Survivability/Vulnerability Information Analysis Center

Volume XV Issue 1 - 2004
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SURVIAC Bulletin

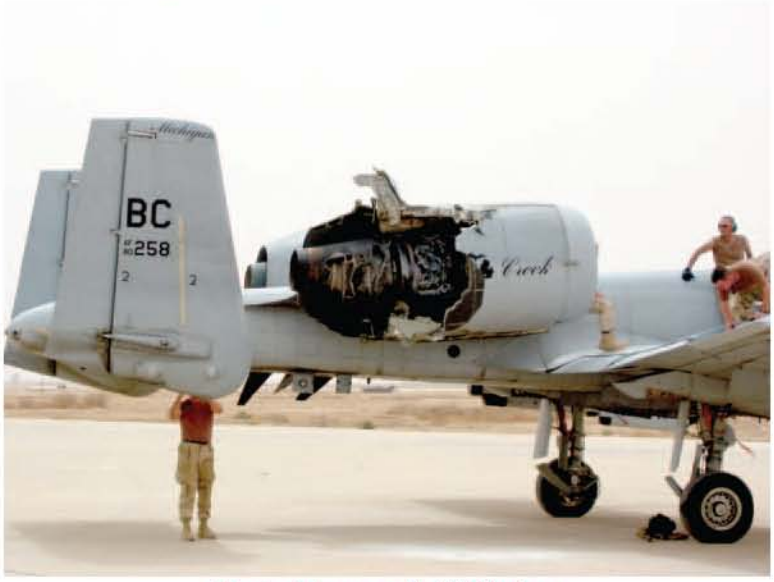
http://iac.dtic.mil/surviac

Joint Combat Assessment Team (JCAT)

An important component in aircraft survivability

by SMSgt. Richard Hoover, Lt.Col. Anthony Brindisi and Mr. Alfred Yee

How do System Project Offices (SPOs) find out that an improvement needs to be made to an aircraft? When the improvement deals with trying to make sure the crew makes it back alive, the Joint Combat Assessment Team (JCAT), headed by Lt. Col. Anthony Brindisi, provides that information. JCAT is a Joint services team currently made up of Individual Mobilization Augmentee (IMA) reservists from the Aeronautical Systems Center (ASC), Navy officers from Naval Air Systems Command (NAVAIR), and the Army Research Laboratory (ARL).



Combat damaged A-10 Warthog

Typically, when a military aircraft takes a hit, specialized assessment and repair teams become the focal point for getting the asset back into the battle. For the Air Force, these units are known as the Combat Logistics Support Squadrons (CLSSs). Ideally, CLSSs document their damage assessment and ensuing repair and then submit this documentation to SURVIAC, where a case file is built, maintained and made available. Case files are maintained at SURVIAC for dissemination to those with the need-to-know in the survivability/vulnerability community. This is only the first part of the story though. Intel debriefs the flight crew and those reports are stored within the organization. For example, pictures of the damaged aircraft may end up in the squadron's archives, or in the personal collection of the pilot or crew chief. Heads Up Display (HUD) tapes go to the Expeditionary Wing that temporarily owns the aircraft. In order to make

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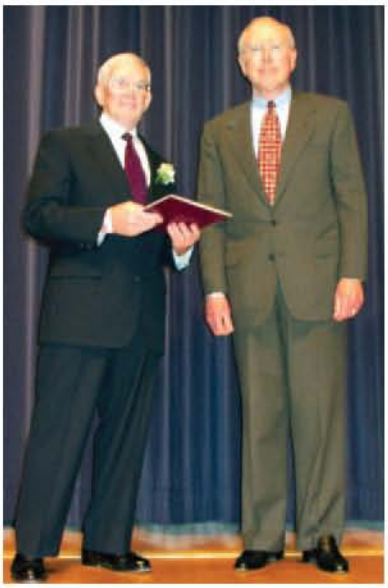
NDIA Combat Survivability Division Presents Annual Survivability Awards

The National Defense Industrial Association's (NDIA) annual Combat Survivability Awards for Leadership and Technical Achievement were presented to Mr. James B. Foulk and Dr. Lewis A. Thurman, respectively, at the Aircraft Survivability 2003 Symposium held November 3-6, 2003 at the Naval Postgraduate School (NPS), Monterey, California.

Combat Survivability Award for Leadership

The NDIA Combat Survivability Award for Leadership is presented to a person who has made major contributions to enhancing combat survivability. Mr. James B. Foulk, President, SURVICE Engineering Company, Aberdeen, Maryland, was the 2003 Leadership Award recipient. Mr. Foulk was recognized for exceptional leadership in the field of aircraft combat survivability. Drawing on his extensive experience in aerospace vehicle and engine ballistic survivability, Mr. Foulk planned and managed a number of key research and development programs and special analyses over the years. He is recognized as an authority on air weapon system survivability analyses, and has been a key contributor and leader in development and application of survivability enhancement features and assessment processes. Mr. Foulk was a principal founding member of the NDIA Combat Survivability Division and was instrumental in the establishment and development of the Department of Defense Survivability/Vulnerability Information Analysis Center (SURVIAC). Under his leadership as founder and president of SURVICE Engineering, the company has become widely recognized throughout Government and industry as a highly valued aircraft survivability resource.



Mr. James B. Foulk (left) receives the Award for Leadership from RADM Robert H. Gormley, USN (Ret), Chairman, NDIA Combat Survivability Division

Combat Survivability Award for Technical Achievement

The NDIA Combat Survivability Award for Technical Achievement is presented to a person or team who has made a significant technical contribution to any aspect of survivability. Dr. Lewis A. Thurman, Head, Division 4 Tactical Systems Technology, MIT Lincoln Laboratory, Lexington, Massachusetts, was the 2003 Technical Achievement Award recipient. Over the years Dr. Thurman pioneered the development of credible analytic processes for assessing the survivability of modern U.S. weapon systems. At the outset of the stealth aircraft era, the U. S. Air Force Special Projects Massachusetts Institute of Technology Lincoln Laboratory where, as head of the Tactical Systems Technology Division, he designed programs and experiments definitively answering questions about a number of critical phenomenology issues. Later,

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Dr. Lewis A. Thurman (left) receives the Award for Technical Achievement from RADM Robert H. Gormley, USN (Ret), Chairman, NDIA Combat Survivability Division

2004 SURVIAC Liaison Workshop Held

The Survivability/Vulnerability Information Analysis Center (SURVIAC) hosted its seventh annual SURVIAC Liaison Workshop at its facility at Wright Patterson AFB, Ohio on 30 March – 1 April 2004. The objectives of the workshop were to increase the knowledge about SURVIAC and what resources we have to support other agency's missions, and for SURVIAC to find out about their respective needs so that we can better support them in the future. The workshop was open to government and industry personnel.

Front row: Mr. Steven Mink, Capt. Robert Harder, Mr. David Scott
Back row: Mr. John Sletten, Mr. James Bement, Mr. Douglas Bly

This year's attendees included Mr John Sletten, Advanced Information Engineering Services; Mr. Steven Mink, National Polar-orbiting Operational Environmental Satellite System Integrated Program Office (NPOESS); Mr. James Bement, OC ALC/PSI; Mr. Douglas Bly, BAE SYstems; Mr. David Scott, Army Evaluation Center; and Mr. Robert Harder, Air Force Operational Test and Evaluation Center Det 2.

Three days were spent investigating databases and libraries, performing searches, reviewing products and models, reviewing Technical Area Tasks, becoming familiar with key survivability and lethality agencies, as well as simply becoming familiar with the day-to-day operation of the SURVIAC office.

For more information, please call Ms. Donna Egner Com: (937) 255-3828 ext. 282 DSN: 785-3828 E-mail: donna.egner@wpafb.af.mil.

Aircraft Survivability Awards continued from page 3

as the warfighting community moved to precision munitions, Dr. Thurman's team performed key experiments examining the impact on weapons accuracy of external effects such as intentional GPS interference. Under his leadership, the Lincoln Laboratory Tactical Systems Technology Division's definitive work on Electronic Countermeasures effectiveness demonstrated what works and what doesn't, and this work is now recognized as the foundation for most of the mission planning systems in use today. Through Dr. Thurman's meticulous scientific approach, the Division has earned an undisputed reputation for experiment credibility.

For more information on the NDIA Aircraft Survivability Awards, please contact Mr. Joe Hylan, NDIA, (703) 247-2583, E-mail: jhylan@ndia.com

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changes in tactics or future aircraft designs, pulling all of those elements into one place to determine the type of threat is vital. JCAT is doing just that. During a recent data gathering and analysis trip under Army sponsorship, JCAT was able to identify vulnerable areas and the Army initiated significant improvements.

JCAT Member, Maj. David Bartkowiak (r) interviews Capt. Kim Campbell at Pope Air Force Base

As a result of recent combat operations, the JCAT has been quite busy. The team has traveled to the CLSSs: the 653rd CLSS at Robins Air Force Base (Warner Robins, Georgia), the 654th CLSS at Tinker Air Force Base (Oklahoma), and the 649th CLSS at Hill Air Force Base (Utah), gathering forms and pictures. Interviews were conducted with the Aircraft Battle Damage Repair (ABDR) teams. ABDR personnel are the maintenance specialists within the CLSS who actually perform the repairs. The JCAT has also been interviewing flight crews and Intel specialists. Some of the information collected includes tail number, aircraft altitude and speed, aircraft maneuver at the time, the sequence of events, any warnings or other indications, any countermeasures (and their results), any meaningful photos, maintenance records, and physical evidence (e.g., pieces of shrapnel). For instance, a recent data-gathering trip to the 110 Fighter Wing, Michigan Air National Guard, Battle Creek, Michigan, yielded several case files worth of valuable data.

Other places JCAT has visited include: Hunter Army Airfield (Savannah, Georgia) to collect data and interview flight crews on the AH-64D Longbow Apaches from the 1st Battalion (Attack) 3rd Aviation Regiment; Pope Air Force Base (North Carolina) to interview and collect battle damage data from the 75th Fighter Squadron A-10 Warthog flight crews and Intelligence personnel; Marine Corps Air Station New River (North Carolina) to interview, photograph and collect battle damage data from the Marine Light Attack Helicopter Squadron 269 (HML/A-269) AH-1W SuperCobras and UH-1N Huey utility helicopters flight crews; and Fort Hood (Texas) to interview flight crews, photograph and collect battle damage data with the 1st Battalion (Attack), 227th Aviation Regiment, 4th Brigade, 1st Cavalry Division AH-64D Longbow Apaches.

Future potential combat data collection trips include the 1st Marine Expeditionary Force, (Camp Pendleton, California), 101st Airborne Division (Fort Campbell, Kentucky), 4th Infantry Division (Fort Hood, Texas), the 6/6 and 2/6 Cavalry (Germany), and the 82nd Airborne Regiment (Fort Bragg, North Carolina).

Lt. Col. Brindisi characterizes the collected information as virtually priceless. "What we are trying to do is bring the warfighter back in one piece. The case files we build from our research help the System Program Office (SPO) modify the aircraft to increase the crew's chances [of survival] and provide a pool of knowledge to better design new systems." Work is in progress to try to have his teams in theater for future conflicts so that the positive effects of their work can be accomplished and delivered faster. Presently data is collected after units return from deployment and the aircraft has been repaired; however, as a result of several high visibility briefings, JCAT members are currently deployed with the 3rd Marine Air Wing

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(MAW) to provide immediate assessment of combat incidents and to provide battle damage collection training to the Marines. At the time this article was being written, a JCAT team was deployed to the Baghdad International Airport to gather data and perform a threat assessment analysis on the DHL Airbus reported to have been damaged by a MANPADS. A draft report has been written and is being circulated.

In the event of a combat incident, the JCAT will assess the aircraft before repairs. Time constraints will most likely be imposed since the aircraft will need to get repaired and back into the field. After taking notes, sketches and photographs, and possibly interviewing the pilots and/or the Intelligence officers, the data will be assessed and assembled into a briefing for the commander, providing real-time information that may lead to changes in tactics or weapon systems modification(s).

Combat damage engine nacelle

The JCAT utilizes extensive knowledge of the weapons that our enemies might use against our aircraft. They understand the value of this knowledge to operators, maintainers and Intelligence personnel and have developed a classified "Threat Awareness Training Class", which they offer to the units they visit. The training class discusses general damage mechanisms, as well as each class of threats - small arms, Air Defense Artillery (ADA), Man-Portable Air Defense Systems (MANPADS), and Rocket Propelled Grenades (RPGs). In fact, the JCAT has developed an unclassified "Sports Guide to Small Arms/AAMG (Anti-Aircraft Machine Gun)/AAA (Anti-Aircraft Artillery)". In effect, the team utilizes the familiarity of common objects to compare what combat damage the warfighter can expect from the range of threats in the battlefield. Also, JCAT has incorporated into the training class actual battle damaged parts and authentic threats. According to SMSgt. Richard Hoover (the only enlisted member of the team), the class offers a "value added" aspect to their visits. "If we can offer a service that is immediately valuable to the people we are gathering data from, we are in a real win-win situation."

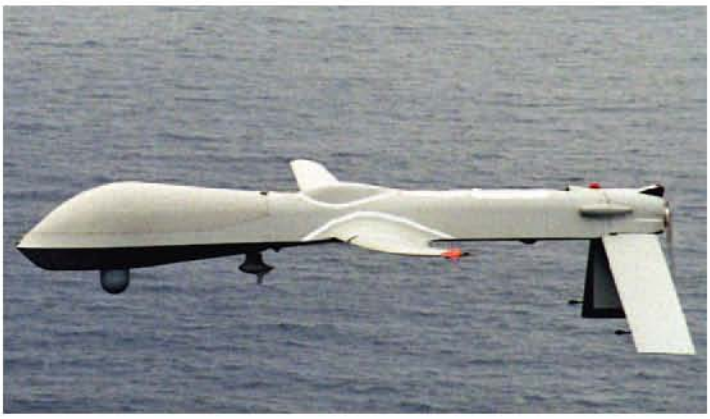
In addition, JCAT conducts a more comprehensive annual training in the form of a four-day "Threat Weapons and Effects Training Seminar" held each year in April at Hurlburt Field and Eglin Air Force Base, Florida. JCAT, under the sponsorship of the Joint Aircraft Survivability Program Office (JASPO) conducts the seminar collaboratively with the Defense Intelligence Agency (DIA), in particular, the Missile and Space Intelligence Center (MSIC), and other agencies. The stated goal is to provide practical, hands-on training for operational personnel on the lethality of threat air defense systems and the damage they can inflict on friendly aircraft. Attendees are drawn from all over, ranging from the engineering and analysis communities, to the intelligence, tactics and logistics organizations. The expansive seminar not only provides experienced instructors and the opportunity for the attendees to gain hands-on experience, but also has live fire demonstrations of small arms, anti-artillery, rocket propelled grenades, and shoulder fired missiles. The Air Force Special Operations Command, 46th Test Wing and the Army Short-Range Air Defense (SHORAD) systems Project Office conduct the demonstrations.

For more information on the seminar, please contact Maj. Ryan Farmer, (937) 781-2821.

NDIA Combat Survivability Division Conducts Workshop on UAV Survivability

by Mr. John Vice

On 29 April 2004 a workshop on UAV survivability was held at the Institute for Defense Analyses in Alexandria, Virginia. Led by Chairman Kevin Crosthwaite, the workshop involved approximately 70 invited experts from the aircraft survivability and unmanned aerial vehicle communities. The workshop purpose was to examine the need for and, if warranted, recommend pursuit of survivability enhancements to UAVs.



The need for an intensive one-day examination of issues related to UAV survivability arose from concerns identified in a survey of attendees of NDIA's Aircraft Survivability 2003 held in November 2003 at the Naval Postgraduate School in Monterey, California. That symposium examined current systems' survivability, survivability technology development, and weapons system survivability lessons learned during Operations Enduring Freedom and Iraqi Freedom. The increasing reliance on UAVs to prosecute military operations and the expanding capabilities and cost of these systems convinced the Division that a closer look at survivability requirements, techniques and technologies was necessary.

The workshop was built around three breakout sessions: Survivability, UAV Systems and Actions. The first breakout session examined technical issues of survivability as potentially applied to UAVs. The second looked at programmatic issues associated with each UAV system that might benefit from survivability enhancements. The third explored what actions would be required to implement survivability enhancements in specific UAV system programs.

The output of the workshop, now in preparation, will be a report on the workshop results summarizing the proceedings and highlighting the survivability enhancements judged to have the highest payoff and identifying a few candidate UAV systems that likely could cost-effectively benefit from survivability features. Also, a series of actions and agents to carry them out were formulated to try to implement at least one survivability feature in the design of one UAV system. Beyond this objective, NDIA hopes that several UAV system program managers will use the workshop results and seriously consider implementation of several of the highest payoff survivability enhancements into their respective system designs.

Because of the dedicated efforts of its organizers and participants, the workshop was highly successful in achieving its objective. Through intense efforts in the breakout sessions, high payoff survivability enhancements and specific UAV systems that are candidates for implementing them were identified and ranked, and specific actions were compiled and assigned for post-workshop efforts. A more detailed article on the workshop final report and implementation effort progress will be forthcoming in the next issue of Aircraft Survivability.

For more information on this workshop, please contact
Mr. Kevin Crosthwaite, (937) 255-3828 x279
E-mail: crosthwaite_kevin@bah.com.

SURVIAC Product Availability

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Product	Classification	Reproduction & Handling Fee
A Critical Review of Graphite Epoxy Laser Damage Studies	SECRET	$ 50.00
A Summary of Aerospace Vehicle Computerized Geometric Descriptions of Vulnerability Analyses	Unclassified	$100.00 (Free to Gov't)
Advanced Materials for Enhanced Survivability	SECRET	$100.00
Aircraft Fuel System Fire and Explosion Suppression Design Guide	Unclassified	$150.00/3 Volumes
"Aircraft Survivability" Video	Unclassified	$ 50.00 or 30-Day Loan
Alternatives For Halon 1301 In Army Ground Vehicle Firefighting Systems	Unclassified	$250.00
An Overview of Laser-Induced Eye Effects	SECRET	$150.00
An Overview of Laser Technology and Applications	Unclassified	$ 50.00
"Battle Damage Repair of Composite Structures" Video	Unclassified	$ 75.00
Collection of Vulnerability Test Results for Typical Aircraft Systems and Components	CONFIDENTIAL	$150.00
Comparative Close Air Support Vulnerability Assessment Study - Executive Summary	SECRET	None (Gov't. Only)
Compendium of References for Nonnuclear Aircraft Survivability (A Supplement to MIL-HDBK-336)	Unclassified	$150.00
Component Vulnerability Analysis Archive (CVAA) and Workshop Notes	Unclassified	$300.00 (Free to Gov't)
Component Vulnerability (Pd/h) Workshop Component Pd/h Handbook w/addendum	SECRET	$200.00 (Free to Gov't)
Component Vulnerability Database Development - CD	SECRET	$100.00 (Free to Gov't)
Countermeasures Handbook for Aircraft Survivability (3 Volumes)	SECRET	$200.00 (Free to Gov't)
Critical Review and Technology Assessment (CRTA) for Soldier Survivability (SSv)	Unclassified	$ 50.00
'Designing for Survivability' Video	Unclassified	30-Day Loan
Directed Energy Effectiveness Modeling State-of-the-Art Report (SOAR)	Unclassified	$ 50.00
Gas Explosion Suppression Agent Investigation	Unclassified	$200.00
Gun and Missile Pedigree Threat Reports - CD	SECRET	$150.00
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National MANPADS Workshop: A Vulnerability Perspective Proceedings - 2 Volumes	SECRET	$200.00
Penetration Characteristics of Advanced Engine Materials	Unclassified	$100.00
Proceedings of the Eighth DOD Conference on DEW Vulnerability, Survivability and Effects - 2 Volumes	SECRET	$125.00/Per Set
RADGUNS 1.8 Parametric Study	SECRET	$100.00 (Free to Gov't)
Ship Survivability Overview	Unclassified	$ 50.00
"SURVIAC - A Capabilities Overview" Video	Unclassified	30-Day Loan
Survivability Analysis Workshop Notebook - 2000	Unclassified	$100.00 (Free to Gov't)
Survivability Systems Master Plan	Unclassified	$ 50.00 (Free to Gov't)
Testing of Aircraft or Aircraft Surrogates with On-Board Munitions	Unclassified	$100.00
"Threat Effects in Aircraft Combat Survivability" Video	Unclassified	$150.00 or 60-Day Loan
Threat Warheads and Effects/Battle Damage Assessment and Repair Archival and Retrieval (TWE/BDAR) System	Unclassified	$300.00
Ullage Explosion Hazard State-of-the-Art Report (SOAR)	Unclassified	$200.00
Unmanned Aerial Vehicles Survivability Compendium—Interim Report Database	Unclassified	$200.00
U.S. Air Force Surface-To-Air Engagements During Operation Desert Storm	SECRET	$100.00 (Free to Gov't)
Vulnerability Reduction Design Guide for Ground Systems in a Conventional Combat Environment	Unclassified	$200.00

For further information on how to obtain these products and how to establish need-to-know certification, please contact SURVIAC at (937) 255-4840 or DSN 785-4840. Requests from non-U.S. agencies must be forwarded to their country's Embassy in Washington DC, Attn: Air Attache's Office.

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AIRADE 7.4—Airborne Radar Detection Model	SECRET	$500.00
ALARM 4.5—Advanced Low Altitude Radar Model (Includes EARCE 2.5)	Unclassified	$500.00
BLUEMAX 5 version 1.0—Variable Airspeed Flight Path Generator	Unclassified	$500.00
BRAWLER 6.5—Air-To-Air Combat Simulation	SECRET	$500.00
*BRL-CAD 6—Ballistic Research Laboratory Computer-Aided Design Package	Unclassified	$500.00
**COVART 4.3—Computation of Vulnerable Area and Repair Time	Unclassified	$500.00
DIME 2.1—Digital Integrated Modeling Environment	Unclassified	$500.00
ESAMS 3.0—Enhanced Surface-To-Air Missile Simulation	SECRET	$500.00
**FASTGEN 4.7—Fast Shotline Generator	Unclassified	$500.00
FATEPEN—Fast Air Target Encounter Penetration Program	Unclassified	$500.00
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JSEM - Joint Service Endgame Model	Unclassified	$500.00
LELAWS 3.0—Low Energy Laser Weapons Simulation	Unclassified	$500.00
MIL-AASPEM 5.3 — Man-in-the-Loop Air-To-Air System Performance Evaluation Model	Unclassified	$500.00
RADGUNS 2.4—Radar-Directed Gun System Simulation	SECRET	$500.00
TRAP 3.1a—Trajectory Analysis Program	Unclassified	$500.00
TRACES 3.0.4—Terrain/Rotorcraft Air Combat Evaluation Simulation	Unclassified	$500.00

* For more information regarding BRL-CAD documentation contact Mr. Dwayne Kregel at the SURVIAC Aberdeen Satellite, Office, (410) 273-7722.

** Model is now part of the Vulnerability Tool Kit

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Future History

History is often segregated as a subject of dusty libraries, professors in glasses and tweed jackets, and bored students in ivy covered buildings. Conversely current events are the topics of newspapers, magazines, CNN and water cooler conversations. Current events are vibrant, of interest, and very literally "happening". History connotes academic, archaic and out-of-date. Donald Trump instead of coining the phrase "you're fired" could just as well have said "you're history". An intriguing process is the continual transition of current events into history as we are living through much of that history day by day. Specifically we are living through the daily history of the global war on terrorism. As SURVIAC we are actively gathering and seeking aspects of this history in the making. In order to assist and inform our community, we will be initiating a series of articles in this bulletin about the incidents in the ongoing Global War on Terrorism.

We will summarize available information on various types of incidents. Aircraft combat damage incidents will be featured along with effects, impact and repairs information. Future articles also focus on incidents, results, personnel casualties, and terrorist threats. We will attempt to organize this data into a useful summary and historical perspective. We will of course be constrained by the public release nature of this publication. Within that constraint, we do solicit the community's thoughts and ideas on what format and information would be useful and insightful. This community feedback will help us tailor our future articles. For specific community questions or data needs that go beyond what can be publicly released, we offer as always the opportunity for directed inquiries to SURVIAC. We can respond to these requests in a more unrestricted media and format as required.

The intent of this series of articles will be to provide the community with a window into the survivability and lethality aspects of current events. There's a war going on and that's making history.

Calendar of Events

August 2004

3rd Annual Directed Energy Test and Evaluation
3-5 August 2004
Albuquerque, New Mexico
POC: Tom Hodge, (505) 679-5045, E-mail: thomas.hodge@helstf.wsmr.army.mil, www.itea.org

AUVSI's Unmanned Systems North America 2004 Symposium & Exhibition
3-5 August 2004
Anaheim, California
POC: AUVSI, (703) 920-2720, E-mail: info@auvsi.org, www.auvsi.org

AIAA Modeling and Simulation Technologies Conference and Exhibit
16-19 August 2004
Providence, Rhode Island
POC: AIAA, (800) 639-2422, E-mail: custserv@aiaa.org, www.aiaa.org

6th Space and Air Protection
31 August - 1 September 2004
Albuquerque, New Mexico
POC: AOC, (703) 549-1600 or (888) OLD-CROW, www.crows.org

September 2004

2004 Combat Vehicles Conference
7-9 September 2004
Ft. Knox, Kentucky
POC: Angie DeKlein, NDIA, (703) 247-2599, E-mail: adekleine@ndia.org, www.ndia.org

AIAA 3rd "Unmanned Unlimited" Technical Conference, Workshop and Exhibit
20-23 September 2004
Chicago, Illinois
POC: AIAA, (800) 639-2422, E-mail: custserv@aiaa.org, www.aiaa.org

Homeland Security
20-23 September 2004
Atlantic City, New Jersey
POC: AOC, (703) 549-1600 or (888) OLD-CROW, www.crows.org

October 2004

2004 TACOM APBI
13-15 October 2004
Dearborn, Michigan
POC: Angie DeKlein, NDIA, (703) 247-2599, E-mail: adekleine@ndia.org, www.ndia.org

November 2004

Aircraft Survivability 2004 "Survivability Within the Integrated Battlespace"
30 November - 2 December 2004
Naval Postgraduate School, Monterey, California
POC: Ann Saliski, NDIA, (703) 247-2577, E-mail: asaliski@ndia.org, www.ndia.org

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