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MARINE CORPS ORDER 5200.28B

From: Commandant of the Marine Corps
To: Distribution List

Subj: MARINE CORPS MODELING AND SIMULATION (M&S) MANAGEMENT

Ref: See Enclosure (1)

Encl: (1) References
(2) Detailed M&S Enterprise Tasks List

1. Situation. The Marine Corps is required to provide policy and procedural guidance for Modeling and Simulation (M&S) Management, per the references. This Order establishes the policies and procedures to provide a strategic vision and centralized oversight that will ensure collaboration and effectiveness of M&S across the Marine Corps. Without a unified vision and consistent collaboration on M&S activities and capabilities, the Marine Corps risks disparate efforts competing for limited resources, developing divergent capabilities, and creating obstacles to integration and interoperability. The scope of this Order consists of managing, resourcing, acquiring, engineering, and operating individual components of the M&S capabilities; managing integration and interoperability between components of M&S capabilities; and enabling infrastructure (i.e., ranges, networks, data centers) that supports reference (a).

2. Cancellation. MCO 5200.28A.

3. Mission. Provide oversight and coordination of M&S throughout the Marine Corps and provide Service-level guidance for the development and implementation of M&S capabilities in order to efficiently manage the significant investment in M&S technologies, mitigate risks, and eliminate barriers to mission accomplishment for the Marine Corps. This Order is in accordance with references (a) through (r).

4. Execution

a. Commander's Intent and Concept of Operations

(1) Commander's Intent. The Deputy Commandant, Combat Development and Integration (DC, CD&I) is the overall Marine Corps M&S lead who manages M&S across all the Marine Corps M&S communities and serves as the lead Marine Corps point of contact on all M&S matters to include coordination with other Department of Defense (DoD) M&S organizations, government agencies, international partners, and industry partners. DC, CD&I staffs and resources the Marine Corps Modeling and Simulation Office (MCMSO) to be the lead in conducting the daily M&S activities on behalf of DC, CD&I. Enterprise M&S management focuses on five key objectives:

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(a) Provide Marine Corps-wide M&S solutions that reinforce the concepts outlined in references (h) and (i) and offer consistent capabilities to both Active and Reserve Components.

(b) Coordinate efficient use of current resources in support of existing system development timelines while identifying future requirements needed for inclusion in the Marine Corps Enterprise Integration Plan.

(c) Support Marines, whether at home station or in deployed environments, by delivering M&S solutions at the point of need, supporting units afloat and ashore, and enabling capabilities at multiple echelons of command and across the Fleet Marine Forces (FMF) simultaneously.

(d) Support the Marine Corps' M&S workforce by identifying existing and future capabilities to meet individual community needs, providing the opportunities for interoperability between communities, identifying areas for synergy between communities, implementing common data standards, and supporting validated M&S requirements with the most efficient and effective solutions.

(e) Comply with established Service-level enterprise initiatives, orders, and directives, synchronize M&S training and education requirements with the enterprise workforce needs, and institutionalize the use of authoritative data sources as defined in reference (f).

(2) Concept of Operations. Marine Corps M&S management has five communities: acquisition, analysis, experimentation and wargaming, intelligence, and training. Three of the five communities (acquisition, analysis, and training) align with Department of Navy M&S management policy and enable the Marine Corps and Navy to coordinate M&S efforts. Reference (d) provides the following definitions for the M&S communities:

(a) Acquisition includes all science and technology (S&T), research and development (R&D), and test and evaluation activities as well as the material solution analysis, technology maturation and risk reduction, engineering and manufacturing development, production and deployment, and operations and support phases for acquisition programs.

(b) Analysis includes capability development to support doctrine, organization, training and education, materiel, leadership, personnel, and facilities; planning; programming and budgeting system support; cost and affordability analysis; campaign and force structure analysis; and fleet and mission operational assessment.

(c) Experimentation and wargaming includes using a simulation-supported scientific method to identify, develop, assess, and recommend changes to doctrine, organizational structure, training, materiel, leadership and education, people, and facilities required to achieve advances in operational capabilities.

(d) Intelligence includes using simulation to support any phases of the intelligence cycle.

(e) Training includes individual-level skills instruction, collective skills, unit-level skills, battle group/force staff Joint and mission preparation.

(f) DC, CD&I shall be the overall lead for Marine Corps M&S. DC, CD&I shall meet with the community leads once per year to discuss Marine Corps M&S. The Marine Corps M&S community leads listed below are responsible for coordinating M&S activities for their community across all relevant Marine Corps organizations.

1. Commander, Marine Corps Systems Command (MARCORSYSCOM) shall be the community lead for acquisition M&S.

2. The Director (Dir), Operations Analysis Directorate (OAD), DC, CD&I shall be the community lead for analysis M&S.

3. The Commanding General (CG), Marine Corps Warfighting Laboratory (MCWL) shall be the community lead for experimentation M&S.

4. The Deputy Commandant for Information (DC, I) shall be the community lead for intelligence and Operations in the Information Environment (OIE) M&S.

5. The CG, Training and Education Command (TECOM) shall be the community lead for M&S use in support of training across all elements of the Marine Air-Ground Task Force (MAGTF).

(g) DC, CD&I shall establish the MCMSO to provide day-to-day management of Marine Corps M&S matters. DC, CD&I can consider as necessary to delegate the oversight of the MCMSO to a general officer or senior executive service civilian and as such, delegates oversight to Dir OAD.

(h) DC, CD&I will use the currently standing M&S integrated process team (IPT) construct to assist in enterprise M&S management.

1. The IPT will be formed based on a charter developed by MCMSO and signed by DC, CD&I.

2. The IPT will meet quarterly.

3. The IPT will be chaired by the MCMSO.

4. Community leads may delegate oversight and IPT duties to M&S personnel or organizations within their communities; however, they remain ultimately accountable.

5. Community leads or delegates meet as necessary for IPT business. IPT actions are based upon consensus and/or majority vote when necessary.

6. Upon request, appropriate representatives will present matters requiring M&S attention or action by non-community lead organizations, along with majority IPT recommendation/rationale and minority IPT participant positions, to the Marine Corps M&S lead for adjudication.

7. Upon general officer request, a special general officer IPT may be called with the general officer community leads and chaired by DC, CD&I for addressing critical M&S issues.

8. The IPT will maintain an open invitation to the Marine Corps M&S stakeholders or their representatives.

(i) United States Marine Corps enterprise M&S management is handled by MCMSO, M&S community leads, and the M&S IPT. Management is organized into five lines of effort.

1. Define M&S policies. As the overall lead for M&S for the Marine Corps, DC, CD&I develops policies to promote interoperability and the use of M&S capabilities throughout the Marine Corps supporting Service, joint, interagency, intergovernmental, and multinational requirements. In addition to the reuse of M&S capabilities, Marine Corps M&S community leads will draft subordinate M&S policies that clearly define roles and responsibilities within their areas of responsibility; encourage research and development activities to respond to emerging challenges; limit the use of proprietary data and applications; and acquire government data rights (as appropriate).

2. Improve the use of M&S across the Service. To set conditions that are favorable for M&S management, Marine Corps M&S communities will use technical standards and standardized data (using common and authoritative data sources and formats); operate on interoperable, open architectures, including those in reference (n); strive to achieve on-demand network accessible capabilities; make efficient use of limited resources; deliver effective M&S solutions based on documented, transparent and operationally validated concepts, conceptual models, proven development approaches; and provide realistic simulation environments that enhance Marine Corps military operations.

3. Establish and maintain an enterprise framework. An enterprise capability requires a robust enterprise framework that promotes the sharing of tools, data, knowledge, and architectures across the Marine Corps. The MCMSO and M&S communities will first seek to leverage frameworks and capabilities across the DoD, other government agencies, industry, and academia (as applicable) to minimize duplicative and divergent efforts. Moreover, Marine Corps efforts must seek to synchronize our business architectures and governance approaches with other DoD M&S initiatives.

4. Build and expand the M&S workforce. It is imperative to provide M&S workforce access to relevant expertise and information. It is envisioned specifically that M&S trained personnel will be properly positioned across the FMF and Supporting Establishment to employ models, simulations, and data appropriately in support of Marine Corps requirements. In order to achieve the envisioned growth, the Marine Corps will improve the visibility and understanding of government, industry, and academic M&S opportunities; strengthen M&S training and education content; improve the visibility and understanding of government, industry, and academic M&S opportunities; and determine if the certification of M&S personnel is required. The larger M&S workforce will use current and emerging best practices across all areas of M&S with emphasis on verification, validation, and accreditation (VV&A); interoperability contracting nuances for M&S; and cyber security of M&S systems.

5. Synchronize S&T efforts. When technically immature concepts and capabilities are identified, M&S research will focus resources on M&S related science and technology objectives and give preference to research related to accomplishing the priorities within reference (h). It is

essential to have a unity of effort across the Marine Corps and partner S&T community when conducting R&D of possible solutions to identified Marine Corps' gaps and fully synchronize R&D efforts with the Marine Corps' Capabilities-Based Assessment processes. These efforts must maximize the leveraging of any existing funded research initiatives across DoD, industry, and academia.

b. Tasks

(1) DC, CD&I

(a) Assume overall Service-level leadership for M&S capabilities.

(b) Establish and resource a MCMSO for enterprise management of M&S.

1. Represent USMC M&S equities at the DoD M&S IPT.

2. Chair the Marine Corps M&S IPT.

3. Act as the 8825 occupational field manager, overseeing the education and assignment of personnel within the 8825 M&S Officer military occupational specialty (MOS). Select and provide guidance to 8825 MOS Specialist for the assignment of Marines to current billets and work with all the M&S communities for recommendations of new 8825 billets.

4. Conduct curriculum reviews of the M&S training and education programs used to generate the Marine Corps M&S workforce to ensure they remain current with the needs of the workforce.

5. Represent the Marine Corps in M&S crossing community efforts including M&S tools, data, standards, and Services. This includes acting as the Marine Corps representative to DoD M&S working groups, M&S standards bodies, Navy M&S Office working groups, and Naval Postgraduate School M&S forums.

6. Lead the effort to develop and implement a Marine Corps M&S Campaign Plan.

7. Ensure Marine Corps M&S systems and applications are accurately reported in appropriate registries of DoD systems and applications.

8. Coordinate M&S research efforts with Naval Postgraduate School.

9. Provide resources to perform responsibilities outlined in reference (p) as the functional area manager for M&S.

(c) Assess current M&S IPT participation levels to ensure all M&S stakeholders are adequately represented.

(d) Develop, refine, and manage the detailed action items in Enclosure (2) that are needed to implement this Order as an enterprise management capability.

(e) Determine, via the M&S IPT, the path forward for developing, resourcing, and fielding M&S capabilities, products, and services. Develop M&S business goals and objectives and the business capabilities and drivers to achieve those goals and objectives. Document and publish an Enterprise M&S Campaign Plan with the results and update the campaign plan every three years.

(f) Develop Service-level VV&A policy to implement references (d) and (e).

(2) M&S Community Leads

(a) Support developing, resourcing, and implementing the action items found in Enclosure (2). This includes providing oversight of the actions that are assigned to their communities.

(b) Create and implement specific M&S policies that specify unique and cross community roles and responsibilities. Review and update as necessary those community specific M&S related policies for compliance with Marine Corps enterprise M&S management.

(c) Identify the M&S requirements needed to support each individual community's mission. Conduct community evaluations to determine efficiency and effectiveness of fielded M&S capabilities to meet mission needs. Communicate identified M&S personnel, expertise, technology, process, and other gaps to the MCMSO.

(d) Assign a representative to the Marine Corps M&S IPT. This representative shall coordinate all M&S requirements across their respective communities and the FMF.

1. If a community is unable to establish internal consensus on an issue, the matter shall be addressed at the community general officer or senior executive service-level where appropriate.

2. Additionally, as appropriate, assigned community lead representatives shall invite community representatives outside their chain of command to participate in IPT business to ensure their communities' interests and equities are best represented.

(e) Represent the Marine Corps in joint, DoD, and other working groups, conferences, and arenas specific to their communities.

(f) Work toward improving the interoperability, commonality, and reuse of Marine Corps M&S, architectures, tools, data, and services.

(3) Marine Corps M&S Stakeholders. The following organizations play key roles in the planning, development, implementation, management, and sustainment of M&S across the enterprise. There is specific tasking contained in Enclosure (2) of this Order for community leads and stakeholders. Stakeholders listed below that are also community leads have been assigned tasks that go beyond the boundaries of their M&S community activities that will contribute to the overall enterprise management of M&S. Stakeholders that are not community leads are expected to align with designated M&S communities for coordination and compliance.

(a) Commander, MARCORSYSCOM.

(b) Commander, Marine Corps Systems Command, Program Executive Officer (PEO) Land Systems and PEO Digital Systems.

(c) DC, CD&I.

(d) CG, MCWL.

(e) DC, I.

(f) Commander, Marine Corps Forces Cyberspace Comamnd (MARFORCYBERCOM).

(g) CG, TECOM.

(h) Director, Marine Corps Operational Test and Evaluation Activity (MCOTEA).

(i) DC, Manpower and Reserve Affairs (M&RA).

(j) DC, Installations and Logistics (I&L).

(k) DC, Aviation (AVN).

(l) DC, Programs and Resources (P&R).

(m) DC, Plans, Policy, and Operations (PP&O).

(n) CGs in charge of the Marine Corps Total Force.

c. Coordinating Instructions

(1) Marine Corps M&S IPT. All efforts outlined in this Order will be coordinated through the USMC M&S IPT identified. Any necessary changes to the M&S IPT shall be documented in an updated charter.

(2) M&S Standards.

(a) Community leads, or their designated representatives, will use the standards processes in accordance with the Marine Corps M&S Technical Standards Profile.

(b) Community leads, or their designated representatives, will submit descriptions of their data and tools to the M&S repository designated by the MCMSO.

(c) Community leads, or their designated representatives, will comply with reference (j) and participate in the DoD recognized consensus-based standards development organizations for their respective communities, when applicable.

(d) VV&A.

1. Community leads will comply with references (d) and (e) that establish policy and procedures for the VV&A of all M&S communities and their associated data within the Marine Corps.

2. Community leads will assign members to DoD VV&A working groups as identified by the MCMSO.

3. Community leads will publish accreditation policies to implement community-specific accreditation processes.

4. Service M&S Policy requires alignment of community missions with associated VV&A requirements and responsibilities. While the use of M&S across communities is encouraged, if the intended design and use of M&S aligns with the mission of the analysis community than the M&S professionals from the analysis community shall oversee the VV&A process to ensure compliance with reference (d) and (e) in enclosure 1.

5. Administration and Logistics

a. Recommendations concerning the contents of this Order may be forwarded to DC, CD&I (MCMSO) via the M&S IPT or the appropriate chain of command.

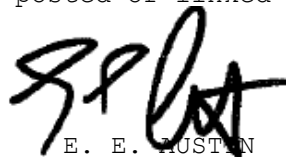
b. Records Management. Records created as a result of this Order shall be managed according to National Archives and Records Administration (NARA)-approved dispositions in reference (g), to ensure proper maintenance, use, accessibility, and preservation, regardless of format or medium. Records disposition schedules are located on the Department of the Navy/Assistant for Administration (DON/AA), Directives and Records Management Division (DRMD) portal page at: <https://portal.secnave.navy.mil/orgs/DUSNM/DONAA/DRM/Records-and-Information-Management/Approved%20Record%20Schedules/Forms/AllItems.aspx>. Refer to reference (k), for Marine Corps records management policy and procedures.

c. Privacy Act. Any misuse or unauthorized disclosure of Personally Identifiable Information (PII) may result in both civil and criminal penalties. The DON recognizes that the privacy of an individual is a personal and fundamental right that shall be respected and protected. The DON's need to collect, use, maintain, or disseminate PII about individuals for purposes of discharging its statutory responsibilities shall be balanced against the individuals' right to be protected against unwarranted invasion of privacy. All collection, use, maintenance, or dissemination of PII shall be in accordance with the Privacy Act of 1974, as amended (reference (l)) and implemented per references (m) and (r).

6. Command and Signal

a. Command. This Order is applicable to the Marine Corps Total Force.

b. Signal. This Order is effective on the date signed. Pertinent information regarding the Marine Corps M&S management and the communities' M&S programs and activities shall be posted or linked to the official MCMSO webpage.



E. E. HUSTON
Deputy Commandant
Combat Development and Integration

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References

- (a) 10 U.S.Code § 8063
- (b) DODD 5000.59 w/ CH-1, "DoD Modeling and Simulation (M&S) Management", October 15, 2018
- (c) DoDI 5000.70 w/ CH-3, "Management of DoD Modeling and Simulation (M&S) Activities", October 15, 2018
- (d) SECNAVINST 5200.46
- (e) DoDI 5000.61, "DoD Modeling and Simulation (M&S) Verification, Validation, and Accreditation" September 17, 2024
- (f) MCO 5230.21
- (g) SECNAV M-5210.1
- (h) 39th Commandant's Planning Guidance (CPG)
- (i) Marine Corps Force Design, Mar 2020
- (j) OMB Circular A-119, "Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities"
- (k) MCO 5210.11F
- (l) 5 U.S.Code § 522a
- (m) SECNAVINST 5211.5F
- (n) Defense Modeling and Simulation Reference Architecture Version 1.0, Feb 10, 2020
- (o) MCO 3550.14
- (p) SECNAVINST 5230.14
- (q) MCO 1524.1
- (r) MCO 5211.5

Detailed M&S Enterprise Tasks List

Chapter 1

Define Modeling and Simulation (M&S) Policy

1. Introduction. The "Define Modeling and Simulation (M&S) Policy" line of effort described below is intended to propagate the commander's intent for M&S throughout the various stakeholder communities.

2. Deputy Commandant (DC) for Combat Development and Integration (CD&I) via the Marine Corps Modeling and Simulation Office (MCMSO)

a. Assume overall Service-level leadership for M&S management including duties as the M&S functional area manager in accordance with reference (f).

b. Designate the MCMSO as the information technology (IT) portfolio manager (functional area manager lead) for the M&S portfolio in accordance with reference (f).

3. Marine Corps M&S Community Leads. Create and implement specific M&S policies that specify unique and cross-community roles and responsibilities. Review and update as necessary those community-specific, M&S-related policies for compliance with Marine Corps Enterprise Management.

4. DC for Information (DC I)

a. Assess existing authority to operate and authority to connect procedures and adapt the procedures to include M&S capabilities.

b. Assess M&S impacts on the Marine Corps Enterprise Network (MCEN) and adapt policies to facilitate M&S capabilities to include guidance on alignment of M&S IT to warfighting and business mission areas.

c. Assess and establish procedures for the creation and management of threat modeling data.

5. Commander, Marine Corps Systems Command (MARCORSYSCOM) and Supported Program Executive Offices (PEOs)

a. Assess and establish a M&S portfolio manager, metrics, and goals.

b. Establish policy for developing and fielding M&S capabilities in support of all M&S communities. Update acquisition plans, system designs, and fielding plans necessary to support maximum availability of M&S capabilities.

c. Draft policy directing programs to use open architecture or government-owned solutions as practicable and maximize usage of voluntary, consensus standards development organization (SDO) developed standards in accordance with OMB Circular A-119, "Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities".

d. Ensure proper coordination with the applicable IT portfolio managers in accordance with reference (f) to facilitate compliance, registration, and certification.

6. Director, Marine Corps Operational Test and Evaluation Activity (MCOTEA). Establish policy and best practices for use of M&S to support operational test and evaluation events as appropriate.
7. DCs and Directorates. Create or modify Service-level policy as required to support use of M&S capabilities.
8. Commanding Generals (CGs) of the Fleet Marine Forces (FMF) and Supporting Establishment. Publish subordinate M&S implementation policy based on the needs of their commands.

Chapter 2

Improve the Use of M&S across the Service

1. Introduction. The "Improve the Use of M&S across the Service" line of effort described below is to ensure lessons learned are implemented and efficient practices are adopted across the Marine Corps.

2. DC CD&I

a. Develop and manage a M&S technical standards profile (TSP). Base the profile on Marine Corps M&S community inputs and coordinate with DC I for MCEN incorporation. Identify appropriate standards development organizations (SDOs) to M&S stakeholders; participate with SDOs and comply with reference (j); develop new standards or modify existing standards to meet M&S capabilities requirements; and ensure applicable TSP-approved standards are included in requirements documents.

b. Ensure that requirements for architectures will be Joint Information Environment (JIE) compliant. Ensure that any JIE-related gaps of current architectures are identified and included in the Marine Corps Capabilities-Based Assessment process. Coordinate with the applicable Information Technology (IT) portfolio managers to ensure there is no unnecessary duplication of IT, and adhere to all IT-related laws, policies, regulations, and guidance.

c. Determine what M&S capabilities are needed to support the Marine Corps' mission. Incorporate M&S into the Marine Corps Capabilities-Based Assessment.

d. Ensure requirements documents for M&S capabilities specify that all processes, conceptual models, and algorithms will be available for inspection by and must include the ability to consume operational data and formats. Requirements documents need to be based on Marine Corps Lessons Learned recommendations from CG, TECOM. Ensure resources are provided to implement and test processes, conceptual models, and algorithms specified in requirements documents.

e. Analyze and provide capabilities and limitations assessments of underlying conceptual models and their interactions within live, virtual, and constructive (LVC) environments. Identify, define, and prioritize the range of military operations (ROMO) concepts that cannot be modeled with current methods or simulated capabilities and notify the Marine Corps science and technology (S&T) community.

f. Define M&S data categories to organize the sharing of data and certification of authoritative data sources.

g. Evaluate existing M&S authoritative data sources and provide recommendations for use by M&S capabilities. Ensure requirements documents identify M&S authoritative data sources (as appropriate).

h. Operational systems requirements developers and integrators shall coordinate with the training M&S community lead to enable interoperability with training capabilities.

3. Marine Corps M&S Community Leads

a. Define how M&S is used to support community's mission. Conduct community evaluations to determine efficiency and effectiveness of M&S capabilities to meet individual community mission needs.

b. Analyze and provide to DC CD&I the simulation and data standards that are required by the community for inclusion in the TSP. Maximize active participation within standards development organizations identified by DC CD&I.

c. Determine the phasing and fielding requirements of M&S capabilities within respective communities. Coordinate these plans with DC CD&I to determine efficiencies across communities.

d. Identify and assess existing architectures within respective communities for JIE compatibility. Coordinate future requirements with DC CD&I's future JIE architecture efforts.

e. Determine constraint and restraint metrics for accreditation and identify community specific operational use cases. Assess the transparency of the M&S tool's conceptual models and assess if the findings impact VV&A or users' acceptance.

f. Identify to DC CD&I operational data and formats needed to enable M&S.

g. Produce requirements documentation for all current and future M&S capabilities provided by or employed by the community and submit them to the DC CD&I Requirements Transition Process for validation.

h. Ensure requirements documentation contains sufficiently detailed information to guide the development and delivery of conceptual models. The DoD Digital Engineering Body of Knowledge defines a conceptual model as, "An abstraction of what is intended to be represented within a simulation environment, which serves as a frame of reference for communicating simulation-neutral views of important entities and their key actions and interactions. The conceptual model describes what the simulation environment will represent, the assumptions limiting those representations, and other capabilities needed to satisfy the user's requirements. Conceptual models are bridges between the real world, requirements, and design." (Department of Defense Digital Engineering, Modeling and Simulation, Digital Engineering Body of Knowledge. <https://www.de-bok.org/glossary/Conceptual%20Model>)

i. Identify community-relevant authoritative data sources for evaluation to DC CD&I. Maximize the use of authoritative data in M&S.

4. DC I

a. Assess and make necessary changes to the MCEN to enable the use of standards specified in the M&S TSP, as required.

b. Work with JIE proponents to levy Marine Corps M&S requirements as Service-level JIE requirements.

c. Assess the impacts of required M&S data and formats on command, control, communications, and computer, and intelligence programs, to include cyber security implications.

d. Provide intelligence mission data and other threat parametric data as required to support M&S capabilities.

5. CG, Marine Corps Warfighting Lab

a. Conduct Wargaming and experimentation to identify areas for standardization to enable or enhance M&S capabilities.

b. Identify and coordinate ROMO concept gaps with the S&T community for future solutions.

c. Maintain awareness of M&S interfaces and conduct wargaming evaluations and experiments to inform S&T requirements.

6. CG, TECOM

a. Analyze Marine Corps lessons learned and provide recommendations to DC CD&I for changes to or development of new M&S capabilities requirements.

b. Incorporate M&S capabilities at formal schools to maximize Service-wide familiarity. Evaluate formal schools for the inclusion of new M&S components.

c. Serve as the proponent for all matters pertaining to the oversight, coordination, and execution of all synthetic training conducted throughout the Marine Corps Training Environment.

7. Commander, MARCORSYSCOM and Supported PEOs.

a. Incorporate applicable standards into the design and development of M&S capabilities.

b. Leverage applicable architectures into the design and development of M&S to ensure JIE alignment and compliance. Coordinate with DC I to identify emerging MCEN capabilities that impact M&S.

c. Ensure all M&S software programs and system designs include well-documented and validated conceptual models.

d. Ensure continuous cost benefit analysis of M&S capabilities to align with budgeted Program Objective Memorandum (POM) resources.

e. Ensure systems can support shared situational awareness, have tailorable resolution, meet Marine Corps M&S user community needs, and can be applied across the full ROMO.

- f. Maximize the use of authoritative data in M&S system design and development.
- g. Ensure system design includes intuitive user interfaces.
- h. Ensure system design includes the capability to use operational data and provide unique M&S data and format requirements to DC I.
- i. Ensure continuous user involvement during the acquisition process to capture their perspectives.
- j. Manage and deliver on-demand network infrastructure required to deliver M&S capabilities to identified points of need.
- k. Ensure M&S components will operate on the MCEN, and are able to connect seamlessly to tactical networks.

8. Director, MCOTEA

- a. Coordinate with DC CD&I and Program Offices to develop VV&A plans for M&S events to support Operational Test and Evaluation (OT&E) requirements.
- b. For programs undergoing operational testing (OT), coordinate with DC CD&I and Program Offices to develop plans and participate in the V&V activities of program manager-developed conceptual models to help define requirements and criteria for M&S use in OT&E.
- c. Coordinate with DC I, Program Offices, and MCTSSA to ensure operational test events mirror the capabilities of the MCEN.
- d. Participate on Simulation Control Panels to help define criteria and assess results to accredit M&S for specific intended uses in OT&E.
- e. Incorporate means to assess open architecture compliance and JIE compliance as part of the operational testing of M&S components.
- f. Use and assess the program manager-delivered conceptual models; and development, test, and evaluation documentation as part of operational test events.
- g. Maximize use of authoritative data, user-interface testing, and the use of operational inputs during operational testing.

9. DC I&L

- a. Assess and make necessary changes to the local infrastructure to support M&S TSP.
- b. Manage and deliver on-demand M&S capabilities as related to the local infrastructure to identified points of need.

10. CG, Marine Corps Forces Cyberspace Command. Coordinate network penetration testing and scanning of M&S capabilities on the MCEN with MARCORSYSCOM.

11. CGs, Commanding Officers, and Officers in Charge of the FMF and Supporting Establishment

a. When requested, provide operating force assessment of M&S capabilities to MCOTEA, MARCORSYSCOM, and sponsoring M&S communities during development and prior to fielding.

b. Determine their commands' requirements for the phasing and fielding of M&S simulation capabilities. Provide these requirements to DC CD&I's M&S IPT.

c. Coordinate with DC I, MARCORSYSCOM, and MARCORSYSCOM-supported PEOs to determine local infrastructure requirements needed to use M&S capabilities.

d. Provide feedback on conceptual models used as M&S foundations in support of VV&A activities.

e. Provide feedback on those systems that are a burden to use and degraded system interface usability.

Chapter 3

Establish and Maintain an Enterprise Framework

1. Introduction. The "Establish and Maintain an Enterprise Framework" line of effort described below defines the actions needed to plan, build, and manage the enablers required for distributing the M&S capability across the Marine Corps.

2. DC CD&I

a. Assess current M&S IPT to ensure all M&S stakeholders are represented.

b. Via the M&S IPT, determine the path forward for the developing, resourcing, and fielding M&S capabilities, products, and services. Develop M&S business goals and objectives and the business capabilities and drivers to achieve those goals and objectives. Document and publish an Enterprise M&S Campaign Plan with the results and update the Campaign Plan every three years.

c. Work with the FMF and Supporting Establishment to best determine the phasing and fielding strategies of M&S capabilities. Based upon the needs of the fielding strategies, define operational use cases with testable metrics and include them in the appropriate requirements documents.

d. Identify foundational M&S architectures and define a LVC integrating architecture roadmap.

e. Develop requirements for the future architecture and frameworks needed to support LVC capabilities. Define and outline a LVC reference architecture that includes technical standards, cross-domain solutions for multi-security environments, component boundaries, and quality of service requirements.

3. Marine Corps M&S Community Leads

a. Identify foundational M&S architectures to DC CD&I. Coordinate with DC CD&I to define the LVC reference architecture. Support Marine Corps Enterprise Integration Plan activities in accordance with the LVC Integrating Architecture Roadmap from DC CD&I.

b. Coordinate with DC CD&I via the M&S IPT to develop M&S business goals and objectives.

c. Monitor M&S components in their respective communities to ensure compliance with established guidelines and specifications.

d. Inform their respective communities about M&S capabilities and

provide community feedback to DC CD&I. Determine the stakeholders within each community that may have unique M&S capabilities requirements.

4. DC I

a. Provide MCEN architecture support to DC CD&I for the development of foundational M&S architectures.

b. Adapt MCEN architecture efforts to incorporate LVC integrating architecture roadmap for M&S capabilities developed by DC CD&I.

c. Provide the Marine Corps' future M&S solution architectures to the JIE proponent.

d. Assess existing infrastructure's ability to meet LVC reference architecture requirements and align POM-related IT activities to enable the LVC integrating architecture roadmap.

e. Identify cross-domain solutions and/or multilevel security solutions that support cybersecurity capabilities and requirements for a multi-security environment with M&S capabilities.

5. Commander, MARCORSYSCOM and Supported PEOs

a. Identify to DC CD&I the current set of Marine Corps M&S architectures.

b. Design new transitional architectures based on the DC CD&I developed LVC Integrating Architecture Roadmap.

c. Comply with DC CD&I-approved LVC reference architectures.

d. Monitor M&S component development to ensure compliance with established guidelines and specifications.

e. Provide representation to the M&S IPT and define business capabilities and drivers.

6. DCs and Directorates

a. Determine necessary stakeholders with unique M&S capabilities requirements.

b. Provide representation to the M&S IPT, as required.

7. CGs of the FMF and Supporting Establishment. Determine necessary stakeholders with unique M&S capabilities requirements.

Chapter 4

Build and Expand the M&S Workforce

1. Introduction. The "Build and Expand the M&S Workforce" line of effort described below defines activities that will educate the current workforce and sets the universal standards for the Marine Corps M&S workforce of the future.

2. DC CD&I

a. Coordinate with M&S community leads, FMF, and the supporting establishment to determine M&S workforce requirements.

b. Identify government, academic, and industry partners with M&S related expertise.

c. Review Marine Corps active duty M&S workforce requirements for graduate-level, M&S-related skills and education requirements. Ensure master's curriculum related to M&S capabilities accommodate current Marine Corps requirements.

d. Define specialized knowledge, skills, and abilities and synchronize all educational requirements for efficiencies. Synchronize M&S-related active duty Table of Organization and Equipment Change Requests (TOECR) requirements for the enterprise. Develop a strategy to correct M&S-related active duty, government civilian, and contractor staffing gaps.

e. Develop and implement mitigation methods to overcome barriers to delivering or accessing M&S knowledge and subject matter expertise.

f. Leverage TECOM's instructional capabilities to create cross-community M&S educational content, to include web-enabled content.

3. Marine Corps M&S Community Leads

a. Identify, educate, and train M&S-related workforce. Identify to DC CD&I community-specific, M&S-related workforce billets and corresponding generalized knowledge, skills, and abilities. Establish billets requiring graduate education in accordance with reference (q) as required.

b. Identify those organizations without direct access to M&S expertise and the level of M&S expertise required by those organizations.

c. Identify barriers to providing M&S expertise to needing organizations.

d. Identify organizations and partners external to the Marine Corps who possess M&S expertise to support M&S capabilities.

e. Report remaining M&S expertise gaps to DC CD&I.

f. Monitor the broader DoD M&S community for current and emerging best practices with emphasis on VV&A; interoperability and reuse; contracting for M&S; and cyber security of M&S systems.

4. CG, TECOM

a. In conjunction with occupational field advocates, draft training and education requirements for each occupational field that leverages fielded and planned M&S capabilities.

b. Develop courses for both military and civilian personnel to fill training and education gaps needed to enable M&S capabilities across the Marine Corps.

5. Commander, MARCORSYSCOM and supported PEOs. Develop and implement best practices to help the M&S workforce conduct program fielding, operations, and maintenance, contracting and licensing, and the retirement of legacy systems for M&S.

6. DC for Manpower and Reserve Affairs

a. Review Military Occupational Specialty (MOS) 8825 staffing to ensure current billets meet M&S needs across the FMF and Supporting Establishment.

b. Staff units with active duty manpower that has M&S expertise to meet M&S capabilities requirements.

c. Assess M&S-related civilian job series and identify common M&S knowledge, skills, and abilities. Determine the need for an M&S community of interest and establish it if required.

d. Identify mitigation strategies to DC CD&I to correct personnel gaps.

7. DCs and Directorates

a. Identify organizations without access to M&S expertise and the level of M&S expertise required to DC CD&I. Ensure occupational field advocates review the duties and responsibilities for M&S educational requirements.

b. Identify barriers to delivering M&S expertise to needing organizations.

8. CGs Marine Forces and Marine Expeditionary Forces

a. Identify and coordinate with TECOM for the education of the M&S-related workforce.

b. Identify M&S-related workforce's generalized knowledge, skills, and abilities.

c. Implement best practices to conduct operations and maintenance, contracting, and licensing and retirement of legacy capabilities.

d. Augment and leverage TECOM's LVC Training Environment efforts to create FMF-specific M&S educational content as required.

9. CGs of the FMF and Supporting Establishment

a. Identify external contacts and partners with M&S expertise.

b. Identify barriers to delivering M&S expertise to needing units and organizations. Identify organizations without access to M&S expertise and the level of M&S expertise required. Assess community M&S workforce requirements and provide feedback to DC CD&I.

c. Use synchronized knowledge, skills, and abilities to revise M&S-related workforce position descriptions and seek to maximize filling these positions.

d. Identify M&S-related workforce staffing gaps to Manpower and Reserve Affairs and DC CD&I.

Chapter 5

Synchronize Science and Technology (S&T) Efforts

1. Introduction. The "Synchronize Science and Technology (S&T) Efforts" line of effort described below defines steps needed to reduce duplication of independent and often divergent research efforts across the Marine Corps that are related to M&S.

2. DC CD&I

a. Work with M&S community leads and other stakeholders to develop a M&S technology strategy to synchronize M&S research, development and implementation efforts.

b. Identify future M&S gaps that require S&T.

3. Marine Corps M&S Community Leads

a. Identify M&S-related science and technology objectives (STOs) for inclusion in the Marine Corps S&T Strategic Plan. Prioritize community S&T efforts and resources to maximize M&S-related research and development.

b. Identify and leverage S&T efforts external to the Marine Corps to advance community-specific M&S capabilities.

c. Coordinate with DC CD&I to identify its required community M&S capabilities to support the Marine Corps' mission and to identify any associated gaps.

d. Coordinate with DC CD&I to develop a M&S technology strategy to synchronize M&S-related technology research, development, and implementation.

4. CG, Marine Corps Warfighting Lab

a. Assess Marine Corps S&T Strategic Plan to identify Service-level M&S capabilities related STOs.

b. Prioritize Service-level S&T efforts and resources to maximize M&S related research and development.

c. Establish STOs for those capability gaps without a technologically feasible solution.

d. Identify and leverage S&T efforts external to the Marine Corps to advance Service-level M&S capabilities.

5. CGs Marine Forces and Marine Expeditionary Forces

a. Coordinate with DC CD&I to identify and define the M&S capabilities requirements needed to support the Marine Corps' mission.

b. Identify M&S needs or opportunities, from a fleet user perspective, to CD&I and community M&S leads to enhance fleet M&S utilization and its effectiveness.

c. Coordinate with DC CD&I to develop a M&S technology strategy to synchronize M&S related technology research, development, and implementation.

APPENDIX A

Glossary of Acronyms and Abbreviations

CG	Commanding General
DC, AVN	Deputy Commandant for Aviation
DC, CD&I	Deputy Commandant for Combat Development and Integration
DC, I	Deputy Commandant for Information
DC, I&L	Deputy Commandant for Installation and Logistics
DC, M&RA	Deputy Commandant for Manpower and Reserve Affairs
DC, PP&O	Deputy Commandant for Plans, Policy, and Operations
DC, P&R	Deputy Commandant for Programs and Resources
Dir	Director
DoD	Department of Defense
FMF	Fleet Marine Forces
IPT	Integrated Process Team
IT	Information Technology
JIE	Joint Information Environment
LVC	Live, Virtual and Constructive
MAGTF	Marine Air Ground Task Force
MARCORSYSCOM	Marine Corps Systems Command
MARFORCYBERCOM	Marine Corps Forces Cyberspace Command
MCEN	Marine Corps Enterprise Network
MCMSO	Marine Corps Modeling and Simulation Office
MCWL	Marine Corps Warfighting Lab
MOS	Military Occupational Specialty
M&S	Modeling and Simulation
OAD	Operations and Analysis Directorate
OIE	Operations in the Information Environment
OT	Operational Testing
OT&E	Operational Test and Evaluation
POM	Program Objectives Memorandum
R&D	Research and Development
ROMO	Range of Military Operations
S&T	Science and Technology
SDO	Standards Development Organizations
STO	Science and technology Objectives
TECOM	Training and Education Command
TOECR	Table of Organization and Equipment Change Request
TSP	Technical Standard Profile
VV&A	Verification, Validation and Accreditation

APPENDIX B

Glossary of Terms and Definitions

1. Accreditation. The official certification that a model or simulation and its associated data are acceptable to be used for a specific purpose.
2. Accreditation Authority. The organization or individual responsible to approve the use of models, simulations, and associated data for a particular application (note: specific intended use).
3. Architecture. The structure of components in a program or system, their interrelationships, and the principles and guidelines governing their design and evolution over time.
4. Conceptual Model. An abstraction of what is intended to be represented within a simulation environment, which serves as a frame of reference for communicating simulation-neutral views of important entities and their key actions and interactions. The conceptual model describes what the simulation environment will represent, the assumptions limiting those representations, and other capabilities needed to satisfy the user's requirements. Conceptual models are bridges between the real world, requirements, and design.
5. Constructive Simulation. Simulations involving simulated people operating simulated systems. Real people can be allowed to stimulate (make inputs) to such simulations.
6. Data. Representation of facts, concepts, or instructions in a formalized manner suitable for communication, interpretation, or processing by humans or by automatic means.
7. Enterprise. An arbitrarily defined functional and administrative entity that exists to perform a specific, integrated set of missions and achieve associated goals and objectives, encompassing all of the primary functions necessary to perform those missions.
8. Live Simulation. A simulation involving real people operating real systems.
9. LVC. A broadly used taxonomy describing a mixture of live simulation, virtual simulation, and constructive simulation.
10. Model. A physical, mathematical, or otherwise logical representation of a system, entity, phenomenon, or process.
11. Proprietary. A technological design or architecture that may not be duplicated without permission from the designer or architect.
12. Reuse. The practice of using again, in whole or part, existing M&S tools, data, or services.
13. Simulation. A method for implementing a model over time.
14. Validation. The process of determining the degree to which a model or simulation and its associated data are an accurate representation of the real world from the perspective of the intended uses of the model.

15. Verification. The process of determining a model, simulation, and associated data accurately represent the developer's conceptual description and specifications.

16. Virtual Simulation. A simulation involving real people operating simulated systems.