Operational Effect Thrust Area

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Overview

- **Mission statement**

- **Objectives & strategy**

- **Scientific approach**

- **Current efforts**

- **Accomplishments & status**

- **Challenges**

- **Conclusion**

Mission

Provide Combat Commanders & Services with Modeling, Simulation and Analysis (MS&A) tools to quantify and assess the ops effects & risks of a CBR attack

- **Courses of Action can be evaluated to determine best action available to commander**

- **Ops Effects Measures Of Effectiveness include, but are not limited to:**

  - **Mobile force movement**

  - **Casualty streams**

  - **Impact on medical support**

  - **Sortie generation rates**

  - **Cargo throughput**

  - **Logistics impacts**

Commander's Trade-offs

Effectiveness (y-axis) vs. Courses of Action (x-axis)
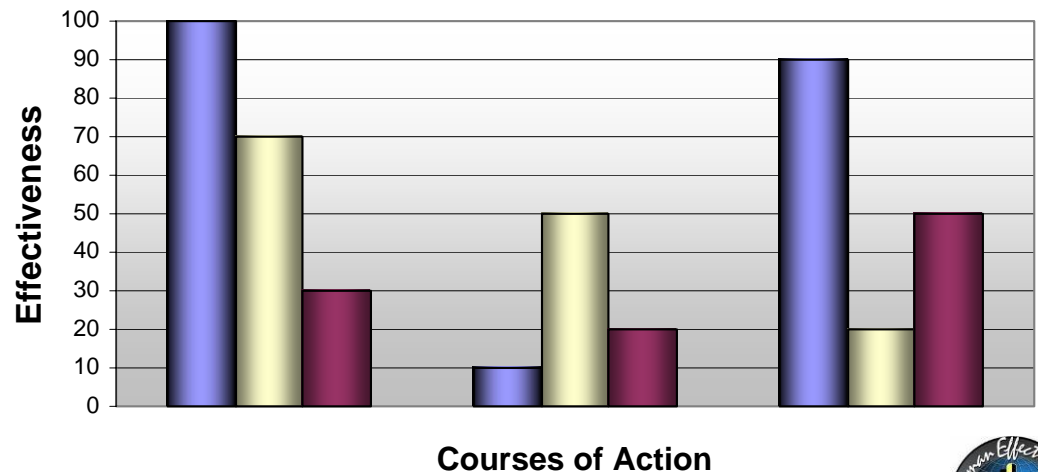
Objectives

- **Build on current programs that have demonstrated progress and success in meeting needs and requirements**

  – Deliver a mix of short term transitional products

  – Continue work on long term technologies

  – Develop new performers

- **Improve capabilities to rapidly assess operational effects on mobile forces and new threat domains**

- **Use of scientific and technological capabilities of civilian contractors and DoD personnel and facilities to max extent possible: Build the infrastructure**

Strategy

- **To max extent possible, efforts leverage related tasks/programs, i.e., JEM, JOEF, Congressionals, etc.**

- **Close coordination with the CBR defense acquisition community is maintained to assure transition to applicable acquisition program**

- **Provides a flexible framework to:**
  - **Incorporate documented requirements**
  - **Respond to new technology and threats**
  - **Assess the current status of M&S development**
  - **Provide capability to propose paths for future efforts**

Scientific Approach – User Input

- JRO provides JSTO "high-level" requirements

- JSTO must go directly to services and Combatant Commanders for more detailed requirements and feedback
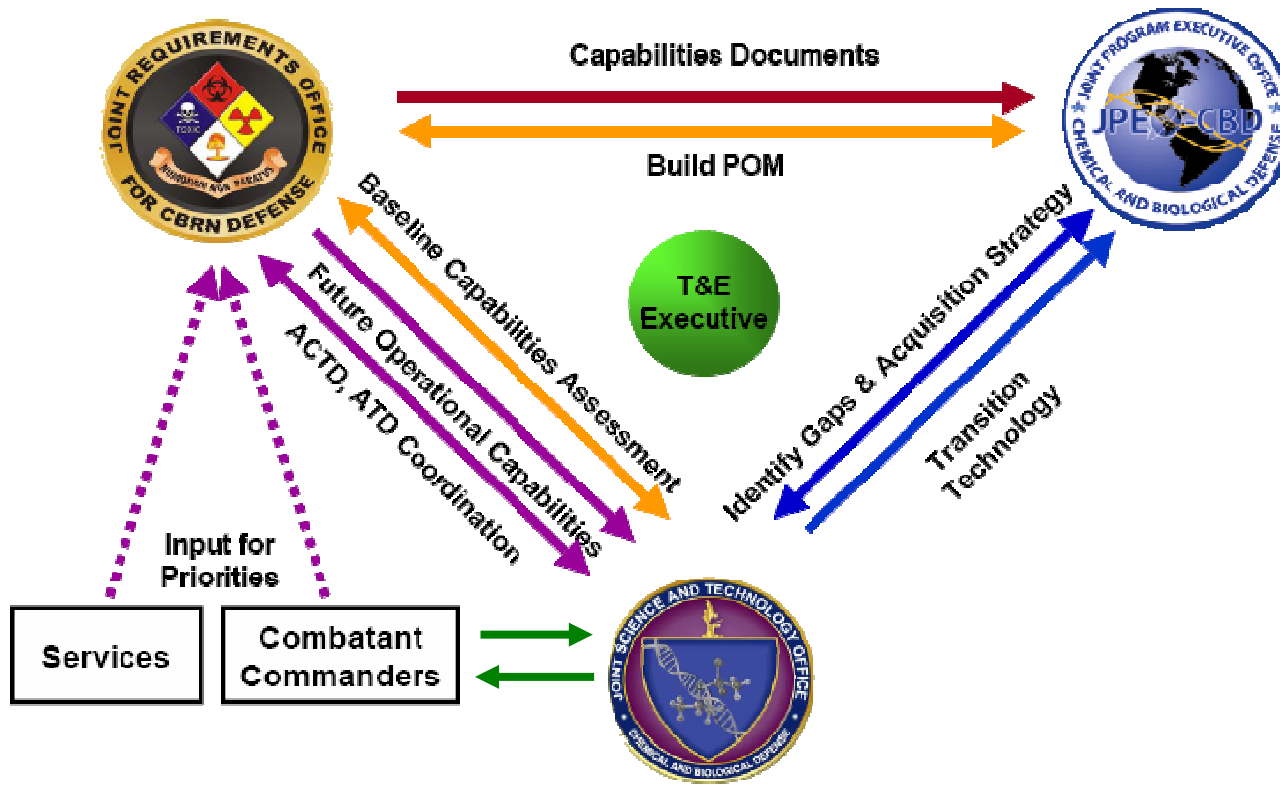

Build the appropriate tools for the appropriate users

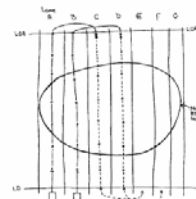# Scientific Approach – Technology Selection

- **Numerous technologies, techniques and environments can be selected when approaching a problem**

  - Database technologies
    - Extended Markup Language (XML)
  - Task networks
  - Intelligent agents
  - Discrete simulation
  - System simulation
  - Pattern recognition & search algorithms
  - Data converters
  - Output post-processors
  - Programming Languages
  - GIS interfaces
  - Data models

  - Hardware platforms
  - Software communication architectures
  - Genetic algorithms
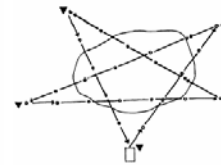 - 3D Viewers
  - Many, many more
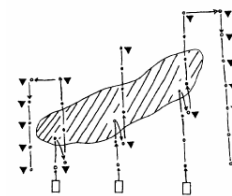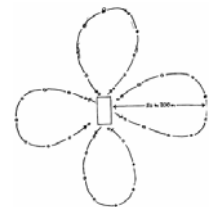
Differing NBC Search Techniques
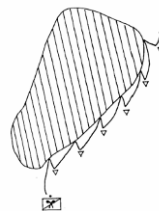
Standard | Lane | Star | Near / Far Side | Clover-leaf

Select the technologies that best address the problem

Figures taken from FM3-19

Scientific Approach – Implementation

- **S&T communities will be surveyed for existing programs that meet user needs.**

  - Where programs exist that meet user needs, these programs will be identified for transition to JPEO

  - Where technologies exist but in disparate programs, integration work will bring the programs together

  - Where no program exists, the S&T community will develop to meet user needs

- **Hard decision trade-offs must be made due to funding and time of development constraints**

- **Configuration Management is key to repeatability and accountability**

Build only when existing technology is insufficient

Scientific Approach – Testing and Documentation

- **Critical to producing products that transition effectively**

- **Limited funds focus efforts on areas of most benefit for least cost**

- **Testing performed and documentation written through-out product development**

  - **Verification tests performed at code, subsystem, system, and installation levels**

  - **Internal and external validation tests performed on most-common and highest sensitivity cases**

Testing and documentation supports future acquisition program efforts

Scientific Approach – Transitioning

- **Technology Transition Agreements (TTAs) written between S&T community and programs of record**

- **Transitions supported by documentation, testing, and consulting where required**

- **Not all S&T programs will be utilized in a final acquisition program product – some advanced and high risk R&D will fail**

Transitions are facilitated by consistent, regular discussion between S&T and Acquisition programs

Current Efforts –
Modeling & Simulation

- **Fundamental Research**

  – **Exploring emergent behaviors modeling and other non-traditional techniques for modeling asymmetric warfare**

- **New Threat and Operational Domains**

  – **TICs/TIMs and radiological Ops Effects modeling**

  – **Mobile Forces including various applications from tactical to the strategic modeling**

- **Customized user-oriented tool development**

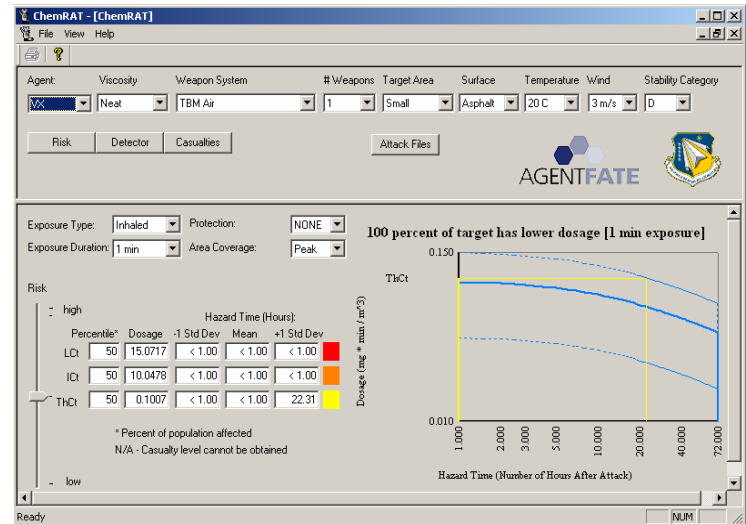 – **Creating tools that answer specific and focused warfighter requirements**

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Current Efforts –
Agent Fate

Live Experimentation

Laboratory Experiments

Field Trials

Results Comparison

Wind Tunnel Trials
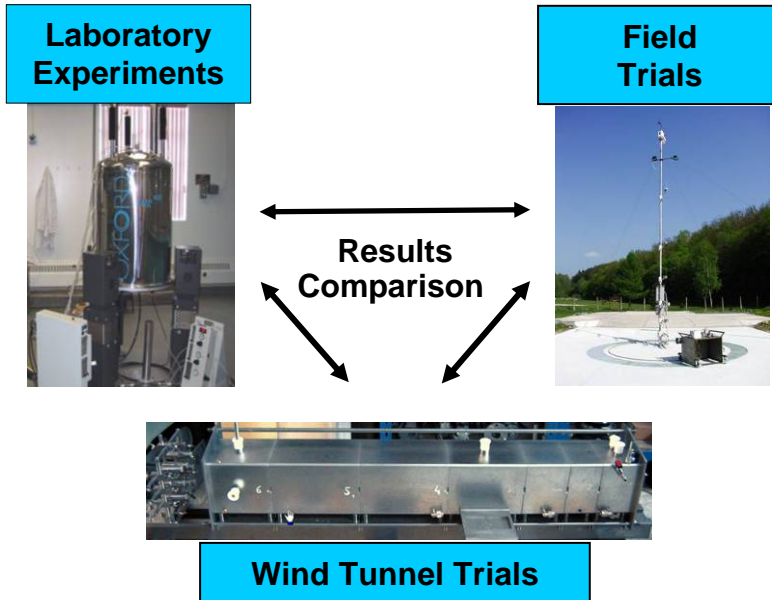
Data collected on real agent in various controlled and natural conditions

Predicative Modeling

Models and methods used to quantify and characterize hazard and associated risk

Mission: Improve prediction of CWA secondary evaporation and liquid contact & pickup

Current Efforts –
University Collaboration

- **Kettering University**

  – **Verification and validation authority working on Agent Fate efforts**

- **University of New Mexico & New Mexico State University**

  – **Creating decision support tools for allocation of resources**

- **University of Oklahoma**

  – **Advancing technology in: threat characterization, consequence management, behavioral dynamics and biomedical applications**
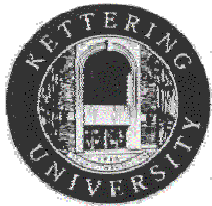
University collaborations often leverage congressional set-asides to produce results

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Accomplishments & Status

- **STAFFS 2.0 & CHEMRAT 1.5 technology transition on schedule for November JOEF Milestone B decision**

  – Future CBD S&T modeling products will follow a similar paradigm transition to programs of record

- **Next Generation Modeling focus on mobile forces -- JOEF**

  – Exploring CB methodologies with existing technology base

- **CHEMRAT II uncertainty representation -- JOEF/JEM**

- **Work with DSTL on linking methodologies -- JOEF/JEM**

- **Planned work with NAVSEA (Dahlgren) on translating methodologies of "CB hardening for buildings and structures" to fixed site operational effects – JOEF**

Challenges

- **Balancing the vastly different user's requirements**

- **Software integration complexity and scope**

- **Applicability and maturity of existing radiological info/tools to ops effects over time is unknown**

- **Data fidelity, adequacy, and currency**

- **Collaboration of international agencies for Agent Fate testing**

- **Software validation and verification**

Conclusion

There will be technical and managerial challenges but none that can not be overcome through collaboration, cooperation and the strength of our scientific community.

Conclusion (cont)

- Questions?

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