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THE DISPENSING AND BEHAVIOR OF CHAFF IN SPACE Apr 12, 1961 49 pages

Authors: J. H. HENSON; J. W. CRAIG; TEXAS UNIV AT AUSTIN DEFENSE RESEARCH LAB

Full Text

... made to determine some possible methods of dispensing **chaff** at very high altitudes. Secondly, the behavior ... separating dipoles in a space-like environment, (2) when dispensing fluid-saturated **chaff** in a low-pressure environment, the dipole velocity is approximately linear with the square root of the fluid vapor pressure, (3) **chaff** dispensed omnidirectionally from a vehicle in a circular geocentric orbit will form a belt around the earth, and (4) **chaff** given a uniform dispensing velocity perpendicular to the original circular orbital velocity will produce a **chaff** cloud which grows and changes ...

Optimal Estimation of Target in Clutter (CHAFF) from Radar Dec 1985 80 pages

Authors: Akylas D. Katsicogiannis; NAVAL POSTGRADUATE SCHOOL MONTEREY CA

Full Text

This work produced a simulation capable of giving the effectiveness of **chaff** used in the self-protective mode. Signal processing techniques were studied in **chaff** discrimination in crucial missile conditions. A missile-ship-**chaff** model will be constructed to provide the optimum confusion of the missile. The radar included in this simulation is a tracking radar with conical-scan modulation. Results of simulation runs illustrate the effects of varying **chaff** radar cross section when ship and **chaff** are in the same resolution cell.

Jamming Performance of Infrared Bait/Chaff Aug 17, 1995 13 pages

Authors: Gongpei Pan; NATIONAL AIR INTELLIGENCE CENTER WRIGHT-PATTERSON AFB OH

Full Text

... of infrared guidance and radar guidance jamming with infrared bait and **chaff** has been proven in modern high-tech warfare. Their jamming ... radiation of the infrared bait, and radar reflective waves from **chaff** to simulate the target (such as aircraft, warships, tanks, and point ... , and confusion mode. Study of the jamming performance of infrared bait and **chaff** is required in developing the smoke, flame, light, and electric/sourceless ... and practical to enhance the jamming performance of infrared bait and **chaff**, as well as to extend the jamming frequency spectrum. ANNOTATION: Jamming ...

CHAFF COUNTERMEASURES AND AIR DEFENSE RADAR DESIGN, Apr 1959 70 pages

Authors: John H. Bryan; STANFORD RESEARCH INST MENLO PARK CA

Full Text

Chaff may be used in a veriety of ways to protect attacking bombers from air defense radars. This report considers the operational problem of **chaff** as a threat to U.S. radars by first surveying the technical characteristics of **chaff** and of anti-chaff techniques and then examining the characteristics tactical **chaff** defense problem in the light of these technical characteristics. (Author)

Response of an Airborne-Short-Pulse Radar to Chaff, Apr 1972 54 pages

Authors: James E. Seltzer; HARRY DIAMOND LABS WASHINGTON D C

Full Text

... the radar approaches the cloud from above and moves into and through the cloud. The **chaff** cloud is modelled as a collection of randomly oriented dipoles having a mean volume density that is a function of altitude but invariant in a horizontal plane. The statistics of the **chaff** echo power when the number of dipoles in the resolution volume is large are reviewed. The impulse ... resolution cell as a function of the position of the radar relative to the cloud are derived for several **chaff** cloud configurations and antenna patterns. Power spectral density functions for range-gated ...

An Empirical Self-Protection Chaff Model Dec 1984 74 pages

Authors: Robert J. Rohrs; AIR FORCE INST OF TECH WRIGHT-PATTERSONAFB OH SCHOOL OF ENGINEERING

Full Text

... the simple, quick running simulation that was desired. This thesis produced a simulation capable of charting the effectiveness of **chaff** used in the self-protective mode. Simulation results can be used to determine which type/design of **chaff**/**chaff** canister will produce a greater probability of breaklock for a given scenario. The radar ... the effect of MTI blind speeds. Results of several simulation runs illustrate the effects of varying **chaff** radar cross section and aircraft velocity on the probability of attaining breaklock, Although ...

Simulation of Chaff Cloud Signature Dec 1985 58 pages

Authors: Richard P. Fray; AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF ENGINEERING

Full Text In this thesis time-varying radar cross sections of **chaff** clouds are generated for use in radar/ECM computer simulations, under the assumption that scattering from **chaff** clouds is a wide sense stationary random process. For a jointly gaussian random ... also derived from gaussian variables to present an alternative way of describing the probability distributions of **chaff** cloud cross sections. Topics for further study are suggested. Keywords: **Chaff** simulation, Correlation techniques, Electronic countermeasures, Radar confusion reflectors, and Radar cross sections. ...

Environmental Effects of RF Chaff. A Select Panel Report to the Undersecretary of Defense for Environmental Security Aug 31, 1999 85 pages

Authors: Barry J. Spargo; NAVAL RESEARCH LAB WASHINGTON DC

Full Text This report presents the assessment of the environmental effects of radio-frequency (RF) **chaff** as determined by a Select Panel of university-based research scientists, each with published expertise in ... , "upper bounds" (or worst-case) estimates based on the amounts and areas of **chaff** use, analysis of known lecture data related to the effects of RF **chaff**, and reasonable, prudent extrapolations and derivations from these data. The Panel concludes that environmental, human, and agricultural impacts of RF **chaff** as currently used are minimal to be based on all the data, analyses, estimations, and ...

Chaff Radar Cross Section Studies and Calculations May 1978 42 pages

Authors: R. J. Garbacz; OHIO STATE UNIV COLUMBUS ELECTROSCIENCE LAB

Full Text The objective of Contract F33615-C-1024 has been to analytically and experimentally investigate **chaff** scattering and the reduction of antenna-related radar cross section. This final report summarizes results obtained during the interim 1 January 1976 through 30 June 1977 on the **chaff** aspect of the effort. Included are summaries of (1) an investigation of scattering by a long wire excited by either a plane wave or by a nearby short dipole with sinusoidal current distribution and (2) an experimental study of small foam shapes very densely coated with **chaff** filaments. (Author)

Chaff Theoretical/Analytical Characterization and Validation Program Sep 30, 1981 124 pages

Authors: E. F. Knott; D. J. Lewinski; S. D. Hunt; GEORGIA INST OF TECH ATLANTA ENGINEERING EXPERIMENT STATION

Full Text This report describes the modeling of radar returns from **chaff**. The dipoles are allowed to follow helical paths as they fall, and the signal scintillation characteristics of the entire **chaff** cloud are assumed to be the same as those of a small collection of up to 1000 dipoles. The dipole motion ... computed assuming a bivariate Gaussian distribution for the dipole number density in a plane transverse to the axis of a plume of **chaff**. The computation of the amplitude requires a numerical integration of the product of the radar antenna radiation pattern ...

Bistatic Radar Cross Sections of Chaff Jun 1983 40 pages

Authors: Peyton Z. Peebles Jr.; Barry Stann; FLORIDA UNIV GAINESVILLE ELECTRONIC COMMUNICATIONS LAB

Full Text Bistatic cross sections applicable to scattering from a cloud of randomly positioned and randomly oriented resonant dipoles, or **chaff**, are found. The **chaff** cloud can have an arbitrary location relative to an illuminating radar and the radar antenna can have an arbitrarily specified polarization. The receiver can be located arbitrarily in relation to the radar and **chaff** cloud and can also have arbitrary polarization (different from transmitter antenna). Average cross sections are found a preferred receiver polarization, and the ...

Errors Inherent in Chaff Centroid Tracking. Jul 1970 38 pages

Authors: C. R. Mullin; GENERAL RESEARCH CORP SANTA BARBARA CA

Full Text An analysis of the errors inherent in tracking the radar-cross-section centroid of a **chaff** cloud shows the centroid to have a random motion in addition to its long-term motion with the **chaff** cloud. This random motion can lead to errors in cloud trajectory estimation. There is a further error caused by the fact that the centroid does not exactly follow a Keplerian orbit. The deviation is slight, however, and can be neglected. (Author)

Statistics of Electromagnetic Scattering from Chaff Clouds Apr 1975 58 pages

Authors: Vittal P. Pyati; AIR FORCE AVIONICS LAB WRIGHT-PATTERSON AFB OH

Full Text Starting from first principles, the first and second order probability densities of the scattered field from **chaff** clouds are derived. Auto-correlation functions and power spectra of the received voltage, radar cross section and phase are obtained. All the ... that an integral relation exists between the speed distribution function and the intensity auto- correlation function. The utility of second order statistics in studying the effects of **chaff** clutter fluctuations on advanced radars such as moving target indicator is demonstrated. Finally, numerical results are included both from an actual ...

A Time Domain Simulation of the Pulsed Radar Return from a Chaff Cloud May 1992 50 pages

Authors: Thoman A. Winchester; ELECTRONICS RESEARCH LAB ADELAIDE (AUSTRALIA)

Full Text A numerical technique for the time domain simulation of the radar return from a **chaff** cloud is developed. This technique is suitable for pulsed radars. A Monte-Carlo analysis of the effect of this return upon the range discriminant of typical pulsed radar systems is then carried out. **Chaff**, Radar signals, Time domain, Pulse radar, Monte carlo method, Ship defense systems.

Chaff Aerodynamics Nov 1975 166 pages

Authors: James Brunk; Dennis Mihora; Peter Jaffe; ALPHA RESEARCH INC SANTA BARBARA CA

Full Text

The aerodynamic characteristics of thirteen distinct **chaff** dipole configurations were determined from drop tests of individual elements in a special enclosed test chamber. The dipole motion and trajectory were recorded by multi-image photographs taken by orthogonal still cameras equipped with specially designed synchronized rotating shutters. The dynamic behavior and descent rate of the dipoles was found to depend greatly upon the principal cross-section dimensions of the filaments. Aerodynamic forces and moment coefficients for each dipole configuration were computed from the photographic ...

Radar Chaff: A Bibliography Nov 1983 58 pages

Authors: Peyton Z. Peebles Jr; FLORIDA UNIV GAINESVILLE ELECTRONIC COMMUNICATIONS LAB

Full Text

A search has been conducted to find unclassified literature citations related to the electromagnetic wave scattering properties of radar **chaff**. Over 155 specific citations (not including books) were found and compiled chronologically, with abstracts, in a main bibliography. They were also separately listed into 1 or more of 10 specific categories according to content.

Bistatic Radar Cross Sections of Horizontally Oriented Chaff Mar 1984 40 pages

Authors: Peyton Z. Peebles Jr; FLORIDA UNIV GAINESVILLE ELECTRONIC COMMUNICATIONS LAB

Full Text

Bistatic Radar Cross sections are determined for scattering from a cloud of randomly positioned resonant dipoles (**chaff**). Dipoles are assumed to be horizontally oriented with axes randomly oriented in the horizontal plane. The cloud is arbitrarily located relative to an illuminating source having an arbitrary (elliptical) polarization. Cloud cross section is found for an arbitrarily located receiver that views the cloud with an antenna of arbitrary polarization. A cross section applicable to the receiver's orthogonal polarization is also found.

The Use of Chaff in Space as a Jamming Device between Ground Stations and Satellites Dec 1988 183 pages

Authors: Alan R. Sterns; AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF ENGINEERING

Full Text

This study predicts the time evolution of the attenuation characteristics of a **chaff** cloud deployed in orbit around the earth. The study consists of three parts: applying the statistical mechanics solution of a satellite breakup model by William Heard of the Naval Research Laboratory, solving for particle density at any time after dispensing, and calculating the attenuation of an 8 GHz signal through the cloud. The study shows that significant levels of signal attenuation can be achieved, with attenuations of greater than -50 db lasting for several hours. Theses. (rh)

Explosive Generation of Chaff Jun 1979 24 pages

Authors: I. M. Napier; I. L. Thompson; WEAPONS SYSTEMS RESEARCH LAB ADELAIDE (AUSTRALIA)

Full Text

A new concept for the explosive generation and rapid dispersal of **chaff** for electronic countermeasures has been investigated. Promising results were obtained in static tests but these and theoretical estimates of radar cross section conflicted with the very low values actually obtained in experiments monitored by radar. Very short bloom times were realized in these experiments. (Author)

A Collaborative High Alitude Flow Facility (CHAFF): University Facility for Studies of High Altitude Propulsion Plumes, Liquids and Gas Releases, and Interactions Sep 30, 1998 38 pages

Authors: E. P. Muntz; Fred Lutfy; Andrew Ketsdever; Steve Vargo; UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF AEROSPACE ENGINEERING

Full Text

Interest in realistic simulation of the space environment as applied to the study of contamination and thruster plumes has led to the development of the CHAFF-4 facility. A multi-fin cryogenically cooled array (approx. 20K) completely envelops the interior of the CHAFF-4 chamber, providing an available condensing surface area of 590 m2. It is anticipated that the equivalent altitudes that can be simulated for various electric propulsion systems vary between 150-350 km (depending on type). The effective pumping speed is predicted to be about 9x106 liters/sec. The facility is designed to ...

MEASUREMENTS USING A POLARIZATION INSTRUMENTATION RADAR ON SELECTED TARGETS Apr 1962 51 pages

Authors: I. D. OLIN; F. D. Queen; NAVAL RESEARCH LAB WASHINGTON DC

Full Text

... of such factors as propeller modulation on polarized component return. An F3H jet aircraft was examined during flight and while dispensing **chaff**. Echo-area calibration indicates nose-on and broadside cross- section areas on the order of 120 and 12,000 sq ft, respectively. The characteristics of **chaff** and sea return were examined in detail. Although the return from **chaff** and the sea appears equally noisy, sea return displays prominent power fading, whereas the **chaff** also displays polarization changes. (Author)

The Measurement of Dipole Angle Distribution Jul 1982 41 pages

Authors: J. H. Wilkin; CRYPTEC PETERSFIELD (UNITED KINGDOM)

Full Text

Chaff has been in existence for more than forty years and it is perhaps remarkable that it is remained a ... of major advances in electronics and the resulting improvements in the capabilities of radars. The fact that **chaff** remains viable today is demonstrated in its increasing use by all of ... be fully exploited, or even understood. Knowledge of even the basic characteristics of **chaff** is very limited and there is a great need to improve our ... the development of Warsaw Pact weapon systems and the extensive use of **chaff** by the countries of the Pact, but perhaps the most compelling reason is the recent ...

Estimation of Aluminum Contributions of U.S. Navy Flight Training Operations in the Chesapeake Bay Jun 2000 33 pages

Authors: Cody L. Wilson; Anis Miladi; Robert L. Carpenter; William K. Alexander; Kenneth R. Still; NAVAL HEALTH RESEARCH CENTER WRIGHT-PATTERSON AFB OH TOXICOLOGY DETACHMENT

Full Text

This document reports the results from an investigation of the impact of aluminized glass **chaff** countermeasures on environmental aluminum levels in the Chesapeake Bay. This study was ... over the potential environmental hazards that might be associated with the release of aluminized glass **chaff** fibers during training exercises by Naval aviators. **Chaff** used to provide protection against radar based attack on aircraft and other military vehicles is ... in the Chesapeake Beach region of the Chesapeake Bay, an area over which **chaff** countermeasure flight training operations have been conducted for nearly ...

Final Environmental Assessment for the Defensive Training Initiative, Cannon Air Force Base, New Mexico Sep 2001 211 pages

Authors: John K. Austin; G. M. Brown; Maureen Cunningham; Linda DeVine; Dave Dischner; Bill Doering; Jerry Dougherty; Claudia Druss; Michele Fikel; Kimberly Freeman; AIR COMBAT COMMAND LANGLEY AFB VA

Full Text

... reflexive maneuvering, and dispensing of defensive countermeasures. Defensive countermeasures include **chaff** that confuses enemy search radars and radar-guided missiles, and ... 27 FW, the proponent of this action, currently conducts training using **chaff** and flares, but is limited to the restricted airspace associated with the ... /5105). The 27 FW proposes to conduct defensive training using **chaff** and flares in the existing military airspace designated as Pecos Military ... Control Assigned Airspace (ATCAA), Sumner ATCAA, and Taiban MOA. **Chaff** use also is proposed for defensive training in the northern ...

Characterization of the Ecotoxicity of Five Biodegredable Polymers Under Consideration by NAVAIR for Use in Chaff-Dispensing Systems Mar 21, 2001 67 pages

Authors: Darryl P. Arfsten; Cody A. Wilson; Kenneth R. Still; Barry J. Spargo; John Callahan; NAVAL HEALTH RESEARCH CENTER WRIGHT-PATTERSON AFB OH TOXICOLOGY DETACHMENT

Full Text

The accumulation of discarded **chaff** dispenser styrene piston and endcaps in the environment is a concern of the Department of Defense. Five biodegradable materials are being considered for use in the manufacture of degradable **chaff** cartridges pistons and endcaps. Relative degradability of the materials is being evaluated by measuring total organic carbon (... Information gained from these studies will be used making decisions on which (if any) of the polymers will be suitable for the construction of biodegradable **chaff** cartridges, pistons, and endcaps.

Robust Detection of Stepping-Stone Attacks Nov 2006 9 pages

Authors: Ting He; Lang Tong; CORNELL UNIV ITHACA NY SCHOOL OF ELECTRICAL AND COMPUTER ENGINEERING

Full Text

The detection of encrypted stepping-stone attack is considered. Besides encryption and padding, the attacker is capable of inserting **chaff** packets and perturbing packet timing and transmission order. Based on the assumption that packet arrivals form renewal processes, and a pair of such renewal ... Theory. An efficient algorithm is proposed based on the detector structure to detect renewal processes with linearly correlated interarrival times. It is shown that the proposed algorithm is robust against an amount of **chaff** arbitrarily close to the amount of **chaff** needed to mimic independent processes.

Performance Characteristics of Meteorological Rocket Wind and Temperature Sensors Oct 1962 39 pages

Authors: NORMAN J BEYERS; OTTO W THIELE; Norman J Wagner; WHITE SANDS MISSILE RANGE NM

Full Text

... tests, and the Meteorological Rocket Network resulted in coordinated firings designed to provide a synoptic picture of the high atmosphere. Rocket-borne inertial systems consisting of radar **chaff** and metalized parachutes were utilized to determine wind flow in the altitude range from 50,000 to 250,000 ft. Fall velocities, parachute oscillations, **chaff** dispersion, and wind sensor lag times were examined with radar and radiosonde ground equipment. Some of the problems involved in the temperature measuring system ...

APPLICATION OF METEOROLOGICAL ROCKET SYSTEMS Jan 1959 7 pages

Authors: Willis L Webb; Kenneth R Jenkins; ARMY ELECTRONICS RESEARCH AND DEVELOPMENT ACTIVITY WHITE SANDS MISSILE RANGE NM

Full Text

... a reasonable observation schedule can be accomplished by the judicious application of currently available rockets and sensors. The most variable of high-atmosphere meteorological parameters is the flow. **Chaff** was used initially for rocket wind measurements because it could be expected to provide a suitable indication of the wind in the atmosphere above balloon sounding levels. It is easy to package and deploy. Most of the available high-atmosphere wind data have been obtained through use of a **chaff** sensor, and it is still most applicable for point measurements and at very high altitudes.

Polarization Processing Techniques Study Nov 1979 150 pages

Authors: Albert Klein; David Hammers; Masaaki Fujita; George Ioannidis; Nhan Levan; ITT GILFILLAN VAN NUYS CA

Full Text

Polarization serves as a discrimant between radar targets and surrounding **chaff** and clutter. A dual channel system is required to utilize polarization information which exists in the target scattering matrix. Several methods are presented for designing an optimum polarization codes transmit waveform and matched coherent receiver based on target and clutter statistics. Simulation results for various target models against **chaff** show a significant increase in detectability for the two-channel system.

Signal-Filter Design and System Performance for Polarimetric Radar Jul 1987 133 pages

Authors: Richard A. Altes; Stephen F. Connelly; James R. Miller; Kishan G. Mehrotra; H. Liu; ORINCON CORP LA JOLLA CA

Full Text

... the computational results. Some important insights have been obtained from the SIR expression for distributed planar targets and randomly oriented dipole clutter, i.e, for the typical target in **chaff** problem. These insights

have resulted in the design of a new polarimetric clutter canceller which theoretically allows a polarimetric radar to see through **chaff**. Signal-to- interference ratio (SIR) maximization has been used to obtain an optimum signal-filter pair for polarimetric radar when targets and/or clutter exhibit ...

The Shootdown of Trigger 4 Apr 2001 49 pages

Authors: Todd P. Harmer; C. R. Anderegg; DEPARTMENT OF THE AIR FORCE WASHINGTON DC

Full Text

... North Vietnam on 29 July 1972, engaged and shot down a MiG-21, a kill credited to Cadillac 1. Shortly thereafter, Pistol, a flight of four F-4s, escorting a **chaff** mission, engaged and shot down a second MiG-21. Almost immediately thereafter, a third MiG-21 shot down Trigger 4, one of a flight of four that was also escorting the **chaff** mission. However, research conducted at Air University over the past few years challenged the official record by suggesting that Trigger 4 was mistakenly shot down by ...

Secure Learning and Learning for Security: Research in the Intersection May 13, 2010 208 pages

Authors: Benjamin I Rubinstein; CALIFORNIA UNIV DAVIS DEPT OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

Full Text

... up of 99% regular legitimate and spam messages, and 1% dictionary attack spam messages containing legitimate words. By increasing the FPR the adversary a defects a Denial of Service attack on the filter. In the second case-study, the False Negative Rate of a popular network-wide anomaly detector based on Principal Components Analysis is increased 7-fold (increasing the attacker's chance of subsequent evasion by the same amount) by a variance injection attack of **chaff** traffic inserted into the network at training time. This high-variance **chaff** traffic increases the traffic volume by only 10%.

FRAGMENTATION TEST OF ROD-EXPELLING WARHEAD NO. 143 Jun 1953 1 pages

Authors: J. GORMAN; NAVAL WEAPONS LAB DAHLGREN VA

Full Text

... mass distribution of 4.74-in.-diam Composition C-3 loaded rodexpelling war heads was determined. The war heads were internally slotted to produce 26 rodlike fragments, each weighing 350 g and 12 in. long. In tests war head no. 143-2, employing a full-length 1/16-in.-thick liner, produced fragments averaging 320 g each. Twenty-four fragments were full length and the other 2 were 11.75 and 10.0 in., respectively. The amount of **chaff** obtained in the war head was reduced by the full-length cork liner. A 3/16-in. cork liner 8 in. long was used in war head no. 143-1, but was not as successful.

STUDY AND MODIFICATION OF CONVECTION STORMS Mar 30, 1963 132 pages

Authors: T. B. Smith; C. J. Todd; Chen-Wu Chien; Betsy Woodward; METEOROLOGY RESEARCH INC PASADENA CA

Full Text

... cumulus clouds of all sizes were investigated using a coordinated system of two instrumented aircraft, two ground radars, and a ground network. There were cases of small and large cloud seeding by dry ice drops and by silver iodide from ground and from an additional aircraft. The investigations were coordinated with the studies of USAERDL, which used three aircraft, a limited ground network, and several lightning study stations, for probing lightning development and characteristics, IR measured ground temperatures, condensation nuclei and seeding with condensation nuclie apparatus and **chaff**.

REVIEW OF THE HIGH ALTITUDE RESEARCH PROGRAM (HARP) Jul 1966 37 pages

Authors: C. H. Murphy; G. V. Bull; ARMY BALLISTIC RESEARCH LAB ABERDEEN PROVING GROUND MD

Full Text

... from 20 pound, 5- inch projectiles reaching 240,000 feet to 185-pound, 16-inch projectiles reaching 470,000 feet. Single and multiple stage rockets launched from the 16- inch gun have very promising predicted performance and are under development. Scientific results to date are primarily wind profiles measured by radar **chaff**, aluminized balloons and parachutes, and tri-methyl-aluminum trails, although a number of successful 250 MHz and 1750 MHz telemetry flights were made. Sun sensors, magnetometers, and temperature sensors were flown and an electron density sensor was fired in early June.

TEST FIRING SERIES, PROJECT HARP Jun 1965 249 pages

Authors: H. J. Luckert; MCGILL UNIV MONTREAL (QUEBEC) SPACE RESEARCH INST

Full Text

... firings during three nights. In three of these rounds a 250 MHz telemetry package was carried with a temperature gauge and a magnetometer for temperature and magnetic field measurements. Modified Martlet 2C vehicles were instrumented with 1750 MHz telemetry and Langmuir probes, as well as with a magnetometer and temperature gauges, for electron density measurements in the upper atmosphere. Ejection tests with S-band **chaff** and parachute-suspended telemetry were also included in this series, and the structural performance of rocket grain at high launch accelerations was tested in two rounds.

WIND MEASUREMENTS IN THE SUBPOLAR MESOPAUSE REGION Jan 1967 30 pages

Authors: James E. Morris; ARMY ELECTRONICS COMMAND WHITE SANDS MISSILE RANGE NM ATMOSPHERIC SCIENCES LAB

Full Text

Mesospheric wind data obtained with a new high altitude Loki system during the summer of 1966 over Fort Greely, Alaska, are presented. Soundings, utilizing very light **chaff** as a wind sensor, were scheduled near noon and midnight for a 50-hour period. These data are from a sparsely sampled region of the atmosphere. The diurnal variations and the high velocities observed give valuable information regarding noctilucent clouds, atmospheric tidal oscillations, and the mean summer flow near the subpolar mesopause.

AEROSPACE APPLICATION OF GUN LAUNCHED PROJECTILES AND ROCKETS Feb 1968 45 pages

Authors: Charles H. Murphy; Gerald V. Bull; MCGILL UNIV MONTREAL (QUEBEC) SPACE RESEARCH INST

Full Text ... an approach lies in the very high accelerations experienced by gun-launched payloads. The guns used in Project HARP vary in size from 5-inch and 7-inch extended guns on mobile mounts to transportable fixed 16-inch guns. Altitude performance varies from 20 pound, 5- inch projectiles reaching 240,000 feet to 185-pound, 16-inch projectiles reaching 590,000 feet. Scientific results to date are primarily wind profiles measured by radar **chaff**, aluminized balloons and parachutes, and tri-methyl- aluminum trails, although a number of successful 250 MHz and 1750 MHz telemetry flights have been made.

Adaptive Cancellation of Scattered Interference Mar 1984 78 pages

Authors: L. E. Brennan; W. L. Doyle; I. S. Reed; ADAPTIVE SENSORS INC SANTA MONICA CA

Full Text This is the final report on a 1 year study of methods of adaptively cancelling scattered jamming. The results contained in this report are relevant to interference scattered into the main beam of a radar or communication system from terrain or **chaff** illuminated by a jammer. These same techniques can be applied to jamming scattered into the sidelobes or main beam of a receiving antenna from scatterers near the antenna, i.e., the multipath problem, which is an important limitation in some adaptive nulling systems.

Airworthiness and Flight Characteristics Test of a Sixth Year Production UH-60A Jun 1985 115 pages

Authors: Robert M. Buckanin; Michael K. Herbst; Roy A. Lockwood; Gary L. Skinner; Patrick J. Sullivan; ARMY AVIATION ENGINEERING FLIGHT ACTIVITY EDWARDS AFB CA

Full Text ... at a referred rotor speed (N sub R/sqare rot theta) of 258 revolutions per minute. Of this increase, 2.5 was attributed to the External Stores Support System fixed provision fairings, 1.5 sq ft to the external mounting brackets of the AN/ALQ-144(V) infrared countermeasures set and M130 **chaff** dispenser, and 1.0 sq ft to numerous other minor external changes. However, throughout the N sub R/square root theta range, the difference in power required between the first and sixth year production aircraft does not equate to a constant Fe. A limited investigated did not completely account for the ...

Doppler Radar Analysis of Coastal Marine Atmospheric Boundary Layer Structure during a Cold Air Outbreak 1988 131 pages

Authors: Michael N. Jones; AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH

Full Text ... . Time-height plots of horizontal wind spread, vertical velocity, horizontal divergence and deformation were constructed to depict the temporal variation of the MABL. Horizontal wind speed and direction versus altitude were plotted for each VAD analysis in order that anomalies in the MABL wind profiles may be identified and explained. The VAD analysis radius was varied between 5 and 15 kilometers so that spatial distribution of the wind field could also be observed. **Chaff** was dispersed by aircraft at a distance equivalent to 40 minutes travel distance upwind from the radar network. (R.H.)

Preliminary Airworthiness Evaluation of the AH-64A Equipped with the Air to Air Stinger (ATAS) Missile System Dec 1988 118 pages

Authors: John S. Lawrence; Joseph A. Lyle; Gerald J. Hopkins; ARMY AVIATION ENGINEERING FLIGHT ACTIVITY EDWARDS AFB CA

Full Text ... sighting symbology, which does not provide the copilot/gunner with accurate missile seeker line of sight relative to the selected sight line of sight except in FLIR wide field of view; reduction in storage space imposed by the ATAS installation in the aft storage bay; location of the repositioned **chaff** fire switch on the cyclic hand grip; and the manual reset feature of the ATAS missile sequencing logic. The absence of an altitude encoding feature in the installation of the AN/APX-100(V) transponder was a shortcoming not associated with the ATAS modification. Seven recommendations specific to ...

A Simulation of a Combined Active and Electronic Warfare System for the Defense of a Naval Ship Against Multiple Low-Altitude Missiles Threat Sep 1989 97 pages

Authors: Hua K. Chia; NAVAL POSTGRADUATE SCHOOL MONTEREY CA

Full Text A computer simulation model was developed (interactive Simulation of System Performance, or ISSP) simulating the integrated performance of hard-kill (surface-to-air missile, and close-in weapon system) and soft-kill (defensive jammer, or ECM, and **chaff**) systems in the defense of a single naval ship against attack threat by four anti-ship missiles. The quantitative contribution of each system to ship survivability is evaluated. The hard-kill and soft-kill weapon systems are the focus of the two major anti-air warfare (AAW) improvement plans assessed in this simulation. Based on on these plans, ...

Electronic Warfare Technology - Trends and Visions May 1990 14 pages

Authors: Kenneth Helberg; Tony White; Kevin Geiger; Joseph Koesters; David Wilkes; WRIGHT RESEARCH AND DEVELOPMENT CENTER WRIGHT-PATTERSON AFB OH

Full Text ... mean time, threat density and sophistication make the basic problem of finding, identifying, and countering all types of threat signals very difficult. The operational choices, as a result, have expanded to include 'smart jamming', support jamming in several different forms (stand-off, UAV), expendables (**chaff**, decoys) and a greater dependence on threat awareness and avoidance. These choices make it imperative to exploit technology to its fullest and in turn they provide an opportunity whereby technologies can be shown to impact the real capability needed operationally. As a result, trends of ...

Wald Sequential Detection with Non-Gaussian Pulsed Radar Data Using the Zakai Equation Jul 20, 1990 92 pages

Authors: S. P. Rodriquez; NAVAL RESEARCH LAB WASHINGTON DC

Full Text ... signals is presented. The result is a threshold test with explicitly computable thresholds. Five possible schemes for a numerical implementation of the test are given. A comparison of the different implementations and

analysis of the detectors performance is done for the radar problem of ship versus **chaff** target discrimination using lognormal and Rayleigh models respectively. Parameter estimation for the lognormal and Rayleigh cases is also studied. Finally, a signal estimation scheme is presented utilizing the conditional expectation of the signal computed from the conditional density of the ...

Off-Board Expendables: An Aid to Aircraft Survivability May 1990 74 pages

Authors: Jeffrey N. Knieriemen; AIR WAR COLL MAXWELL AFB AL

Full Text

During World War II, off-board expendables in the form of **chaff**, significantly reduced Allied bomber losses to radar guided anti-aircraft artillery. From World War II on, the United States has employed Electronic Counter-Measure (ECM) techniques on various bomber, fighter, cargo and special mission aircraft to enhance their survivability. The primary threats to aircraft today are the highly sophisticated radar and infrared guided air-to-air and surface-to-air missiles. Advances in computer hardware and data/signal processing techniques have enabled these missiles to increasingly distinguish ...

Stealth Technology in Surface Warships: How This Concept Affects the Execution of the Maritime Strategy May 18, 1992 33 pages

Authors: John W. McGillvray; NAVAL WAR COLL NEWPORT RI DEPT OF OPERATIONS

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... and discusses how a warship with a much reduced RCS might better execute various naval missions. It was found that actual stealth performance data is highly classified, but much open source literature is available which addresses the technical concepts of stealth. In theory stealth, when employed with **chaff** decoys, has the potential to enhance surface warship defenses against present generation ASCMs. With the proliferation of modern ASCMs to the Third World, stealth warships with an 'improved' soft kill capability are better suited to conduct various sea control, power projection and crisis ...

On the Integrated Scheduling of Hardkill and Softkill Assets Using Dynamic Programming Jul 18, 1994 40 pages

Authors: Douglas W. Oard; Sheldon I. Wolk; Anthony Ephremides; NAVAL RESEARCH LAB WASHINGTON DC

Full Text

The problem of integrated employment of cruise missile defenses by a single ship is considered in this report. Two defensive systems, surface to air missiles and **chaff**, are examined, and a mathematical model of their performance is developed. An optimal scheduling problem is posed using this model, and a dynamic programming solution is developed. The computational complexity of this solution is beyond the capability of current computer facilities, therefore several simplifications are proposed. The study concludes with a discussion of the potential for application of heuristic techniques to ...

A Systems Engineering Approach to Aircraft Kinetic Kill Countermeasures Technology: Development of an Active Aircraft Defense System for the C/KC-135 Aircraft. Volume 1 Dec 1995 243 pages

Authors: Mark C. Cherry; Bruce R. Dewitt; Christopher G. Dusseault; Joel J. Hagan; Brian S. Peterson; AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH

Full Text

Modern Surface to Air Missiles (SAMs) present a significant threat to today's military and civilian aircraft. Current countermeasure systems such as flares and **chaff** rely on decoying the missile threat and do not provide adequate protection against advanced computerized missiles (Schaffer, 1993:1). An aircraft defense system that actively seeks out and defeats an incoming missile by placing a physical barrier in the missile's path offers a promising alternative to current countermeasures technology. This thesis reports the preliminary design of an active aircraft defense system for the ...

Joint Suppression of Enemy Air Defenses (J-SEAD) Developing a Realistic Strategy for Today's Operational Artist May 20, 1996 21 pages

Authors: David B. Woods; NAVAL WAR COLL NEWPORT RI

Full Text

... enemy air defenses (SEAD) was the answer to this air power counter History shows the leap frog effect that technology advancements in enemy air defense and SEAD have had on each other. Defense radio detection and ranging (RADAR) equipment facilitated the development of RADAR jamming and **chaff**. RADAR guided surface-to-air missiles (SAM) and antiaircraft artillery (AAA) created the requirement for antiradiation missiles (ARM), drones, and decoys. Linking early warning and acquisition RADARS to SAM sites with radios and data links hastened the development of communication and data link jamming. ...

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