RDECOM

Decision Analysis Team Project Summaries August 2007

EDGEWOOD CHEMICAL BIOLOGICAL CENTER
A U.S. Army RDECOM Laboratory

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

DECISION ANALYSIS TEAM
Edgewood Chemical Biological Center

Approved for public release

TABLE OF CONTENTS

Introduction 3

Technology/Equipment Downselect 4

Resource Allocation and Cost-Benefit Analysis 8

Source Selection 10

Simulation Modeling and Design 11

Risk Assessment 13

Front End Analysis (FEA) and Master Planning (MP) 14

Strategic Planning 15

Surveys 16

Technology/Program Assessment 18

INTRODUCTION

The Decision Analysis Team (DAT) at the Edgewood Chemical Biological Center (ECBC) supports managers and decision-makers within the Chemical/Biological Defense community by conducting studies and analyses of complex problems.

Scientists, engineers, and managers face tougher choices, fewer resources, and more outside oversight than ever before. Typically, the problems and issues they encounter:

- Are complex and ill-defined,
- Have multiple alternatives and stakeholders,
- Have competing objectives,
- Deal with uncertainty, and
- Require defendable results.

The problem-solving approaches employed by the DAT are based in Operations Research. Team members draw from their diverse, multi-disciplinary backgrounds to develop processes that clearly define the problem, potential solutions, and relevant evaluation factors. The DAT implements one of a variety of decision analysis methodologies to efficiently assess the problem and develop recommendations. This structured problem-solving process is applicable to the entire spectrum of the acquisition process and creates practical and documented results that help decision makers at all levels.

This brochure provides a summary of the DAT's recently completed and on-going projects. The summaries describe the problem, methodology, and outcome for each project. The projects are organized into the following problem types:

- Technology/Equipment Downselect
- Resource Allocation and Cost Benefit Analysis
- Source Selection
- Simulation Modeling and Design
- Risk Assessment
- Front End Analysis and Master Planning
- Strategic Planning
- Surveys
- Technology/Program Assessment

The problem types correspond to a unique set of methodologies. Descriptions of each problem type are included at the beginning of each section.

DAT Business Model

TECHNOLOGY/EQUIPMENT DOWNSELECT

This type of analysis involves choosing from a finite set of alternatives. The alternatives are compared against evaluation factors, or measures, to determine which alternative or group of alternatives provides the most overall benefit.

Projects

Commercial Off-the-Shelf (COTS) Individual Water Purification (IWP) Evaluation	The DAT led the U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM) in evaluating 75 COTS IWPs using a multi-criteria decision making approach. Four scenarios of use were defined; the IWPs were evaluated against a wide range of military requirements, based on the scenarios. The results of this study (available on the web at <http://usachppm.apgea.army.mil/WPD/Default.aspx>) fill a critical need by providing an unbiased assessment and reliable data to assist military personnel in selecting the best IWP for mission deployments and associated needs.
Environmental Protection Agency (EPA) Environmental Response Team (ERT) Bio-Detector Assessment	ECBC was asked by the EPA to provide recommendations for an improved biological response capability for use during incident responses by EPA ERTs. The DAT developed an evaluation approach to assess the problem. The approach involved the formation of a panel of subject matter experts, who participated in a systematic evaluation process that included defining and prioritizing customer requirements, identifying alternative procedures and equipment, and systematically assessing those alternatives. Final panel recommendations specified a two-pronged response approach along with specific detection equipment. This information was presented to the EPA and documented in a technical report (ECBC TR-171).
Environmental Sentinel Biomonitors (ESB) Downselect	A technology downselection approach was developed for the U.S. Center for Environmental Health Research to determine the most promising ESB technologies that provide rapid detection of non-militarized toxic chemicals in drinking water. Assessment models were developed by first determining six scenarios of use and corresponding technical requirements for each scenario. Thirty-eight technologies were identified and researched. The study team determined that critical information for most technologies was missing, so a test program was initiated to collect the needed information. Due to insufficient funds to test all the technologies, a qualitative assessment model was created and used to identify the most promising technologies for testing. After the additional research and tests were completed the study team reconvened and evaluated 12 ESB technologies against a quantitative assessment model. Results were analyzed and several technologies were selected for follow-on research and development. DAT published both an interim (ECBC TR-477) and final report (ECBC TR-517) for this study.
Joint Biological Agent Identification and Diagnostic System (JBAIDS) Assessment	The DAT helped the Joint Program Executive Office (JPEO) assess candidate biological detection devices that had recently undergone field testing. An evaluation model was developed based on user requirements, and the devices were assessed relative to the model using the test data. The most promising candidates were identified, and an internal report which documented the final results was provided to the JPEO.

Technology/Equipment Downselect Projects (continued)

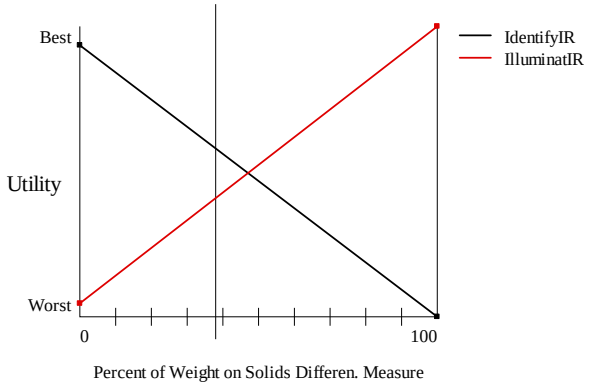
Joint Service Agent Water Monitor (JSAWM) Technology Downselect

A formalized multi-stage technology downselection process was used to assess a large number (>100) of potential water monitoring technologies and select a small set for breadboard development and testing. Two screening phases were conducted; the first used a go/no-go approach to reduce the number of technologies to a manageable number, and the second used a high-level qualitative approach to further reduce the list. In the final step, evaluation criteria were defined and weighted in conjunction with the Joint Service Integration Group, and the most feasible candidates were assessed relative to the criteria. The final products of the downselection were a prioritized list of the top nine technologies and a published technical report (ECBC TR-124) documenting the downselect results and recommendations.

Joint Service Agent Water Monitor (JSAWM) Brassboard Downselect

This study, a follow-on to the initial JSAWM technology downselect, assessed five JSAWM breadboard technologies. The DAT led the development of an evaluation model consisting of criteria, criteria weights, performance scales and utility levels, as well as a process to examine combinations of CW and BW detection technologies. The DAT also provided facilitation during the evaluation to obtain subject matter expert consensus and to document all proceedings and results. Sensitivity analysis was conducted on the results and a final report (ECBC TR-468) was developed to document the process and final recommendations.

Example sensitivity graph which shows how sensitive the rank of alternatives is to the amount of weight put on a particular measure.



Product Manager Weapons of Mass Destruction Analytical Lab System (PM WMD ALS) Sensor Downselect

The purpose of the ALS Block I Analytical Laboratory Suite Upgrade Sensor Downselect was to identify biological and chemical sensors using complementary technologies for inclusion in the Civil Support Teams ALS Block I analytical suite upgrade. The DAT developed and led a multi-phase evaluation process to downselect available technologies and sensors. As a result of this effort, several biological and chemical sensors were recommended for laboratory testing. ECBC technical report TR-503 documents this effort.

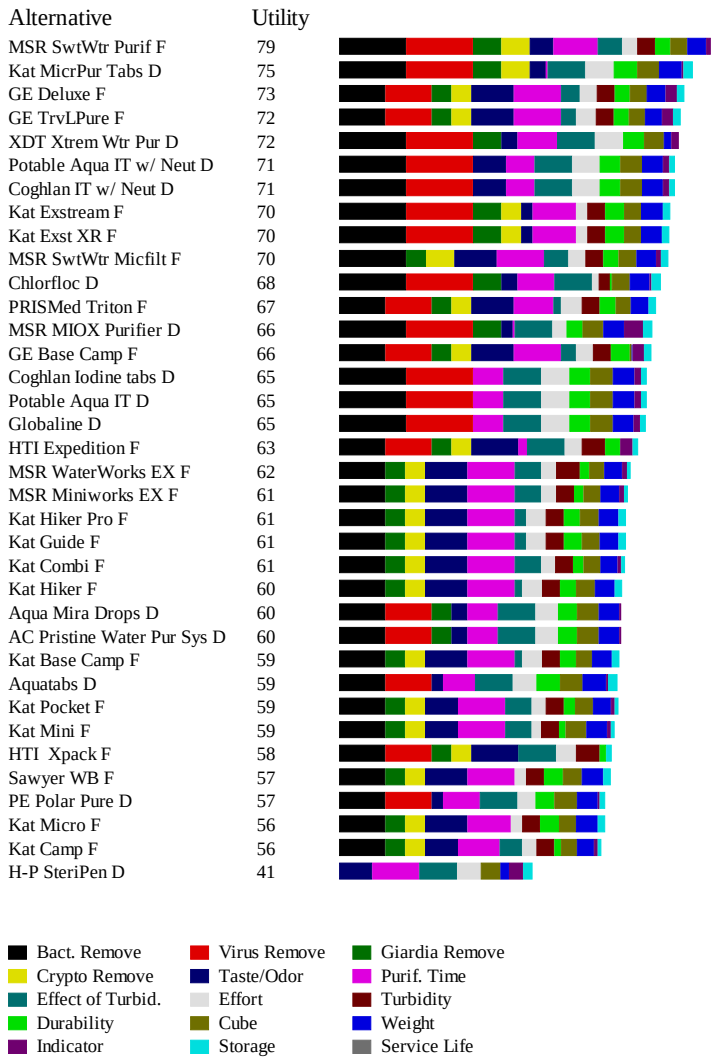
Technology/Equipment Downselect Projects (continued)

Protection Simulant Downselect	The goal of the protection simulant downselection is to develop a process for selecting appropriate testing simulants, and to initially use this process to identify the best simulants for Protection applications. The DAT has developed a 7-phase approach to identify, evaluate, and select appropriate simulants, and to develop correlations between the simulants and the agents. This approach is currently being implemented to identify simulants for nerve and blister agents for Collective Protection testing applications.
Riot Control Agent (RCA) Comparison Study	The DAT developed a multi-criteria decision analysis approach to examine several RCA candidates relative to user needs and to help make recommendations concerning the future direction of the RCA program. This study, in support of ECBC's Target Defeat Team, was a follow-on effort to the Non-Lethal Front End Analysis (NLFEA) described in the Front End Analysis/Master Planning section. The most promising RCA compounds were identified for several user-driven scenarios of use. A classified technical report was published to document the results.
Skin Decontamination Business Case Analysis (BCA)	The Joint Service Personnel/Skin Decontamination System (JSPDS) program conducted a BCA to support a Milestone C fielding decision. The BCA evaluated the costs, benefits, and industrial base considerations for the continued fielding of the current skin decontamination system, as compared to the fielding of a new skin decontamination solution. The DAT conducted the benefits portion of this analysis, which evaluated performance, operational, and logistical considerations for the two potential solutions. The DAT also developed an interactive simulation model for use in evaluating different cost scenarios that is described in the Simulation Modeling and Design section. Finally, the DAT integrated the three portions of the analysis to develop overall conclusions and recommendations, and wrote and published a final report to document the effort.
Standoff Biological Agent Detector (SBAD) Initial Technology Assessment	The objective of this technology assessment was to evaluate biological detection technologies for their potential to meet SBAD program needs, and to recommend the best candidate for further testing. The process involved identification and description of candidate devices, the development of an evaluation model, the evaluation of the candidate devices, and analysis and documentation of results and recommendations. Results of the downselect were documented in an internal report provided to the customer.
Surface Detection for Post Decontamination	The objective in this study was to evaluate several technical papers to identify the most feasible approaches/technologies for conducting post decontamination detection. The evaluation process included determining appropriate evaluators; identifying and gathering information on use concepts, user requirements and technology alternatives; developing and implementing a multi-criteria decision analysis approach; and performing an analysis to identify the most promising alternatives including an assessment of strengths, weaknesses, and data gaps. The results, associated rationale, and recommendations were documented in an unpublished final report that was provided to the Defense Threat Reduction Agency (DTRA).

Tech Base Reviews

Capability Area Project Officers (CAPOs) annually assess proposed and ongoing research projects to determine appropriate funding strategies and investment portfolios with the highest potential benefit. Proposals were evaluated with multi-criteria decision analysis methodology (MCDM) using quantitative and qualitative decision models with defined evaluation factors. The DAT provided facilitation support during the committee-based evaluation of proposals and documented comments and rationale to develop funding recommendations. At the completion of the annual review, the DAT provided evaluation summaries to CAPOs and a results briefing to the Defense Threat Reduction Agency (DTRA). The DAT originally developed and implemented the basic evaluation process in FY96, and the DAT provides process improvements each year.

Example of a stacked bar diagram, which is typical output from a multi-criteria decision model.



RESOURCE ALLOCATION AND COST-BENEFIT ANALYSIS

This type of analysis includes an assessment of costs and benefits to help determine optimal funding portfolios. A technical assessment is performed first to determine the benefit of each alternative, followed by a cost analysis to determine the total cost for each alternative. The benefit and cost for the alternatives are compared to determine which set of alternatives provides the most benefit for different levels of cost within pre-defined budget constraints.

Projects

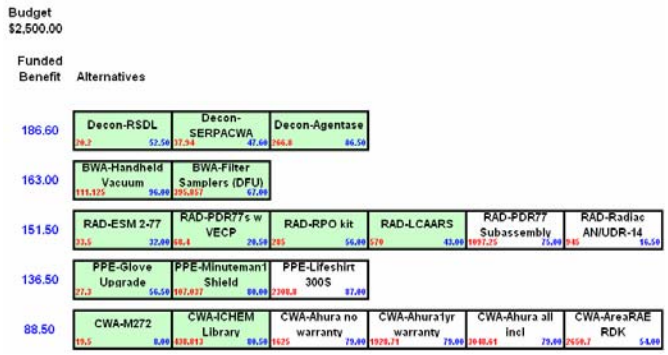
CBD Small Project Acquisition (C-SPA) Modernization

The Product Manager Consequence Management (PM CM) oversees the C-SPA program, which was designed to ensure that the Civil Support Team (CST) survey teams stay on the cutting edge of technology and equipment. C-SPA is an annual process in which commercial off-the-shelf (COTS) items are evaluated for their applicability and suitability for survey team use. The DAT implemented an approach that involves the individual assessment of the potential items within each of five technical areas followed by a combined assessment of the most promising items across all technical areas. A resource allocation assessment, using LDW Portfolio, is then performed to identify the combination of items that would provide the most benefit for the cost, within the PM budget. The FY07 process resulted in the recommendation of a prioritized list of items for fielding; a technical report documenting this effort is in process.

Collective Protection Master Plan

The DAT developed a resource allocation model to examine alternative funding strategies to determine which investment portfolio would provide the highest return. Various combinations of technologies were considered to identify which ones offered the most efficient use of the finite budget. The results of the Collective Protection Master Plan were a prioritized list of technologies and funding levels showing the incremental and cumulative costs and benefits for each technology, and a final portfolio of the best set of technology investments. The results were documented in a published technical report (ECBC TR-368).

Chart contains output for an example cost-benefit scenario; shows in green cells which alternatives can be funded under scenario constraints.



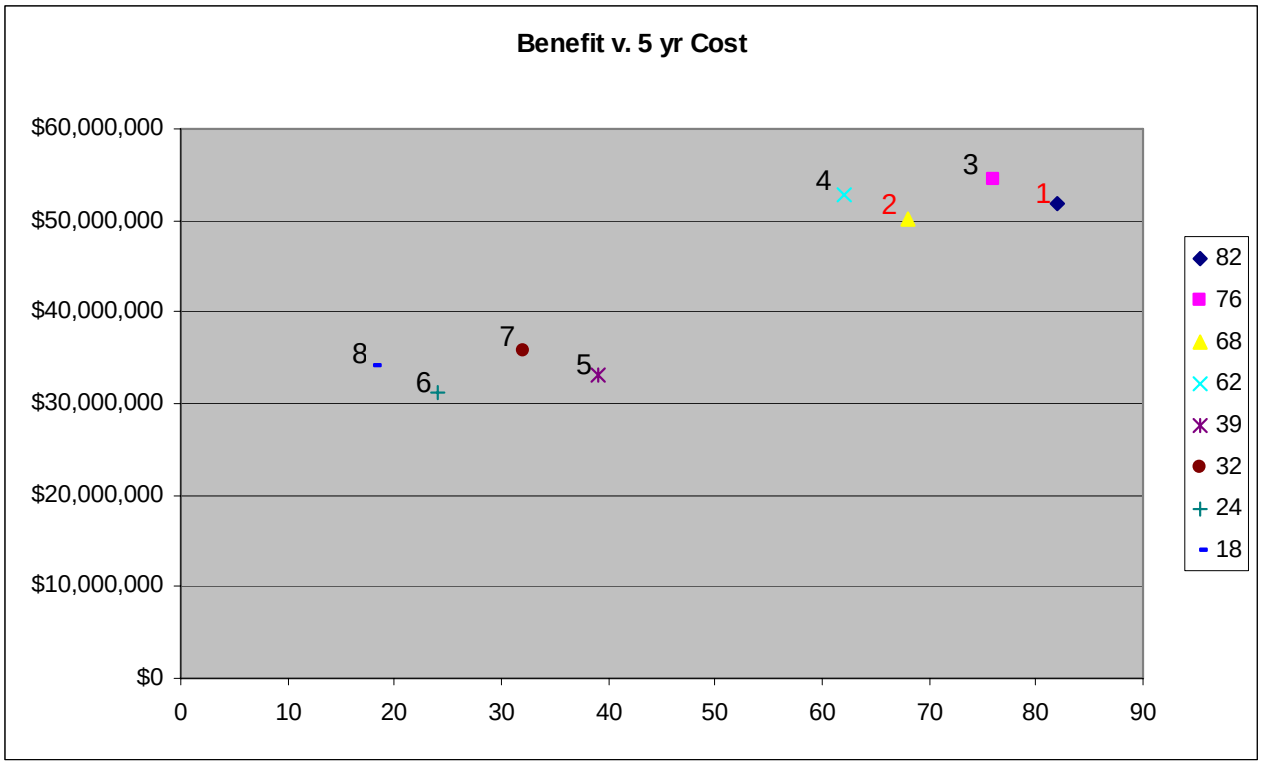
Resource Allocation/Cost-Benefit Projects (continued)

Joint Service Agent Water Monitor (JSAWM) Resource Allocation

The DAT led a study to determine how much funding should be allocated to breadboard technologies for testing. Estimates for benefit and cost were developed for various levels of effort for each technology. The Equity resource allocation software was used to sort this information and identify an optimized program portfolio. The DAT provided an internal report to the JSAWM Program Manager.

Product Manager Weapons of Mass Destruction Analytical Lab System (PM WMD ALS) Final Component Selection

This study was a follow on effort to the ALS Sensor downselect described in the Technology/Equipment Downselect section. Following laboratory testing of the sensors recommended by the initial downselect, the Final Component Selection was conducted to identify the final suite of chemical and biological detection and identification equipment for inclusion in the ALS Block I. The study involved a performance-based downselect of the tested sensors, followed by a cost-benefit analysis for final sensor selection. A technical report documenting this effort will be published.



Graph represents cost-benefit analysis. Cost is on the y-axis, and benefit is on the x-axis. Preferred alternatives have low cost and high benefit.

SOURCE SELECTION

Source selections are a form of downselect in which contract proposals are evaluated relative to pre-determined evaluation factors. This type of analysis is unique and sometimes challenging. In the Army system the proposals must be rated with adjectives or colors instead of with numbers. Additionally, the factors against which the proposals are assessed must be determined before the proposals are submitted, which makes it more difficult to identify discriminating criteria.

Projects

- Task Order Contract for Engineering Support (TOCES)
- Joint Biological Standoff Detection System (JBSDS)
- Contractor Logistic Support for the Joint Program of Biological Detection Systems (CLS BDS)
- Newport Chemical Depot Task Order Contract
- Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME)
- Joint Expeditionary Collective Protection (JECP)
- Joint Chemical Agent Detector (JCAD)
- Joint Service General Purpose Mask (JSGPM)
- Joint Material Decontamination System (JMDS)

The DAT has assisted several acquisition teams with the evaluation phase of various source selections. This support included developing the evaluation approach and defining evaluation criteria, training the source selection teams on the evaluation process, facilitating the teams during the caucus phase, and documenting the ratings and rationale in the automated source selection tool *FedSelect*.

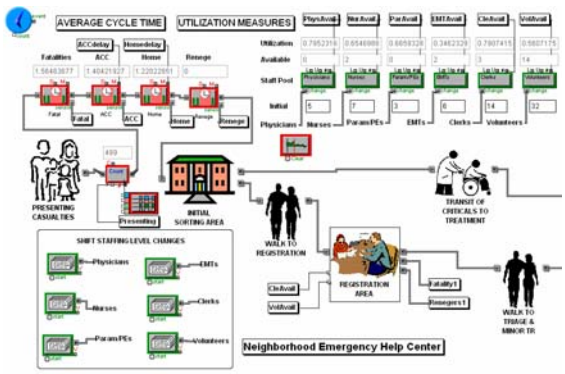
SIMULATION MODELING AND DESIGN

Simulation involves the use of computer modeling to represent concepts, problems, and processes. These computer models can be used for discrete event or continuous processes. They help decision-makers in numerous ways, including defining problems and determining key parameters, visualizing and optimizing processes, as well as providing relevant output data and information for analysis.

Projects

Biological Weapons Improved Response Program (BW IRP)

The DAT supported the BW IRP in the development of several medical response concepts (Neighborhood Emergency Health Centers [NEHC], Acute Care Centers [ACC], Modular Emergency Medical Systems [MEMS]). The DAT provided extensive analytic support, to include development and use of simulation models to design and validate response concepts, multi-criteria decision analysis and decision tree techniques to assess the concepts, and ultimately a BW SimLab community planning tool. For the NEHC, a simulation model was developed to validate a conceptual system for emergency response to moderately-sized biological warfare incidents involving non-contagious agents. Response center performance was predicted in six areas: facility throughput, casualty cycle time, staff utilization, treatment efficacy, disposition of casualties, and casualty data completeness. Desktop exercises and live field tests were conducted to validate the simulation model. Similar support was provided for the ACC and overall MEMS development. Several reports were published to document this work (ECBC TR-456, TR-204, and TR-129).



Screenshot of portion of NEHC simulation model.

Facility Design Simulation Modeling

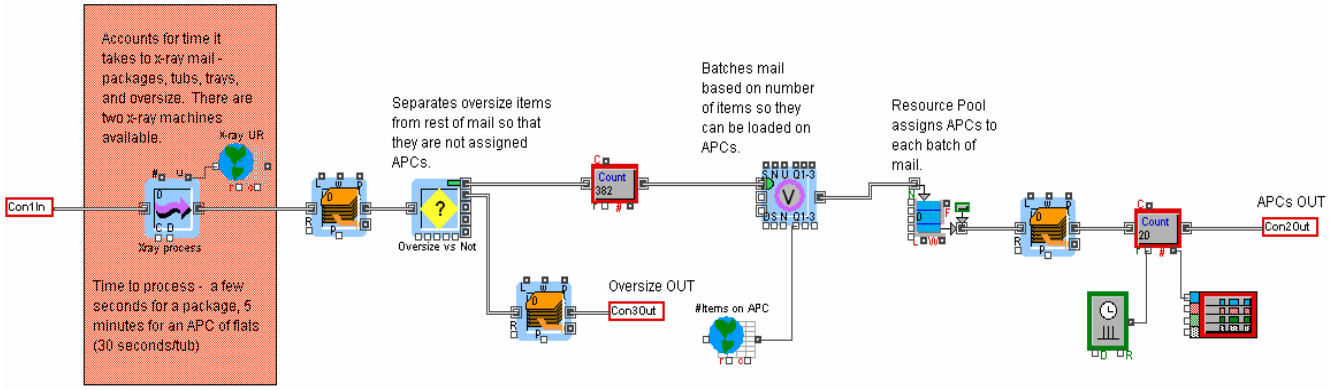
The DAT created a simulation model to determine floor space requirements for a new mail processing facility. Data was collected on the amount and type of items that were expected to be processed as well as the time required to complete various processes within the facility. The DAT incorporated stochastic model inputs to simulate best and worst case scenarios of item throughput. The DAT used results projected by the model to identify the most appropriate facility layout; final results were briefed to the customer.

Shelter Shotglass Simulation Model

A simulation model was developed for the Shelter Shotglass Team to help gain an understanding of the effects of various scenarios and determine an appropriate action plan for future processing capabilities and backlog elimination. The model was used to simulate numerous real-life events and provided the capability to evaluate various potential processing scenarios. The simulation model development included model verification, data collection, and model validation. The DAT's analysis of model results provided the Shotglass team with the information needed to optimize process capabilities.

Skin Decontamination Business Case Analysis (BCA)

The Joint Service Personnel/Skin Decontamination System (JSPDS) program conducted a BCA to support a Milestone C fielding decision. The BCA evaluated the costs, benefits, and industrial base considerations for the continued fielding of the current skin decontamination system, as compared to the fielding of a new skin decontamination solution. In support of the cost analysis, the DAT developed an interactive cost simulation model. This model provided a user-friendly interface which allowed users and decision-makers to examine numerous cost scenarios. These scenarios provided a mechanism to conduct a sensitivity analysis, and examine the effects of uncertainty in requirements for skin decontamination kit quantities. It was used to assess the feasibility of purchasing different quantities and combinations of types of kits. An ECBC technical report which summarizes the results is in progress.



Screenshot of portion of facility design simulation model.

RISK ASSESSMENT

Risk assessment is concerned with the probability of an event occurring and its resulting impact. Risk can be quantified using an equation or it can be qualitatively determined using a risk matrix. Alternatives are typically assessed against subfactors that represent impact and probability.

Projects

Chemical Security Analysis Center (CSAC) Chemical Terrorism Risk Assessment (CTRA)

The CSAC is performing a CTRA to prioritize the most dangerous chemicals based on their risk to the U.S. homeland population. In Phase 1 of the CTRA, called the Screening Assessment, the DAT developed a simplified risk model to help the CSAC screen the thousands of chemicals that exist. The model was based on the U.S. Army Composite Risk Management Field Manual 5-19. The 136 most dangerous chemicals identified through the screening process will now be modeled and evaluated in greater detail and prioritized in Phase 2 of the CTRA. The results of the completed CTRA (Phases 1 and 2) will support high-level resource allocation decisions to protect the U.S. homeland population more effectively against terrorist use of these chemicals. Phase 1 of the CTRA will be published as an ECBC technical report.

Risk = Toxicity x [(Availability or Ease of Synthesis) + Historical Use]

The risk equation and risk matrix used for the CSAC CTRA project.

Consequence	Likelihood					
	Most Likely	Much More Likely	More Likely	Likely	Unlikely	Very Unlikely
Extremely Catastrophic	Extreme	Extreme	High	High	Medium	Medium
Catastrophic	Extreme	High	High	High	Medium	Low
Very Severe	High	High	High	Medium	Medium	Low
Severe	High	High	Medium	Medium	Low	Low
Marginal	Medium	Medium	Low	Low	Low	Low
Negligible	Low	Low	Low	Low	Low	Low

FRONT END ANALYSIS (FEA) AND MASTER PLANNING (MP)

FEA/MP is an assessment of broad program functional areas such as Decontamination or Detection, usually conducted before formal program milestones. Program alternatives or research approaches are compared against evaluation criteria that are derived from high level program documentation such as capability and requirements documents. The alternatives are typically assessed in terms of benefit, cost, and technical risk to determine the best program development strategy or plan.

Projects

Collective Protection FEA

Individual Protection FEA

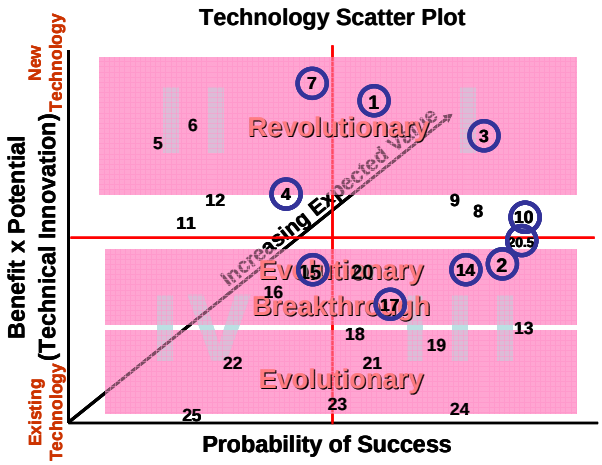
Decontamination FEA

Three separate FEAs were conducted in support of the Joint Science and Technology Panel for Chemical and Biological Defense to assess the potential of technologies to meet user needs and to lay out program area roadmaps. The DAT worked with the respective Business Area Managers to develop an evaluation methodology and approach. Evaluation models were developed for each FEA, and technologies were assessed relative to the models. Technologies were ranked based on overall benefit and individual strengths and weaknesses. The results were then used to formulate program research plans for each business area. Each FEA was documented in a separate technical report. The Decon FEA was recently updated, using an innovative methodology to separately assess evolutionary and revolutionary technologies. This approach allowed the study team to recommend a portfolio of technologies that crossed the spectrum of benefits and risk, as shown in the chart below.

Non-Lethal Front End Analysis FEA

The DAT led the FEA to identify promising chemical materials and to develop a roadmap for the Non-Lethal program. The DAT developed and implemented a structured assessment approach, which involved scenario and evaluation model development and assessment of diverse NL candidates. The DAT facilitated several decision conferences with user representatives, technical experts, and the Joint Non-Lethal Weapons Directorate to develop the model and assess alternatives. The DAT then analyzed the results and co-authored a published technical report that documents findings and program recommendations.

Chart developed for recent FEA to summarize which revolutionary and evolutionary technologies will be pursued.



STRATEGIC PLANNING

Strategic planning involves an analysis of the current organizational situation relative to future needs of the organization. The final product typically includes a plan to improve organizational elements such as structure and communication.

Projects

CB Services Directorate Off-site	The objective of the off-site was to improve the CB Services Directorate's overall efficiency and effectiveness. Prior to the off-site the DAT performed a pre-assessment by collecting data on intra-departmental issues and concerns through one-on-one interviews. The DAT synthesized and analyzed this data along with previously conducted survey data, and then facilitated a 1-day offsite meeting of managers and supervisors. At the off-site, the issues were presented, discussed, assessed, and prioritized. Actionable tasks were developed to address the highest priority issues. The DAT subsequently supported CB Services with the formation and implementation of a process action team (PAT) to address the issue of vertical information flow within the directorate. The PAT identified specific improvements and developed an action plan to implement these recommendations. The DAT provided an internal report and presentation of the results to the CB Services Director.
Deputy Assistant to the Secretary of Defense for Chemical and Biological Defense (DATSD [CBD]) Off-Site	The purpose of this project was to ensure the new staff and support organizations for the DATSD (CBD) shared a common understanding of what DATSD does, collectively and individually. The DAT conducted personal interviews with government staff and selected support organizations to collect information and identify concerns and issues that needed to be addressed. The DAT compiled and assessed this information and then facilitated an off-site conference. During the off-site, concerns and issues were presented by the DAT and reviewed and prioritized by the group. Action plans were then developed to address the major activities required to resolve the top issues. The DAT provided an internal report to the customer.

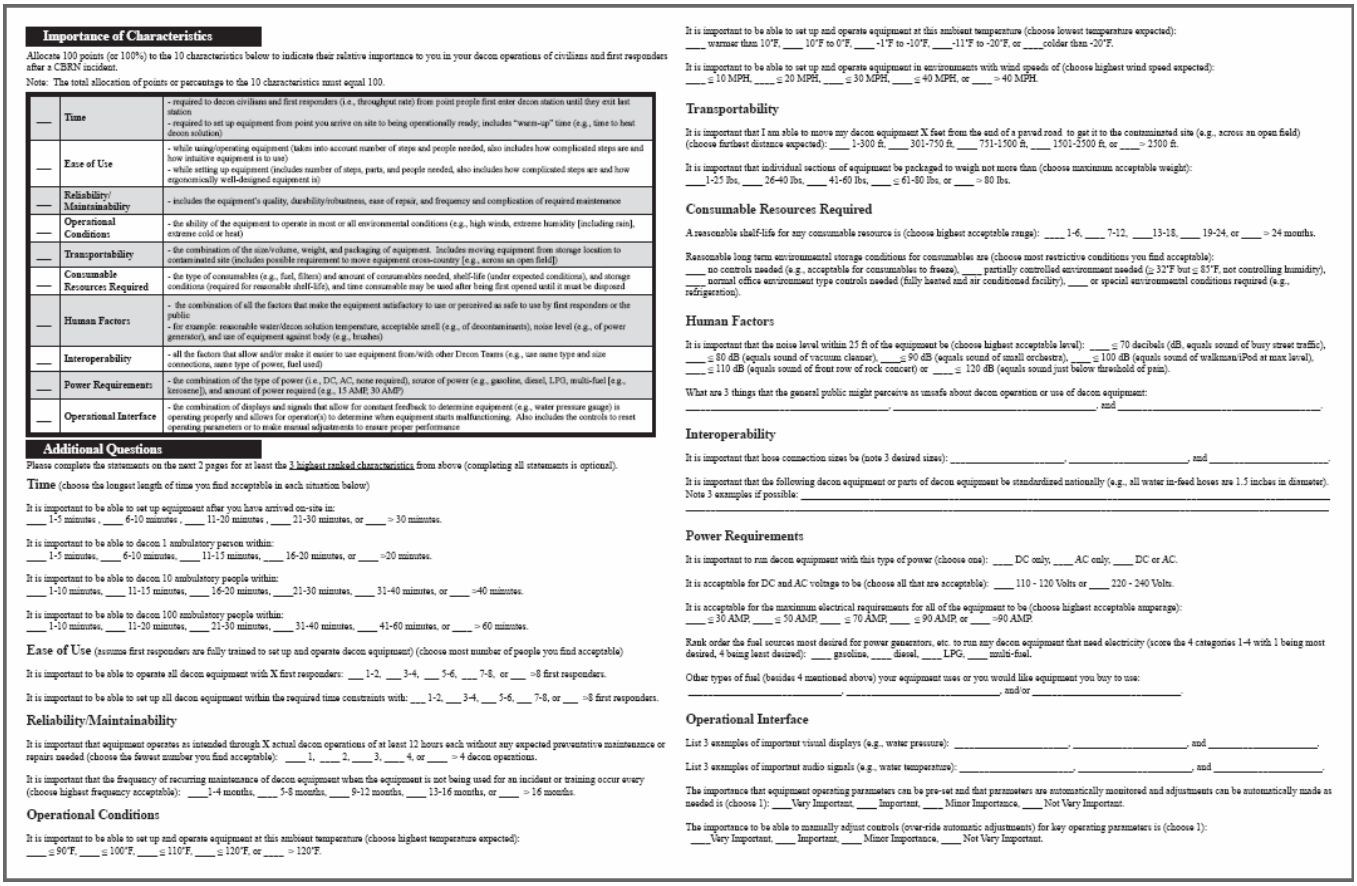
SURVEYS

In a survey, participant knowledge and/or opinion of an item or service is gathered and assessed to identify issues and determine what improvements are needed. This type of study includes designing and administering a questionnaire, analyzing and creating meaning from raw data, and determining recommendations for improvement.

Projects

1999 Soldier & Biological Chemical Command (SBCCOM) Employee Opinions Questionnaire

An extensive survey was designed to examine issues related to morale, job satisfaction, and the organization. The survey was administered manually and via the Web to over 1,300 employees. The DAT collated and analyzed the resulting information and data to generate findings for use by the SBCCOM Human Resources office.



Importance of Characteristics

Allocate 100 points (or 100%) to the 10 characteristics below to indicate their relative importance to you in your decon operations of civilians and first responders after a CBRN incident.

Note: The total allocation of points or percentage to the 10 characteristics must equal 100.

___	Time	- required to decon civilians and first responders (i.e., throughput rate) from point people first enter decon station until they exit last station - required to set up equipment from point you arrive on site to being operationally ready; includes "warm-up" time (e.g., time to heat decon solution)
___	Ease of Use	- while using/operating equipment (takes into account number of steps and people needed, also includes how complicated steps are and how intuitive equipment is to use) - while setting up equipment (includes number of steps, parts, and people needed, also includes how complicated steps are and how ergonomically well-designed equipment is)
___	Reliability/ Maintainability	- includes the equipment's quality, durability/robustness, ease of repair, and frequency and complication of required maintenance
___	Operational Conditions	- the ability of the equipment to operate in most or all environmental conditions (e.g., high winds, extreme humidity [including rain], extreme cold or heat)
___	Transportability	- the combination of the size/volume, weight, and packaging of equipment. Includes moving equipment from storage location to contaminated site (includes possible requirement to move equipment cross-country [e.g., across an open field])
___	Consumable Resources Required	- the type of consumables (e.g., fuel, filters) and amount of consumables needed, shelf-life (under expected conditions), and storage conditions (required for reasonable shelf-life), and time consumable may be used after being first opened until it must be disposed
___	Human Factors	- the combination of all the factors that make the equipment satisfactory to use or perceived as safe to use by first responders or the public - for example: reasonable water/decon solution temperature, acceptable smell (e.g., of decontaminants), noise level (e.g., of power generator), and use of equipment against body (e.g., brushes)
___	Interoperability	- all the factors that allow and/or make it easier to use equipment from/with other Decon Teams (e.g., use same type and size connections, same type of power, fuel used)
___	Power Requirements	- the combination of the type of power (i.e., DC, AC, none required), source of power (e.g., gasoline, diesel, LPG, multi-fuel [e.g., kerosene]), and amount of power required (e.g., 15 AMP, 30 AMP)
___	Operational Interface	- the combination of displays and signals that allow for constant feedback to determine equipment (e.g., water pressure gauge) is operating properly and allows for operator(s) to determine when equipment starts malfunctioning. Also includes the controls to reset operating parameters or to make manual adjustments to ensure proper performance

Additional Questions

Please complete the statements on the next 2 pages for at least the 3 highest ranked characteristics from above (completing all statements is optional).

Time (choose the longest length of time you find acceptable in each situation below)

It is important to be able to set up equipment after you have arrived on-site in:
___ 1-5 minutes , ___ 6-10 minutes , ___ 11-20 minutes , ___ 21-30 minutes, or ___ > 30 minutes.

It is important to be able to decon 1 ambulatory person within:
___ 1-5 minutes, ___ 6-10 minutes, ___ 11-15 minutes, ___ 16-20 minutes, or ___ >20 minutes.

It is important to be able to decon 10 ambulatory people within:
___ 1-10 minutes, ___ 11-15 minutes, ___ 16-20 minutes, ___ 21-30 minutes, ___ 31-40 minutes, or ___ >40 minutes.

It is important to be able to decon 100 ambulatory people within:
___ 1-10 minutes, ___ 11-20 minutes, ___ 21-30 minutes, ___ 31-40 minutes, ___ 41-60 minutes, or ___ > 60 minutes.

Ease of Use (assume first responders are fully trained to set up and operate decon equipment) (choose most number of people you find acceptable)

It is important to be able to operate all decon equipment with X first responders: ___ 1-2, ___ 3-4, ___ 5-6, ___ 7-8, or ___ >8 first responders.

It is important to be able to set up all decon equipment within the required time constraints with: ___ 1-2, ___ 3-4, ___ 5-6, ___ 7-8, or ___ >8 first responders.

Reliability/Maintainability

It is important that equipment operates as intended through X actual decon operations of at least 12 hours each without any expected preventative maintenance or repairs needed (choose the fewest number you find acceptable): ___ 1, ___ 2, ___ 3, ___ 4, or ___ > 4 decon operations.

It is important that the frequency of recurring maintenance of decon equipment when the equipment is not being used for an incident or training occur every (choose highest frequency acceptable): ___ 1-4 months, ___ 5-8 months, ___ 9-12 months, ___ 13-16 months, or ___ > 16 months.

Operational Conditions

It is important to be able to set up and operate equipment at this ambient temperature (choose highest temperature expected):
___ ≤ 90°F, ___ ≤ 100°F, ___ ≤ 110°F, ___ ≤ 120°F, or ___ > 120°F.

It is important to be able to set up and operate equipment at this ambient temperature (choose lowest temperature expected):
___ warmer than 10°F, ___ 10°F to 0°F, ___ -1°F to -10°F, ___ -11°F to -20°F, or ___ colder than -20°F.

It is important to be able to set up and operate equipment in environments with wind speeds of (choose highest wind speed expected):
___ ≤ 10 MPH, ___ ≤ 20 MPH, ___ ≤ 30 MPH, ___ ≤ 40 MPH, or ___ > 40 MPH.

Transportability

It is important that I am able to move my decon equipment X feet from the end of a paved road to get it to the contaminated site (e.g., across an open field) (choose farthest distance expected): ___ 1-300 ft, ___ 301-750 ft, ___ 751-1500 ft, ___ 1501-2500 ft, or ___ > 2500 ft.

It is important that individual sections of equipment be packaged to weigh not more than (choose maximum acceptable weight):
___ 1-25 lbs, ___ 26-40 lbs, ___ 41-60 lbs, ___ ≤ 61-80 lbs, or ___ > 80 lbs.

Consumable Resources Required

A reasonable shelf-life for any consumable resource is (choose highest acceptable range): ___ 1-6, ___ 7-12, ___ 13-18, ___ 19-24, or ___ > 24 months.

Reasonable long term environmental storage conditions for consumables are (choose most restrictive conditions you find acceptable):
___ no controls needed (e.g., acceptable for consumables to freeze), ___ partially controlled environment needed (≥ 32°F but ≤ 85°F, not controlling humidity), ___ normal office environment type controls needed (fully heated and air conditioned facility), ___ or special environmental conditions required (e.g., refrigeration).

Human Factors

It is important that the noise level within 25 ft of the equipment be (choose highest acceptable level): ___ ≤ 70 decibels (dB, equals sound of busy street traffic), ___ ≤ 80 dB (equals sound of vacuum cleaner), ___ ≤ 90 dB (equals sound of small orchestra), ___ ≤ 100 dB (equals sound of walkman/iPod at max level), ___ ≤ 110 dB (equals sound of front row of rock concert) or ___ ≤ 120 dB (equals sound just below threshold of pain).

What are 3 things that the general public might perceive as unsafe about decon operation or use of decon equipment:
_____, _____, and _____.

Interoperability

It is important that hose connection sizes be (note 3 desired sizes): _____, _____, and _____.

It is important that the following decon equipment or parts of decon equipment be standardized nationally (e.g., all water in-feed hoses are 1.5 inches in diameter). Note 3 examples if possible: _____

Power Requirements

It is important to run decon equipment with this type of power (choose one): ___ DC only, ___ AC only, ___ DC or AC.

It is acceptable for DC and AC voltage to be (choose all that are acceptable): ___ 110 - 120 Volts or ___ 220 - 240 Volts.

It is acceptable for the maximum electrical requirements for all of the equipment to be (choose highest acceptable amperage):
___ ≤ 30 AMP, ___ ≤ 50 AMP, ___ ≤ 70 AMP, ___ ≤ 90 AMP, or ___ >90 AMP.

Rank order the fuel sources most desired for power generators, etc. to run any decon equipment that need electricity (score the 4 categories 1-4 with 1 being most desired, 4 being least desired): ___ gasoline, ___ diesel, ___ LPG, ___ multi-fuel.

Other types of fuel (besides 4 mentioned above) your equipment uses or you would like equipment you buy to use:
_____, _____, and/or _____.

Operational Interface

List 3 examples of important visual displays (e.g., water pressure): _____, _____, and _____.

List 3 examples of important audio signals (e.g., water temperature): _____, _____, and _____.

The importance that equipment operating parameters can be pre-set and that parameters are automatically monitored and adjustments can be automatically made as needed is (choose 1): ___ Very Important, ___ Important, ___ Minor Importance, ___ Not Very Important.

The importance to be able to manually adjust controls (over-ride automatic adjustments) for key operating parameters is (choose 1):
___ Very Important, ___ Important, ___ Minor Importance, ___ Not Very Important.

Screenshot of an example survey that the DAT created.

Surveys (continued)

Automated Decision-Aid System for Hazardous Incidents (ADASHI) User Survey	The DAT developed a web-based user survey to determine what the ADASHI software tool should look like and how it should work. ADASHI is intended for use by CB incident commanders and response teams to aid in the decision-making process and to act as a response template for guiding the actions of first responders. The survey was implemented to determine what improvements were desired for ADASHI, what was worthwhile, the "value added", how easy it was to use, and any other recommended features/functions. The results of the survey were compiled, and the DAT then facilitated a Blue-Ribbon Panel meeting to discuss the findings. The findings were documented in a published technical report (ECBC TR-369) and used to further develop and refine ADASHI.
Low Volatility Hazard Detector (LVHD) Survey	The DAT created a user survey for the LVHD add-on to the M256A1 Chemical Agent Detector. The LVHD is designed to detect low volatility hazards via use of an innovative sample heater assembly. The survey addressed ease of use, "value added," areas of improvement, and needed functions/features of the LVHD. The DAT implemented the survey collection process, analyzed and created meaning from the raw data, and used the survey data to develop both detailed results and a summary. Actionable next steps were then presented to the customer.

TECHNOLOGY/PROGRAM ASSESSMENT

This type of study focuses on high level program tradeoffs, which can be used to address a variety of program manager needs, including determining technology requirements, analysis and organization of test data, development of test plans, and/or analysis of materiel approaches.

Projects

Auto Genetic Identifier (AGI) Analysis of Alternatives (AoA)	A study was conducted to determine feasible uses for the AGI and the optimum system configuration(s) to include the most cost effective approach for analysis of biological agents. The DAT developed a study approach which included identification and translation of mission requirements and Joint Future Operational Capabilities into target capabilities, and a feasibility assessment of those target capabilities against optimum system characteristics. The DAT facilitated several meetings with technical experts from multiple organizations through this process to develop a list of results and recommendations for the future development of the AGI breadboard system. The results were documented in an internal final report provided to the customer.
Chemical, Biological, Radiological, Nuclear (CBRN) Installation Protection System Measure of Effectiveness Study	A decision/risk analysis approach was developed to assess the specific benefits of current and proposed CBRN defense installation protection systems. A prototype model was developed using an off-the-shelf decision/risk analysis software package called DPL and by systematically collecting information and data from user representatives and technology experts. The model allowed for multiple final state outcomes to be assessed while incorporating uncertainty and flexibility into the decision process. An internal report was provided to Lockheed Martin.
ECBC Quantitative Business Plan Evaluation Model	The DAT developed a quantitative model to comprehensively evaluate ECBC's annual performance results against annual business plan goals. The model had five goals (manpower, technology, infrastructure, Center visibility, and funding) and 16 measures which corresponded to the business goals. The DAT presented summary level results using FY04 year-end data and FY05 mid-year data to the Technical Director and the four ECBC Directorate Directors. Initial feedback from the Technical Director was encouraging but ultimately the project was put on hold while other analysis approaches were considered.
Joint Biological Standoff Detection System (JBSDS) Increment II Trade-off/Capability Assessment	The DAT led an effort to assess the likelihood that prospective JBSDS technologies will meet user requirements, and to identify achievable threshold requirements based on current and near term technologies. The Joint Requirements Office intends to use this information when it develops the JBSDS Increment II Capability Development Document (CDD). The DAT developed a nine-phase approach to complete this study, and helped to implement the initial phases, to include developing an evaluation methodology and facilitating the study team through the analysis of mission employment scenarios and requirements definition. The project was placed on hold prior to the assessment of individual technologies, as the development of the CDD was delayed until the FY10 timeframe. The DAT completed an interim report for Joint Product Manager Biological Detection Systems.

Technology/Program Assessment Projects (continued)

Joint Chemical Biological Radiological Agent Water Monitor (JCBRAWM) Increment I Test and Evaluation (T&E) Internal Product Team (IPT)	The DAT provided program support to the JCBRAWM Program Manager (PM) during the JCBRAWM Increment I T&E IPT development. The purpose of the JCBRAWM T&E IPT is to develop and maintain/revise, as appropriate, the T&E strategy for the JCBRAWM program. The DAT worked with the JCBRAWM PM to identify the major objectives of the Increment I T&E IPT, and facilitated initial IPT meetings to develop the T&E program roadmap. The DAT documented meeting results and provided them to the PM.
Joint Chemical Biological Radiological Agent Water Monitor (JCBRAWM) Detection Levels Tradeoff Study	The Joint Program Manager for Nuclear, Biological, and Chemical Contamination Avoidance and the Joint Requirements Office requested information regarding the mission and program impact of achieving various levels of detection for potable water. The DAT worked with subject matter experts to determine optimal detection levels for 10 biological agents/toxins for JCBRAWM Increment I. Current and alternate target detection levels for these agents/toxins were then evaluated, and a trade-off analysis approach will next assess health, mission, and program (cost and schedule) impacts of achieving these levels. Results will be used to focus research and development program resources on the development of appropriate sample pre-concentration equipment/technology.
Low Volatility Hazard Detector (LVHD) Product Improvement Plan (PIP)	The DAT is supporting the Project Manager for Nuclear, Biological, and Chemical Contamination Avoidance in documenting and analyzing the results of the PIP testing for the LVHD. The LVHD is an urgently fielded add-on to the M256A1 chemical hazard detection kit; it provides the ability to detect liquid and solid chemical hazards in addition to the gaseous hazards for which the kit was designed. The DAT developed a data collection format for PIP test data, provided high level analysis of the test results, and documented the study in a test report. After all data is collected, the DAT will provide the final test report to the Army Test and Evaluation Center, who will conduct an independent evaluation for the final fielding decision for the LVHD.
Next Generation General Purpose Mask (NGGPM) Program Review Support	The DAT supported the NGGPM program by facilitating a two-day program review to clarify requirements and discuss technical concepts with the potential for inclusion in the NGGPM program. During the review, technical and user briefings were conducted, followed by a requirements discussion. Prior to the meeting, the DAT worked with NGGPM program management to develop requirements and solutions matrices, which were used to guide and document the discussions during the meeting.
NTA Test Plan	The DAT developed a swipe plan to help the NTA Test Team obtain data on the effective decontamination and detection associated with the Primary Containment System testing. Prior to developing the swipe plan, the Test Chamber was assessed to determine cost, safety and data requirements. The swipe sample size and sub-sample sizes were based on several factors such as: reduced variability in the data, the presence of the normal distribution, and acceptable cost for the sample collection/analysis.

Technology/Program Assessment Projects (continued)

ORIGEN® Analysis of TRE 02-2 Ovalbumin Sample Unknowns

A statistical analysis was performed to design an experimental process for the evaluation and quantification of unknown samples containing proteinaceous material. The effort included problem setup/analytic approach, and involved data preparation, regression analysis of assay data to develop standard curve, quantification of unknown samples using standard curve interpolation, presentation of results for standard curve and each unknown sample, and technical discussion of regression analysis and interpolation.

Rapid Identification of Nerve (RAIDON) Test Support

RAIDON is intended to be a detection device associated with the M256A1 chemical detection kit that allows for further discrimination between different classes of nerve agents. The current configuration of the M256A1 provides information only on whether the agent is a nerve, blister, or blood agent; if a nerve agent is present, the RAIDON will identify the specific type of nerve agent. The DAT helped the Principal Investigator (PI) and the testing team develop a test plan and create a data collection template to aid in program development and data gathering. The testing will ultimately be used to determine the best configuration of the RAIDON device, which will then proceed into formal testing for fielding.

			Payload/Dissemination Technique/ Delivery System Combinations	Logistics		Operational				Performance						Overall Rating
												Time	Ranges			
		P or L Mission	Alternatives	Availability	Size/ Weight	Safety Hazards	Environmental Hazards	Hum Fact System	Hum Fact Obscuration	Terrain	Weather	Build-up time	12km	30km	40+ km	
1	Visual	P	155mm with Exploding/propellant RP													2
2		P	155mm with Pyrotechnic TA													6
3		P	155mm with Exploding/propellant Titanium Dioxide													10
4		P	Class 4 UAV with Exploding/propellant WP													8
5		P and L	MULE UGV with vaporized Fog oil													1
6		L	Manned ground vehicle module with vaporized Fog oil													4
7		P	Manned aircraft with exploding/propellant RP													7
8		P	Manned aircraft with Pyrotechnic RP													9
9		P	Multiple launcher with Exploding/propellant RP													5
10		L	Stationary system with vaporized Fog oil													3
11	Bi-Spectral	P	155mm with exploding/propellant RP													3
12		P	155mm with exploding/propellant Brass Flakes													4
14		P	Class 4 UAV with single-use Blowers with Aluminum Nanoflakes													6
15		P and L	MULE UGV with multi-use Blowers with Graphite Flakes													1
16	IR only	P and L	MULE UGV with multi-use Blowers with Conductive Nanofibers													2
17		P and L	Manned aircraft with single use Blowers with Conductive Nanofibers													7
13		P	155mm with exploding/propellant Conductive Nanofibers													5
18		?	Jammers													
19	MMW/CMW	P	155mm with exploding/propellant Conductive Nanofibers													2
20		P and L	MULE UGV with multi-use Blowers with Carbon Fibers													1
21		P	Multiple launcher with Exploding/propellant Carbon fibers													3
22		?	Jammers													

Table showing example results for a program assessment. Many alternatives can be quickly assessed using a red-yellow-green scale.

Technology/Program Assessment Projects (continued)

U.S. Army Chemical School and PM Obscuration Distance Obscuration Functional Solutions Analysis (FSA)	The DAT conducted a study to support the FSA portion of the Joint Capabilities Integration and Development System (JCIDS) process for Distance Obscuration. The intent of this study was to identify solutions to meet projected and large area obscuration needs. The FSA involved a multi-phase qualitative and quantitative evaluation of various payloads, dissemination techniques, and delivery systems with the capability of either projected or large area obscuration. The study resulted in the recommendation of a short list of payload, dissemination technique, and delivery system combinations which can provide the most utility for accomplishing the desired missions, without the need for any major research and development. In addition, other items with potential for distance obscuration use that were identified in this study will be used to guide obscuration research and development through 2020. A unique methodology was required for this evaluation to address the requirements of the JCIDS process. This methodology was presented at the 2005 Military Operations Research Society Symposium (MORSS) to the Decision Analysis Working Group (WG), where it was selected as the best paper from that WG, and nominated to compete for the Barchi Prize for the best paper at the symposium. ECBC technical report TR-508 documents this effort.
U.S. Army Chemical School and PM Obscuration Screening Obscuration Devices/Modules (SOD/SOM) Analysis	The analysis conducted by the DAT for SOD/SOM was done to support a Joint Capabilities Integration and Development System (JCIDS) analysis being conducted by the US Army Chemical School and PM Obscuration. The JCIDS analysis identified numerous potential SOD/SOM solutions with the capability to meet program needs for small to medium area obscuration. Following an FNA and FSA for SOD/SOM (which had been conducted previously), the DAT developed an evaluation methodology to provide additional information and discrimination between the various potential solutions. The process involved a quantitative evaluation of the potential options with respect to performance, operational, and logistical criteria for various scenarios of use. The evaluation used information generated by various obscuration computer models to assess the capabilities of the options. The DAT then conducted an analysis of the results and developed recommendations for the most promising SOD/SOM solutions. A technical report documenting this effort will be published.