SAND2007-2502P

# Implementation Plan for Fully Embedding Mod/Sim in the NW Program

Presented by
Bruce Walker and Art Ratzel
on behalf of the
Mod/Sim Leadership Steering Team

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# This has been and will continue to be a Team effort

Steve Rottler and Rick Stulen charged Bruce Walker and Art Ratzel, as representatives of the NW Product Engr and Mod/Sim-S&T communities, to define path for fully embedding Mod/Sim in NWSMU.

**Senior Manager Team**: Hal Morgan, Larry Walker, Jim Handrock, Brian Damkroger, Paul Yarrington, Carl Peterson, Rick Fellerhoff

**Mod/Sim Leadership Steering Team**: Bruce Walker, Art Ratzel, Corey Knapp, Art Hale, Dave Corbett, Hal Morgan, Larry Walker, Davina Kwon, 8200 Senior Manager, Carl Peterson

## Achieving these goals requires a significant transformation of the way we do business

Key elements of successful change management include:

- Clearly articulated vision (and charge)
- Executable implementation strategy (a start)
- Commitment and buy-in at all levels (expectations)

# Implementation strategy is driven by four themes

**Bias for Action**

- Identify early opportunities for success
- Build on successes
- Continually improve (living, dynamic implementation plan)

**Collaboration**

- Improve teaming among product engineering, S&T community, mod/sim developers and analysts, and program
- Maintain balance between User-pull and Technology-Push

**Customer Engagement**

- Ensure NNSA customers appreciate value mod/sim provides to Sandia's mission

**Sustainability** (**Systemic, enduring behavioral changes)**

- Institutionalize through supporting policies and processes
- Provide training on tools and capabilities
- Develop and support needed tools and infrastructure

# Bias for (coordinated) Action

Enduring Stockpile

- Develop Full Weapon System Models
- Mod/Sim emphasis in Annual Assessment (and Stockpile Review Conference)
- Alts & Mods
- Stockpile Evaluations & SFI's

Future Stockpile

- RRW-1 M&S Transformation Initiative
- Advanced and Exploratory (e.g., CASA)
- RRW-2

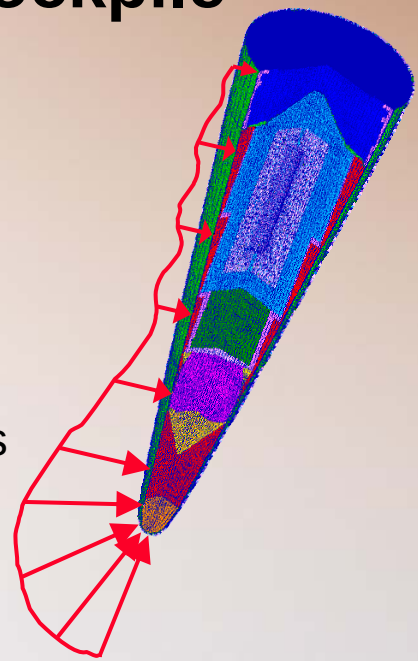
# Full system models for the Enduring Stockpile

## W78 Structural Dynamics model

- Analyze effects of subassembly bracket cracking during shock testing
- Simulate 3rd Stage Resonant Burn environment

## W88 Re-entry and Weather model

- Predict random vibration component specifications
- Develop component response during weather re-entry encounters



## Development of additional Full System Models has begun in FY07

- B83 Abnormal Mechanical
- W80 Full System Electrical
- W78 Abnormal Thermal
- W88 Radiation Effects

# Mod/Sim contributed significantly to W76-1 Qualification

## Significant Reduction in Qualification Testing for W76-1

| | W88 | W76-1 |
|---|---|---|
| Joint Flight Tests | 25 | 10 |
| Joint Ground Tests with LANL & LMSSC | 39 | 23 |
| Sandia Ground Tests | 67 | 26 |
| Under Ground Tests (UGT) | 5 | 0 |
| Total | 136 | 59 |

RRW can continue this trend and also improve utilization of mod-sim in design phase (anticipate rather than respond)

# ASC/RRW partnership promotes transformational M&S

**Focused ASC effort targeted at identification and systematic application of M&S tools to support RRW development and qualification**

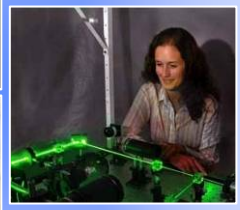
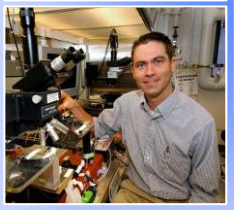
- Early evaluation and insertion of tools and processes to support system and component design
- Timely utilization of simulation to anticipate rather than respond

**RRW mod-sim analysis communities at both sites are partnering on…**

- Full system Electrical Model
- Evolutionary system modeling for early component specifications with uncertainty quantification for mechanical, thermal, radiation, EM
- Power supply technology maturation
- Integrated hostile environment effects (Radiation environments through mechanical response)
- CMOS7 radiation response

# This effort demands Collaboration across the broad NW Community

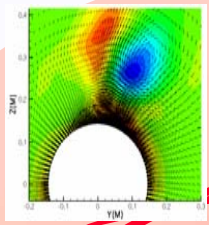
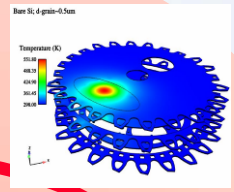
**Research**
***establishes scientific understanding***

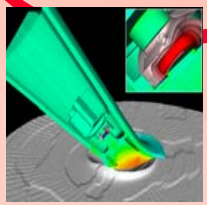
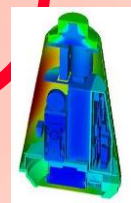
**… and forms the basis for the physical models used in computational simulations**

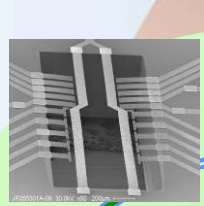


**Advanced Computational Platforms**
**provide both capacity and capability computing**

**Computational Simulation**



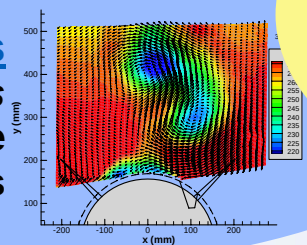
**Product Engineering**



**Physical Simulation**
**validates design intent**



**Experiments**
***validate the models***
**used in the numerical simulations**

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# Collaboration is Underway!

We are taking steps to build on existing collaborative efforts and to initiate new activities that will improve alignment between capabilities and needs.

**“Top 10” Weapon System Needs**

**New ASC Thrusts (FY07)**

- RRW Initiative
- Enduring System Full System Models
- NW Focus Areas (NG, Reentry, GTS, RNE, Safety, Surety, HEDP, QASPR, Full System Electrical)

Model development / analysis efforts were selected by DSW leadership

# Our NNSA NA-10 Customers Must Appreciate that Mod-Sim is Essential to Sandia's NW Mission

We need your help in reinforcing the value that mod/sim (from scoping analyses through high-end simulation) brings to Sandia's NW Mission.

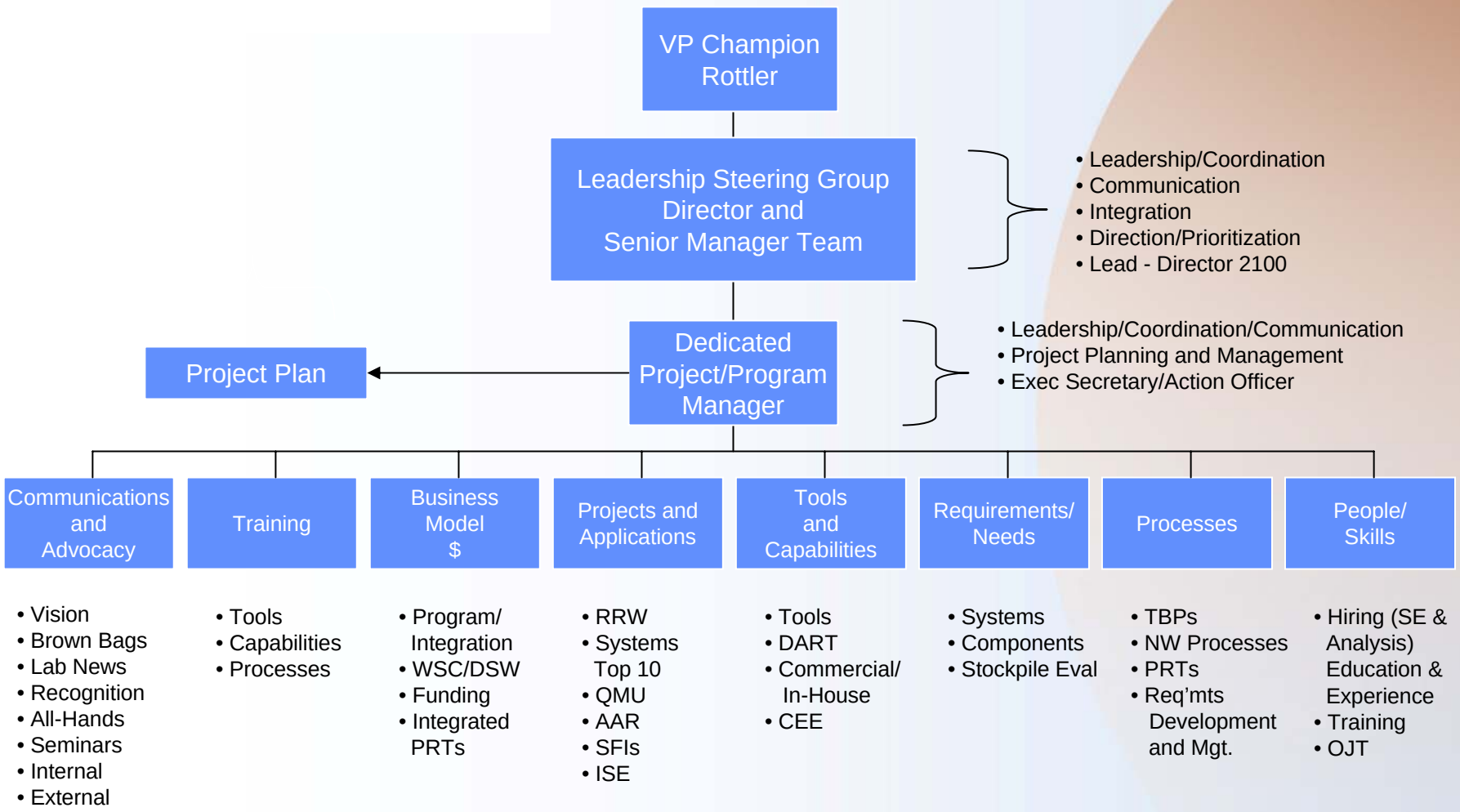
- Demonstrate User Pull (e.g. Annual "DSW mod-sim needs list" for NA-115)
- Advertise successes
- Tell the Sandia mod/sim story consistently and often

# We are establishing a Leadership & Management Framework to provide guidance and ensure Sustainability

Accountabilities include:

- Develop the strategic vision, leadership framework, and program plans
- Develop the collective commitment and ownership across NW necessary to achieve the vision and execute the plan
- Develop and implement communication and engagement strategies necessary to affect change across the NW Program
- Achieve collective agreement on planned actions and priorities
- Implement specific plans and activities that provide strategic direction to individuals and teams tasked with leading
- Maintain leadership focus and commitment in applying necessary resources to achieve the plan

# Leadership & Management Framework

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# BACKUPS

# Alignment of ASC Advanced Deployment (AD) and DART Pilot Projects for DSW

**In FY07, the ASC Program made a concerted effort to align AD Projects with DART Pilot Projects to support DSW customers**

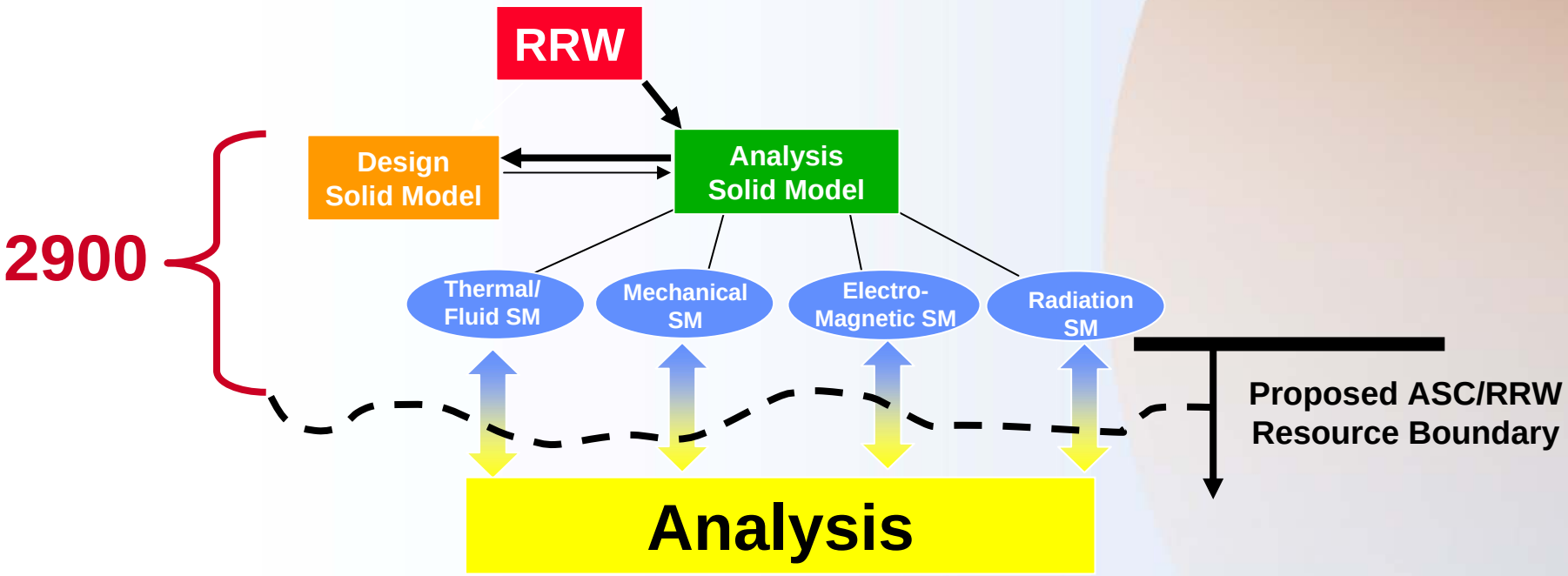
**Three major objectives were identified for these aligned projects:**

- **Rapid model development**
- **Data and configuration management of analysis activities**
- **Uncertainty quantification**

**There are six different projects that received AD and DART funding in FY07 to implement one or more of the above objectives:**

- **Integrated surety component survivability in adverse environments**
- **B61 system response for abnormal thermal environments**
- **Coupled random pressure loads on full-body models for RB/RV structures – W88**
- **Improving the predictions of nuclear survivability using the W87**
- **B61 normal and abnormal mechanical response modeling**
- **RRW normal and hostile analysis**

Initial FY06 DART Pilot Project was successful in developing full-system structural model for W78 3rd Stage Resonant Burn analysis in 10 weeks


RRW
Design Solid Model
Analysis Solid Model
2900
Thermal/ Fluid SM
Mechanical SM
Electro-Magnetic SM
Radiation SM
Proposed ASC/RRW Resource Boundary
Analysis

# Transition from W76-1 to RRW via transformation

The What, How, Why, and Who of M&S transformation…

- Support of tech maturation, design, and qualification using cutting edge tools for rapid model development and execution
- Systematic approach to M&S including solid model & analysis management, uncertainty, and margins
- Data transformed to information enabling critical decisions with measurable impact in time, cost, reliability
- Clearly identified system and component partners to act on M&S information

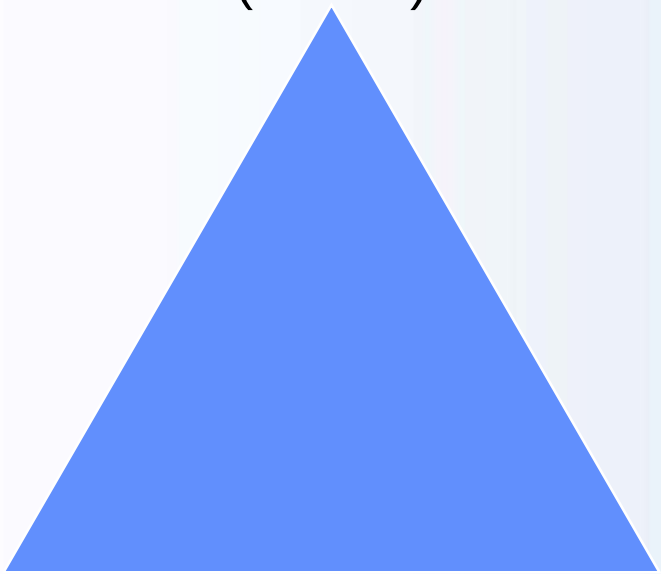
# Supporting RRW will require shared ownership and collaboration across both sites

- Accountability assignments being worked
- Teams will include NM and CA analysts and experimentalists
- Requirements will be used to derive mod-sim needs that will be worked through ASC and the Engineering Campaigns

**CA RRW leadership are standing up a structure to assure mod-sim will be broadly applied**

# RRW Collaboration will be realized under the evolving NW Management Model

Stockpile and Weapon Product Realization (Rottler)



NW Science & Technology (Stulen)

Campaigns & Tech Maturation (Hommert)