Business Development in the New Navy

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Outline

• Overview of Ball Aerospace and Technologies Corp.
• Corporate Partnerships and “Win Win” Strategies-
  – “Technology Spin-on” and the spiral development process.
  – Northrop Grumman Ship System partnering with Ball Aerospace and Technologies Corp.
• Navy Industry R&D and Technology Partnerships
  – Industry IR&D
  – Corporate Joint IR&D
  – Navy sponsored S&T and R&D
  – Industrial Interface
• Technology Transition to the Shipbuilding industrial base
  – The DoD/Navy Budgeting Process
  – President/Congressional Budgeting Process
  – Industry Interaction
• Creating a Winning Team (Composite Antenna Technology- A successful example)
Ball Aerospace & Technologies Corporation (BATC) is a Subsidiary of the Ball Corporation.

**Ball Corporate Sales are $5B Annually**

**Ball Packaging Operations**
Serving Food and Beverage Container Customers Since 1884

**Ball Aerospace & Technologies Corp.**
Serving Government and Commercial Technology Customers Since 1956

**BATC Sales are $500M+ Annually**
Ball Aerospace & Technologies Corp. Has Three Strategic Business Units

Defense Operations
- Defense Systems
- Systems Engineering Solutions
- Antenna Systems and Technologies
- Component Technologies

Civil Space Systems
- Space Sciences
- Earth Sciences
- Planetary Missions
- Great Observatories

Commercial Space Operations
- Remote Sensing Products
- Spacecraft Buses
- High-resolution Cameras

Led from Colorado with Customer-Driven Regional Sites

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BATC’s Colorado Based Facilities Cover the Full Spectrum of Aerospace and Advanced Technology Work

- Ball Corporate Headquarters (BCH) Compartmented Engineering (219,000 square feet)
- Boulder Campus Satellites, Sensors, Instruments (659,000 square feet)
- Broomfield Research & Development (BRD) Compartmented Mfg. & Test (117,039 square feet)
- Aerospace Manufacturing Center (AMC) Antennas, Video (121,000 square feet)
Antenna Systems and Technologies (AST)

- **Strategic Focus**
  - State-of-the-art antenna systems and services for military applications

- **Core Competencies**
  - Antenna technology development
  - Design and production of specialized antenna systems and sensors
  - Low observable antenna system development

- **Products and Services**
  - Antennas, radomes, data links, and fuses for missiles, seekers, projectiles, and targets
  - Low observable antennas for stealth vehicles
  - Space-based reflectors and electronically scanned arrays for RF communications and sensing
Corporate Partnerships and “Win Win” Strategies-

“Technology Spin-on” and the spiral development process.

Northrop Grumman Ship System partnering with Ball Aerospace and Technologies Corp
• Why do Large Companies work with Small Companies?
  – Northrop Grumman’s Strategy was to develop a composite center of excellence for ship building.
  – Ball Aerospace seeking new markets for our antenna technology
  – Navy desire to increase composite technologies in future ship designs.
    • Technology Spin-outs take risky projects “off-book.”
      – “This is not Steel, Why do we want to do it?”
  – Spin-out/Spin-in brings agility to large companies. Minimizes risk of investment for core technologies
  – Joint IR&D investments allow both companies to
    • become involved in value creation by helping to imagine and realize radically new business models--and then the technology to support them.
  – In-house capital supplemented with partners capital.
Key Tenets of a Successful Corporate Partnership

Trust
- Work together to Address the Market not individual business opportunities

Define:
- Roles and Responsibilities
- Each contributor’s business interests
- Strategy
- Financial Investment
- IP Ownership
- Timeline

Partnerships
- Form Non-Competitive Relationships
- Parties add value to the end product or technology
- The Value of the end product/technology is worth more than the sum of the parts.
- Share development roadmaps and technology production cost models

Prime/Sub/Leader/Follower Roles Become Irrelevant
Composite Applications for Warships (Structural)

Full Service Operations R&D has contributed to marine composite design for many years. We designed, manufactured and installed the Advanced Enclosed Mast System (AEMS) on the USS Arthur W. Radford (DD968). Modern versions of this mast will be installed on the LPD 17 ship class. Other recent programs include the Low Observable Multi-Function Stack (LMS), DDG51 Class Composite Helicopter Hangar, Remote Minehunting System (RMS), and Integrated Topside Demonstration System (ITDS).

Advanced Planar Antennae

Full Service Operations R&D continues to be involved in programs that embed antennas into composite structure or cover antenna elements for RCS reduction. Recent programs include S-Band Antenna Program, Integrated VHF/UHF/L-Band Antenna (IVUL), Advanced Multifunction Radar Frequency Concept (AMRF-C) Program and LMS.

Radar Signature Assessments

The new Northrop Grumman Ship Systems Near Field Radar Reflectivity Range (NFR3) in Pascagoula, Mississippi provides the capability to measure the radar reflectivity of large structures accurately and with high resolution. Individual component contributions and their interactions with adjacent structure are a critical element of our warship radar cross section design effort.
Based on work with NSWC Carderock Maryland. R&D work in the early ‘90s on the AEM/S, Ball was awarded a competitive contract for the development of the LMS UHF/L/S-Band Phased Array System.

Based on experience with NSWC Carderock and NGSS Ball transitions conformal multifunction apertures to small boats and Marine Corps AAAV program.

In 1999, S-band antenna developments evolved into Multifunction Electromagnetic Radiating System Rubicon antenna fabrication.

Based on work to form a strategic alliance with Ball/Ingalls NGSS is awarded ONR IVUL Program. In 2001, Ball Aerospace was awarded Office of Naval Research contracts for low observable S-Band phased-array antenna development with NGSS integration and testing support. This antenna will support multiple applications and provide the Navy with capabilities it does not currently have, while abolishing the maintenance and support traditional antennas require.
Industrial Partnership IR&D to support DD-21 Topside Design

- Litton Ingalls Unveils new Integrated Topside Demonstration System
  - PASCAGOULA, Mississippi, April 19, 2000 -- Litton Ingalls Shipbuilding, a Litton Ship Systems Company and the leader of the DD 21 Gold Team, recently unveiled its Integrated Topside Demonstration System. The system, previously reviewed by representatives of the U. S. Navy's DD 21 Program Office, has been under development for the past year and a half, and showcases the integrated implementation of a variety of technologies available to the U.S. Navy for application on DD 21, the Navy's new Land Attack Destroyer......

- To develop the system and demonstrate that the topside technologies were mature enough to be integrated into a warship application with minimum risk, Ingalls teamed with six other companies.

- Each of these companies is a recognized expert in their respective field, a well-known provider of military or commercial equipment, or both. The six companies include the Telecommunications Products Division of Ball Aerospace and Technologies Corporation; Temeku Technologies, Incorporated; the Command, Control, Communication and Information Systems Segment and Radar Laboratory of Raytheon Systems Company; Litton Advanced Systems; Litton Winchester Electronics; and Litton Data Systems.

- The primary source of funding for the effort was from the companies' Independent Research and Development Programs.

Source NGSS Website

Source DoD DD-X Website
The Good News for Northrop Grumman (Plus many others) is that the Gold Team WON!!!!!!!!!!!!!!!

Source DoD DD-X Website
Ball Shipboard Antenna Developments - Technology Overview

Ball A Decade of Developments

Embedded Antennas

Multi-function Apertures

Conformal Multi-function Antennas
Typical Antenna Mast Configuration
Typical Antenna Suite Problems

- Large Masts
- Co-Interference
- Coverage Limitations
Multi-Band Antenna

- Marine antenna system combines 6 functions in a compact design
- All functions may be operated simultaneously: GPS, IFF, UHF SATCOM, UHF LOS, VHF Marine Band, and X-Band Radar
- Qualified for ship and small craft applications

Multi-function Antenna System
Multiband Antenna Simultaneous Requirements

- Communications
  - UHF SatCom
  - UHF LOS
- IFF
- GPS
- Radar
  - Space to house existing X-band radar
Integrated Multi-Function Antenna Improvements

- **Integrated Mast**
  - More Room for Passenger & Crew Movement
- **Multiband Antenna**
  - Improved Coverage
  - Limited Interference
Multi-Band Antenna Systems

Mast Mount Version

Deck Mount Version
Transition to the Shipbuilding industrial base

The DoD/Navy Budgeting Process
President/Congressional Budgeting Process
Industry Interaction
Military Budget Issues

Deficit management inevitable
- Triggered by Greenspan, Wall Street and voters
- Discretionary budget is vehicle
- DOD is one half the discretionary budget
- Spending controlled by outlays instead of budget authority
  - Defense vulnerable to cuts

• Current equipment is aging faster than anticipated
• Unfunded high priority programs and unaccounted cost growth will add to shortfalls
• Inflation assumptions unrealistically low and diverging
• Personnel retention issues must be addressed
The DoD Budget Process

- Understand the sources of volatility and their indicators
- Sources include:
  - Political
  - Economic
  - Transformation
- Remember this is a cyclical business
- Don’t overreact to limited data

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Government Budget Milestones

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DoD Budgeting Vs. Forecasting

The Difference Between a Budget and a Forecast

There is one thing that is virtually certain about a budget—it will be wrong. That’s because nobody can accurately predict the future, regardless of what process, information, tools or models are used. That is why many organizations also develop forecasts throughout the budget execution period. The purpose of a forecast is to continually update the expected results for the period based upon the latest information available.

So what could cause the budget to be wrong?

Changes in...

• customer demand
• suppliers processes and costs
• internal procedures and/or priorities
• government policy
• technology
• the global economy
• global stability
Political Uncertainty

• **What Happens If Bush Is Not Re-elected?**
  – In the short term, not much
  – New President would have limited ability to influence the budget he inherits
  – Defense budget will be relatively flat, constrained by arithmetic possibilities and politics
  – Foreign policy objectives and defense posture likely to change
  – Increased emphasis on tactical programs at the expense of strategic

• **What Happens If Control of Congress Changes?**
  – DOD budgets will be relatively flat
  – Focus shifts to domestic agenda and budgets
  – If Bush is in office, political polarization increases.
    • Executive decisions and regulatory actions, etc.
    • Fewer opportunities to influence Budget
  – Public support for the DOD wanes
Economic Uncertainty Cont’d

• DOD budgets
  – Zero real growth likely
  – MILPERS and O&M growing
  – Research & Development at risk
  – Process to recast defense budget may have begun

• Use of blue smoke and mirrors in budgeting
Economic Uncertainty Cont’d

• Politicians solve problems with impact falling later

• Balanced Budget and Deficit Control Act of 1985 (Graham Rudman Hollings)
  – Budget outlays capped
  – Automatic sequestration used as forcing function
  – Pro-rata distribution of cuts to meet target
  – SECDEF empowered
    • Limited authority to exempt programs from cuts
    • Cost of exemptions must be offset
  – Reduced opportunity to effect outcomes
Economic Uncertainty Cont’d

FY 91 CONSTATE $B TOA

YEAR


200 300 400 500

 PROCUREMENT "HORROR STORIES"

PUBLIC CONSENSUS

REAGAN INAUGURATED DESERT I

GRAHAM-RUDMAN GOLDWATER-NICHOLS ACT REPUBLICANS LOST SENATE MAJORITY

PLANNED FOR 6% REAL GROWTH

FY 85-89 FY 86-90

FY 87-91

FY 88-92

FY 90-94

FY 91-97

-4178

APR 89 1st BUSH PLAN

PEACE DIVIDEND

DEFICIT PRESSURE

1st PLAN FOR REAL DECLINE $132B

CURRENT (-2%) CONGRESS: $290B NOMINAL FREEZE?
Transformation

Old System

1. Service identifies a need and sends draft requirements to JROC
2. JROC decides whether:
   a. The need is sufficient to proceed.
   b. The draft requirement fulfills the need and
   c. The result will work in a joint environment.
3. JROC returns approved requirement to service
4. Service creates acquisition program

New System

1. Service or FCS identifies need and proposes Requirements
2. Gatekeeper either rejects the idea, or...
3. Sends it to an FCB.
4. FCB
   - Gets joint input
   - Checks for redundancy
   - Rejects of certifies req.
5. If more than $2.2B requirement goes to JROC
6. If less than 2.2B requirement goes to the service.
7. Once approved, service creates an acquisition program

- Not just about technology and software, it’s about how the military:
  - Organizes, trains and equips itself
  - Networks
  - Changes doctrine and tactics
  - Develops Requirements
- DOD Organization and Management
- PPBE vs PPBS
  - “E” gives SECDEF ability to recast budget w/o congressional oversight
  - Off-year changes through
    - PCPs reviewed by PA&E (urgent issues)
    - BCPs reviewed by Comptroller (fact of life changes)

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“SEAPower 21”

- Navy’s Transformational Architecture

- Main Components:
  - SEA STRIKE: Projecting Precise and Persistent Offensive Power (NAVAIR)
  - SEA SHIELD: Projecting Global Defense (NAVSEA)
  - SEA BASING: Projecting Joint Operational Independence (NAVSEA)

- FORCENET (SPAWAR & NETWARCOM)
  - Glue that binds Sea Strike, Sea Shield, & Sea Basing Together
  - IT BACKBONE: Connects warriors, sensors, networks, C2, platforms, & weapons
  - “Nothing But Net”
DoD and Industry IR&D
Communicating DoD Needs and Contractor Capabilities

**DoD**
- Provide Information on DoD’s R&D activities & Plans, mission needs, & operational requirements
- Review IR&D activities and provide feedback to contractors
- Review IR&D database to identify IR&D for use

**Contractors**
- Plan, Fund, and Conduct IR&D
- Provide technical information about IR&D
- Provide IR&D project description

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U.S. and Worldwide Research Base since WWII

Source: Report of the Defense Science Board Task Force on the Technology Capabilities of Non-DOD Providers; June 2000; Data provided by the Organization for Economic Cooperation and Development & National Science Foundation
FY04 Research Investments
Navy

Navy S&T Investments
$ in Millions

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Navy Research Priorities (based on funding allotment):

**Basic:**
- Defense Research Sciences: $368.517M
- University Research Initiatives: $70.669M
- In-House Laboratory Independent Research: $17.4M

**Applied:**
- Power Projection Applied Research: $114.144M
- Force Projection Applied Research: $75.909M
- Undersea Warfare Applied Research: $62.583M

**Advanced:**
- Power Projection Advanced Technology: $173.478M
- Navy Technical Information Presentation System: $151.058M
- Common Picture Advanced Technology: $69.194M

**Future Naval Capabilities (12 approved)**
- Approximately
- 67% of 6.3 funding
- 40% of 6.2 funding

Source DoD 2004 PBR

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DOD Service
Science and Technology (S&T) Trend

Source: GEIA 2002 10 year Forecast
Industries Influence on the DoD S&T Budget

- Industry Trade Associations provide a forum for Non-attribution question and answer with professional committee staff. Industry inputs can provide information on shortfalls/relevance to the current President’s budget.
- Narrow margins in the House and Senate has increased Industry awareness to the election process. Winning a competitive House race in Election 2000 cost a candidate between $1.1-$2M.
  - PAC’s provided 32% of all funds for House candidates and 12% of all Funds for Senate Candidates in the 2000 election cycle. Without PACs $245.3 million would have been missing from the system.
  - Corporate and association PAC’s are continuing to grow, even as the typical business donor has become less comfortable giving to the parties.
  - Achievement of an issue driven platform is part of a PAC’s agenda.
- The Navy/Services and Agencies have OLA’s to address request from the Hill and professional staff for information on budget changes +/-.

Be aware of Industries Influence on the DoD Budget work with your OLA when requested!
# Navy New Ship Construction 2004 Budget

## Chart 10 - Shipbuilding Programs

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*Funded in RDTEN

Source: 2004 Navy Budget Highlights
Ships Forecast

CAGRs: FY03-08 FY03-13

O&M +2.3% +1.3%
RDT&E +2.9% +0.3%
Procurement +1.0% +1.7%
NDSF +6.9% +4.2%
Composite +1.9% +1.6%

FY03 $B

Source GEIA 2002 10 year Forecast
* Addressable O&M

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Surface Combatants

- **DDX - New family of multi-mission ships**
  - Key Drivers: Cost and reduced risk; reduced manning and new technology; how to share ship R&D developments across various ship platforms?
    - Electric Drive
    - Common Hull – DDX/CG(X)
- **LCS - A New 60-70 ship Potential for Industry**
  - Affordability Drivers: Achieve lower cost ship to allow a Force Level of 300 ships or more
  - A New Warfighting Concept for Surface Ships, highly networked and mission reconfigurable
  - Potential for: Smaller hull, modular, mission packages, small crew size, and plug & play
  - May open up competition to smaller U.S. shipyards and foreign competition
The DD(X) Program acquisition strategy differs from the previous DD 21 effort. The new strategy emphasizes the Spiral Development approach, technology risk mitigation, and continued competition to award the Lead Ship in FY05.
Industry Technology Insertion

Source DoD Navy DD-X Website
The image displays a schedule chart titled "LCS Master Schedule." The chart outlines a timeline from FY02 to FY10, detailing various stages of the LCS program, including:

- FY02: Develop CRD, Ship Concept Design
- FY03: Develop LCS ORD, LCS Prelim. Design
- FY04: Construct 1st LCS (R&D), Construct 2nd LCS (R&D), Develop MPs
- FY05: Construct 3rd & 4th LCS (SCN), Concept Design
- FY06: Preliminary Design, Final System Architecture
- FY07: Final System Design, Detail Design/Construct 1st LCS
- FY08: Detail Design/Construct 2nd LCS
- FY09: Detail Design/Construct 3rd & 4th LCS
- FY10: Delivery

The chart highlights key milestones such as "industry technology insertion." The source of the document is cited as the DoD Navy LCS Website.

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Marketing Trends in Shipbuilding (1)

• Major Ship Programs being driven by the need to reduce risk
  – De-Scoping/Elimination Programs due to affordability constraints; examples CVN77, JCCX, and DD21
  – Expanded use of R&D funding for lead ships of a ship class
  – Adequately fund development to avoid cost growth in production phase
  – Eliminate design risk, transition to production when proven ready
  – More platform experimentation and testbeds key to reduce risk
  – More system development translates to more opportunity for the electronics industry

• Spiral Development being implemented across all platforms
  – Minimize risk and evolve to full capability
Marketing Trends in Shipbuilding (2)

- **Modular Ships and Mission Packages** – Hull forms designed for plug & play
  - Pay only once for a platform
  - Re-configurable for various missions
  - Maximum flexibility to meet future needs
  - Too early to tell what the impact is on combat capability and cost
  - Inventory of Mission Packages may be cost driver, no analysis

- **Growing use of off-board sensors and vehicles**
  - A force multiplier, funding does not live up to rhetoric; submarine community more active than surface community
  - Major new future opportunities in UUV, USV
R&D Timelines-Match the Roadmaps!

- S&T Projects
- Industry IRAD
- Lab R&D
- EDM’s
- Lab Demos
- Prototypes
- Fleet Experiments
- ACTD’s
- FNC’s
- LCS
- DD-X
- FSD
- System Test & Operations
- System Development
- Technology Demonstration
- Technology Development
- Research to Prove Feasibility
- Basic Technology Research
- TRL 1
- TRL 2
- TRL 3
- TRL 4
- TRL 5
- TRL 6
- TRL 7
- TRL 8
- TRL 9
- EMRL 1
- EMRL 2
- EMRL 3
- EMRL 4

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Technology Transition-Avoiding the Death Spiral

Figure 2: Timelines and investments in science and technology.

Figure 3: DARPA’s role in science and technology.

Source DARPA 2003 Strategic Plan

Figure 4: A summary of key DARPA accomplishments spanning more than four decades.

Figure 5: DARPA transition methods.

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Summary

• Naval fleet has long life, by necessity transformation has to come slowly
  – Wholesale replacement of ships is unrealistic and unaffordable
  – Transformation ability of existing ships limited
  – Navy needs to be building new ships which transform more easily over their life cycle
  – Reduction of life cycle cost continues to be important
• Resources will continue to be tight, however there are lots of opportunities
• Prepare to meet new and different shipbuilding opportunities:
  – High Speed and Modular Ships, electric power ships, high energy systems, offboard sensing and extensive complex networking
  – Increased opportunities for electronics industry as Navy increasingly uses mission packages
• Numerous significant new opportunities ranging from platforms to mission packages to off board vehicles