Industry's Challenge in Transitioning Disruptive Technology

Mal O'Neill
CTO (ret.)
Lockheed Martin
mal.o'neill@lmco.com

Agenda:

- What is it?
- Why so hard?
- Success stories
- How should we do it?

Disruptive Modernization in 3-D

- Transitions can be disruptive in three areas:
  - New customer – new way to use existing or slightly modified product (Hellfire on Predator)
  - New process – new way to conduct operations (Performance Based Logistics Contracts)
  - New product – significant improvement of performance and cost or totally new capability

Disruptive Technology:

1. Promises major long term improvements in performance, cost, quality, and/or new capabilities
2. Isn't yet part of a successful product – largely unproven in a practical application
3. Faces competition from existing systems and adversaries inside and outside industry
4. Lacks advocates, especially with customer
5. Forces change in a system which resists change
6. Can't transition without perceptible risk for industry developer and user, potentially
    1. Significant development issues, missed IOC
    2. Poor performance, warranty-profit losses
    3. Damaged industry reputation

Difficulty of Transitioning

- Must educate large decisionmaker group
- Possible new customers – no history w/them
- Acceptably performing systems must be replaced. Are new capabilities good or bad?
- Monies must be found (difficult in any case)
  - Valley of Death (large investment to prove)
  - Unknown unknowns (survivability, environment, vulnerability, reliability, etc.)
- Doctrine and Force structure may be threatened/displaced/obsoleted
- Community of practice may be damaged

Leading Transition

Industry line of business mgt prefers incremental modernization:

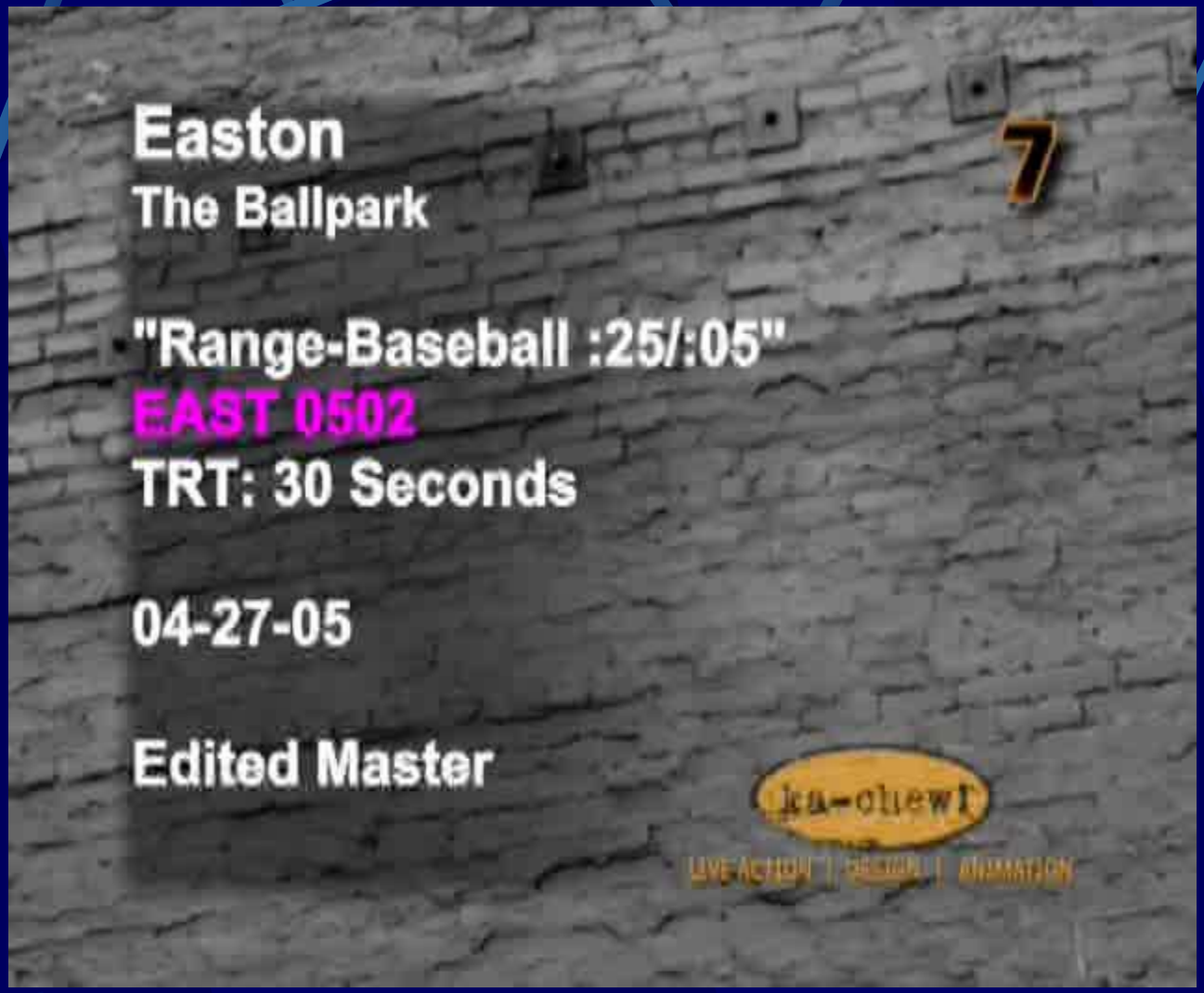
- Wants low risk, predictable customer, known volume, costs, and profits
- Can't differentiate its "commodities" from competitors unless the "process" is improved (Lean, 6-sigma)
- Won't support disruptive modernization without:
  - Independent leadership
  - External resources (corporate or government)
  - Customer knowledge/buy-in

Success – Nano in Sports

- Who said it's "disruptive" – avoid frontal assault
  - Don't hype nanotechnology
  - Existing products work okay – this is just better
  - If it's disruptive, let that be proven in future
- Engage suppliers in modernization strategy
  - Sell as better performance/quality at lower cost.
  - Use positive aspects of new technology vice risks – acquire/show real data
  - Worst vice is overselling!!! Credibility is Key!!

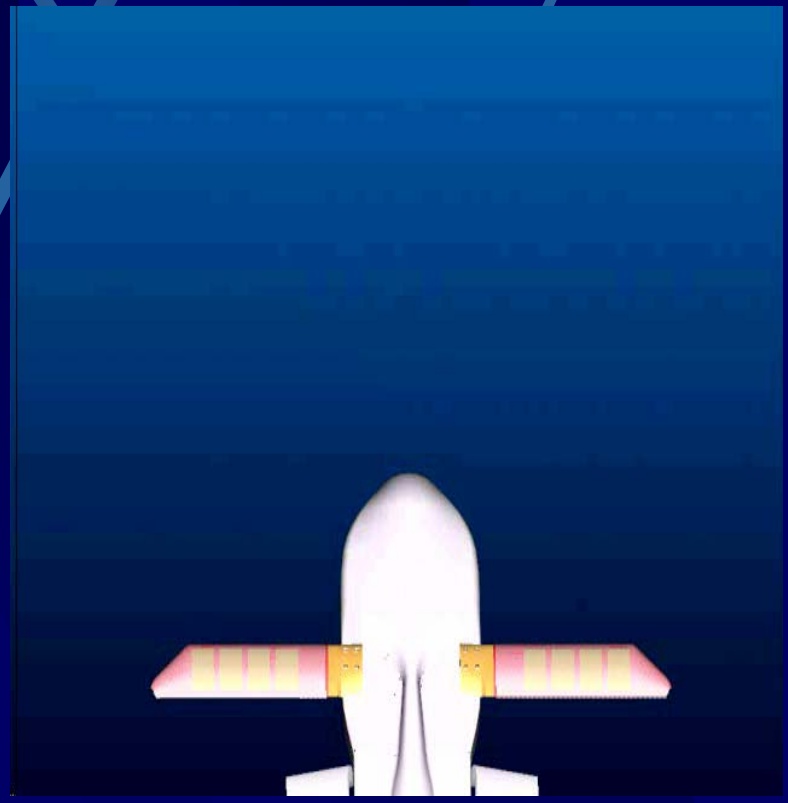
Interview, Dr. Tom Cellucci, Pres/COO, Zyvex Corp.

Nanomaterials Hit the Field



Nanomaterials Transition to DOD

- **Multifunctional Nano-Structures**
  - **Ultra Light Weight**
  - **Strength, rigidity**
  - **Producibility**
  - **Mission Adaptability**



Extended Wing LOCAAS

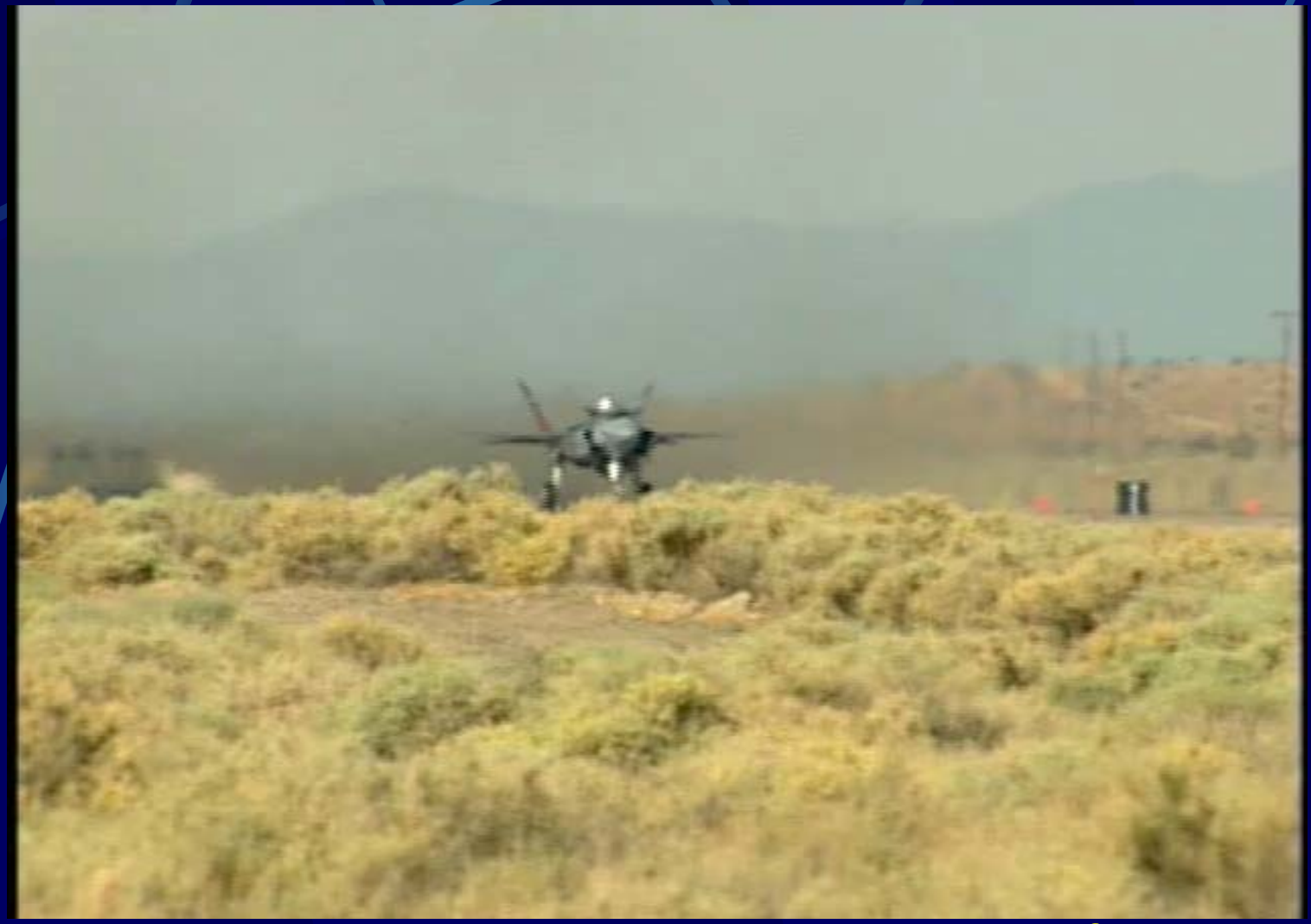
Courtesy of Dr. Les Kramer, LMMFC

Success – JSF Lift Fan

- Hit press in ’01 but lean team began in ‘87: USMC, DARPA and Lockheed
- USMC knew its objectives – stayed in-charge
- DARPA supported before PM had IRAD $
- Skunks had 50 concepts – PM picked “lift fan”
- Company liked “lift engine”; team/competitor influenced final “lift fan” decision
- Sold concept to engine teams thru AF code
- AF added strong staff/tech support (AQR)

Interview, Dr.P. Bevilaqua, NAE Skunk-PM, Invented Lift Fan

FIRST: STO-SSDash-VL



Courtesy of LMAero

DOD Developer is Key

- Engage the internal R&D community
  - Access to all information (SAP, proprietary)
  - Low cost to sponsor
  - Aids planning and avoids tech surprise
  - Quick response capability
  - Inherently governmental tasks
  - Corporate Memory
  - Continuity Throughout System Life Cycle
- Refresh RDECs to ensure in-house capabilities across new tech domains

Reference: Mike Marshall, "From Science to Seapower"

Industry Needs DOD Developer to:

- Fund tech base for set of designated disruptive technologies – enliven “Reliance”
- Hire/support new S&Es to ensure knowledge of and access to disruptive tech domains (best/brightest)
- Engage Industry/DOE/HSARPA/NSF to ensure input on new system options (w/DARPA)
  - Assess all information (SAP, proprietary)
  - Assign joint monitor (Service lab, other)
  - Coordinate on budgets, goals, performance.
  - Co-develop transition strategies
  - Perform inherently governmental tasks
  - Act as corporate Memory
  - Support Product Across System Life Cycle

Warfighter is Critical

- Provides insights on what capability is needed
- Identifies value/impact of potential improvements
- Envisions when such improvements would be needed
- Doesn't understand the technology – needs explanation
- Thinks he knows what he needs – but hasn't been exposed to disruptive potential of new technology/capability
- Might be wrong customer, so joint and multifunctional inputs needed (might be better suited to MP than SOF)
- Can't articulate all of his knowledge – simple user surveys are of little value – prototype test results may be too late

"If I'd asked my customers what they wanted – they would have asked for a faster horse" Henry Ford

Industry Needs Warfighter to:

- Include industry in Combat Developments
  - Immediately allow access to Lessons Learned
  - Integrate mod/sim, prototyping as tools
- Train cadre to understand capability options
  - Make system OR/SA trades (CAIV, AOA, COEA)
  - Make hard-nosed decisions early in process – drop dumb stuff sooner-the-better
  - A-TRADOC and JFCOM have good approaches
- Use concept of “pilot” operations in field to evaluate new hardware
- Be willing to revise TOEs, Tactics, Techniques and Procedures to achieve improvements

Industry Must: (1)

- Develop accountability for Independent leadership of disruptive transitions (COO, CTO, other)
- Allocate resources to evaluate disruptive tech
- Shield disruptive technologies from internal trades
  - Don’t assign tech to “disrupted” system organization
  - Hire/empower engineers with access to new ideas
  - Build a cadre of “skunks” for mission areas
- Develop credibility with government
  - Understand warfighter problem - communicate
  - Prove the evolution/revolution possibility
- Convince BOD/shareholders that long term survival requires disruptive tech transition

Industry Must: (2)

- Establish Skunkworks-like organizations at corporate level with charters like DARPA
- Develop world-class virtual collocation, simulation, continuously validated, to model disruptive features (scalability, etc.)
- Tie above activities to warfighter and DOD developers, including DOE/Others
- Fully explore the potential of new tech to improve capabilities in DOD mission areas
  - Whether profitable to industry or not
  - Include subcontractors/suppliers/innovators
- Allow failure – assessing evolution/termination

Summary/Conclusion

- **Transition of disruptive technology is difficult and if not expedited could negatively affect modernization**
- **Industry can successfully catalyze valuable disruptive capability with the help of warfighter and developer**
  - **Warfighter to brainstorm and assess potential**
  - **Developer to provide tech/business interface**
- **Industry must realize that success is not guaranteed by only market share and volume growth**

"I must work longer and harder each day to weave a world in which I can live. Survival is the play and I want the leading role",

Callahan, *Adrift – 76 Days Lost at Sea*

QUESTIONS

OR WRAP-UP AND

LUNCH, YOUR CALL?

BACKUP