



WARGAME 2000 PROGRAM INDEPENDENT VERIFICATION ACCOMPLISHMENTS

**A briefing for the
NAVSEA Modeling and Simulation
Management Office (NAVMSMO) Symposium**

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AGENDA



- **EXECUTIVE SUMMARY**
- **BACKGROUND**
- **VV&A PURPOSE**
- **VERIFICATION APPROACH**
- **BLOCK 10/20 VERIFICATION**
- **BLOCK 3x VERIFICATION**
- **FUTURE BLOCK DEVELOPMENT**
- **SUMMARY**



EXECUTIVE SUMMARY



- **Based on initial Independent VV&A of NMD elements within Wargame 2000 ensemble The Wargame 2000 Program was acceptable for use in the NMD-based Command and Control Simulation 1999 (C2SIM99) given minimal caveats.**
- **Independent VV&A has been conducted on TMD-based applications of the Wargame 2000 Program.**
- **Independent VV&A activities were tailored to DoD Instruction 5000.61 and DMSO Recommended Practices Guide (RPG) Version 1.**
- **Wargame 2000 Program independent VV&A has evolved into supporting both Wargame 2000 development and wargaming-supported events.**



BACKGROUND



- **ARGUS (Advanced Real-Time Gaming Universal Simulation) has been the main wargame simulation used by the JNTF for over 10 years but in need of upgrade due to:**
 - **Maintainability**
 - **Maximization of program performance limits**
 - **Long cycle times between wargames**
- **Wargame 2000 Program development was initiated in 1996 to overcome ARGUS shortfalls and provide the growth capacity and capability to meet future requirements.**
 - **Built using formal design methodologies**
 - **Built on advanced simulation framework**
 - **Incorporates lifecycle support tools**
 - **Independent VV&A incorporated from the start**



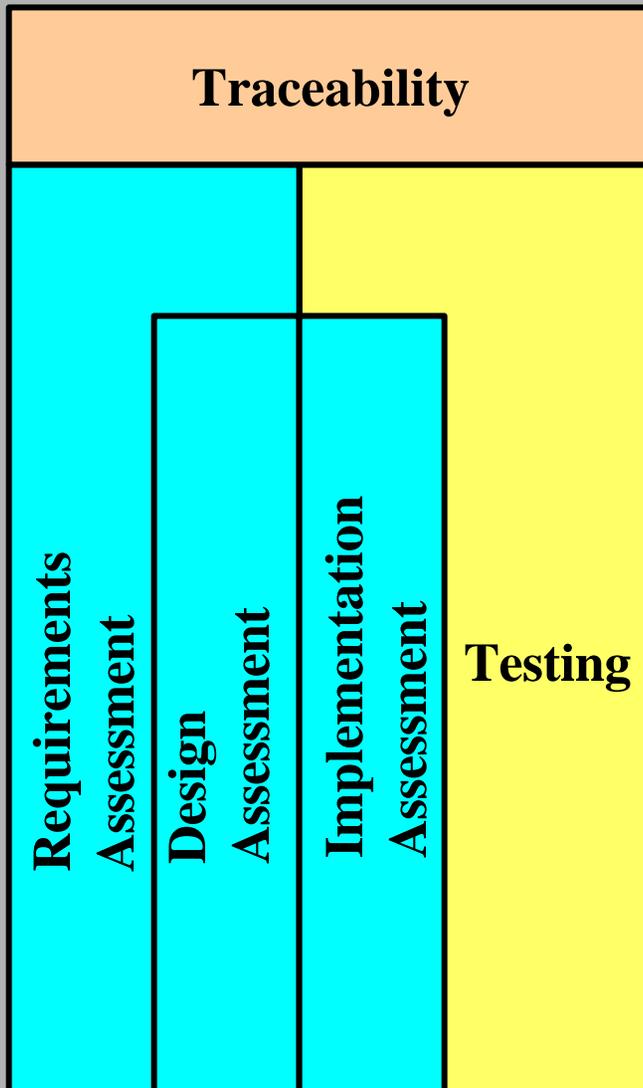
VV&A PURPOSE



Independent Wargame 2000 Program VV&A serves to collect a body of evidence in support of accreditation decisions on acceptability for specific wargames. This includes the individual models and/or simulations used as well as the ensemble of models, simulations and operational prototypes used.



VERIFICATION APPROACH



- Assessed all phases of Wargame 2000 system development.
 - Assessed traceability/satisfaction of system requirements during all phases
 - Assessed suitability of use against the requirements
- Evaluated the model representations of NMD systems and elements for completeness, correctness, consistency, and appropriateness in terms of performance objectives and behavioral needs.
- Verified that Wargame 2000 system development satisfied the defined functional requirements.
- Provided value-added rapid feedback to system development.



VERIFICATION APPROACH DETAILED TASKS



- **Requirements Analysis Assessment**
 - **Verified requirements capture and linkage**
 - **1454 requirements verified for Block 10/20**
 - **68 requirements verified for Block 30**
 - **Evaluated requirements quality attributes for each requirement**
 - **Evaluated requirements scope**
- **Design Assessment**
 - **Reviewed Pertinent design documents**
 - **Participated in design reviews**
 - **Participated in developer-led design walkthroughs**
 - **Verified requirements to CSC linkages**
 - **Evaluated requirements/design scope**



VERIFICATION APPROACH DETAILED TASKS



- **Implementation Assessment**
 - Performed independent code reviews
 - Participated in Developer-led code walkthroughs
- **Testing Support**
 - Evaluated Developers test plans and test cases
 - Monitored unit testing
 - Monitored system integration testing
 - Participated in Block-level qualification testing
 - Included findings in formal Verification reports
- **Programmatic Support**
 - Active member of the Wargame 2000 VV&A Working Group
 - Provided technical expertise to the development of the Wargame 2000 Program VV&A Strategy, V&V Plan, and Demonstration Accreditation Plan
 - Provided verification finding in support of accreditation decisions via formal report



BLOCK 10/20 VERIFICATION



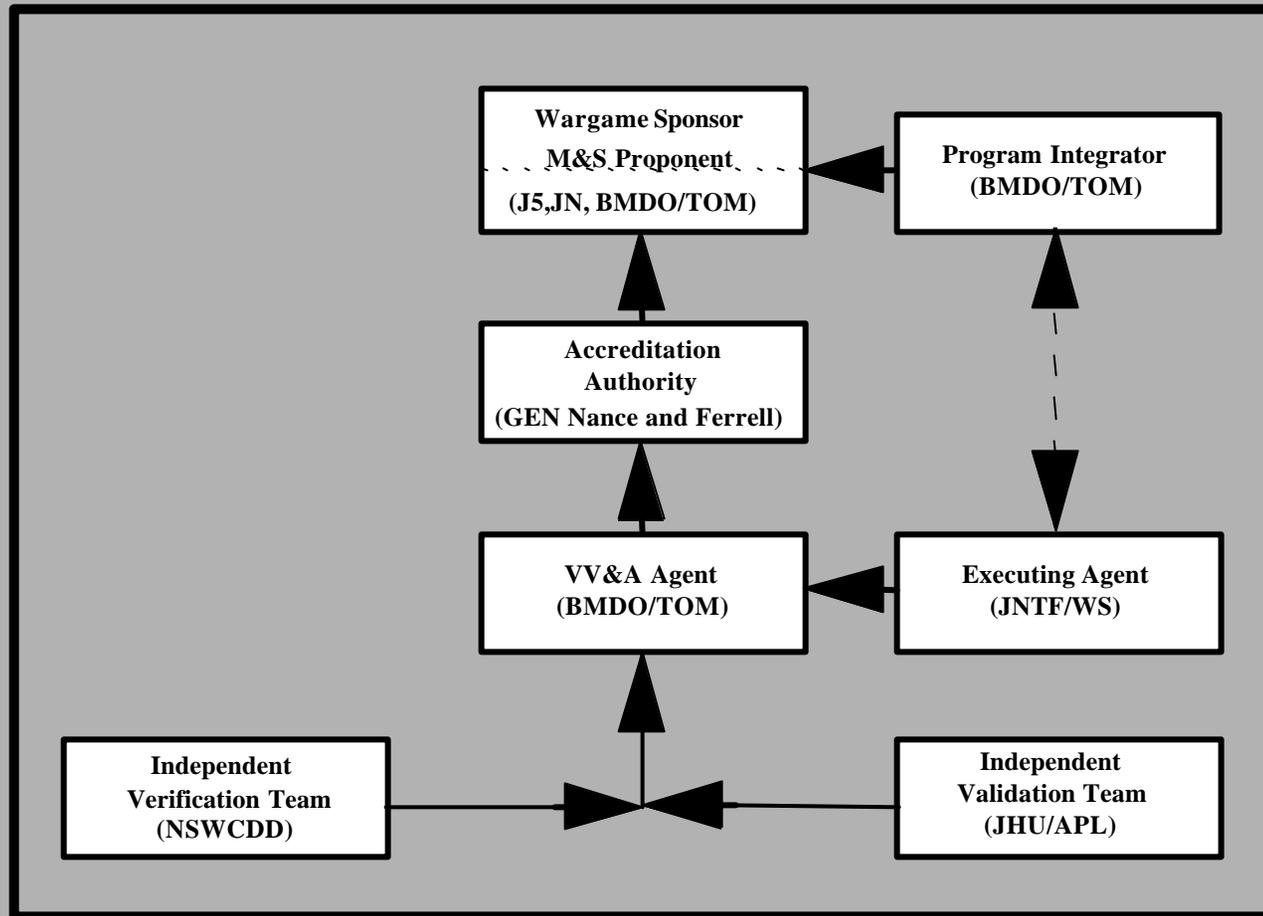
BLOCK 10/20 DEVELOPMENT PARADIGM



- **Based on a Block-centric approach (i.e. 10, 20, 30, etc.)**
- **Schedule deltas forced synthesis of Blocks 10 and 20 into one Block.**
- **Block 10/20 used in annual NMD C2Sim in 1999 in lieu of ARGUS.**
- **Block-centric approach prompted independent VV&A activities to be levied on the Block level.**



VV&A WORKING GROUP ORGANIZATION NMD-CENTRIC





VERIFICATION ACCOMPLISHMENTS



	Block 10	Block 20
Requirements Assessment	<ul style="list-style-type: none"> • Requirements Reviews <ul style="list-style-type: none"> ✓ Documents: OCD, SSS, SRS, Facility Specification • Requirements Review Objectives <ul style="list-style-type: none"> ✓ Requirements Capture ✓ Traceability ✓ Quality ✓ Scope 	<ul style="list-style-type: none"> • Requirements Reviews <ul style="list-style-type: none"> ✓ Reviewed Updated Documents and New Functionality
Design Assessment	<ul style="list-style-type: none"> • CDR and Design Documents <ul style="list-style-type: none"> ✓ SDD, IDD, ... • Design Reviews <ul style="list-style-type: none"> ✓ MADSIM, Viewers and Editors and WRR CSCs Reviewed 	<ul style="list-style-type: none"> • CDR and Design Documents <ul style="list-style-type: none"> ✓ Reviewed Updated Design Documents ✓ Reviewed Architecture Document (SSDD) • Design Reviews <ul style="list-style-type: none"> ✓ MADSIM, Viewers and Editors CSCs reviewed ✓ New Functionality -- Summary Displays, ITWAA, HLA, ...
Implementation Assessment	<ul style="list-style-type: none"> • Monitor Block 10 Qualification Tests <ul style="list-style-type: none"> ✓ Qualification Tests postponed until Block 20 	<ul style="list-style-type: none"> • Code Reviews <ul style="list-style-type: none"> ✓ Participated in Block 20 Code Reviews ✓ Executed IV&V Code Reviews for Conceptual Models Developed in Block 10 • Testing Participation <ul style="list-style-type: none"> ✓ Developer SRS and Pre-Qualification Testing ✓ C2Sim99 Single Missile and Scenario Testing ✓ W&E System Testing ✓ Block 20 Qualification Testing

Block 20 Results Represented a Fusion Of Block 10 and 20 Functionality



WARGAME 2000 BLOCK 10/20 VV&A FINDINGS



- **Wargame 2000 development was based on a useful set of requirements documentation and tools.**
- **Conceptual Model descriptions provided adequate detail necessary to guide program development and Independent VV&A activities.**
- **Discrepancies discovered by the Independent Verification Team were rapidly communicated to the developer prompting expedient resolution(s).**



BLOCK 3x VERIFICATION



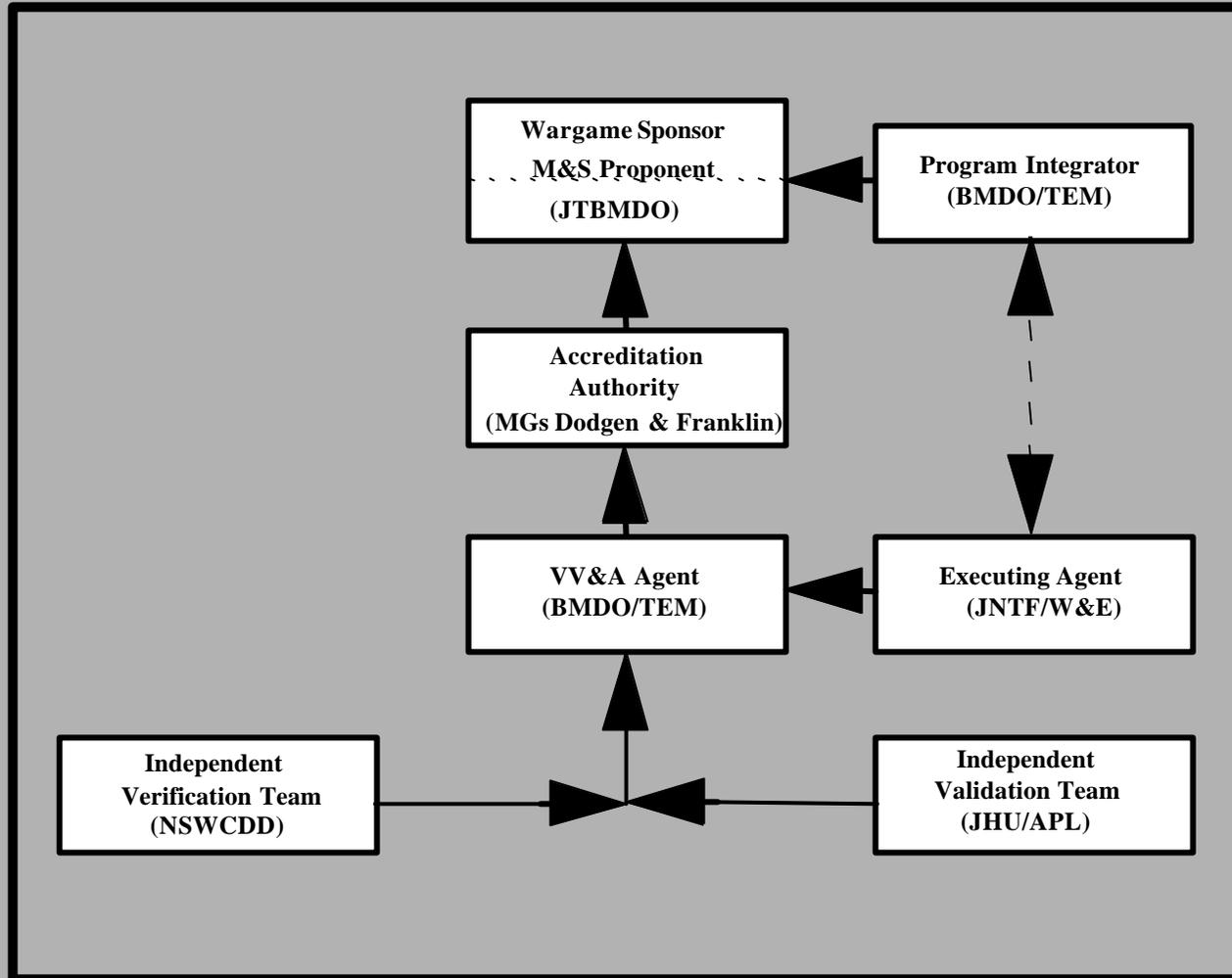
BLOCK 3x DEVELOPMENT PARADIGM



- **Based on an incremental, evolutionary development paradigm employing object oriented CASE tools (Rational Rose, DOORS).**
- **Previous Block-centric development now geared at sub-block level (i.e. Block 31, Block 32, etc.) and specifically targeted at increments within sub-blocks (Increment-centric).**
- **Block 31 used in Multi-National Conference in Philadelphia, PA in Jun 00 and the JTBMD Phase 1 Workshop in Colorado Springs, CO in Jul 00.**
- **Block 32 used in JTBMD Phase 2 Workshop in Colorado Springs, CO in Sep 00.**
- **New increment-centric development approach prompted independent VV&A activities at various levels for various applications.**



VV&A WORKING GROUP ORGANIZATION TMD-CENTRIC



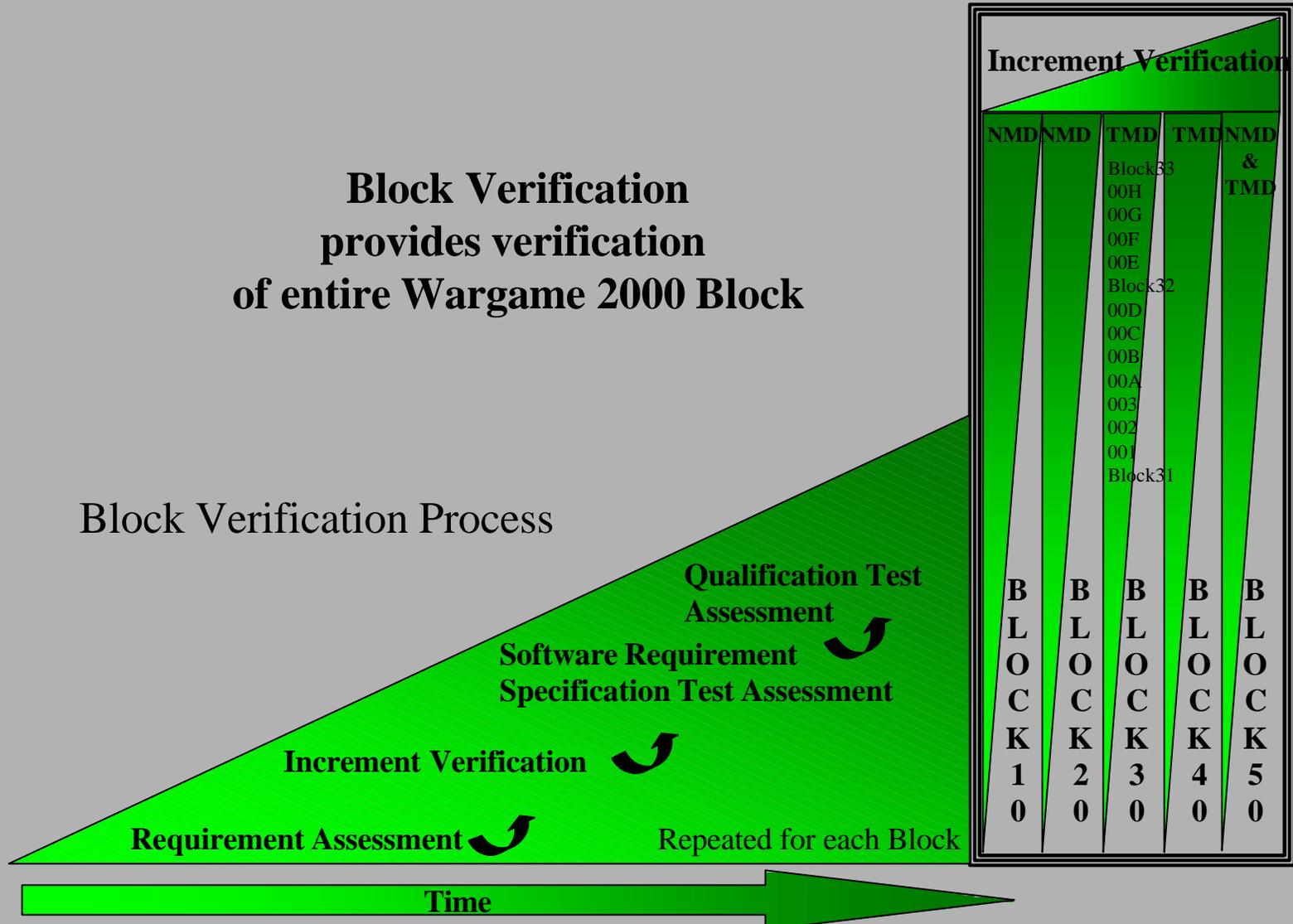


WARGAME 2000 BLOCK VERIFICATION



**Block Verification
provides verification
of entire Wargame 2000 Block**

Block Verification Process



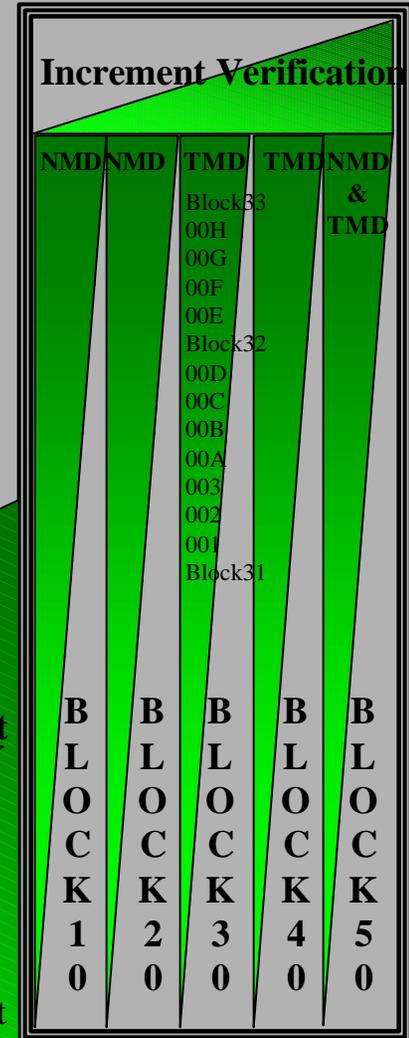
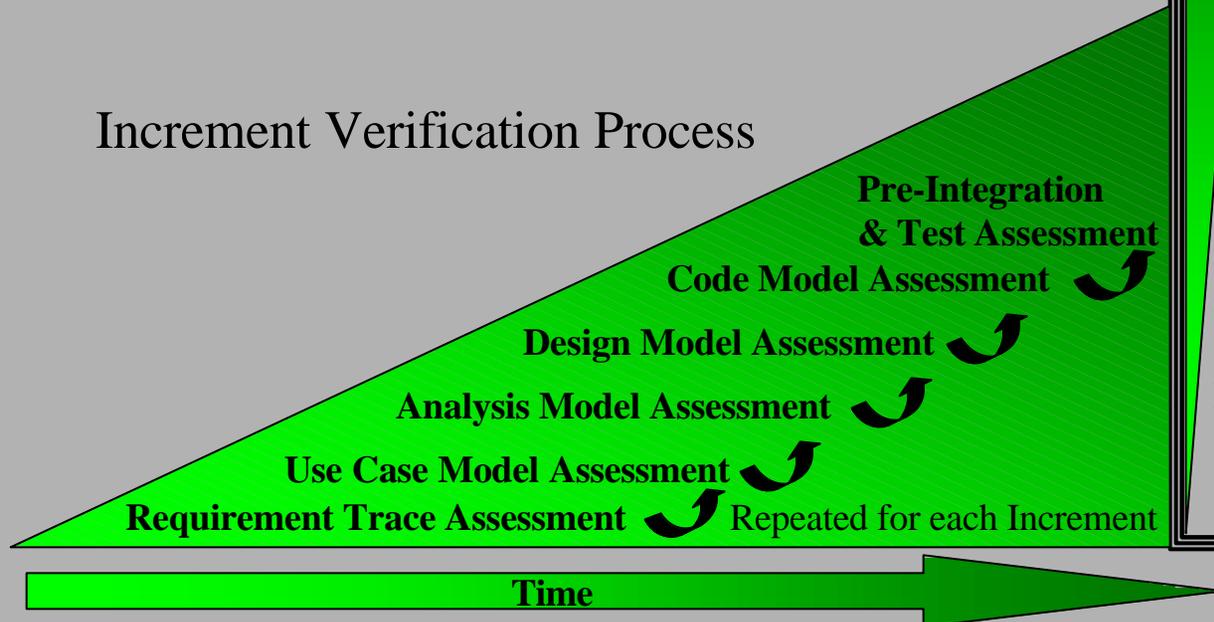


WARGAME 2000 INCREMENT VERIFICATION



Increment Verification provides verification of Wargame 2000 by increment

Increment Verification Process



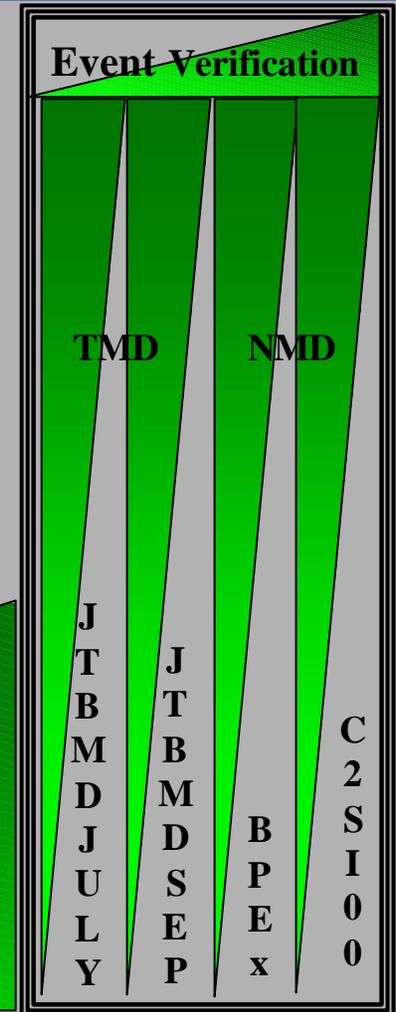
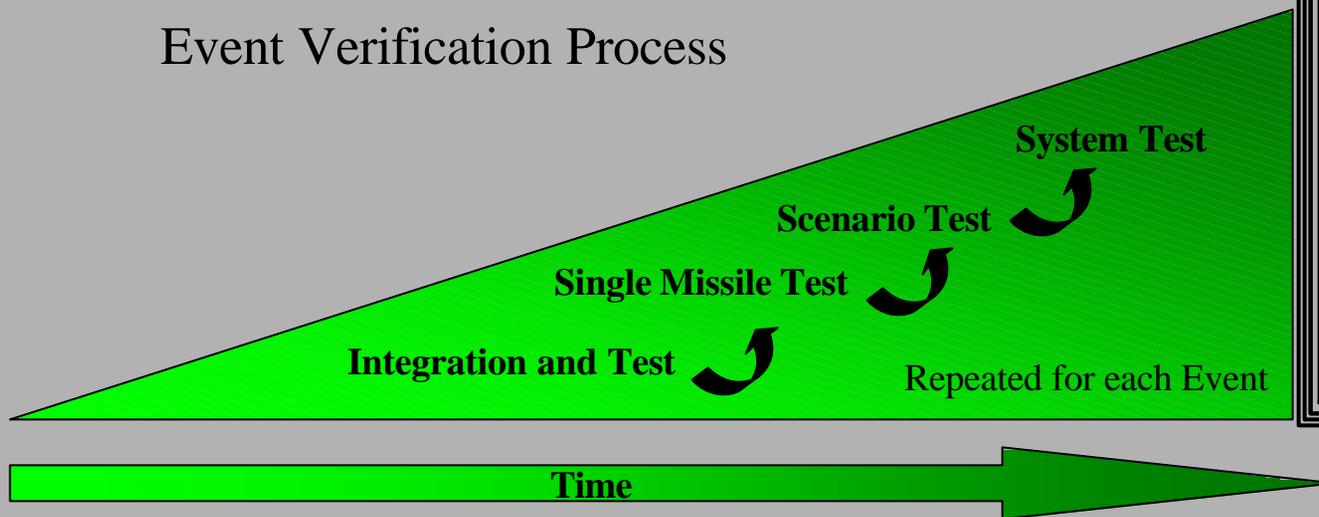


EVENT VERIFICATION PROCESS



**FY00 Event Verification
provides verification of Wargame 2000
in support of
event accreditation or certification**

Event Verification Process





FUTURE BLOCK DEVELOPMENT



WARGAME 2000 TODAY AND TOMORROW



- **Independent VV&A is continuing as Block 3x is developed by the JNTF.**
- **Paradigm changes in development of Wargame 2000 Program are again anticipated for Block 40. VV&A will most likely be re-focused.**
- **NMD and TMD applications employing Wargame 2000 have yielded a body of historical data that can guide future Independent VV&A efforts.**
- **Independent VV&A support warranted and necessary for duration of program development as voiced by sponsor.**



SUMMARY



SUMMARY



- **Wargame 2000 development has been more focused and energized through the employment of independent VV&A assessments from Program inception.**
- **Deltas both in development paradigms and schedules have helped focus independent VV&A activities to mission-critical areas.**
- **Independent VV&A accomplishments have been recognized by both the sponsor and the developer as being good for the Program.**
- **Independent VV&A of NMD and TMD applications have helped Wargame 2000 establish itself as one of the premier M&S Human-in-the-loop Command and Control simulations in DoD.**
- **Independent VV&A has evolved into supporting both Wargame 2000 development and wargaming-supported events (i.e. C2Sim99, C2Sim00, JTBMD PH I&PH II).**