THE DETONATOR

Official Publication of the International Association of Bomb Technicians and Investigators

POWDER TRAIN

PART 1

X-ray Vision

Ergonomics in Bomb Suit Design

EOD Toy Alert!

Training for Reality?

NIJ Certification for Bomb Suits

January/February 2019

MED-ENG
A BRAND OF THE SAFARILAND GROUP

EOD® 10

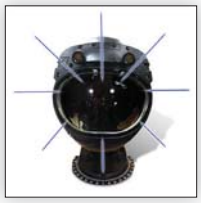
FRAGMENTATION

BLAST

IMPACT

FLAME & HEAT

FIELD OF VIEW



MOBILITY & WEIGHT

DONNING & DOFFING

FACTORY AUDITS

The EOD® 10 bomb suit has been officially 'certified' to the new NIJ Standard 0117.01 for Bomb Suits.

This achievement means that EOD 10 suits and helmets manufactured as of January 2018 meet or surpass a comprehensive and stringent set of protection levels, performance tests and manufacturing standards, developed by the National Institute of Justice to help protect bomb techs and EOD operators.

In fact, the EOD 10 exceeds the NIJ standard by offering many other protective and user-focused operational capabilities such as blast overpressure mitigation, voice recognition, integrated cooling, CBRN compatibility, communications, tactical lighting options, and weight load distribution.

To learn more about how this helps protect and assure your team, please contact your authorized Med-Eng representative.

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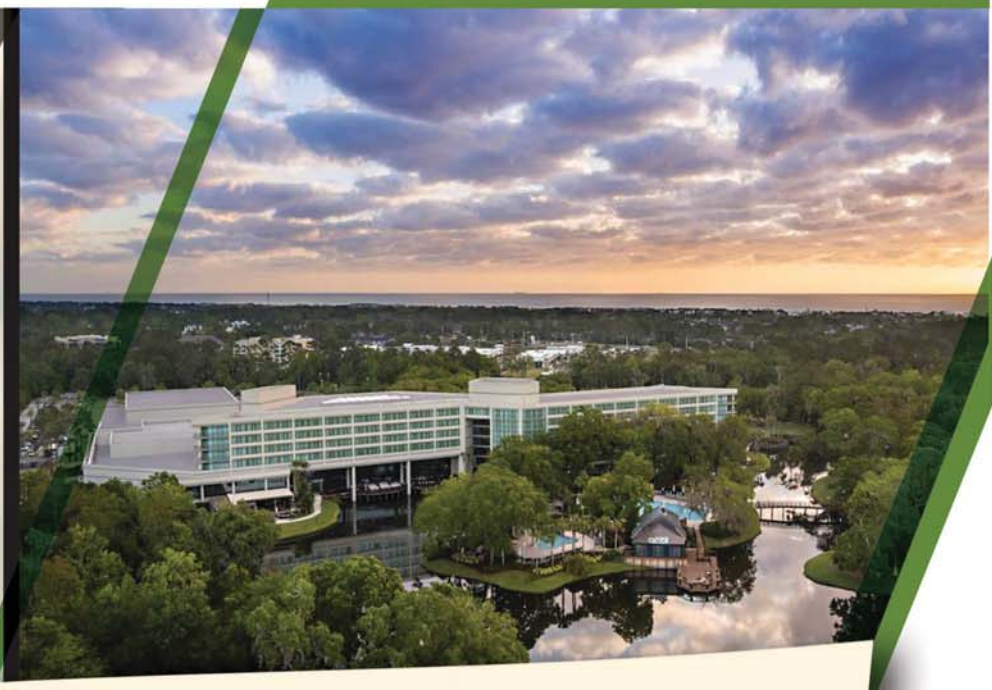
The International Association of Bomb Technicians & Investigators

Sawgrass Marriott
Ponte Vedra Beach, FL

2019 IN-SERVICE TRAINING & EXPO



June 24th- 28th

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Greetings!!

The IABTI is happy to deliver the first peek at the 2019 International In-Service Training and Expo in Ponte Vedra, Florida!

We received lots of great feedback from last year's multi-track approach to training and we used that feedback to create this year's event. Every day of the week will have at least 2 tracks to choose from, with a few days offering up to four training options.

The lineup includes an 8-hour electronics workshop delivered by WMD Tech, a hook & line workshop, a lock picking class that will include a tool kit, a post blast workshop, and Federal Resource's HME Above the Line/Below Line certified course.

There'll also be briefs from around the world, RCIED training, and presentations on the threat of drones and drone countermeasures. A chemist will be presenting on binary chemical weapons and emerging threats from other countries.

Canine handlers will be able to attend a trauma/first aid workshop, so they can be prepared to treat their partner in the event of stabbing, gun shot or explosion injury.

We've put a ton of effort into delivering the kind of training that our members requested, and it will be a busy and rewarding week! Some of the classes will have limited seating available, so sign up soon and get your spots reserved.

You don't want to miss this event. I hope to see you in Sawgrass!

Bob Epps
2nd Assistant International Director

Ordnance and UXO training • RCIED Threats for the Future • Drone Threats • HME Above the Line/Below the Line • RCIED Threat Assessments • ECM Pros and Cons • Houston Debrief • Emerging Threats • Synthetic Opioids • TEEX Ordnance Class • Binary Weapons • Clearing Unexploded Blasting Holes • Commercial Explosives • Oil Well Perforators • Allentown, PA. Debrief • 3D Printing classes • Drone Countermeasures • Vapor Detection with Canines • Electronic Evidence Exploitation • Post Blast Workshop • Supervising Motion Pictures Special Effects • Blast Effects • Grenade Workshop • Hook & Line Workshop • K9 Trauma and CPR • Lock Picking

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THE VALUE OF

HAVING THE ENTIRE FLEET AT YOUR DISPOSAL.

The first line of defense is the most critical one. With the advanced versatility and unmatched dexterity of Northrop Grumman's Remotec Andros™ fleet, EOD technicians can defuse a wide range of dangerous situations from a safe distance. From military units to law enforcement and firefighters, our robotic solutions give first responders complete control in crisis.

That's why we're the leader in dynamic, mission-proven robotic solutions.

***THE VALUE OF** PERFORMANCE.*

NORTHROP GRUMMAN

northropgrumman.com/**remotec**

THE DETONATOR

Contents

IABTI

From the Director

Jake Bohi

International Director

id@iabti.org

Greetings to all my fellow members,

As we move into the New Year, I want to wish everyone happiness, health, and safety in the coming year. I am extremely proud and honored to be part of such a distinguished group of dedicated professionals.

Start making your plans to attend IABTI's 2019 International In-Service Training (IIST) in Ponte Vedra Beach, Florida at the TPC Sawgrass Marriott June 24 – 28, 2019. IABTI is continuing to move forward with relevant training and we will have plenty of hands-on workshops and multi-track training offered to meet your needs. It is also a beautiful resort that the whole family may enjoy.

I want to congratulate Wally Meeks as the incoming 3rd Assistant International Director and Region II Director Jason Hodges, Region IV Director Mike Savioli and Region VI Director John Simpson for their re-elections and continued service. It takes a lot of dedication to work in these positions, as these Executive Board Members are all volunteers.

Please assist me in thanking and recognizing Derick Ivany for his dedication and service to IABTI. After sixteen years as the Region VII Director, Derick has stepped down from this role to allow someone else the opportunity to serve. The countless hours he has devoted to the colleagues, members and friends of the IABTI would not be the same without Derick's guidance and input. Derick has truly shaped Region VII into what it is today. We wish Derick all the best!

At this time, I would also ask that you join me in welcoming Darrell Colwell as the new Region VII Director. Darrell has been a member of the IABTI for fifteen years and Regional Secretary since last year. Many in Region VII know Darrell for his contributions and assistance at In-Service events over the last several years. Welcome Darrell!

Winter Board Meeting

The Executive Board just concluded the Winter Board Meeting on January 26th. A few of the topics discussed included:

- Future locations for the IIST – Cork, Ireland may be an option for the 2021 International In-Service Training.
- Professional Development Coordinator – This would be a position to provide continuity in training for the organization.
- Application Vetting process – The board discussed the current vetting process and possible security concerns. A detailed vetting process guideline will be added to the SOG's for use by Regional Directors.
- Website – The new website is up and running and I want to commend the Website Committee for doing it with zero down time. The new website is mobile friendly and has more capabilities than the old one. Future suggestions include the addition of computer-based training (CBT) and much more.

State of the Association:

IABTI is continuing the efforts to professionalize our organization, making it more relevant to the needs of our membership. Accompanying this issue is the current financial statement of IABTI, which reflects a full account of the Association's finances through December 31, 2018.

	December 31, 2018	December 31, 2017
Total Assets	$1,711,826.95	$1,702,683.88
Total Liabilities	$4,760.17	$1,787.88
Total Equity	$1,707,066.78	$1,700,896.00

Membership

The members of IABTI are our most valuable asset and our membership numbers have dropped just a bit from last year. We are doing a great job recruiting new members and will work harder to continue to offer relevant information and training to the membership. IABTI can provide excellent "FREE" training at the Chapter level. Chapter training is an excellent way to introduce IABTI to new prospective members and to involve current members. If you need assistance, please contact your Regional Director for guidance. Thank you for your continued support.

Year	Number of members	Difference
2018	4,300	-237
2017	4,537	+20
2016	4,517	

Best wishes to you and yours,

Jake Bohi

Jake Bohi, CIPBI
International Director

IABTI's Executive Board

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id@iabti.org

1st Asst. Director
Danny Waltenbaugh
1asstid@iabti.org

2nd Asst. Director
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3rd Asst. Director
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Director, Region I
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Director, Region II
Jason Hodges
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Director, Region III
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Director, Region IV
Mike Savioli
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Director, Region V
John Paletto
region5@iabti.org

Director, Region VI
John V. Simpson
region6@iabti.org

Director, Region VII
Darrell Colwell
region7@iabti.org

Cash Basis

IABTI
Balance Sheet Prev Year Comparison
As of December 31, 2018

	Dec 31, 18	Dec 31, 17	$ Change	% Change
ASSETS				
Current Assets				
Checking/Savings				
International	587,490.36	553,795.28	33,695.08	6.08%
Region I	77,078.20	89,456.75	-12,378.55	-13.84%
Region II	45,000.93	33,902.86	11,098.07	32.74%
Region III	55,310.79	61,560.38	-6,249.59	-10.15%
Region IV	73,385.61	73,225.99	159.62	0.22%
Region V	128,464.91	124,552.59	3,912.32	3.14%
Region VI	85,857.18	131,181.25	-45,324.07	-34.55%
Region VII	63,016.25	95,394.97	-32,378.72	-33.94%
Total Checking/Savings	1,115,604.23	1,163,070.07	-47,465.84	-4.08%
Other Current Assets				
Due to International Treasury	0.00	5,077.74	-5,077.74	-100.0%
Inventory Asset	28,205.82	29,200.49	-994.67	-3.41%
Undeposited Funds	17,445.00	-49.65	17,494.65	35,235.95%
Total Other Current Assets	45,650.82	34,228.58	11,422.24	33.37%
Total Current Assets	1,161,255.05	1,197,298.65	-36,043.60	-3.01%
Fixed Assets				
Furniture, Fixtures & Equipment	102,320.45	101,333.78	986.67	0.97%
Building - 1120 Intnl Pkwy #105	407,998.65	407,998.65	0.00	0.0%
Leasehold Improvements	5,353.85	5,353.85	0.00	0.0%
Museum Donations	1,251.46	1,251.46	0.00	0.0%
Website Design/Database	106,515.39	87,315.39	19,200.00	21.99%
Software	16,190.00	16,190.00	0.00	0.0%
Accumulated Depreciation	-143,048.00	-143,048.00	0.00	0.0%
Total Fixed Assets	496,581.80	476,395.13	20,186.67	4.24%
Other Assets				
Trademark	1,541.10	1,541.10	0.00	0.0%
Accumulated Amortization	-51.00	-51.00	0.00	0.0%
Security Deposits	52,500.00	27,500.00	25,000.00	90.91%
Total Other Assets	53,990.10	28,990.10	25,000.00	86.24%
TOTAL ASSETS	**1,711,826.95**	**1,702,683.88**	**9,143.07**	**0.54%**
LIABILITIES & EQUITY				
Liabilities				
Current Liabilities				
Credit Cards				
BofA Visa Credit Card	4,758.45	439.78	4,318.67	982.01%
Total Credit Cards	4,758.45	439.78	4,318.67	982.01%
Other Current Liabilities				
Due to Wounded EOD Warriors	0.00	378.00	-378.00	-100.0%
Due to Reg Pattee	0.00	968.00	-968.00	-100.0%
Sales Tax Payable	1.72	2.10	-0.38	-18.1%
Total Other Current Liabilities	1.72	1,348.10	-1,346.38	-99.87%
Total Current Liabilities	4,760.17	1,787.88	2,972.29	166.25%
Total Liabilities	4,760.17	1,787.88	2,972.29	166.25%
Equity				
Retained Earnings	1,220,784.00	1,195,923.92	24,860.08	2.08%
Temp Restricted Member Benefit	100,905.74	100,574.72	331.02	0.33%
Unrestricted Net Assets	379,206.26	379,537.28	-331.02	-0.09%
Net Income	6,170.78	24,860.08	-18,689.30	-75.18%
Total Equity	1,707,066.78	1,700,896.00	6,170.78	0.36%
TOTAL LIABILITIES & EQUITY	**1,711,826.95**	**1,702,683.88**	**9,143.07**	**0.54%**

State of the IABTI

PERSONAL PROTECTION

BOMB RESPONSE KIT

IED DETECTION

BOMB NEUTRALIZATION

EOD VEHICLE

Beijing Defense Co., Ltd. is a company focuses on the manufacturing of EOD/IED disposal equipment. As a professional supplier of anti-terrorist and homeland security equipment, Beijing Defense believes that continued success depends upon the ability to provide superior quality products and services. We promote passion to transcend with a "can-do" spirit at all levels of our organization. Integrity and commitment to customer satisfaction are our core values.

"Integration Innovation"

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Global Leading
EOD Equipment Manufacture

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State of the IABTI

Cash Basis

IABTI
Profit & Loss Budget vs. Actual
January through December 2018

	Jan - Dec 18	Budget	$ Over Budget	% of Budget
Ordinary Income/Expense				
Income				
100 · Membership Dues	238,193.00	215,000.00	23,193.00	110.79%
110 · Donations	2,520.00	3,000.00	-480.00	84.0%
112 · Detonator Advertising	200,585.00	180,000.00	20,585.00	111.44%
113 · Logo Sales	4,151.36	3,750.00	401.36	110.7%
114 · DVD Sales	615.00	1,000.00	-385.00	61.5%
115 · Per Capita	37,878.00	43,000.00	-5,122.00	88.09%
117 - Buyers Guide	40,800.00	40,000.00	800.00	102.0%
118 · Podcast Revenue	200.00			
120 - Interest	586.59	750.00	-163.41	78.21%
125 - Royalties	45.00			
132 · Website Advertising	7,500.00	4,000.00	3,500.00	187.5%
138 · Sales of Custom Art	1,080.00			
140 - IST Delegate Regis Fees	126,200.00	136,800.00	-10,600.00	92.25%
142 - IST Exhibitor Fees	124,000.00	150,000.00	-26,000.00	82.67%
143 - IST Silent Auction	3,600.00			
144 - IST Raffles	0.00	3,000.00	-3,000.00	0.0%
145 - IST Mobile AppAdvertising	3,400.00			
146 - IST Exhibitor Sponsorship	36,000.00	35,000.00	1,000.00	102.86%
148 - IST Logo Sales	3,540.00			
149 · IST Meal Ticket Sales	1,950.00	250.00	1,700.00	780.0%
IST Hotel Commission/Rm Credit	13,957.28	21,407.40	-7,450.12	65.2%
150 - RIST Delegate Regis Fees	66,872.50	100,000.00	-33,127.50	66.87%
152 - RIST Dollar Draws	1,342.00	1,000.00	342.00	134.2%
153 - RIST Raffles	6,720.00	6,000.00	720.00	112.0%
154 - RIST Exhibitor Fees	63,962.55	70,000.00	-6,037.45	91.38%
155 · RIST Silent Auction	3,572.11	8,000.00	-4,427.89	44.65%
156 · RIST Exhibitor Sponsorship	25,095.00	10,000.00	15,095.00	250.95%
157 · RIST Logo Sales	3,891.66	2,000.00	1,891.66	194.58%
158 · RIST Meal Ticket Sales	1,430.00			
RIST Hotel Commission/Rm Credit	2,083.20	2,000.00	83.20	104.16%
165 · ID Card income - replacement	0.00	50.00	-50.00	0.0%
170 · CIPBI Application Income	1,650.00	2,250.00	-600.00	73.33%
171 · CIPBI Book Sales	1,140.00	500.00	640.00	228.0%
180 · Exhibitor Event w/ BTMF	20,500.00			
181 · Exhibitor Event - Sponsorship	2,260.00			
Total Income	1,047,320.25	1,038,757.40	8,562.85	100.82%

Cash Basis

IABTI
Profit & Loss Budget vs. Actual
January through December 2018

	Jan - Dec 18	Budget	$ Over Budget	% of Budget
Gross Profit	1,047,320.25	1,038,757.40	8,562.85	100.82%
Expense				
200 · Accounting	1,635.00	4,700.00	-3,065.00	34.79%
210 · Awards, Honoraria	524.46	500.00	24.46	104.89%
220 · Bank Charges/Credit Card Fees	20,644.72	22,500.00	-1,855.28	91.75%
230 - Board Meetings	18,783.18	17,500.00	1,283.18	107.33%
239 · Buyer Guide	9,500.07	500.00	9,000.07	1,900.01%
240 - Chapter Expenses	9,356.89	10,000.00	-643.11	93.57%
245 · Committees	3,969.49	19,500.00	-15,530.51	20.36%
260 · Contributions/Donations	29,093.00	26,000.00	3,093.00	111.9%
280 · Detonator	74,887.88	78,000.00	-3,112.12	96.01%
283 · Dues and Subscriptions	2,720.92	3,000.00	-279.08	90.7%
285 · Elections	2,374.50	5,750.00	-3,375.50	41.3%
300 · Insurance	18,868.00	20,000.00	-1,132.00	94.34%
310 · Licenses and Permits	90.00	100.00	-10.00	90.0%
320 - Logo	3,174.86	3,000.00	174.86	105.83%
330 - Marketing	2,501.96	11,000.00	-8,498.04	22.75%
350 · Miscellaneous	0.00	1,000.00	-1,000.00	0.0%
360 · Office Supplies	3,522.62	6,000.00	-2,477.38	58.71%
370 - Online Fees	8,007.23	8,000.00	7.23	100.09%
400 - Peer Support	675.90			
500 - Per Capita	40,428.00	43,000.00	-2,572.00	94.02%
510 - Per Diem (misc)	0.00	1,000.00	-1,000.00	0.0%
520 · Podcasts	175.00			
550 · Penalties	50.00			
585 · Professional / Legal	618.00	1,000.00	-382.00	61.8%
600 · Postage & Delivery (misc)	2,799.99	2,800.00	-0.01	100.0%
610 · Printing	3,319.38	3,000.00	319.38	110.65%
620 · Professional Certification	4,182.67	15,000.00	-10,817.33	27.88%
630 - Software	209.99	500.00	-290.01	42.0%
650 - Renewals	774.83	2,000.00	-1,225.17	38.74%
850 - Management Contract	340,321.41	340,321.41	0.00	100.0%
660 · Telephone	3,870.93	3,000.00	870.93	129.03%
690 · Rent / Storage Space	12,294.35	14,000.00	-1,705.65	87.82%
699 · Taxes - Personal Property	1,137.20	1,000.00	137.20	113.72%
700 · Travel	16,942.81	15,000.00	1,942.81	112.95%
8817 · 2017 ITC - Green Bay, WI	-340.51			
8818 · 2018 IST - Silver Legacy, Reno	138,369.84	245,512.55	-107,142.71	56.36%
8819 · 2019 IST - Ponte Vedra, FL	4,180.21			
900 - RIST Expenses	265,753.83	186,000.00	79,753.83	142.88%
Total Expense	1,045,418.61	1,110,183.96	-64,765.35	94.17%
Net Ordinary Income	1,901.64	-71,426.56	73,328.20	-2.66%
Other Income/Expense				
Other Income				
Currency Exch-Canadian2US$Acct	4,269.00			
Sales Tax Discounts	0.14			
Total Other Income	4,269.14			
Net Other Income	4,269.14			
Net Income	**6,170.78**	**-71,426.56**	**77,597.34**	**-8.64%**

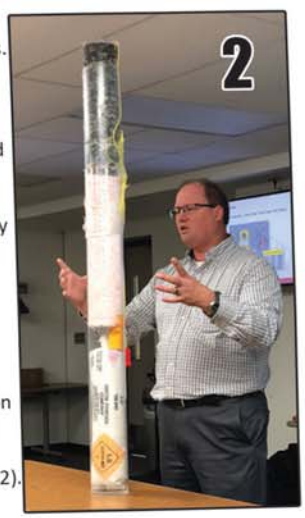
CHAPTER CHALLENGE

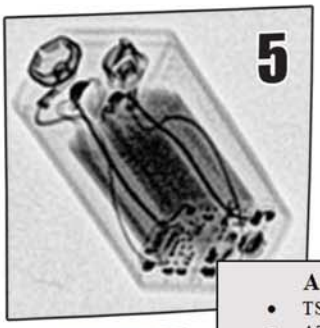
Michigan Chapter Workshop By: William Bennett

The Michigan Chapter of IABTI Region IV held a workshop on November 7th at the Ingham County Sheriff's Office in Mason, MI. IABTI Michigan Chapter Director Jeff Osborne planned and facilitated the workshop. The featured speaker was Austin Powder Company Great Lakes Technical Manager Chuck Palmcook who summarized current trends in quarry blasting industry products, transportation, and mine/quarry blasting operations.

Electronic detonators require connectivity with specific programming hubs and initiation devices to function. The electronic detonators (Image 1) allow for greater synchronization of blasts of up to 1,600 individual detonators all programmed and controlled from a single hub. This is possible through the use of serialized microchips embedded in each detonator. The microchip control allows for millisecond variances between individual blasts. Serialized microchip control enhances traceability from manufacturer to purchaser and hopefully end user. The microchips are shielded from radio frequency and not affected by nuisance electrical current or electromagnetic interference (EMI). The electronic detonators have even been struck by lightning and remained safe. The quarry blasting industry works actively with ATF to ensure changes in technology, supplies, and techniques are recognizable as legitimate.

Other innovations discussed include emulsion blends of blasting components and the means of transporting them. The emulsion blends are less affected by the residual water often found in blast bore holes allowing for greater blast efficiency and specificity (Image 2). A field mixing unit truck was on hand for the workshop. The field mixing units (Image 3) are a great advancement in the safe and efficient transport of blasting supplies and components to job sites. Field mixing units safely segregate the oxidizer emulsions from the other blast components combining them at the point of use through an onboard auger system. Securely segregating individual explosives components assists first responders, enhances public safety, and affords the transporter greater flexibility in transportation regulations (49 CFR) over legacy means of transporting explosives. Detonators and cast boosters are transported safely in blast boxes located along the truck chassis while bulk components remain secure in reinforced individual compartments. The presentation concluded with a collection of blast videos at quarries and mines chronicling the planning, logistics, and execution of a quarry blast. Inert quarry blasting product samples (Image 4) were also discussed and displayed.





IABTI provided a hearty lunch while information concerning a USB rechargeable 9-volt battery was shared by one of the chapter members. Of particular interest are the differing x-ray image (Image 5) characteristics of the USB variant compared to conventional 9-volt batteries. Michigan Chapter Director Jeff Osborne concluded the workshop by soliciting the group for future workshop ideas and speakers. Continuing to offer relevant and interesting speakers and topics furthers the IABTI's important mission.

William Bennett is a consultant and portable analytical instruments trainer at Houghtons, Inc (www.hazardid.com). William retired from the U.S. Air Force with 32 years of service and nearly two decades as a CBRNe analyst, primarily with the 51st WMD Civil Support Team (MI). He may be reached at william.bennett@hazardid.com.

Image 1 - Programmable electronic detonator
Image 2 - Chuck Palmcook displays a model of layered components within a typical blast hole.
Image 3 - Field mixing unit
Image 4 - Inert products display
Image 5 - USB rechargeable 9V oblique

Attendee Organizations

- TSA
- ATF
- Michigan State Police
- Ingham County Sheriff's Office (MI)
- Elkhart PD (IN)
- Houghtons Inc.
- Kalamazoo DPS (MI)
- Flint PD (MI)
- Grand Rapids PD (MI)
- Berrien County Sheriff's Office (MI)
- Detroit PD (MI)
- Independence PD (OH)
- IABTI Region IV Director Mike Savioli

NIJ Certification for Bomb Suits
What is it, and why does it matter?

Dr. Aris Makris, Ph.D., Vice-President, RD&E and CTO, Med-Eng
& Dr. Jean-Philippe Dionne, Med-Eng

Historically, bomb suit manufacturers relied on multiple performance standards, or test protocols, inspired from adjacent technical fields and adapted to the EOD context, in order to quantify, or characterize, the performance of their bomb suit design. Test methods were inconsistent between laboratories and many results could not be consistently reproduced, compared, or trusted, in part due to lack of standardization and documented detail. On occasion, bomb suit suppliers made unsubstantiated claims of their product's performance, based on their own technical misunderstanding, or provided questionable test data from laboratories which may not have adhered strictly to approved test methods. Naturally, it was not reasonable to expect that end-users would have the time or be sufficiently qualified to evaluate the diverse test reports for suitability, protocol adherence, results accuracy, or laboratory accreditation.

After more than a decade in development, the release of the US NIJ 0117.01 standard for public safety bomb suits in 2016 bridged this gap in standardized EOD PPE evaluation. It is intended to provide objective evidence and confidence in performance of EOD suits, once they are officially certified by the accredited authority. The need for an NIJ standard for EOD suits was originated by the National Bomb Squad Commanders Advisory Board (NBSCAB), facilitated by NIST (National Institute of Standards and Technology), supported by DoD (various Department of Defense laboratories where expertise resided) and industry participants, under the auspices of NIJ (National Institute of Justice).

NIJ certification can only be achieved through an NIJ-approved certification organization which undertakes all testing in accredited third-party laboratories that are qualified to adhere to the standard and test methods. This organization is intimately engaged during the entire certification process, including initial and annual testing, as well as audits of the manufacturing facilities where the suits are built. This third-party oversight is intended to instill confidence to the end-user community, in the performance stipulations under the standard, for certified bomb suits. A bomb suit design should offer at a minimum what is prescribed within NIJ 0117.01. A number of additional capabilities and features, not explicitly stipulated within the minimum standard, are expected by end-users and should be considered in the purchase of most modern bomb suits currently available, such as lighting, communications, cooling, feature control preferences, battery power longevity, electromagnetic signature management, and more.

The NIJ standard can thus help government agencies in the selection and procurement of EOD PPE, without needing wide ranging technical expertise to properly assess and qualify a bomb suit from all engineering disciplines, i.e., protection against all blast threats, human factors, optics, field of view, electronics, manufacturing quality, labelling, etc.

Highlights of the NIJ 0117.01 standard for Public Safety Bomb Suits

Protection

The NIJ 0117.01 V50 fragmentation methodology is inspired from MIL-STD-662. The pass/fail requirements are based on three different fragment simulating projectiles (17, 44, 207-grain, Figure 1). The large 207-grain (13.4 grams) fragment permits reliable V50 rating determinations for highly protective areas of the suit (frontal chest, neck and groin plates). Obtaining V50 fragmentation protection ratings based on the high-energy 207-grain fragment, representative of actual threats, for the highest protection regions of the suit, is the practical approach authorities have recommended. In the past, V0 ratings based on the smaller 17-grain fragment simulator have sometimes been used to characterize fragmentation protection for highly protective suit areas. However, 17-grain V0 ratings are practically impossible to obtain for such high protective areas based on STANAG 2920, given the requirement to fire fragments at 1.5 times the estimated V0 velocity (no known laboratory can perform this).

The standard includes the qualitative evaluation of bomb suit blast integrity against a spherical charge, comprised of 1.25 lbs (0.567 kg) of C4 explosive, at a standoff of 2 feet (0.6 m), with a Hybrid III mannequin in a kneeling position (Figure 2). Many qualitative requirements are included (protection to remain in place, no gaps exposed after a blast, etc.) Because the NIJ standard does not currently specify reductions in blast overpressure, the ASTM Working Group WG22759 has begun work to define a standardized test method for bomb suit quantitative overpressure evaluation. When published, this methodology will complement the NIJ suit blast integrity test. This new ASTM effort is supported by members of the end-user community, NIST and industry experts.

Prior to the release of the NIJ bomb suit standard, historical focus had been on overpressure and fragmentation, with minimal emphasis on impact. Field experience from actual blast events highlighted the need for helmet impact protection to mitigate the very common occurrence of traumatic brain injury (arising from either blast or direct impact). The NIJ 0117.01 standard thus mandates a stringent set of helmet testing to ensure that EOD helmets provide high impact protection. The test methodology involves 9 different helmets being dropped 8 times each, for a total of 72 impacts (Figure 3). The impact energies and pass/fail thresholds are customized for EOD operations, recognizing the importance of

Figure 1: **NIJ 0117.01 Fragment Simulating Projectiles (17, 44 and 207-grain)**

Figure 2: **High speed video images of the NIJ 0117.01 blast overpressure test. Kneeling facing 1.25 lbs (0.567 kg) of C4 explosive, at a standoff of 2 feet (0.6 m). Two mannequins used for more data**

head impact protection to mitigate the risk of traumatic brain injury. The tests are conducted at three temperatures (68°F/14°F/131°F, or 20°C/-10°C/+55°C). These temperatures ensure helmet protection across the range of extreme hot and cold conditions in which bomb technicians must operate. The standard also includes a multi-temperature spine protector test methodology, developed specifically for bomb suits (as opposed to motorcycle test standards, sometimes used by bomb suit manufacturers), with appropriate pass/fail thresholds. This type of test addresses the critical need for blunt impact protection over the spine if a technician were to be propelled by the force of a blast.

The NIJ standard includes flame resistance tests for the suit outer shell materials and the helmet shell, based on ASTM D6413-99. The pass/fail requirements are customized for EOD applications, ensuring protection against the flash heat threat from IEDs.

Human Factors

While the bomb suit's primary objective is to protect from the main blast threats, EOD ensembles must also minimize hindrance to bomb disposal operations. As such, the NIJ standard includes stringent field of view requirements. The static field of view test (Figure 4) is conducted with a headform and a laser system, ensuring objective measurements with thresholds determined based on actual bomb technician requirements (e.g. downward field of view when manipulating devices, horizontal field of view for peripheral vision). The dynamic field of view tests (Figure 5) evaluate the appropriate integration of the helmet with the suit and protective plates. These tests ensure that the visual field is not blocked by suit components, such as the collar or frontal plates. Visor optics tests evaluating the level of distortion, light transmission, refractive power, and haze resistance, are also carefully conducted to ensure clear visibility and prohibit visual distractions. Finally, an end-user dressed in the EOD suit walks on a treadmill in order to assess the particular helmet system's ability to prevent visor fogging in accordance with the stipulations of NIJ 0117.01.

The NIJ 0117.01 includes additional requirements related to ergonomics whereby certified bomb technicians go through exercises relevant to EOD operations. For instance, an obstacle course involving the handling of a disruptor is included, as well as other tests like "lie on back and standup" and "kneel and rise". Such tests ensure that users can readily perform the critical motions required for their work.

The number of sizes, maximum weight and label legibility, are also explicitly prescribed. Certification to the NIJ standard thus provides a clear independent evaluation of a bomb suit against a wide range of test methods relevant to EOD. All tests

Figure 3: **Helmet drop tower testing relevant to traumatic brain injury. 72 drops conducted at 3 temperatures**

Figure 4: **NIJ Static FOV apparatus – helmet fitted on headform and tested at various angles**

Figure 5: **NIJ Dynamic FOV test – Head and Body motion with volunteer**

are conducted under the auspices of NIJ, overseen by an accredited standards organization in qualified third party and accredited laboratories. End-users and their procurement agencies, therefore, are no longer obliged to exclusively rely on supplier credibility and claims, or diverse test reports from disparate laboratories and test methods.

Beyond the NIJ Standard

While a critical step forward for the EOD community, the NIJ 0117.01 remains a "minimum standard", as its requirements do not address all the possible protection and functional requirements end-users may require. Procurement agencies must thus also take other requirements into account when selecting bomb suits. Quantitative blast overpressure measurements based on statistically meaningful data samples should be required, involving head acceleration, ear and chest overpressure. Other suit features, not necessarily directly related to protection, should also be seriously considered, or mandated. For instance, bomb technicians may need to communicate remotely (voice, data, images) in a safe manner. All electronics within the suit and helmet must meet the more relevant and highly stringent military standards for electromagnetic compliance (emissions and susceptibility according to MIL-STD and DEF-STAN), as opposed to the less stringent industrial standards (EN, FCC). EOD ensembles must provide proper lighting to work in dark areas, and they must fit a wide range of body sizes and shapes (recommended 5th percentile female to 95th percentile male). In addition, there may be a need for personal cooling or ventilation, when operating in hot environments. Ergonomics must also be evaluated beyond the NIJ requirements, which only ensure basic functionality in simulated scenarios.

In addition, purchasing agencies should ensure that bomb suit manufacturers provide long-lasting, high quality and reliable products, with strong customer support. The NIJ manufacturing facility audit plays an important role for this aspect. Other accreditations of the product, such as CE markings, RoHS compliance and some regional standards may also apply for bomb suits to be procured and used in certain countries. Finally, the NIJ standard for bomb suits requires regular re-certification after a period of time has elapsed, or a number of bomb suits have been manufactured, thereby ensuring constant vigilance and oversight of the quality and performance.

Conclusion

Bomb suit certification to the NIJ 0117.01 standard is a way to ensure fully independent, comprehensive and reliable validation of bomb suit performance against relevant EOD threats, built as per documented manufacturing processes and regularly audited independently, by an officially appointed and accredited organization. Self-certification to NIJ 0117.01 or unsupported claims about "meeting NIJ" are not permitted.

End-users should also ensure that beyond getting an officially certified suit, they specify any additional features of a bomb suit that may be important to them which may not be explicitly called out in the NIJ standard.

About the authors:

Dr. Aris Makris holds a Ph.D. in Mechanical Engineering with over 30 years of expertise in the fields of shock waves, detonation, and associated protection technologies. Since joining Med-Eng in 1994, Dr. Makris has led numerous R&D programs, including the development of several generations of highly advanced personal protective equipment for Explosive Ordnance Disposal (EOD). He has also participated in the development of industry standards and NATO working groups.

Dr. Jean-Philippe Dionne holds a Ph.D. in Mechanical Engineering with more than 20 years experience in the fields of detonations, blast waves and combustion. Since joining Med-Eng in 2000, he has been involved in numerous projects involving protective equipment against blast as well as the development of test methodologies and protection standards.

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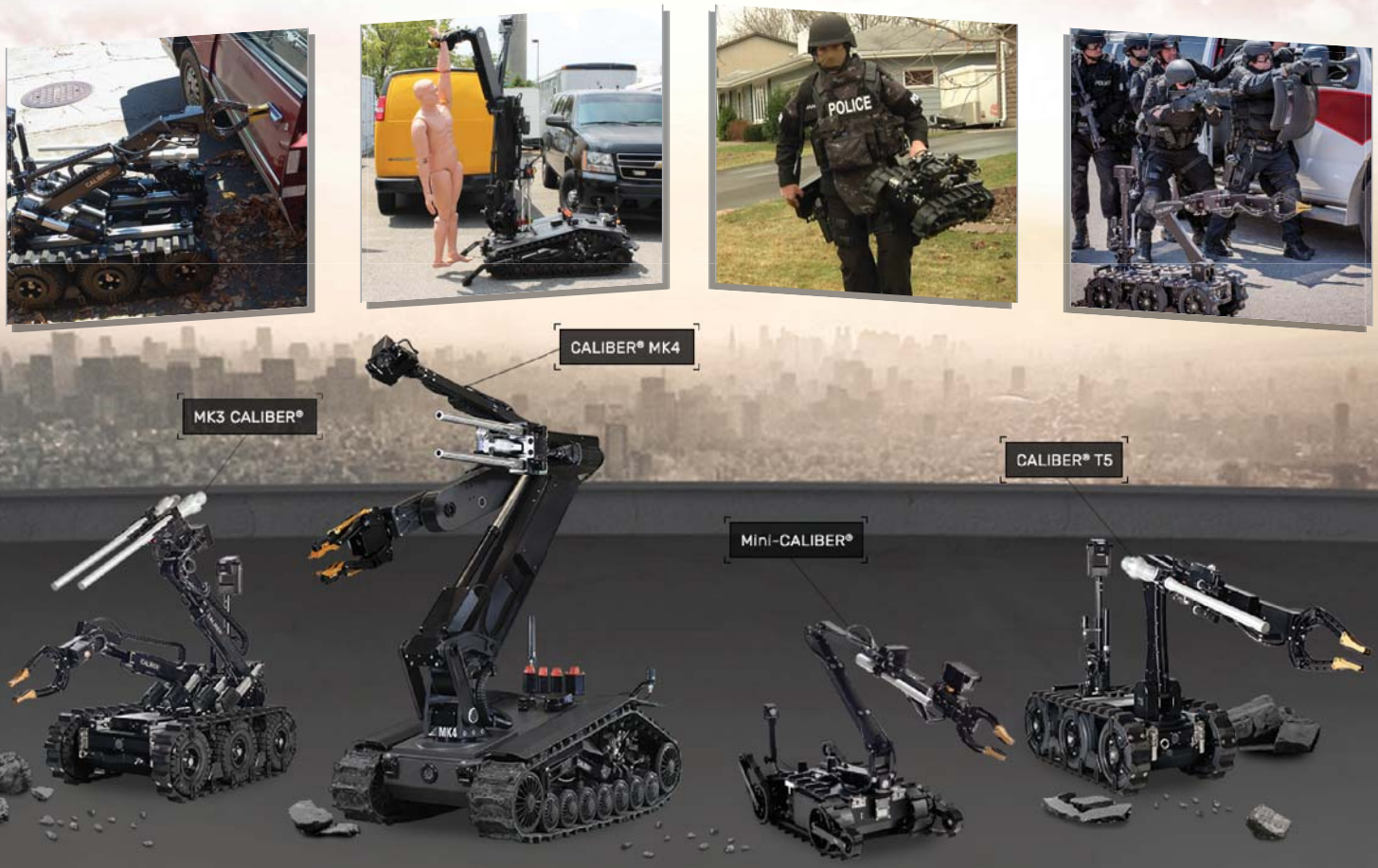

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"Advanced" training:
Is it helping or hurting our capabilities?

Are we Training for HOLLYWOOD or reality?

During a recent exercise I observed techs with little or no "advanced" training outperform those that were trained "advanced" operators. In each case the team died because they wasted so much time hunting for switches that had no right being there that they were killed by the timer (the only switch present) running down. This article highlights some of the problems I have encountered with "advanced" training within the public safety bomb technician and military EOD communities and where this training could be taking us if we are not careful. The goal of the article is to prompt the community to start talking about the issues, and then take steps to avoid some of the pitfalls I believe are there. I must stress that the comments I make are my own opinions. I have run them through my peers within both communities, as well as training contractors who also agree with them. It is therefore up to you, the technician and reader, to decide if you agree with my comments and conclusions and take my recommendations for change onboard, or reach your own conclusions based upon your own personal experiences.

I have had the privilege of training public safety and military technicians for almost 16 years and have seen a dramatic shift in the capabilities of the community towards advanced training, more specifically hand entry training. Some of my comments may seem contentious, but I make no apology for that. This article is not critical of any group, organization or company (I have never met anyone within these groups that wasn't well intentioned.) My purpose here is to bring to light a general philosophy I see creeping

into our training that I believe is doing us more harm than good. All of the comments that follow are based upon my observations of technicians performing poorly during training scenarios, due to what I term "training scars." This is where poorly designed training leads to bad habits being formed.

My concern is that we are heading down the path of training which focuses on what is possible rather than what is likely and realistic. This is exacerbated by a lack of threat assessment training coupled with the impossibility of conducting an accurate threat assessment when the training device and/or scenario make(s) no logical sense.
Following are my four main observations of poor training habits that hurt our operational capabilities. I will do my best to explain each one, but due to the open nature of this publication I cannot go into too great a detail. I encourage you to look at your own training experiences and I'm sure you will find your own examples.

Comment 1 – Poor training device design leads to the adoption of inappropriate RSPs and negates sound practices.

This is my number one criticism and I regularly see the results of unrealistic training device design. There is a tendency for the training provider to take a real-world device and decide that it's not challenging enough for training and modify it to make it harder. The classic example (but only one of many) I have encountered is the suicide vest. I have seen several examples of techs, when forced into a manual RSP, taking an inordinate amount of time clearing the vest. This is because in previous training they had encountered VO switches concealed within. When asked where this happened in the real world, and what purpose it served, the techs had no answer and were never informed that it was set up by the training provider to simply "catch the tech". However, the damage is now done and the techs that were "caught out" by this unrealistic device remember the lesson, incorporate it into their operational response, and are driven away from a sound threat assessment and RSP. The standard response from the training provider when cornered is that "well they could" which is a complete cop out. They could put an RC backup in everything, but do we always respond with ECM? They could put chemicals in everything, but do we avoid disruption just in case? We need to train on what is happening and what is likely and realistic, not what is possible and very unlikely. This attitude can only lead us to doing nothing, just in case.

Comment 2 – Poor training scenarios and mis-matched devices

This problem is generally linked to my first comment. No terrorist that I can think of arbitrarily selects a device for a specific target. One is usually intentionally chosen to match the other. The types of switches that could be incorporated into an IED are almost endless. Training to this standard is completely self-defeating. All it achieves is to cause the tech to slow completely down. I can usually tell who provided a team their training by the most frequently encountered "gotcha switch" they use precautions against, with light sensors being the major one.

For any C-IED operation the ability to conduct an accurate threat assessment is important. For a manual hand entry scenario, it's vital. If the device design, however, does not match the scenario then it's impossible to accurately conduct a threat assessment. Your trainer should be able to answer questions such as; Who or what is the target? Who is the bomber? What is their aim or goal? What are their capabilities/history? If you have the answers to these and other questions, then you should be able to start deducing how the IED is designed to function and what switches/ precautions can be discounted.

As an example, I recently ran a scenario that involved a very crude chemical IED attack on a hospital by an aggrieved relative of a patient that died there. A threat assessment should have led to the deduction that the firing switch was a timer and the target was not a bomb tech. All the teams

that responded to the task were successful, with the notable exception of the teams that had been trained in "advanced" techniques. They decided to take precautions against light activated and penetration switches (which didn't fit the scenario at all.) They ignored the real threat of time, which is what caught them out.

I believe a threat assessment is as important a tool as my disruptor or multi meter. It unfortunately is the most overlooked aspect of advanced IED training. One of the hardest tasks I encounter as a trainer is to try to persuade the student to trust me that I have not put out any "catch you" problems and that a well-executed threat assessment will serve them well.

Comment 3 – Training concentrating on drills rather than threat assessment and observation

A great example of this is detonator and switch diagnostics. These skills were, until recently, only practiced by a few but have now become fairly commonplace across the community. The problem I see is that these skills have become dumbed down into a drill or procedure. Part of the issue is that some of those teaching the techniques do not fully understand them. I often hear the skills erroneously referred to as wire attack. I do not know of any tech that is capable of safely attacking an unknown wire in an IED, although some will tell you that they can. The problem with a drill is that it may lead to blindly following it. I estimate that at least 50% of the detonator/switch diagnostics I see conducted during training were unnecessary. If the tech had been taught to understand the basic circuitry (specifically, the number of detonator connection points) the procedure could have been dispensed with. This reduces the risk of errors being made and speeds up the response. Those that have trained with me, know my mantra, "the more you do, the greater the chance you have of screwing it up". The same problems exist with many other procedures, such as light and dark countermeasures, X Ray, ECM, etc. They are sometimes blindly followed without thought being given to whether or not they are necessary and, more importantly, will they be detrimental to mission success?

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Comment 4 – Training based upon vendor/trainer invented problems and the requirement to use their equipment/technique to defeat the non-existent problem.

This has been an issue going back many years, the most insidious example in my view being that of alarm diagnostics/defeat. It started 20 years ago and was driven by our national labs as part of the national WMD mission. It is one of the most time-consuming skills to maintain mastery of, and completely useless in the real world. I defy anyone to let me know when we last encountered, or ever encountered, such a system in an IED. The alarm example is just a waste of your money. Far more dangerous, however, is the vendor designed techniques. I know of at least one case where a vendor is selling a piece of training equipment (vendor designed problem) and a technique to defeat it. I have proven that this technique does not work outside of their training device, however the technique and equipment to practice it on is still being marketed.

So how do we overcome these issues?

Ideally, you will have never encountered any of these issues, so you can stop reading now and I apologize for wasting your valuable time. (In my experience this will not be the case for most of you.) For those of you who have experienced these issues, here are my recommendations.

Step 1 – Check the credentials and reputation of those training you.

An astronaut is someone who travels beyond the earth's atmosphere, not someone who is trained to travel beyond the atmosphere but has never done so. The same is true of the Bomb or EOD tech. The onus is on you to check that the trainer you use is qualified and experienced in the area you wish to train in. I have heard some quite shocking statements from trainers that show they have no understanding of the basic principles of C-IED. For instance; "I built the device to be so complicated they couldn't hand enter it but had to do a precision disruption instead". This statement is 180 degrees out and shows a complete misunderstanding of the fundamentals of C-IED. This trainer could be training you or your technicians.

Be aware of trainers that are teaching a new/novel, or worse, a "proprietary" technique. Have these techniques been reviewed and approved? And by whom? I have recently reported two incidents to the FBI regarding techniques (both wire attack) that are being taught that I believe are downright dangerous and don't work. Both are being taught by personnel who obviously have no understanding of the dangers involved yet advertise themselves as subject matter experts.

"Subject matter expert" is a misleading and very overused term. What is a subject matter expert? I could take 3 "experts" with similar time on the job but from different disciplines and areas: military EOD who operated in Afghanistan, an LAPD bomb technician, and a bomb technician from rural Kentucky who worked protected drug fields. Each is at home in their area of expertise but would initially be completely out of their depth if asked to operate in one of the other areas. Ask yourself if your instructor is qualified to train your squad in your environment.

Step 2 - Call out your instructor.

Your instructor should have a detailed scenario that goes along with each device. That device should have been designed/built to match the scenario. If this has been done, then there should be enough information available to you to complete a detailed and accurate threat assessment. Once you have completed your task, have the instructor explain the scenario and justify each and every switch within the IED and call them out when the scenario and switch are not compatible with the bomber/device goals.

Summary

The goal of advanced training is to enable the technician to defeat a device using hand entry. This is a high-risk operation and requires good training from experienced instructors and continued practice to ensure success. It is my opinion, however, that consistent training on unrealistic scenarios and unrealistic devices is hurting our capabilities rather than improving them.

To be clear though, I am not suggesting that we don't train for the switches that are possible but unlikely. But when we do, we have to make a clear distinction between a scenario and device that are realistic and a "Catch You" device, where a threat assessment is impossible and is purely an additional way to practice techniques. These types of devices are fun and a good way to hone and refine skills during continuation training. They have no place during initial training, however, as this is where our habits are formed.

The Hollywood device is great for TV but is developing in our techs poor decision-making habits and making it difficult to practice an effective threat assessment. Exclusively training for what is possible, and not for what is realistic and likely, is not helpful. It may ultimately doom your team to failure.

Keep it Real!

About the author:

Steve Strong currently works for PAE (formerly A-T Solutions). He joined the British Army in 1978 as an ammunition technician and operated in several high threat theaters of operations, taught C-IED at the Army School of Ammunition and attended hand entry training in 1992. The last 10 years of his military career were spent supporting UKSF, which is where he developed strong ties with the US EOD and Bomb Technician communities. He retired in 2002 and moved to the US and has since become a US citizen. For the last 16 years he has been training both the military and public safety communities and is the author of several courses including: the bomb squad/SWAT interoperability and special event in–extremis C-IED course. Steve can be reached at: Steve.Strong@pae.com.

EOD TOY ALERT!

There is a new product on the toy market that has generated some interest in the bomb community: "CUT THE WIRE" by Yulu International, Ltd. out of Hong Kong.

The toy consists of a plastic bundle made to resemble dynamite. It has a series of 9 wires connecting to both ends. The object of the game is to cut a wire using an enclosed tool. Players roll the dice to get a private clue or the option for an opponent to cut a wire. If you cut the wrong wire, an alarm goes off.

It was previously advertised by Target with an MSRP of $24.99. I found it on Amazon for $34.18. Upon receiving the "toy", I took a series of reference X-Rays in case we encountered the toy or its electronics in an IED or hoax device in the future. (Due to its outward appearance, it could result in future calls, especially when it gets old or broken and is discarded).

On January 9, 2019 WFLA8 reported, as did several social media sites, that a deputy in Florida had resigned after mailing one of these toy bombs to a Lieutenant as a joke along with a note saying "BOOM". The joke prompted the partial evacuation of the administration building along with responses from their explosives K9 and local bomb squad. The package was determined to be a toy.

The photo's depicted below (from wfla.com) match this particular toy. Walmart and Target said they have stopped selling this product. YULU, the game's manufacturer, said it stopped making Cut the Wire in October 2018, and that they no longer ship this product to North American markets. However, it was still available for sale in the USA on Amazon this week.

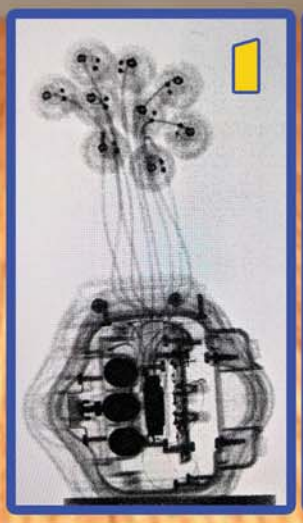
Submitted by G Michael Grimes who can be contacted at mikeg@butlersheriff.org

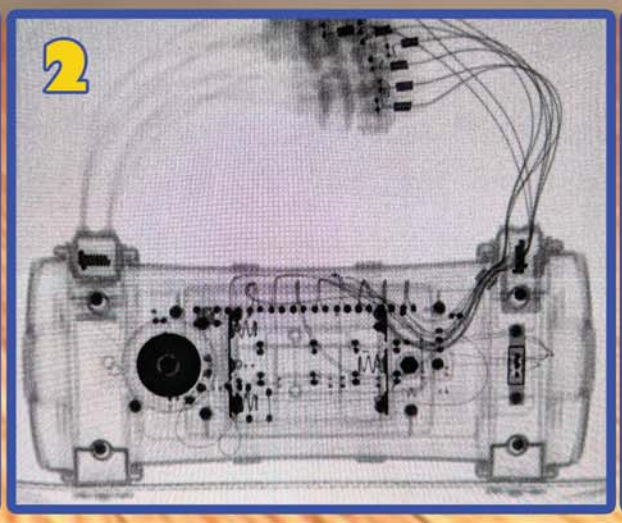
All X-Rays were taken at 6 feet, with an XRS-3 generator set at 3 pulses. Processed and photographed off a Nano's

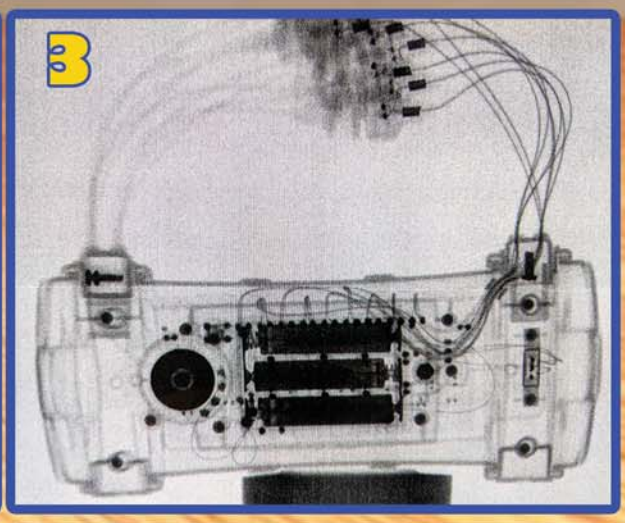
#1 is an end view

#2 is a side view without the batteries

#3 is a side view with the 3 AAA batteries inserted into the toy







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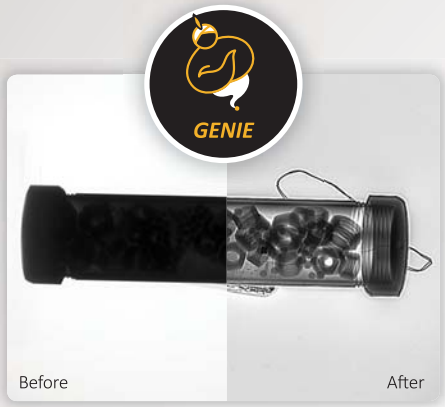

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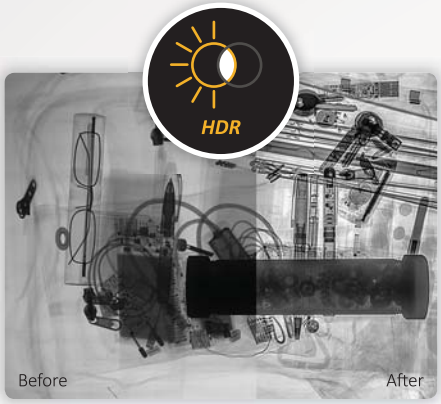

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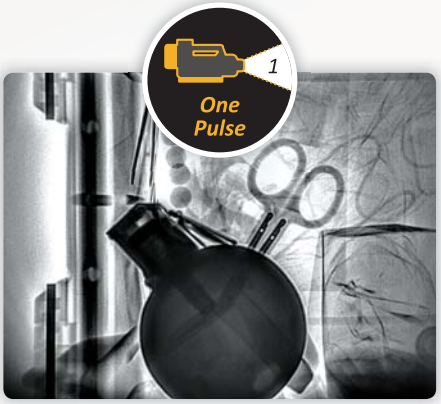

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POWDER TRAIN

PART 1

The first two issues of The Detonator in 2018 included a two-part article of mine on the subject of black powder. I felt that the history, varied use, and significance of the oldest explosive warranted the two-part issue. The same applies to the unique tools, accoutrements and methods used to ignite black powder.

Just what is a "powder train"? In the December 1923 issue of the Blue Diamond Biu Whang, (Photo # 1) a monthly magazine published by Blue Diamond Materials Company of Los Angeles, California, a powder train was just that-it was a freight train loaded with powder. In this case the powder was dynamite. Pictured in their magazine were 10 rail cars filled with Hercules Powder Company dynamite to be loaded in their quarry in Hoag's Canyon near Corona. The article stated that tunnels were being driven deep into the huge face of solid rock and that the tunnels would be loaded with the ten cars of dynamite and that at 2 o'clock on the afternoon of January 20th, 1924, "we expect to set off the whole works in one shot." (Note: there were delays in loading all the cases of dynamite and the shot was not fired until March.) 2,000,000 tons of rock were broken in the single shot.

BLUE DIAMOND BIZZ WHANG

THE BIGGEST EXPLOSION IN THE WORLD

OF COURSE, we expect to have our regular "blowouts" on Christmas and New Year's. But along about January 20th we're going to stage what promises to be the biggest "blowup" in the world.

Tunnels are now being driven deep into the huge face of solid rock at the Blue Diamond quarry near Corona. These tunnels will be loaded with ten cars of dynamite and about 2 o'clock on the afternoon of January 20th we expect to set off the whole works in one shot.

Those who witness this imposing spectacle will see the effect of the largest single charge of dynamite ever exploded. They will see a mountain of rock, weighing millions of tons, torn from its peaceful moorings and thrown a distance of 300 feet over the quarry floor in a fraction of a minute.

This gigantic blast will cost in excess of $50,000. It will be loaded and fired under the personal direction of J. C. Cushing, technical engineer of the Hercules Powder Co. Mr. Cushing has made all previous shots at the Blue Diamond quarry and has executed each shot at a remarkably low cost.

No other shot ever made in America will compare in magnitude to the Blue Diamond blast next month, according to Mr. Cushing. The Corona explosion will be almost twice as large as the largest fired heretofore.

Provision will be made for the safe accommodation of all who care to witness this interesting spectacle.

INTERPRETATIONS

In England they call it "Plawstering."

In America it's known as "Plastering."

In college it's known as the "art of applying mortar."

A child says it's "spreading stuff on the wall."

A builder refers to it as "mud slinging."

But to a plasterer it was "just darn hard work" until he used our plaster.

10

SERVICE

PICTURE PUZZLE

Find a famous building materials company's trade mark concealed in the Christmas trees pictured above.

DECEMBER 1923

1

At that time, this was the single largest blast that the world had ever seen. The rail cars loaded with explosives, even at that point in our history, were required to have warning "cards" (placards) stating that the rail cars loaded with explosives must not be placed in a passenger train, next to loaded tank cars, refrigerator cars equipped with gas burning automatic refrigeration, or next to cars containing lighted heaters, stoves or lanterns, or cars placarded "Inflammable " or "Corrosive Liquid". (Photo# 2)

I mentioned in the Black Powder article in the March/April 2018 issue of The Detonator that I had found references to construction and mine blasting in Connecticut as early as 1773. Black powder is relatively insensitive to shock and friction and must be ignited by flame or heat. In those early days, devices such as torches, glowing tinder and heated rods were used to ignite the powder, and in most cases a "trail of black powder" was poured from a 25-pound wooden keg as the blaster walked away from the main charge. The trail of black powder, which would bum and smoke its way to the main explosive charge, would give the shot firer time to get to a safe place.

The simplest form of fuse is the burning fuse, believed to date back to the 10th century and originating during the medieval Chinese Song dynasty. This simple fuse consisted of lightweight paper filled with loose gunpowder, and served as a means of delaying ignition in fireworks. A similar product sold today is "Pyrolace". (Photo # 3). A version of this simple fuse is called visco fuse, and consists of the burning core coated with wax or nitrocellulose lacquer for durability and water resistance. (Photo # 4). Early fuses for grenades also consisted of a wooden plug with a longitudinal hole filled with a slow burning gunpowder mixture inserted into the grenade. Such fuses were in use until the 18th century.

The commercial and military version of a burning fuse referred to as "safety fuse" is a textile tube filled with combustible material (black powder) and wrapped in tough textile or plastic to prevent external exposure of the burning core. Traditionally, fuse was sold in 100-foot lengths in a soft paper wrapping. The wrappings themselves are quite scarce, since they were normally used as toilet paper in the mines. (Photo # 5). About 20 years ago the powder companies went to 1000-meter spools. The military fuse time blasting M700 is sold in sealed metal cans approximately 14 ¼ inches long and 6 ¾ inches wide. The can in my museum is labeled "The Ensign-Bickford Co." (Photo # 6) Military time fuse is typically colored green or black. Most commercial fuse is orange in color, but varied with location and intended use. It was common to see white fuses at coal mines and black fuse at salt mines for ease of visibility. Safety fuses are used to initiate the detonation of explosives through the use of a blasting cap. (Photo #7) Always conduct a test bum on your fuse to check the rate of burn, which is normally rated at 30 to 40 seconds per foot.

As professionals working with explosives, we must understand that we are unique in our knowledge. Less than 1% of the general population knows anything about explosives. Other than cartoons and old western films, most people have neither seen nor used explosives. History, unfortunately, is filled with examples of how lack of knowledge on the subject has injured or killed individuals. As recently as 6 September 2018, when thunderstorms knocked out power to homes in Bridgeport, Connecticut, a 30-year-old woman, a mother of two, went into her basement to grab what she believed were candles left behind by the former residents of the house. She lit what she thought was a wick to the candle. What she picked up and lit was actually a fuse in a quarter stick of dynamite. The news article said the woman was taken to the hospital with "extreme injuries" to her hands and face.

William Bickford (1774-1834), an English inventor, had lived in Tuckingmill in the heart of the Cornish mining industry, and was well aware of the large loss of life from explosives accidents in the mines. He invented safety fuse in 1831. He had been inspired by watching a friend, James Bray, making rope. With his son-in-law George Smith, he established a factory in Tunkingmill for the production of safety fuse, and in its first year the factory produced 45 miles of fuse. He died a short while before his company actually started up. It took a while for miners to use the new safety fuses, for the old ones were cheaper. His company eventually became part of the Ensign-Bickford Company. Blasters used crimpers to attach the blasting cap to the fuse. I know that you are all familiar with these tools, but I will show a few anyway. (Photo # 8) My little collection of 30 or so crimpers is considered rather meager to the avid collector, but unique to my little museum is a rusted-out piece of junk in which the spring has sprung. (Photo # 9) I have found no literature on it nor have I even seen a similar device. It was donated by the blasting superintendent of an Arizona copper mine. They had dismantled an old powder prep building, which had been the workroom for cutting fuses and capping the fuses prior to taking the explosives into their mine. This device, viewed up-side down, was a wind-up, spring activated, safety fuse cutter from early 1900's. It was attached to the work bench next to a DuPont Superior Crimper. (Photo # 10) These tools were used to crimp caps to fuses in mass production.

I know that most of you are familiar with electric matches. (Photo # 11) They typically consist of a pair of wires leading to a thin resistance wire that heats when voltage is applied. The resistance wire is covered by a bit of pyrotechnic composition that ignites from the wire heating. The electric matches can be used on individual fireworks. (Photo #12) Large fireworks displays are launched with complex timing sequences using a computer that energizes electric matches connected to the individual device fuses. Please note that electric matches are not new. Pictured are three electric matches that I found in an old lead/zinc mine near Socorro, New Mexico. (Photo #13) The mine had closed in 1945, right after WWII. These matches were discovered in a large rat's nest located about 40 feet from what had been the underground explosives storage site. These electric matches were manufactured sometime in the late 1880 to 1890's. The blaster at that time was using a "plunger" blasting machine. It would ignite all the fuses at one time, but the black Monarch fuse was cut to different lengths to provide a time delay between shot holes. This provided for better breakage of the rock.

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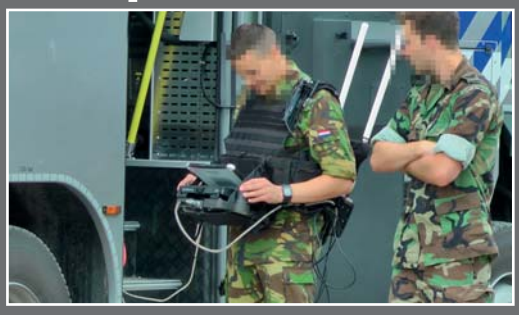

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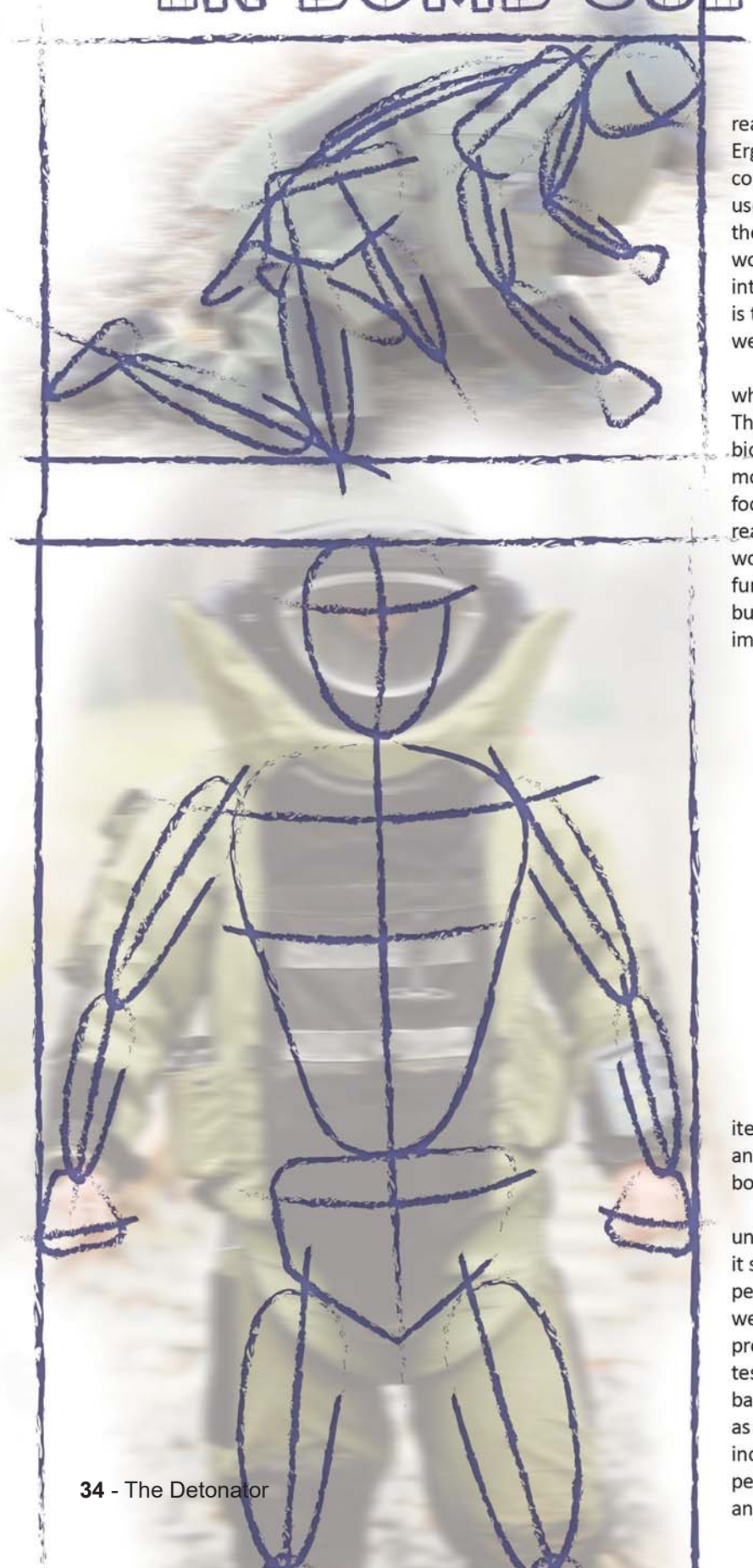
ERGONOMICS IN BOMB SUIT DESIGN

By: Matthew Keown



We've all heard about ergonomics. But what does this really mean and why is it important to EOD operators? Ergonomics, or human factors, is the process in design that considers the safety, comfort and capabilities of the human users. Human factors engineers study the interface between the user and product, whether that product is a machine, a work method or the workplace environment. The user interaction with a product can be cognitive or physical and it is the physical interface that defines the experience of wearing a bomb suit.

Physical ergonomics is what we are most familiar with when it comes to the consumer products we use every day. This has to do with human anatomy, anthropometry and biomechanics which defines how our size, posture and motion interacts with the product. Cognitive ergonomics focuses on mental processes, like perception, memory and reasoning and how the products we use influence our mental workload and decision-making ability. Maintaining cognitive function is imperative for conducting render-safe procedures but this article will focus on why physical ergonomics is important too.

Figure 1: Evaluating a participant's ability to climb over a barrier in a mobility study.

Ergonomic design can be applied in a three-phase, iterative process that is used throughout the design cycle of any product from an electric toothbrush or a mobile app to a bomb suit.

The first phase in the design process is gathering and understanding customer requirements. This is not as easy as it sounds. Consider safety and performance requirements in personal protective equipment. These are often based on well-established test methodologies. Fragmentation protection levels, for example, use V50 ballistic resistance testing with a known fragment type and impact velocity based on risk assessments. Ergonomic requirements are not as easily defined. Typical bomb suit requirements might include that it fits a certain group of people or that the suit permits user mobility. Published literature and anthropometric surveys provide insight into the size of

individuals within a target population, but how well the bomb suit fits each body shape can be very subjective. And the suit's influence on mobility will vary depending on the user and their fitness level, as well as the activity they are attempting to complete.

Sizing requirements involve establishing both ends of the target population, typically a small female and a large male, to accommodate variations in user height. For the small female, a 5th percentile height indicates that five percent of the women surveyed are that height or shorter. At the other end, the 95th percentile male height says that five percent of the measured men are that tall or taller. Using these boundaries captures over 90% of the user population, based on their height.

But percentiles are numbers, not people. A 5th percentile female simply does not exist. Or more accurately, a woman with all her body dimensions corresponding to 5th percentile numbers doesn't exist. If a woman matches a desired percentile height, she will not likely match the same percentile value for waist circumference or arm length. The height and weight percentile numbers of any given person will be different. But these numbers do give a good starting point for garment design.

In the absence of uniformly proportioned individuals, we develop models of the people we expect to fit each of the planned sizes of bomb suit. Starting with the height and weight, the model is constructed by studying anthropometric data of the target population and estimating body dimension using averages, deviations and trends. The garment designers can then build patterns using standard grading methods for clothing measurements like sleeve length and pant inseam, to ensure proper fit in all directions.

Identifying and understanding who is wearing the bomb suit leads to the second phase of the ergonomic design process: gathering end-user requirements. These differ from performance requirements which are more about blast protection and less about the features that EOD operators need to do their job. For the user, it is the convenience of reaching for a tool with one hand while the other hand is already holding something. Or the ability to activate headlamps using a voice command if both hands are busy. User requirements may be as simple as being able to walk in a confined space without getting snagged, like the operator is seen doing in Figure 2.

Figure 2: Searching a school bus for a suspected device during a live action training scenario.

There are several ways to gather user requirements. Customer feedback of existing products is a great resource to identify opportunities for adding or improving features and Med-Eng has a long history of products designed to meet customer requests. User requirements may also be gathered through observation of bomb techs in action and a great way to do this is attending IABTI regional training events and other live activities. Finally, and most importantly, user requirements are identified through communication with active end users. By speaking with bomb techs and listening to what they have to say, the goal of the human factors engineer is to fully understand the expectations of the user experience while wearing the bomb suit on a mission.

These expectations are passed onto the engineers and designers early in product development. When functional prototypes are ready, the third step of the ergonomic design process starts. Usability trials offer the opportunity for participants to wear these prototypes. They are asked to complete specific activities to determine whether the end-user requirements are being met. And as I always remind my participants, this is an evaluation of the product, not the person. Strong ergonomic design should not require the user to adapt to the product. Instead, the product should fit into the user's standard operating procedures.

The characteristics of the participants required in a usability trial depend on the goal of the testing and the readiness level of the product under evaluation. Several former EOD operators on staff at Med-Eng are engaged as participants to have immediate access to mission-relevant feedback. When an advanced prototype becomes available, an unbiased evaluation by active operators provides incredible value. For example, in a recent study on the performance of a new sizing system for the EOD 9/9A helmet, the experience and expertise of an EOD team was leveraged in the successful product validation during simulated operational scenarios.

Figure 3: Climbing stairs (NIJ Bomb Suit Standard 0117.01).

The activities selected for usability trials also depend on the trial goals and can be as simple as a single test stand where the operator sorts tools in a kneeling position. For an overall evaluation of a complete ensemble, the NIJ Standard 0117.01 for Public Safety Bomb Suits states ergonomic requirements and test methodologies including an obstacle course designed to replicate many of the typical challenges that an EOD operator may encounter, like climbing over a railing or walking up stairs (see Figure 3). The NIJ standard has measurable requirements for some tests while for other tests, success is determined by whether the operator can complete the task. When using these test methods as an evaluation tool within the ergonomic design process, feedback from the participants during each activity is recorded to identify areas for product improvement.

The three phases presented for the ergonomic design process of a bomb suit ensemble can be re-stated as:

(1) identifying basic requirements related to the target population,
(2) understanding the needs of the end user to facilitate their EOD operations, and
(3) validating the design through usability trials with representative operators.

A bomb suit with a good ergonomic design is easy to wear and intuitive to use. Instead of thinking about the suit they're wearing, operators can focus on completion of their task. They can concentrate on their cognitive ergonomic functions, like perception, memory and reasoning, necessary in critical decision-making.

About the author:

Matthew Keown holds a degree in Mechanical Engineering and is the Senior Human Factors Engineer at Med-Eng. In this role, he works with designers to shape product usability and runs test programs to gauge user acceptance across all product lines. Matthew can be reached at matthew.keown@safariland.com.

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April 3-12, 2019	April 7-12, 2019	State Preparedness Training Center, Oriskany, NY
May 1-10, 2019	May 5-10, 2019	YMCA, Winter Park, CO
June 5-14, 2019	June 9-14, 2019	Muscatatuck Urban Training Center (MUTC), Butlerville, IN

** Please note: Observer Controllers (OC) have a 10-day commitment.*

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17cm, Not Your Ordinary Ordnance

BY: Jeff Osborne

Most ordnance items that are frequently seen by US EOD and bomb squads have had sufficient research and attention that, if a little time is spent searching or the right questions are asked, an appropriate identification can be made without too much difficulty. In this article we will examine an exception to that rule and try to provide some information to make it easier for teams to make an initial identification and determination of potential hazards.

Foreign ordnance items found by law enforcement bomb squads are most frequently war souvenirs. Brought back with official permission or covertly snuck back, these pieces are typically small and relatively light, things that could easily fit into a pocket or pack.

Occasionally however, teams come across larger ordnance items. The larger it is, the harder it was for a service member to get home, so a different origin is more likely. Most often, large ordnance found is from government release of US items, frequently as sales of scrap to salvage yards. Artillery projectiles, bombs, rockets – over the years the government has released from their inventories nearly anything you can imagine. But where do large pieces come from that are not US manufactured items?

Nothing pushes ordnance development like conflict. For those creating and manufacturing munitions there is a constant effort to advance and improve. As a normal procedure, both during and after the end of hostilities, the military complex looks at what worked well on each side and how to improve its armaments. Studying and testing the arms of other countries is a part of this process. Typically, during and following the end of conflict, hundreds of different munitions types are brought back for testing and evaluation. Normally quantities of these items are relatively small, and once testing is done they are destroyed or placed in museums. Seldom are they released, at least in any significant number.

An exception to this is an item that is surprisingly common in many areas of the US. It is a large caliber projectile, 170mm (6.7 inches) in diameter and 808mm (31.8 inches) long, weighing 120lbs (54kg) empty. Over the years I have picked up eight of these projectiles and I have three in my possession currently. I know of 11 others found in Michigan alone in recent years, 5 in one discovery. I've also seen them firsthand in Ohio, Indiana and Oklahoma. I've been told of them in Idaho, California, Florida, Massachusetts and Arizona. Ordnance collectors confirm that they are widespread across the country.

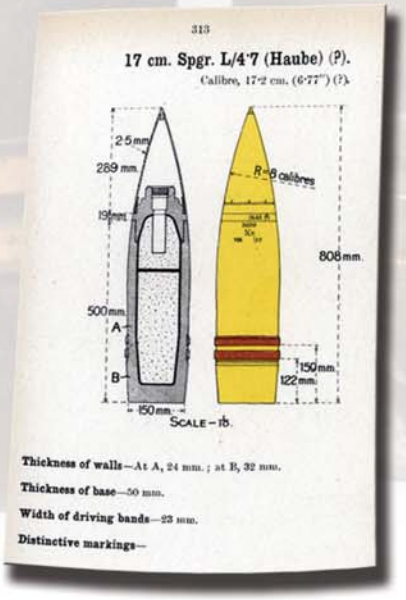
In many cases this munition has been misidentified as a US projectile that is similar in size, the Vietnam War era US 175mm. In fact, however, it is a WWI projectile (and early WWII), used by the German Navy. Its nomenclature is the 17cm Streamline Naval High Explosive Shell with a False Cap (17cm Spgr. L/4'7 (Haube) (P). Following the end of WWI the battleships using these rounds were considered obsolete and the guns were then turned over to the Army for use as rail guns or towed artillery. Without documentation or a comparison item it would not be difficult to misidentify the ammunition, with most bomb squads never suspecting the actual origin.

To date it has not been possible to verify with certainty why these projectiles are in the US and how they became so widespread. However, in both of the World Wars the German military led the world in the development of advanced weaponry and ordnance. Even today many of the world's munitions are still based on German wartime innovations and designs. This projectile and associated gun were considered highly advanced for the time, so it is very likely that at the end of the war examples of the guns and ammunition were brought back for testing and evaluation. Following completion of testing, any empty rounds would have been scrapped or could have been given away as souvenirs, both to private citizens and organizations like the VFW. I've found no documentation of this, but it would follow the pattern of other non-ordnance test items brought back by the military.

With proper references and information, the projectile is not difficult to identify or separate from the US 175mm. A comparison photo is provided to the right. Perhaps the most significant identification features are that the 17cm has two rotating bands vs one on the 175mm, and the fuze well for the 17cm is concealed under the false cap (windshield) vs the 175mm being prominently nose fuzed. At the nose of the 17cm is only a small steel threaded nipple. The 17cm projectile is frequently seen with the entire ogive (nose) painted red, but it may be found as black also.

During WWI the projectile used one of two different fuzes, designated as the E.Kzdr.f.Spgr. (m.H.) and the DoppZ 16 o Az. It is significant to note that from all of the sources I have spoken with which have recovered these items, none have identified a fuzed round inside the US, nor one containing any energetic materials.

WWI British intell doc


313

17 cm. Spgr. L/4·7 (Haube) (P).

Calibre, 17·2 cm. (6·77") (?).

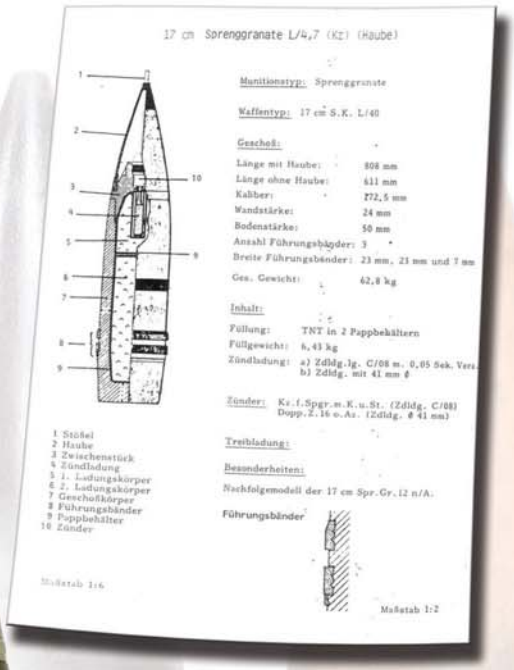
Thickness of walls—At A, 24 mm.; at B, 32 mm.

Thickness of base—50 mm.

Width of driving bands—23 mm.

Distinctive markings—

German EOD Identification document


17 cm Sprenggranate L/4,7 (Kz) (Haube)

Munitionstyp: Sprenggranate

Waffentyp: 17 cm S.K. L/40

Geschoß:

Länge mit Haube:	808 mm
Länge ohne Haube:	611 mm
Kaliber:	272,5 mm
Wandstärke:	24 mm
Bodenstärke:	50 mm
Anzahl Führungsbänder:	3
Breite Führungsbänder:	23 mm, 23 mm und 7 mm
Ges. Gewicht:	62,8 kg

Inhalt:

Füllung: TNT in 2 Pappbehältern

Füllgewicht: 6,43 kg

Zündladung: a) Zdldg.lg. C/08 m. 0,05 Sek. Verz.
b) Zdldg. mit 41 mm ∅

Zünder: Kz.f.Spgr.m.K.u.St. (Zdldg. C/08)
Dopp.Z.16 o.Az. (Zdldg. ∅ 41 mm)

Treibladung:

Besonderheiten:

Nachfolgemodell der 17 cm Spr.Gr.12 n/A.

Führungsbänder

1 Stößel
2 Haube
3 Zwischenstück
4 Zündladung
5 1. Ladungskörper
6 2. Ladungskörper
7 Geschoßkörper
8 Führungsbänder
9 Pappbehälter
10 Zünder

Maßstab 1:6

Maßstab 1:2

175mm 17cm

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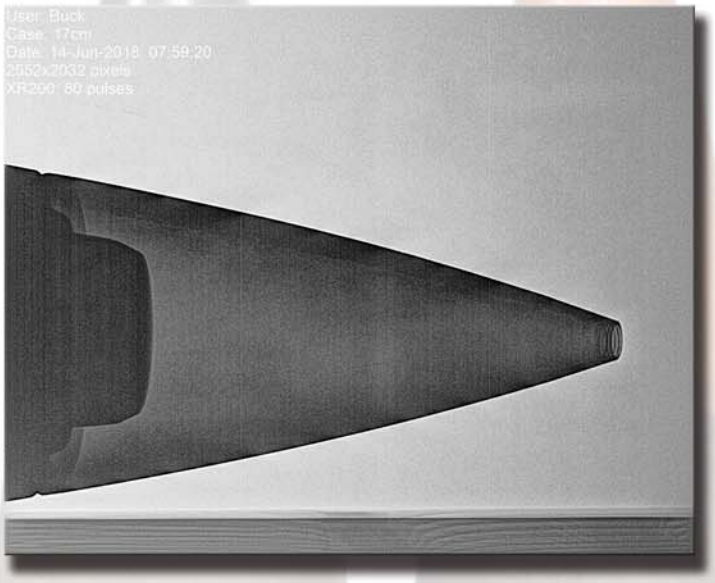
If you locate one of these projectiles it may not be possible to unscrew the false ogive. There are then two possible ways to confirm that no fuze/filler are present:

The projectile body is very heavy and standard squad X-ray units will not be able to penetrate it. The false ogive (forward quarter of the projectile) however, is much thinner and can be X-rayed successfully (see photo). Once you have a decent image you should be able to see the raised ledge that the fuze screws into, and note the absence (or presence) of the fuze. If for some reason you are unable to X-ray the projectile, you may still be able to remove the small nipple at the tip of the projectile and use fiber optics through the opening to view the interior.

Of all of the projectiles I have encountered, only one was in good enough condition for me to unscrew the false ogive. Photos are included to show the internal construction and aid in identification.

While out of the ordinary and initially somewhat intimidating, with a little thought and examination you may be able to successfully clear these projectiles as empty and save yourself some major headaches in the process. Fortune favors the prepared mind.

17cm Ogive X-ray



17cm top view nofuze

Fuze present

No Fuze

About the Author:

Jeff Osborne has spent the last 40 years working as US Army EOD, commercial UXO quality control officer, chemical weapons recovery and destruction specialist and in his current position an Explosives Specialist (TSS-E) for the TSA covering transportation assets in central Michigan. In his free time, he manages the Bombatorium, a private museum housing one of the largest inert ordnance collections in the United States. From the Bombatorium he teaches ordnance recognition classes to military and civilian bomb squads at the Federal, State and local levels. He is currently the IABTI Chapter Director for the State of Michigan. He can be contacted at jgoeod@hotmail.com.

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Reg Pattee, Region I member, and retired Bomb Squad Commander, has created four sculptures with ATF, EOD, and IABTI icons. Each of the four sculptures are made of plate steel and sell for US$40 *(price includes shipping within the continental United States)*.

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Item 1 - Master EOD Wings: 15"W x 12"H (Basic & Senior wings also available)
Proceeds go to the EOD Warrior Foundation

Item 2 - Powder Monkey: 4.5"W x 8.5"H (limited sale ATF & affiliated personnel)
Proceeds go to the IABTI Rob Williams Scholarship Fund

Item 3 - ATF K9: 8"W x 3.5"H (limited sale ATF & affiliated personnel)
Proceeds go to the IABTI Rob Williams Scholarship Fund

Item 4 - Mad Bomber: 9.5"W x 9.5"H
Proceeds go to the IABTI General Scholarship Fund

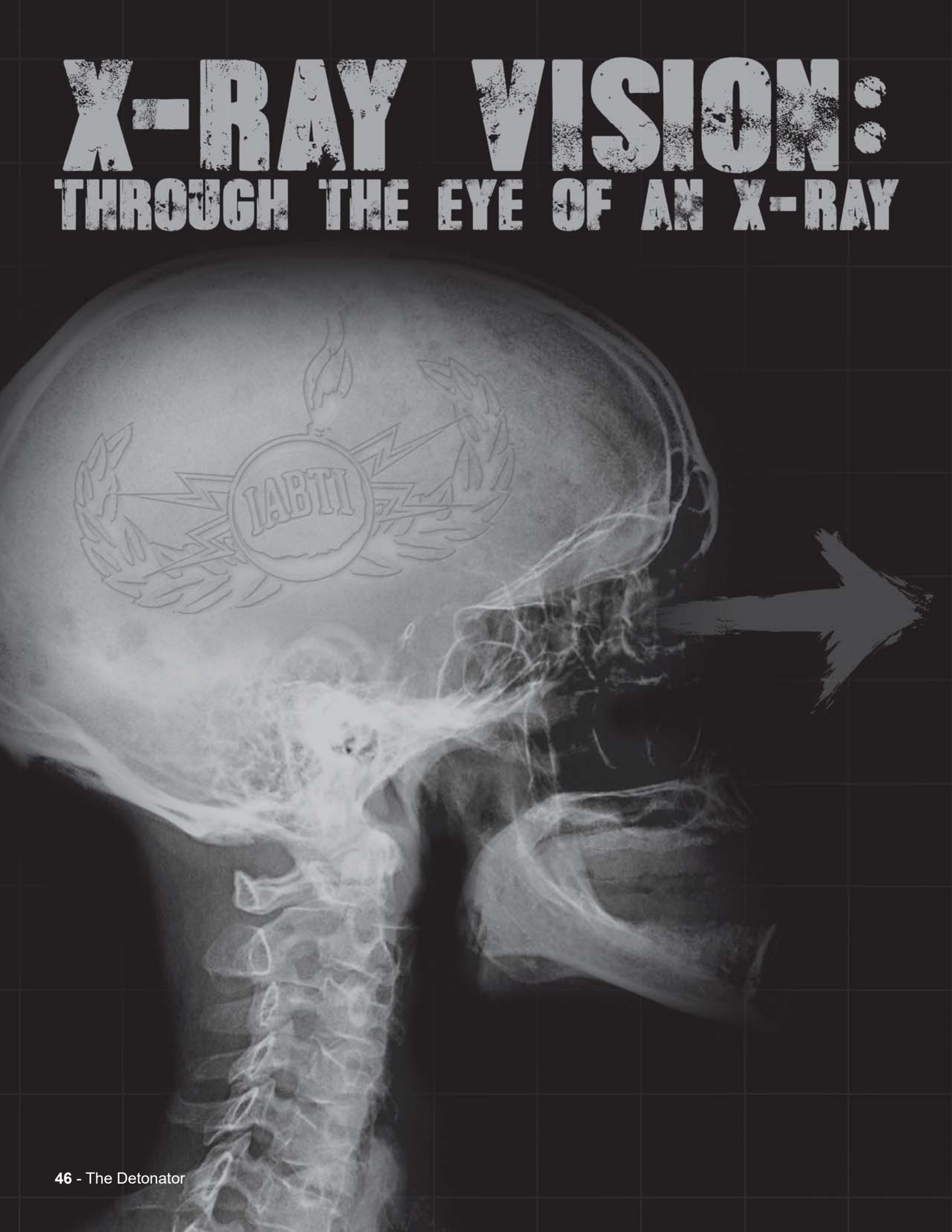
Item 5 - IABTI Wings: 14.75"W x 9.5"H
Proceeds go to the IABTI General Scholarship Fund

Each sculpture is **custom cut**, **hand finished** and **made in the USA**.

Net proceeds benefit members of the EOD community or their families.

To order, email: members@iabti.org with the desired sculpture number.

X-RAY VISION:
THROUGH THE EYE OF AN X-RAY



From the RECON database. RECON is a project funded by CTTSO/TSWG to develop software tools to help identify components in x-ray images. For more free component ID training please visit https://xtk-recon.sandia.gov.

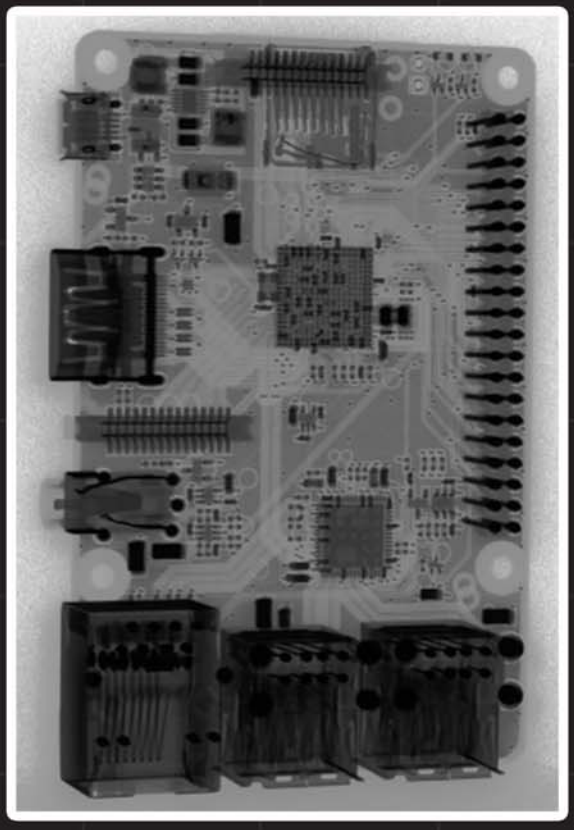
ITEM DESCRIPTION:

Type: Raspberry Pi Model B+ Hobby Computer Board

Cost: ~$30

Function: Small single board computer with on-board USB, HDMI, ethernet, and analog or digital I/O interfaces. Can stack with a large variety of other boards to enable functions such as Wifi, motor control, sensor interfaces, etc.

Size: 9cm x 6cm



X-RAY Information:

System: Nikon 450 Digital X-Ray System, 85 micron

Source : 270 keV, 1mm Copper Filter

Exposure: 1 second

To submit for this feature, please include a photo of the item, as well as an X-ray image. Include which X-ray system, source, stand-off distance, and number of pulses that were used to capture the X-ray. If applicable, please include what the item is typically used for (ie. electronic component) and where it can be found or purchased, if know. Your submission can be emailed to: detonator@iabti.org.

IABTI Chapter Directors

State	Chapter	Officer's Name	Email Address
Region I			
AK	Alaska	Brad Conklin	Bradley.Conklin@dhs.gov
AZ	Arizona	Danny Waltenbaugh	drwaltenba@cox.net
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Switzerland		CPT Alexandro Spora	Alexandro.Spora@vtg.admin.ch
UK Ireland		Andrew Pettitt	andrewjpettitt@icloud.com

IABTI Scholarship Fund

IABTI's Scholarships are available for IABTI members or their dependents who are enrolled or planning to enroll as a full-time undergraduate or graduate student in an accredited two-year, four-year, or vocational school. Selection criteria is based upon academic merit, school, and community involvement.

The IABTI Scholarship criteria and application are available on IABTI's website (once you're logged in, click About, Scholarship). Annually the IABTI awards about $20,000, with individual awards in the amounts of $3,000.00, $1,500.00 and $1,000.00 USD each. Applications are due by April 1st.

Passing Parade

Frank J. Guerra
2018

Michael L. Peck
6/2/18

Charlie Stumph
1/30/19

Patrick J. Webb
12/17/18

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Walter Chavez	Riverside County Sheriff
Travis Clapie	Unified Fire Authority
Christopher Johnson	Snohomish County Sheriff
Steven Kimbrell	Douglas County SO
Mike Lacer	Oregon State Police
Zach Mickle	Oregon State Police
Shaun Palm	The Church of Jesus Christ of Latter-Day Saints
Christopher Roberts	Napa County Sheriff Department
Ben Ruddell	Salem Police Department
Ryan Sanders	Tahoe Douglas Fire Protection District
Edward Tomany	Nye and Esmeralda County SO
David Turner	Sacramento PD
Paul Willprecht	Maricopa County SO

Region II

Chris Adams	LA State Police
Joe Baker	City of Mesquite
Bryan J Bartnes	LOVELAND PD
Matthew Biernacki	Amarillo Police Dept
Steve Buratt	DPS/LA State Police
Keith Coates	Dallas PD
Nicole Green	DFW Airport DPS
Cody Kessler	Denton FD
Aaron Lancaster	Norman PD
Steven Long	Louisiana State Police
Randy Matson	DFW International Airport
Scott McFerrin	DFW Airport PD
Jonathon Nunley	Little Rock Fire Department
Kevin Robinson	DFW Airport DPS
David L Skipper	Wyoming State Parks
Michael Walsh	Denver Police Dept
Michael Walton	Dallas PD

Region III

Matthew Conley	Winnebago County SO
John Danner	Bloomington Police
Gregory Gillming	USPIS
David Glenn	Scottsbluff Police Dept
Derrick Jones	USPIS
Darren Lewis	University of Illinois PD
Brent Long	ELKHART PD
Noah McNeese	Nebraska State Patrol
Anthony Merlo	Olathe Fire Department
Nicholas Peterson	USPIS
Brent Phillips	Winnebago County SO
Anthony Piwowarczyk	
Andrew Schippers	Kansas Highway Patrol
Jonathan L. Shearer	Outagamie County SO
Derik Thieme	USPIS
Mike Weber	Winnebago County SO

Region IV

Teddy R. Arthur	Cincinnati FD
James Bise	Montgomery County Fire & Explosives
Vondell Caldwell	Cincinnati FD
Michelle Clarke	ATF
Walter B. Cook	Cincinnati FD
Christopher Fenzel	MD State Fire Marshal's Office
Dan Gardner	Arlington County Police Department
Daniel Haggerty	US Navy
Michael J. Helbling	Cincinnnati FD
Dee Dee Hulker	Blasters Tool & Supply
Justin Jameson	Westshore Enforcement Bureau
Michael C. Klems	Cincinnati FD
Brian Koos	NSWC IHEODTD
Byrdell J. Love	Cincinnati FD
Christopher Moe	Montgomery Fire & Explosive Investigations
William Potts	Maryland State Fire Marshal

Region IV (cont.)

Mark A. Reuss	Cincinnati FD
Todd A. Ring	Baltimore PD
David Sadler	Lexington Police Department
Martin Samelak	Cincinnati Fire Department
Jonathon Schwalm	Michigan State Police
Matt Stevens	Maryland State Fire Marshal
Steven J. Sweeney	Cincinnati FD
Stuart Taylor	Stucan Solutions Corporation
John Tennyson	Maryland State Fire Marshal
Robert Thomas	Cincinnati FD
Aaron Tyler	Prince George's County Fire
Andrew Urbiel	Michigan State Police
Robert H. Von Hoene	Cincinnati FD
Erin Wirth	Montgomery County Fire Rescue
Calvin	Woodruff Lima Fire Department
Matthew Wrenn	Maryland State Fire Marshal

Region V

Kevin Pelkey	Connecticut State Police
Kenneth Strigaro	Nassau County PD
Jose Vidaurri	Bangor Police Department

Region VI

Cody Adams	Seminole County Sheriff's Office
Alejandro Arenas	Fort Lauderdale Police Department
Patrick Beaver	Gastonia Police Department
Jeremy Beavers	Greensboro Police Department
Matthew Bond	Hoover PD
Brandon Broome	City of Gastonia Police Dept
Carl Burell	COBB CO PD
Nestor Cabarcas Ortega	Charlotte-Mecklenburg Police Department
Roberta Case	State FM Office
Jason Chalut	Fort Lauderdale Police Department
Sarah Charbonneau	Div of Investigative & Forensic Services
Sharon Cormier	SRS Law Enforcement Department
John Cosentino	Seminole County Sheriff's Office
Matthew Craft	Durham County Sheriff's Office
Bridget Crump	Greensboro Fire Department
Calvin Davis	Charlotte-Mecklenburg Police Dept
Marc R. DeSourdy	Hillsborough County SO
Travis Devinny	Alachua County SO
Kyle Dietrich	Greensboro Police Department
Caleb Douglas	DFS, DIFS
Jerry Edwards	Hoover PD
Margo Feaser	Seminole County Sheriff's Office
Christopher Feliciano	Greensboro Police Department
Steve Foster	Durham County Sheriff's Office
Robert Gebing	Anderson County Sheriff's Office
James Holloway	Jacksonville SO
Kenrich John	Fort Lauderdale PD
Darell Johnson	Kingsport Police Department
Zachary King	Hoover PD
Mark Martin	
Brian Meo	Fort Lauderdale Police Department
Brandon Nuccio	St. Lucie County Sheriff's Office
Timothy S. Pennenga	Hillsborough County SO
Christian Peralta	Broward Sheriff's Office
Michael Richardson	Alachua County SO
Michael Salvati	Fort Lauderdale Police Department
Don D Sarginson	Hillsborough County SO
Domenico Singleton	Florida Department of Law Enforcement
Kurt Stafford	Greensboro Police
Jerry Swank	Collier County Sheriff's Office
Monty Taylor	Div of Investigative & Forensic Services
John Thanasas	Hillsborough County SO

New IABTI Members

Region VI (continued)

Antoine Thomas	94TH EOD
Daniel Woolley	Hillsborough County SO
Michael Wright	Hillsborough County SO

Region VII

Yusuf Adebayo	Nigeria Police Force
Adeyinka Adejumo	Nigeria Police Force
Festus Agbede	Nigeria Police Force
Sehinde Alade	Nigeria Police Force
Femi Animashaun	Nigeria Police Force
Bunmi Arise	Nigeria Police Force
Sebastien Cyr	Department of National Defence
Micheal Delarge	Department of National Defence
Kayode Demilade	Nigeria Police Force
Peter Dunville	Explosives Ordnance Technical Services
Kolade Fasola	Nigeria Police Force
Alexandre Gaudreault	Royal Canadian Air Force
Gard Haraldstad	Norwegian National Police -EOD unite
Brent Hardy	ScentPro Limited
Tyrone Hempston	RCMP
Christina Holley	Department of National Defence
Stan Hyde Metro	Vancouver Transit Police
Rory James	Australian Defence Force
Michael Lumsden	Gwent Police
Cecil MacVeigh	Pacific Northwest Kennels Ltd
Joerg Marxen	State Criminal Investigation Dept of Lower Saxony
Gordon McGuinness	Metro Vancouver Transit Police
Steve Moore	Toronto Police Service
Adam Murphy	Metro Vancouver Transit Police
Tim Nolan	Ottawa Police Service
Simiat Ogunjinmi	Nigeria Police Force
Ayodele Ojo	Nigeria Police Force
Olawale Olaeso	Nigeria Police Force
Sesan Omowaye	Nigeria Police Force
Ron Plomp	Knight Hazard Protection Ltd
Mike Salinas	Ottawa Police Service
Grant Stevenson	Visiontec Systems
Brendan Vick	Department of National Defence
Nicholas Watts	Kirintec Limited
Sean Wright	Ottawa Police Service

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Lloyd L. Timmons (D)
Gilbert O. Karner (D)
Ronald W. McCracken (D)
Richard V. Ottman (D)
Ted C. Perez (D)
John C. Kynor
Terence G. McTigue
Alan Rennison MBE (D)
David L. Audsley
Rolla W. Green
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Bobby Klepper
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Bob Boland

Charter Members
(D) Deceased

Showcase what you do!!

Send us your pictures – Cool, working pictures can be published on the page to the right.
What does "a day in your life" look like?
Response, Training, a call, X-ray.
Email photos to: members@iabti.org

IABTI Reminders:

June 24-28, 2019, International In-Service Training, Ponte Vedra Beach, FL admin@iabti.org
Sept 9-13, 2019, Region VI In-Service Training & Expo, Myrtle Beach, SC region6@iabti.org
Oct 7-11, 2019, Region IV/V In-Service Training & Expo, Erie, PA region5@iabti.org
Oct 29-31, Region II In-Service Training & Expo, Oklahoma City, OK region2@iabti.org

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Mary Gill - Operations
Karen Alexander - Operations
Todd Pattee - Publication
David Buck - Copy Editor

The Detonator magazine is the official publication of the International Association of Bomb Technicians and Investigators, a nonprofit professional association dedicated to the furtherance of Explosive Training and Safety in both the public and private sectors.

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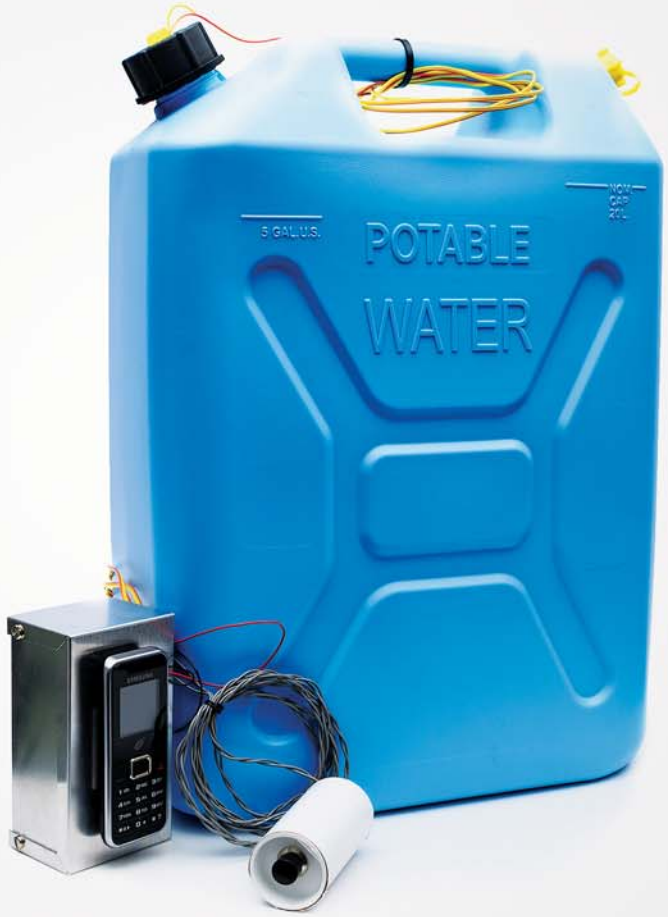

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