Transitioning Developmental Technologies to Engineered Systems for Military Applications

Tulane University Engineering Forum
June 2, 2006

Safe Haven From Hurricane Katrina

Scientists, Engineers and Entrepreneurs

- Scientists build to learn.
- Engineers learn to build.
- Entrepreneurs build a business.

How does this apply to the topic of this conference?

New challenges relating to coastal protection from both environmental and security perspective

- Can scientists come up with new approaches to old problems?
- Can engineers come up with workable solutions?
- Why will businesses support this effort?
- Ionatron is a unique blend of science, engineering and business

Introduction

- Ionatron is a high-tech, start-up company working on new technologies for Defense applications:
  - We have built an environment that allows rapid:
    - Proof of Principal Demonstrations,
    - Prototype Development and Effectiveness Demonstration,
    - Path to Production
- The challenge has been to take new technology from the laboratory to useful, real world applications quickly.
  - How do you transition “technology push” into a “user pull”?
  - What are the most important considerations of the customer?
  - What are the true limiting factors for success?

- What is the role of the engineer in this process?

Real-World Need, Real-World Technology

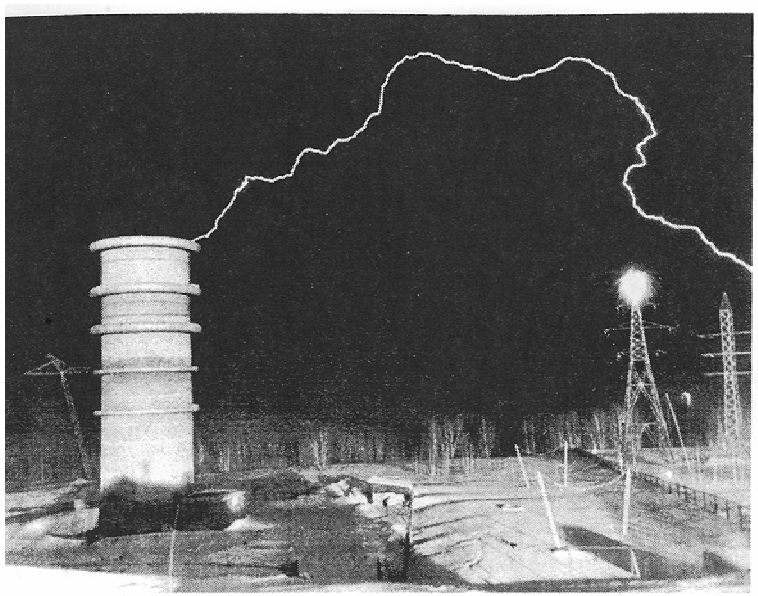
- What is the need?
  - Global War on Terror has replaced the Cold War
    - The battlefield is in cities, not open terrain
    - Engagement range is close-in
    - Enemy is among the civilian population
  - Security organizations are forced into non-conventional situations
    - Requires new less-than-lethal / lethal, innovative weapon systems to handle multiple types of threats and scenarios

The New “Threat”

Electrical Discharge through the Atmosphere

- Scientists have studied the phenomenon of atmospheric electrical discharges for many years.
- Others have conducted initial demonstrations of guiding or initiating electrical discharges using lasers

Unguided electrical discharge at a Russian High Voltage Test Facility. 5MV can travel a half a kilometer on its own.



Guiding using an ultra-short pulse laser demonstrated in Germany

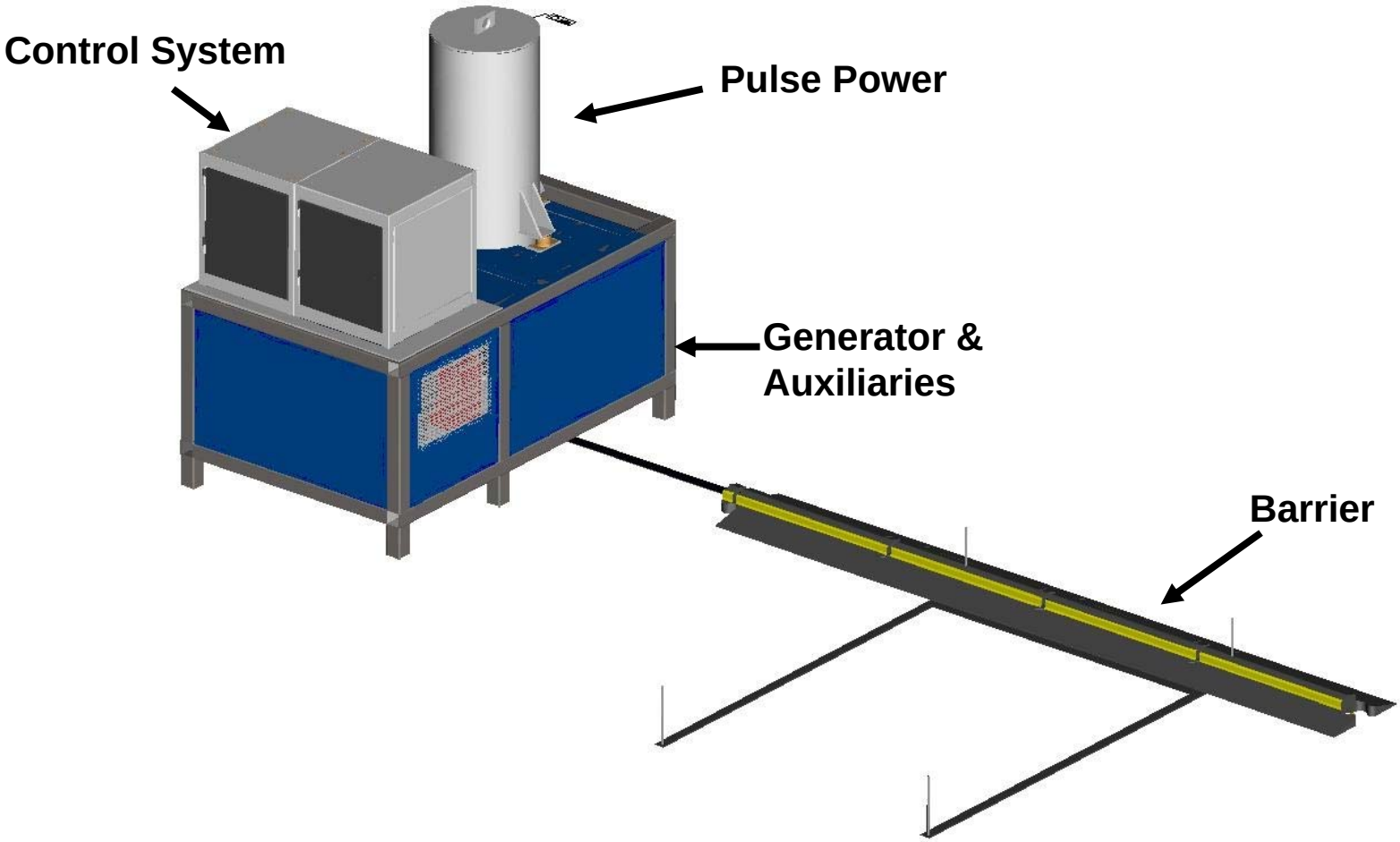
Opportunities Arise from Working Solutions

- Solutions to solving the long term problem can provide short term opportunities
  - Pressing needs from the customer for innovative solutions to new problems
    - Look at the requirements and review your “tool chest”
    - Ask the question: “Do we have something that can be used now?”
  - Is the potential solution a distraction, or does it complement your primary effort?
- A quick experiment, prototype or demonstration can help answer the question(s)
  - Vehicle Stopping
  - Roadside Bombs

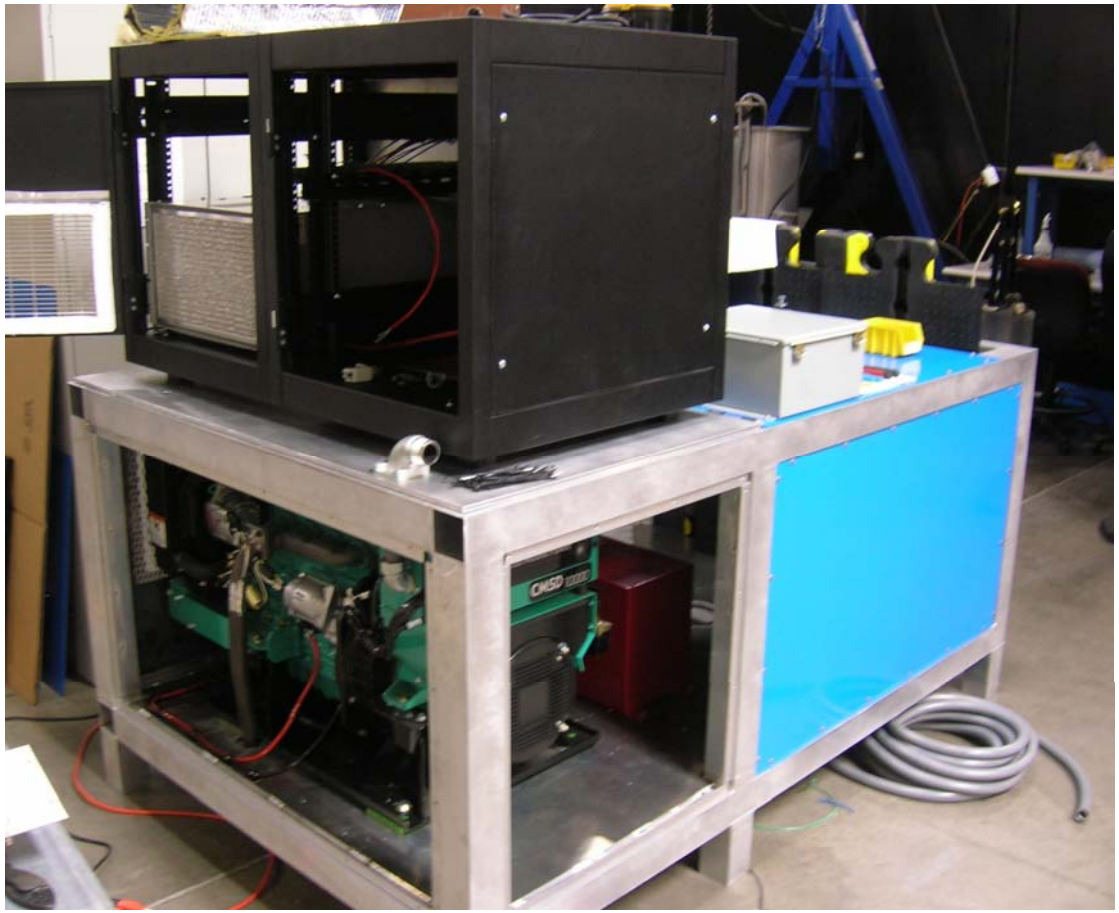
Vehicle Stopping

- Use existing High Voltage Pulse Power supplies to address need:
  - Must be operated at a distance
  - Must be safe to occupants of vehicle
  - Allow Security Personnel to activate when needed
  - Disrupt (Stall) or Deny/Destroy (Stop) Option preferred
  - Must be portable, easy to set up, easy to operate, relatively inexpensive

Vehicle Interrupt System (VIS)



VIS During Assembly



Road Side Bombs

- Use existing HV pulse power supplies
  - Operated remotely
  - “Sweep” an area
  - Relatively inexpensive
- Solution: Counter – IED System (CIEDS)
  - 4WD Utility Vehicle
  - Configured to operated remotely from a command vehicle
  - 3 months from lab to first demo
  - 16 weeks from contract award to field test

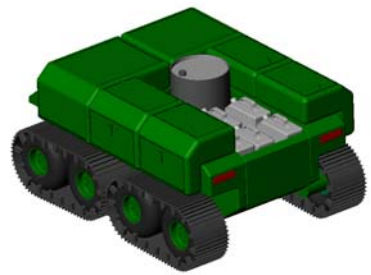
Original CIEDS Prototypes

Version I

Version II

Platform Technical Roadmap

Present → *Future*



How to Transition from Lab to Real-World?

- Integrate the System
  - Auxiliaries and controls
  - High Voltage Power Supply control
- Operator interface
  - Instrumentation and controls to monitor system performance and parameters
  - Allows operator to generate desired system output and verify it is achieved
- All must meet a set of user requirements
  - Generates a predictable and reliable system output
  - Works in the field environment
  - Delivers the capability the customer needs

What are the Compelling Customer Needs?

- Capability*
- Reliability*
- Safety*
- Cost*
- Compatibility*
- Acceptability

*Engineering plays a significant role

What are the True Limiting Factors for Success?

- Customer's needs are not met
  - Capabilities oversold
  - Product under-delivers
  - Requirements change
- Cost over-runs
- Competition wins
- Resistance to Change
  - Organizational
  - Cultural
  - Social

Lessons For Today

- Innovation and product delivery continue to change the world
  - New capabilities offer new solutions
- “Technology push” can transition to “Customer pull”, but it’s not easy
  - Change is hard
- Engineering is a key enabler
  - Necessary, but not sufficient for success
- Never stop trying to improve