Butler, the Red Devils Brigade in Vietnam, and the Tiger Brigade in the Persian Gulf. This paper then develops a vision of what a brigade based Force XXI structure might look like.

**Full Text**

[Radar Studies of Aviation Hazards](#) May 31, 1995 28 pages

Authors: [F. I. Harris](#); [David J. Smalley](#); [Shu-Lin Tung](#); [HUGHES STX CORP LEXINGTON MA](#)

Hughes STX is developing algorithms/techniques that are targeted for use with the WSR-88D weather radars. Phenomena being addressed are precursors to severe weather, precursors to **lightning**, and the monitoring of potentially hazardous weather associated with baroclinic front situations. Progress made during the past year in each of the algorithms is outlined.

**Full Text**

[Integrated Terminal Weather System \(ITWS\) 1994 Demonstration Phase OT&E Final Report](#)

Nov 1995 110 pages

[Report](#)Authors: [Thomas M. Weiss](#); [Gloria Yastrop](#); [Glenn Smythe](#); [FEDERAL AVIATION ADMINISTRATION TECHNICAL CENTER ATLANTIC CITY NJ](#)[Full Text](#)

... ) weather sensors as well as aircraft in flight to provide FAA air traffic personnel with products that require no meteorological interpretation. These products include current terminal area weather and near-term predictions of significant weather phenomena (e.g., microbursts, wind shear, gust fronts, precipitation, **lightning**, terminal winds, etc.). A Demonstration/Validation (DEMVAl) of ITWS prototypes was conducted at Memphis and Orlando International Airports (MEM) (MCO) and the Memphis and Jacksonville Air Route Traffic Control Centers (ARTCC) during the summer of 1994. ITWS products were ...

[Ground Cloud Dispersion Measurements During the Titan IV Mission #K23 \(14 May 1995\) at Cape Canaveral Air Station. Volume 1 - Test Overview and Data Summary](#)

Feb 27, 1996 199 pages

Authors: [AEROSPACE CORP EL SEGUNDO CA TECHNOLOGY OPERATIONS](#)[Full Text](#)

... that took northeast and southeast trajectories out to sea consistent with rawinsonde data. The ground cloud's stabilization height was twice that predicted by REEDM. Of numerous deployed dosimeters, large HCI responses (greater than or equal 100 ppm-min) were obtained only for dosimeters on four **lightning** towers surrounding the pad and at a southeasterly position on the perimeter fence 180 meters away. REEDM predicted that a low-level inversion layer would prevent the cloud from diffusing back to ground. Aircraft HCI measurements briefly performed at altitudes as low as 400 meters 50 min after ...

[Ground Cloud Dispersion Measurements during the Titan IV Mission Number K19 \(10 July 1995\) at Cape Canaveral Air Station](#)

Mar 22, 1996 120 pages

Authors: [AEROSPACE CORP EL SEGUNDO CA](#)[Full Text](#)

... the launch plume against the rising sun. The infrared imagery results were found to be superior to the visible imagery results during most of the #K19 plume tracking since parts of the visible imagery were saturated with scattered sunlight. The imagery data show that the stabilization height of the ground cloud (1850 m) was twice that predicted by REEDM, as was found for the Titan IV #K23 launch. Ground-level HCI measurements made by dosimeters placed on the pad's **lightning** towers and perimeter fence, as well as along Phillips Parkway, also show that the ground-cloud moved to the northeast.

[Ground Cloud Dispersion Measurements During The Titan IV Mission #K21 \(6 November 1995\) at Cape Canaveral Air Station](#)

Jun 21, 1996 97 pages

Authors: [AEROSPACE CORP EL SEGUNDO CA](#)[Full Text](#)

... height predicted by REEDM is in closer agreement with the value determined by imagery for this launch than for launches #K19 and #K23 where the ground clouds were found to stabilize at heights twice those predicted by REEDM. The imagery data show that the ground cloud rose and spread with minimal east/west transport for the first 10 min following launch. Ground-level HCI measurements made by dosimeters placed on the pad's **lightning** towers and perimeter fence show that the majority of the ground-level HCI moved northwest and south-southwest of the launch pad, consistent with the imagery data.

[The Test Environment Challenge](#)

Mar 20, 1997 6 pages

Authors: [ARMY TEST AND EVALUATION COMMAND ABERDEEN PROVING GROUND MD](#)[Full Text](#)

... faces the challenge of generating natural and manmade environments that represent conditions under which new weapon systems must operate. Natural environments include weather, terrain, and natural electromagnetic (EM) conditions which traditionally have been individually tested in climatic chambers and **lightning** facilities. Manmade environments are conditions generally created by the military forces to disrupt the enemy, ranging from chemical, biological, and nuclear agents which kill or incapacitate, to electronic countermeasures and obscurants which distract or confuse its weapons (or ours ...

[A Qualitative Analysis of the Elements Required for the Successful Implementation of the 'Rolling Down-Select Strategy'](#)

Sep 1997 82 pages

Authors: [Brent A. Kelly](#); [AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH](#)[Full Text](#)

This research explored the elements required for the successful implementation of the 'rolling down-select strategy' Inspired by **Lightning** Bolt 10, this study investigated five acquisitions which have or are in the process of implementing the 'rolling down-select strategy' The results suggest several elements which appear to contribute to the successful use of the 'rolling down- select strategy' These findings can be used by acquisition planners to aid in determining whether or not the 'rolling down-select strategy' is a viable strategy for their particular acquisition.

[Ground Conductivity Estimated from Wideband dE/dt Waveshapes of Distant Lightning Sources Near Ground](#)

Nov 21, 1997 27 pages

Authors: [Jim Schueler](#); [Ewen M. Thomson](#); [FLORIDA UNIV GAINESVILLE DEPT OF ELECTRICAL AND COMPUTER ENGINEERING](#)[Full Text](#)

An electric field propagating as a ground wave over finitely conducting ground suffers Ohmic loss, which increases with frequency. This loss is a function of the ground constants (conductivity and dielectric constant) and source height. Ground conductivities were estimated from waveshape differences in dE/dt pulses arising from different propagation distances. The data were wideband dE/dt signals recorded from five measurement sites stations at Kennedy Space Center. A model was used to introduce additional loss into the closer station waveshape so that it matched the more distant ...

[A Case Study of Two Computer Methods Used to Simulate Fires in Industrial Facilities](#) Oct 27, 1997 116 pages

Authors: [Christopher Asselta](#); [DEPARTMENT OF ENERGY WASHINGTON DC](#)

... with respect to understand." Some anthropologists suggest that early humans discovered fire through spontaneous combustion. The arrangement of decaying organic matter may have been enough to generate a small fire. Conventional anthropologists argue that fire may have been first discovered in forest fires started by lightning, lava flows or other natural causes. Fire is real and must be controlled. An area to best control and minimize its destructive effects is during the design process. The design concerns for fire include: Control of ignition Control means of escape; Detection Control Spread ...

Full Text

[Air Defense Initiative \(ADI\) Clutter Model](#)

Apr 1998 124 pages

Authors: [William L. Simkins Jr.](#); [PAR TECHNOLOGY CORP NEW HARTFORD NY GOVERNMENT SYSTEMS DIV](#)

... early warning (AEW) radar environment, and quantify the number of sources as a function of radar frequency, location, season, and time of day. Analysis is presented for radars designed to operate at UHF, L-Band, and S-Band. The environments modeled included tropospheric clutter (precipitation, lightning, and turbulent layer), sea clutter (open sea and land-sea interface), distributed terrain clutter, discrete manmade clutter (buildings, vehicles, and vessels), angels (birds and insects), and aurora. ADI was initially created to provide for a defense against low radar cross section threats. The ...

Full Text

[Electromagnetic Compatibility \(EMC\) Standards Handbook](#)

Jul 1994 346 pages

Authors: [Walter C. Carter](#); [ELECTROMAGNETIC COMPATIBILITY ANALYSIS CENTER ANNAPOLIS MD](#)

Information on EMC-related standards, specifications, handbooks, and regulations is presented that includes basis, scope, interrelationships, and applications. Emphasis is on DoD documents, although non-DoD documents are also included. Among the other categories are NATO, Federal, voluntary, foreign national, and international documents. Technical disciplines covered include EMC and RADHAZ with lightning added (not separately listed). Although many areas of application are included, emphasis is placed on DoD tactical and long-haul communications.

Full Text

[Fourteenth International Wroclaw Symposium and Exhibition on Electromagnetic Compatibility, June 23-25, 1998](#)

Jul 29, 1998 764 pages

Authors: [PORTO UNIV \(PORTUGAL\) FACULTY OF ENGINEERING](#)

The Final Proceedings for 14th Int'l Wroclaw Symposium and Exhibition on Electromagnetic Compatibility, 23 June 1998- 25 June 1998 This is an interdisciplinary conference. Topics include all aspects of EMO theory and practice: antennas and propagation, biological effects, ESO, lightning, EMI reduction techniques, grounding, shielding, and absorption.

Full Text

[The Lightning Bolt and the Quill: Determining the Role of Air Force Public Affairs in Information Warfare](#)

Oct 8, 1998 50 pages

Authors: [David L. Englin](#); [HARVARD UNIV CAMBRIDGE MA](#)

As the Air Force's internal and external public voice, Air Force public affairs is uniquely positioned to influence the flow of information to different audiences about a variety of issues and operations. In this new operating environment, Air Force public affairs must determine its proper role in information warfare. The key to determining this role is to examine the tension between the public information and public relations functions of Air Force public affairs. The public information function focuses on the complete release of all information about the Air Force. The public relations ...

Full Text

[Diurnal Variations of Globally Measured ELF/VLF Radio Noise](#)

Jul 1997 124 pages

Authors: [D. A. Chrissan](#); [A. C. Fraser-Smith](#); [STANFORD UNIV CA SPACE TELECOMMUNICATIONS AND RADIOSCIENCE LAB](#)

... , then the resulting monthly diurnal variations are averaged by month over subsequent years. These calculations provide the long-term averages of the diurnal variations of ELF/VLF noise for each month and channel and at each location. Since the principal source of ELF/VLF radio noise is lightning in thunderstorms, and the various thunderstorm centers around the globe have specific diurnal signatures, these data help determine source locations of the sferics that contribute to a given station's received radio noise. In addition, since contribute to a given station's received radio noise. In ...

Full Text

[Statistical Analysis and Modeling of Low-Frequency Radio Noise and Improvement of Low-Frequency Communications](#)

Aug 1998 118 pages

Authors: [Douglas A. Chrissan](#); [STANFORD UNIV CA SPACE TELECOMMUNICATIONS AND RADIOSCIENCE LAB](#)

Naturally occurring radio noise above approximately 100 MHz is well modeled for most applications as a Gaussian random process; however, atmospheric radio noise below 100 MHz is often impulsive in nature and is not well modeled as Gaussian. Atmospheric events (mainly lightning strokes, which create electromagnetic emissions known as sferics) produce large, clustered impulses in the noise waveform seen at a receiving antenna, causing the waveform to vary greatly from typical Gaussian background noise. Due to large variations in sferic activity on a seasonal and diurnal basis and with the ...

Full Text

["Like Thunder and Lightning:" British Force Projection in the West Indies, 1739-1800](#)

1999 95 pages

Authors: [Kristian M. Marks](#); [OHIO STATE UNIV COLUMBUS](#)

In the 18th century, the Caribbean basin served as a near continuous battleground for the major European powers. While many historians tend to focus upon the North American conflict between the English and the French, they often overlook the very important Anglo-Spanish rivalry that occurred farther to the south. This latter struggle, in fact, eventually determined the balance of power in the West Indies. By the turn of the 19th century,

Full Text

England had emerged as the only true global power. When President Monroe declared the United States the protector of the Western Hemisphere in 1823, he did ...

[Like a Lightning Bolt - Information Warfare](#)

Feb 1, 1999 47 pages

Authors: [Kenneth Boll](#); [ARMY WAR COLL CARLISLE BARRACKS PA](#)

Full Text

Combatant commanders currently do not have the best possible support from information warfare doctrine and capabilities that facilitate organizing forces for offensive and defensive information warfare. A balance of offensive and defensive information power is required and this research project suggests clearer doctrinal command and control relationships, integrated ways of employment, and sufficient information warfare means to enable a joint force commander to project dominant information power. The appropriate organization for combat will include a Joint Information Warfare Task Force to ...

[Development and Testing of the F/A-18 Replacement MIL-STD-I760 Umbilical](#)

Jul 1997 12 pages

Authors: [Susan Jahn](#); [Greg Miller](#); [NAVAL AIR WARFARE CENTER AIRCRAFT DIV PATUXENT RIVER MD](#)

Full Text

... the specific problem areas of the existing cable as well as improving overall performance and service life. The service life goals for the umbilical were to be suitable for reuse for at least 25.30 releases. NAWCAD patuxent River 4.11.2 developed a testing approach for qualification of the umbilical and to credibly assess service performance potential without specific airborne release tests. The qualification effort is discussed from an overall perspective as well as details of the **lightning** testing of the connector, static and ejection testing, and captive flight testing of the cable.

[Accuracy and Reliability of a Short-Baseline Narol System](#)

Oct 1957 79 pages

Authors: [Richard A. Houghten](#); [Richard B. Harvey](#); [AIR FORCE CAMBRIDGE RESEARCH CENTER BEDFORD MA ELECTRONICS RESEARCH DIRECTORATE](#)

Full Text

... Albuquerque net, 0.4 nautical miles for the Vale net, and 0.8 nautical miles for the Rapid City net. These lines of position gave fixes having an average error of 0.8 nautical miles. In general, the times of detonation were measured with an error of less than 10 milliseconds. **Lightning** transient data were recorded and analyzed throughout the test series at various times of the day. In general, it was found that there were no consistent patterns peculiar to the waveforms, field strengths, or pulse durations of these transients that would distinguish them from the electromagnetic pulse of ...

[Electromagnetic Compatibility - 15TH International Wroclaw Symposium AndExhibition On Electromagnetic Compatibility, Part 2](#)

Jul 24, 2000 482 pages

Authors: [J. M. Janiszewski](#); [W. Moron](#); [W. Segal](#); [INSTITUTE OF TELECOMMUNICATIONS WROCLAW\(POLAND\)](#)

Full Text

... Exhibition on EMC, 27 June 2000-30 June 2000. This is an interdisciplinary conference. Subject matter will include all aspects of Electromagnetic Compatibility (EMC) theory and practice as seen in this partial list of topics for planned sessions: EMC on Component and PCB Level; **Lightning** and ESD; EMC in Communication and Power Systems; Modeling and Simulation Theory and Practice. NATO EMC issues: Military vs Civil EMC Standards - Comparisons and Problems Standard Procedures for Simulation, Prediction and Modeling Antennas and Propagation, Biological Effects of EM Radiation - Technical ...

[Electromagnetic Compatibility - 15TH International Wroclaw Symposium AndExhibition On Electromagnetic Compatibility, Part 1](#)

Jul 24, 2000 546 pages

Authors: [J. M. Janiszewski](#); [W. Moron](#); [W. Segal](#); [INSTITUTE OF TELECOMMUNICATIONS WROCLAW\(POLAND\)](#)

Full Text

... Compatibility, 27 June 2000 - 30 June 2000. This is an interdisciplinary conference. Subject matter will include all aspects of Electromagnetic Compatibility (EMC) theory and practice as seen in this partial list of topics for planned sessions: EMC on Component and PCB Level; **Lightning** and ESD; EMC in Communication and Power Systems; Modeling and Simulation Theory and Practice. NATO EMC issues: Military vs Civil EMC Standards - Comparisons and Problems, Standard Procedures for Simulation, Prediction and Modeling Antennas and Propagation, Biological Effects of EM Radiation - Technical ...

[Coercion and Land Power](#)

May 1, 2000 71 pages

Authors: [Michael H. McMurphy](#); [ARMY COMMAND AND GENERAL STAFF COLL FORT LEAVENWORTH KS](#)

Full Text

OPERATION ALLIED FORCE has become a **lightning** rod sparking strong debate within the US military. The debate revolves around the subject of decisive military action and which branch of service most contributed to the successful campaign in Kosovo. Air power enthusiasts proclaim operations in Kosovo as further vindication of the supremacy of air power. Land power enthusiasts posit that it was the contribution of land power that delivered the decisive blow in Kosovo. Useful lessons learned are obscured by parochial diatribe. Anachronistic debate between the two polarized communities ...

[Development and Testing of the F/A-18 Replacement MIL-STD-1760 Umbilical](#)

1998 12 pages

Authors: [Susan Jahn](#); [Greg Miller](#); [NAVAL AIR WARFARE CENTER AIRCRAFT DIV PATUXENT RIVER MD](#)

Full Text

... life goals for the umbilical were to be suitable for reuse for at least 25-30 releases. NAWCAD (4. 11.2) developed a testing approach for qualification of the umbilical and to credibly assess service performance potential without specific airborne release tests. The qualification effort 5 discussed from an overall perspective as well as details of the **lightning** testing of the connector, static, and ejection testing, and captive flight testing of the cable. A short summary of post. certification efforts involving the umbilical is also given along with conclusions concerning the test effort.

[National Convective Weather Forecast \(NCWF\) 1999 Assessment Report](#)

Jun 2001 77 pages

Authors: [Danny Sims](#); [Cynthia Fidalgo](#); [FEDERAL AVIATION ADMINISTRATION TECHNICAL CENTER ATLANTIC CITY NJ](#)

- The report summarizes the National Convective Weather Forecast (NCWF) 1999 Assessment conducted by ACT-320 at Comair and Delta Airlines from April through November 1999. The NCWF, developed by scientists at the National Center for Atmospheric Research (NCAR), combines radar information along with **lightning** data to produce a graphical convective detection field as well as 1- and 2-hour forecasts of convective weather. Feedback was collected from airline dispatchers and focused on the value, perceived benefit, and performance of the NCWF for airline dispatch use. The assessment demonstrated the ...
- Full Text**
- [They Too Served: A Unit History of the 496TH Fighter Training Group, 1943-1945](#) Apr 2000 58 pages  
 Authors: [David H. Kelley](#); [AIR COMMAND AND STAFF COLL MAXWELL AFB AL](#)  
 In-theater Combat Crew Replacement Centers (CCRCs) represented a brief but important stop for replacement aircrews training to replace losses in the European theater during World War II. The Eighth Air Force's 496th Fighter Training Group operated a fighter CCRC at Goxhill, England and illustrated the unique challenges and successes of the CCRC mission. The 496th Fighter Training Group overcame maintenance shortfalls, aircraft shortages and persistent morale issues to train over 2,400 fighter pilots for combat duty in the Lockheed P-38 **Lightning** and North American P-51 Mustang.
- Full Text**
- [C4I of Army Deep Operations and Air Interdiction: Fusion of Effort Within the Same Battlespace](#) Apr 2000 52 pages  
 Authors: [Brooke H. Janney](#); [AIR COMMAND AND STAFF COLL MAXWELL AFB AL](#)  
 ... the United States Army and United States Air Force. As surface force weapons and weapon systems capable of long range operations and engagements have proliferated in the last decade, this contention has increased and could arguably be the greatest joint operational issue between the services today. The doctrinal '**lightning rod**' of this debate is the Fire Support Coordination Line or FSCCL. Its use, placement, and movement have proven to be an issue that seems to defy reconciliation. Yet, when one delves into the issue and the doctrinal underpinnings of it, one finds a deeper, more fundamental ...
- Full Text**
- [Tropic Lightning Transformation](#) May 30, 2001 59 pages  
 Authors: [George Glaze](#); [ARMY COMMAND AND GENERAL STAFF COLL FORT LEAVENWORTH KS SCHOOL OF ADVANCED MILITARY STUDIES](#)  
 To manage the many strategic concerns and threats to United States interests in his area of responsibility (AOR), the Commander-in-Chief (CINC) pacific, or USCINCPAC, must have access to military assets that will provide him a variety of readily available options for effective response to missions that span the spectrum of warfare. Force providers in the Army, Navy, Air Force, and Marine Corps provide capabilities that enable USCINCPAC to implement viable options in dealing with regional shaping and crisis response situations. These options are executed in the form of force packages designed ...
- Full Text**
- [The Indirect Approach: How US Military Forces Can Avoid the Pitfalls of Future Urban Warfare](#) Oct 1998 8 pages  
 Authors: [Robert H. Scales Jr](#); [CENTER FOR ARMY LESSONS LEARNED FORT LEAVENWORTH KS VIRTUAL RESEARCH LIBRARY](#)  
 ... military professionals would prefer to avoid, is still with us. Moreover, it may be the preferred approach of future opponents. Consider one of the key lessons that emerged from the Spring 1998 Army 2025 wargame conducted at the US Army War College. The enemy (Red Force) conducted a **lightning** assault to seize and control a web of complex terrain (a large urban area). This enabled it to decapitate the political leadership and control critical lodgment areas. Designed to dismember coalition efforts and collapse American resolve, the Red Force dispersed its army within the cities and prepared to ...
- Full Text**
- [How Can the Air Force Maximize the Value of Reverse Auctioning as a Pricing Technique?](#) Mar 2002 75 pages  
 Authors: [Cynthia L. Marion-Mullins](#); [AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF ENGINEERING AND MANAGEMENT](#)  
 ... and the sellers compete with each other for the sale, driving the price steadily down until no seller is willing to go any lower. Darleen A. Druyun, Principal Deputy Assistant Secretary of the Air Force for Acquisition and Management, Washington, D.C., launched the Air Force acquisition reform "**Lightning Bolts**" initiatives. These initiatives jump-start acquisition reform to find processes leading towards a better, faster, and cheaper way of conducting business. A reverse auction is one of these processes. A review of the extant literature shows that reverse auctioning has been utilized in the ...
- Full Text**
- [Proceedings of the "Partners Along the Fall Line: Sandhills Ecology and Ecosystem Management Workshop"](#) Mar 2002 103 pages  
 Authors: [Robert C. Lozar](#); [Harold E. Balbach](#); [William D. Goran](#); [Beverly Collins](#); [ENGINEER RESEARCH AND DEVELOPMENT CENTER CHAMPAIGN IL CONSTRUCTION ENGINEERING RESEARCH LAB](#)  
 ... to other land managers across similar ecoregions. Workshop presentations included: ecosystem management challenges; activities at the Savannah River Ecology Laboratory; origin and goals of SEMP; ecoregional systems heritage and encroachment monitoring; a southern Appalachian assessment; cooperative efforts of the Southeastern Natural Resource Leaders Group; regional ecosystem management at Eglin Air Force Base, FL, and the Sonoran Desert; progress in SEMP research; the impact of **lightning** on longleaf pine ecosystems; and the relationship of coarse woody debris to red-cockaded woodpecker prey.
- Full Text**
- [Electromagnetic Diagnostics of Atmospheric Plasmas](#) Mar 2000 47 pages  
 Authors: [Frank T. Djuth](#); [John H. Elder](#); [GEOSPACE RESEARCH INC EL SEGUNDO CA](#)

... in which missile fuel generates a highly collisional plasma. Plumes from Aries rockets launched from NASA Wallops Island Flight Facility, Virginia were simultaneously monitored with radars operating at 139 MHz, 50 MHz, 430 MHz, and 2840 MHz. Absolute plume cross section and spectral signature were the measured quantities of primary interest. Additional research entailed studies of the equatorial ionosphere, investigations of upper atmosphere **lightning** flashes, and an examination of ion and Langmuir oscillations excited by the high-frequency, ionospheric modification facility at Tromso, Norway.

[Full Text](#)

[Studies of Intensive X, gamma and Optic Emission in Runaway Breakdown Process](#) Apr 2001 83 pages

Authors: [Alexander V. Gurevich](#); [LEBEDEV PHYSICS INST MOSCOW \(RUSSIA\)](#)

... investigation of 'runaway breakdown' will be in both atmospheric and in laboratory experiments. It has been established that runaway breakdown is accompanied by a strong optic, X and gamma ray emissions. The contractor will address the following advanced problems in this proposal: (1) Investigate runaway breakdown process in stationary electric field. (2) Investigate runaway breakdown phenomena in laboratory installation in conditions of cyclotron resonance. (3) Investigate the influence of combined effects of runaway breakdown and cosmic rays on **lightning** processes in thunderstorm atmosphere.

[Full Text](#)

[They Too Served: 496th Fighter Training Group, 1943-45](#) Apr 2001 55 pages

Authors: [David H. Kelley](#); [AIR COMMAND AND STAFF COLL MAXWELL AFB AL](#)

... In-theater combat crew replacement centers (CCRC) represented a brief but important stop for aircrews training as replacements for personnel lost in the European theater during World War II. The Eighth Air Force's 496th Fighter Training Group operated a fighter CCRC at Goxhill, England, and illustrated the unique challenges and successes of the CCRC mission. The 496th Fighter Training Group overcame maintenance shortfalls, aircraft shortages, and persistent morale issues to train more than 2,400 fighter pilots for combat duty in the Lockheed P-38 **Lightning** and North American P-51 Mustang.

[Full Text](#)

[From Gettysburg to the Gulf and Beyond: Coping With Revolutionary Technological Change in Land Warfare](#) 1993 100 pages

Authors: [Richard J. Dunn III](#); [NATIONAL DEFENSE UNIV WASHINGTON DC INST FOR NATIONAL STRATEGIC STUDIES](#)

... history. One day's marvel becomes a necessity of ordinary life the next. Rapid technological change permeates the whole of human existence, exhausting our mental ability to comprehend and cope. In the military realm, we have won the most technologically sophisticated war ever fought. With **lightning** speed, high-tech weaponry annihilated a massive Iraqi force while the world watched minute-by-minute from its living rooms, leading to a fundamental question of critical importance to the armed services and the nation: How does our military as an institution deal with technological change? How well ...

[Full Text](#)

[Stability and Transient Effects in Ultraviolet Filaments](#) Sep 2004 135 pages

Authors: [Thomas A. Niday](#); [ARIZONA UNIV TUCSON OPTICAL SCIENCES CENTER](#)

Short, high intensity laser pulses induce nonlinear optical effects in the atmosphere that have the potential to make them propagate for long distances. Applications for long distance propagation of short pulses include active spectral remote sensing and laser **lightning** control. Much of the work in this field has been done with infrared pulses; however, it has been proposed that ultraviolet pulses have the advantage that longer pulse lengths can be used, thereby delivering more energy. Long pulse lengths lead to a simplified instantaneous model for the plasma response, which has been shown by ...

[Full Text](#)

[Analysis of Communist Vietnamese Special Operations Forces During the Vietnam War and the Lessons That Can Be Applied to Current and Future U.S. Military Operations](#) Jun 2005 81 pages

Authors: [James M. Cloninger Jr](#); [NAVAL POSTGRADUATE SCHOOL MONTEREY CA](#)

... gathering, terrorism, assassination, and special operations in the large urban areas such as Saigon and Hue. The Naval Sapper was responsible for attacking shipping, bridges, and bases located near waterways. The Field Sapper conducted operations against deployed US and South Vietnamese troops, trained other communist troops as sappers, and gave the communist leadership an elite force for **lightning** raids. The sapper force had certain operational principles, organizational constructs and functional methods that set it apart from any other communist military element used during the Vietnam War.

[Full Text](#)

[The Iberian Leech: Napoleon's Counterinsurgency Operations in the Peninsula, 1807-1810](#) Jun 17, 2005 108 pages

Authors: [Mark A. Reeves](#); [ARMY COMMAND AND GENERAL STAFF COLL FORT LEAVENWORTH KS](#)

By 1807, Napoleon's victories over his European adversaries were legendary. His Grand Army had defeated the greatest European armies of the period. Each army, in succession, from the Hapsburg Empire to Russia, had been soundly beaten and had not been able to come to grips with how to deal with his **lightning** style of warfare. Yet, over a six year period from 1807 to 1813, in the backwater Iberian Peninsula, Napoleon lost both his prestige and more troops than he lost in the infamous wintry campaign in Russia. How did an army of bandits, priests, and commoners along with a small expeditionary ...

[Full Text](#)

[Impulse Flashover Tests at Edgar Beauchamp High Voltage Test Facility, Dixon, California, in Support of Cutler Insulator Failure Investigation](#) Jul 2006 42 pages

Authors: [P. M. Hansen](#); [G. Dann](#); [SPACE AND NAVAL WARFARE SYSTEMS CENTER SAN DIEGO CA](#)

This report describes an investigation into safety core insulator failures at Naval Radio Transmitting Station, Cutler, Maine. The failures are believed to be the result of **lightning** strikes to the antenna. Impulse tests showed that flashover occurred along the surface of the insulator when the voltage rises very fast (high dV/dt), resulting in damage to the insulators. Scale model tests were conducted to determine if different corona ring configurations

[Full Text](#)

could keep flashover away from the insulator body. Results indicated that the insulators could be protected from lightning-induced impulse ...

[Studies of Plasma Instabilities Excited by Ground-Based High Power HF \(Heating\) Facilities and of X and Gamma Ray Emission in Runaway Breakdown Processes](#)

Aug 2006 66 pages

Authors: [Aleksander V. Gurevich](#); [RUSSIAN ACADEMY OF SCIENCES MOSCOW \(RUSSIA\) LEBEDEV INST](#)

... : 1. The interaction of Langmuir turbulence with surrounding ionospheric plasma determining kinetics of thermal and suprathermal electrons; 2. The optic emission of suprathermal electrons; 3. The effect of ionospheric drifts on the generation of field aligned small scale striations; 4. The runaway breakdown process in inhomogeneous thunderstorm electric field; 5. X-ray emission in different gases due to runaway breakdown phenomena in a laboratory cyclotron installation; 6. An influence of combined effects of runaway breakdown and cosmic rays on **lightning** processes in thunderstorm atmosphere.

[Full Text](#)

[Safety Core Insulator Failures Reliability Analysis](#)

Oct 2006 21 pages

Authors: [P. M. Hansen](#); [SPACE AND NAVAL WARFARE SYSTEMS COMMAND SAN DIEGO CA](#)

... of safety core insulators. Known incidents (Navy and non-Navy installations) of safety core insulator failure since 1970 were identified and categorized, and mean time between failure estimated. In general, safety core insulators were determined to be extremely reliable. However, it was found that reliability at one Navy installation (Cutler, ME) was poor due to the different configuration of the Cutler antenna and insulator, combined with the occurrence of large **lightning** strikes in that area. The report analyzes the failures at Cutler and provides recommendations to mitigate these failures.

[Full Text](#)

[Environmental Support to Space Launch](#)

May 31, 2006 62 pages

Authors: [Sheryl F. Thorp](#); [Mike Kapel](#); [BOSTON COLL CHESTNUT HILL MA INST FOR SCIENTIFIC RESEARCH](#)

... AFSPC). Metrics include weather warnings, weather advisories (watches) and forecasts of Launch Commit Criteria (LCC). The criteria were chosen based on the meteorological conditions found in the LCC. Results demonstrate current shortfalls in forecasting across several key environmental parameters which include **lightning**, convective and non-convective winds, precipitation and temperature. Both ranges show a large number of false alarms (forecasted but did not verify) for some of the environmental parameters. Even more significant are the low success scores or the probability of issued warnings ...

[Full Text](#)

[In America's Best Interests: 1977 Additional Protocol I to the Geneva Conventions.](#)

May 2005 43 pages

[Redux](#)

Authors: [Maritza S. Ryan](#); [NAVAL WAR COLL NEWPORT RI](#)

... , incorporating "a wide range of provisions regarding protection of the wounded and sick, methods and means of warfare, and protection of the civilian population and civilian objects from dangers arising from hostilities." The United States signed the accord in December of 1977, but soon after, Protocol I became a **lightning** rod of controversy for some domestic critics. This paper will show that it is in America's best interests to revisit her decision to reject Protocol I, and if possible, to ratify it. But even failing that as a realistic option, the United States should and must make clear ...

[Full Text](#)

[Recycled Glass and Dredged Materials](#)

Mar 2007 13 pages

Authors: [Jr Lee Landris T.](#); [ENGINEER RESEARCH AND DEVELOPMENT CENTER VICKSBURG MS GEOTECHNICAL AND STRUCTURES LAB](#)

... (DM) amended with glass cullet may prove to be a marketable combination especially useful as an engineered material and construction aggregate substitute. RECYCLED GLASS: Glass is manufactured from silica sand (SiO<sub>2</sub>) and other compounds, and occurs naturally as black obsidian rock (volcanic deposit) and fulgurite (from **lightning** strikes). Man-made glass was first made by heating a sand, soda, and lime mixture, which formed a clear liquid that turned into a hard solid when cooled. Glass has been made into containers since about 1500 BC, and glass-making evolved from the Roman times about 50 AD ...

[Full Text](#)

[The Mesoscale Forecasting Process: Applying the Next Generation Mesoscale Forecast](#)

Oct 5, 2006 39 pages

[Forecast](#)

Authors: [Calvin C. Naegelin](#); [Paul J. McCrone](#); [AIR FORCE WEATHER AGENCY OFFUTT AFB NE](#)

... the cascade of energy that occurs in the atmosphere, with hemispheric features providing energy for the synoptic scale, synoptic features providing energy for the mesoscale, and so forth. Many observation and modeling tools exist to aid the forecaster along the way, including RAOB soundings, satellite imagery, wind profiler data, radar data, **lightning** data, and model data, and all are useful in mesoscale forecasting. When performing a mesoscale forecast, however, it is prudent to use a mesoscale model, such as the Air Force Weather Agency's (AFWA) Weather Research and Forecasting (WRF) model.

[Full Text](#)

[Detection of Incipient Thermal Damage in Polymer Matrix Composites \(Preprint\)](#)

Feb 2007 10 pages

Authors: [Eric Lindgren](#); [John Welter](#); [Shamachary Sathish](#); [Erik Ripberger](#); [AIR FORCE RESEARCH LAB WRIGHT-PATTERSON AFB OH MATERIALS AND MANUFACTURING DIRECTORATE](#)

Polymer matrix composite mechanical properties have been shown to decrease significantly with the presence of thermal damage. For aerospace applications, this type of damage typically occurs as a result of exposure to elevated temperatures from localized heating, such as **lightning** strikes, exhaust wash, or improper maintenance/repair procedures. Mechanical testing has shown that this type of damage, known as incipient damage, is present even when no visible damage is observable and can cause significant reduction in mechanical properties. Incipient damage is not currently readily detected with ...

[Full Text](#)

[Severe Weather Forecasting for Laughlin AFB, TX](#)

Mar 2007 99 pages

Authors: [Eric J. Cercone](#); [NAVAL POSTGRADUATE SCHOOL MONTEREY CA](#)

... of a variety of parameters commonly used to forecast deep, moist convection using upper-air observations is developed. The data set includes 0000 and 1200 UTC rawinsonde data (approximately 3629 soundings) from Laughlin AFB, TX from April September 1995 2004. Cloud-to-ground **lightning** data, surface observations, and severe weather reports from the Storm Prediction Center (SPC) SeverePlot2 Program were used to categorize soundings as representative of conditions for no convection, light convection, convection within vicinity, moderate severe convection, or severe convection. Indices, including ...

[Full Text](#)[Digital C4I Interoperability: The EM Protection Issue](#)

Oct 2000 12 pages

Authors: [Robert Pfeffer](#); [ARMY NUCLEAR AND CHEMICAL AGENCY FORT BELVOIR VA](#)

In this paper, a unified protection methodology is applied to a digital mobile C4I platform subjected to several human-generated and nature-generated EM environments and effects. The unclassified values for self-induced electromagnetic interference (EMI), EM radiation (EMR), electrostatic discharge (ESD), near-strike **lightning**, and high-altitude EM pulse (HEMP) came from ML-STD-464 and several commercial standards. By applying this methodology the EM protection requirements were estimated to be 70 dB enclosure port protection for frequencies between 100 MHz and 5 GHz, and 80 dB penetration ...

[Full Text](#)[Reluctant Samurai? Partnering with Japan to Combat Terrorism](#)

Apr 2006 43 pages

Authors: [Derek A. West](#); [AIR COMMAND AND STAFF COLL MAXWELL AFB AL](#)

The tragedies of 11 September 2001 brought into focus the United States and Japan's shared common values and vulnerability to asymmetric attacks by terrorists. It was as if a flash of **lightning** from out of the blue illuminated shared fears around the world. Memories of the Aum Shinrikyo (Aum Supreme Truth) sarin-gas attack on the subway system of Tokyo in March 1995 intensified the horror felt by the Japanese people as they watched the World Trade Center attack on television. The impact hit home for them upon learning 24 Japanese citizens died in the attacks along with approximately 3,000 ...

[Full Text](#)[Detection of Incipient Thermal Damage in Polymer Matrix Composites \(Preprint\)](#)

Dec 2006 10 pages

Authors: [Eric Lindgren](#); [John Welter](#); [Shamachary Sathish](#); [Erik Ripberger](#); [AIR FORCE RESEARCH LAB WRIGHT-PATTERSON AFB OH MATERIALS AND MANUFACTURING DIRECTORATE](#)

Polymer matrix composite mechanical properties have been shown to decrease significantly with the presence of thermal damage. For aerospace applications, this type of damage typically occurs as a result of exposure to elevated temperatures from localized heating, such as **lightning** strikes, exhaust wash, or improper maintenance/repair procedures. Mechanical testing has shown that this type of damage, known as incipient damage, is present even when no visible damage is observable and can cause significant reduction in mechanical properties. Incipient damage is not currently readily detected with ...

[Full Text](#)[Naval Law Review, Number 55, 2008](#)

2008 402 pages

Authors: [Syed N. Ahmad](#); [David M. Gonzalez](#); [Jon D. Peppetti](#); [David G. Wilson](#); [Benjamin V. Madison Lofland III](#); [Keith B. John A. Wickham](#); [Jessica Hudson](#); [Kyle Fralick](#); [John A. Sautter](#); [NAVAL JUSTICE SCHOOL NEWPORT RI](#)

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Authors: [Michael W. Wynne](#); [Michael Moseley](#); [SECRETARY OF THE AIR FORCE WASHINGTON DC](#)

... Tomorrow's Challenges. The Air Force's top acquisition priorities specifically begin to address our critical recapitalization and modernization needs the new Tanker (KC-X); the new Combat Search and Rescue Helicopter (CSAR-X); modern space systems to provide capabilities vital to our Joint warfighters; the F-35A **Lightning** II; and a new Bomber we intend to field by 2018. We will continue our efforts to modernize and protect America's vital air, space, and cyberspace capabilities. We strongly recommend extending the existing C-130J production line. We are also concerned with preserving America ...

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Aug 1986 9 pages

Authors: [James A. Knaur](#); [ARMY MISSILE COMMAND REDSTONE ARSENAL AL](#)

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waves. **Lightning** discharges trigger this global resonance, which is known as Schumann resonances at the frequencies of 8, 14, 21 Hz etc. Even though the inhomogeneity (like day-night asymmetry, local perturbation etc.) is important for such subionospheric ELF propagation, the previous analyses have been always made by some approximations because the problem is too complicated to be analyzed by exact full-wave analysis. This paper presents the first application of the conventional FDTD ...

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