Doolittle Series 18

Multi-Domain Operations

Prepared By
Air Force Lessons Learned

Approved By
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Commander, LeMay Center for Doctrine Development and Education,
and Vice President of Air University

Brigadier General Bradley C. Saltzman
Director of Current Operations
Headquarters US Air Force

LeMay Papers

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LeMay Paper 3

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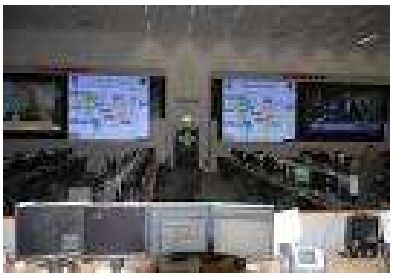
DOOLITTLE SERIES 18:
MULTI-DOMAIN OPERATIONS



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EXECUTIVE SUMMARY

The Doolittle Series (DS18) was chartered by the Chief of Staff of the United States Air Force to explore multi-domain warfighting concepts to improve command and control of air, space, and cyberspace forces in support of dynamic and operationally agile operations. The event held 6 - 8 November 2018 at the LeMay Center Wargaming Institute, Air University, was the first in this series.

Three teams were assembled with individuals having backgrounds in cyberspace, electromagnetic spectrum, space, air, ISR, nuclear operations, legal, and Air Force special operations. There were also participants from the Royal Air Force and the Royal Australian Air Force. Each team was presented with the same scene-setting scenario of fighting a peer competitor in the 2030 timeframe while having to constrain simultaneously another peer competitor.

Team #1 was to maintain the "Status Quo" of organization and policy, but was allowed to slightly modify the current C2 architecture. Team #2, "Status Quo Redesigned," was encouraged to modify "within the box" the current C2 architecture and use likely technology. Team #3, "Clean Sheet Unconstrained" was encouraged to look at technology within the realm of the possible and create an "outside the box" MDC2 architecture.

Several players and facilitators were interviewed and answered questions crafted to provide the player's rationale and insights gained from their decisions to achieve DS18's objectives. These interviews were non-attributional and provided each team's "why" and "what is needed" to modify the operational chain of command to achieve integrated multi-domain command and control (MDC2) at the operational level. The questions and answers are broken down by team and summarized in the body of this report.

Finally, the participants were given surveys to assess the game's design and look for ways to improve. Forty-five paper individual surveys were collected at the end of DS18. The results of these surveys and the comments from game participants are given at the end of this report. Five cross-cutting observations were gathered from the teams:

OBSERVATION 1: Invest in a shared data "cloud" backed by resilient/reliable/secure communication network.

OBSERVATION 2: There is a need for highly trained and operationally experienced personnel in Command and Control.

OBSERVATION 3: The capability to integrate Coalition partners needs to be built into new MDC2 hardware and software from the beginning.

OBSERVATION 4: Push capabilities and authorities to the lowest level possible.

OBSERVATION 5: Each team included a Multi-Domain Operations Center (MDOC).

DOOLITTLE SERIES 18 DESCRIPTION

The Chief of Staff of the Air Force chartered The Doolittle Series to explore multi-domain warfighting concepts to improve command and control of air, space, and cyberspace forces in support of dynamic and operationally agile operations. Doolittle Series 18 (DS18), the series inaugural event, was held on 6 - 8 November 2018 at the LeMay Center Wargaming Institute, Air University. For this initial event, participation was limited to USAF, Royal Air Force, and Royal Australian Air Force personnel.

Doolittle Series 18 Concepts and Objectives

DS18 specifically examined Multi-domain Command and Control (MDC2)[1] with the hypothesis that, "The USAF must modernize rules, responsibilities, relationships, and authorities and tactics, techniques, and procedures (TTP) to effectively command and control (C2) multi-domain operations to converge air, space, and cyber capabilities to meet the challenges of these contested domains." To test the hypothesis, the following objectives guided DS18's development and execution:

1. Examine the opportunities and limitations regarding commanders' authorities, command relationships, and their collective abilities to exercise command and control at the operational level.
2. Examine the C2 mechanisms and processes the respective commanders use to exercise authority and direction to facilitate integrated planning and synchronized execution of operations to achieve integrated effects across the Air, Space, and Cyber domains.
3. Examine Air, Space, and Cyber effect timelines and tasking order processes (to include classification restrictions) to achieve integrated effects across the Air, Space, and Cyber domains.

Doolittle Series 18 Design

To achieve these objectives, DS18 used a facilitated Table Top Exercise (TTX) format with three teams[2] of air, space, and cyber subject matter experts to examine/modify/create three MDC2 models. These teams represented the Joint Force Commander's planning staff.

- Team #1 was to maintain the "Status Quo," organization and policy, but was allowed to "tweak" the current C2 architecture. Its participants, Lieutenant Colonels and Colonels, had practical experience at the senior leader/command level.
- Team #2 was to be the "Status Quo Redesigned" team. It was encouraged to modify "within the box" the current C2 architecture and use likely technology. The team was comprised of Majors to Lieutenant Colonels with practical experience.
- Team #3 was "Clean Sheet Unconstrained" by present policy and encouraged to look at technology within the realm of the possible. The team had Captains to Majors with

[1] Defined as: "The coordinated execution of authority and direction to gain, fuse, and exploit information from any source to integrate planning and synchronize execution of multi-domain operations in time, space and purpose to meet the commander's objectives.

[2] A fourth group of ACSC Multi-Domain Operational Strategist (MDOS) Course participants performed a parallel, simultaneous event using a red vs. blue model to devise an operational concept. Group 4 members were the Air Command and Staff College Multi-Domain Operations Seminar.

practical experience who were given the freedom to create an "outside the box," but plausible MDC2 architecture.

Each team was presented with the same scene-setting scenario of fighting a peer competitor in the 2030 timeframe while having to constrain simultaneously another peer competitor. Specifically each team was to design a command and control structure to deter and/or to compel the adversary to return to a pre-conflict posture, be prepared to defeat the adversary, defend partner nations, protect critical infrastructure, and control escalation.

The Joint Force Commander, Gregory (Speedy) Martin, General, USAF, Ret'd charged the notional planning staffs to "organize our leadership and staff to achieve:

- Decision Superiority
- Full Spectrum Battlespace Knowledge
- The ability to act with the speed to present the enemy and its partners with more deceptive, disruptive and destructive dilemmas than they can overcome."

In addition, the Joint Force Commander identified the friendly force's center of gravity as: "Having the ability to ensure that our forces have an accurate and shared battlespace awareness. In order to assure our COG we must:

- Protect our intelligence gathering systems
- Maintain the security of our C2 networks and their ability to undergird our planning, directing, execution and battle management capabilities over our assigned and supporting forces
- Neutralize the enemy's ability to project power beyond their borders"

Therefore, each team's focus was designing a command and control architecture to employ the capabilities presented in the table below.

Key
Air Force – F
Army – A
Navy – N
Marines - M

Domain	Kinetic/Non-reversible		Non-Kinetic/Reversible		Enablers			
	Offensive	Defensive	Offensive	Defensive	Transp	Tankers	ISR	Other
Cyber	F, A, N, M	F, A, N, M	F, A, N, M	F, A, N, M	-	-	F, A, N, M	F, A, N, M
Space	F	F	F, A	F, A	F	-	F	F, A, N
Air	F, A, N, M	F, A, N, M	F, A, N	F, A, N	F, A	F, N, M	F, N	F, A, N, M
Land	A, M	A, M	F, A, M	F, A, M	A, M	-	F, A, N, M	F, A, N, M
Sea	N, M	N, M	N	N	N, M	-	F, N, M	N

The following are explanatory chart notes:

- The difference between offense and defense is based on the mission
- Cyber Non-reversible capabilities – use of "malware" for destructive effects on targets (overheats, catastrophic malfunction, etc.)
- Space Non-reversible capabilities - co-orbital ASATs, Directed Energy, "Rods from God" (RfG) with 8-20min execute to impact
- Air, Land & Sea non-reversible capabilities consistent with current capabilities but also Hypersonics, Directed Energy & ASAT

- Cyber reversible capabilities leverage "malware" for less than destructive/temporary effects (deny, disrupt, degrade, etc.)
- Space reversible capabilities include on-orbit EW and EW from space to ground
- Air, Land & Sea reversible capabilities similar to current capabilities with additional EW
- Transportation includes Space lift, rotary, sealift, airlift (strategic and theater)
- ISR enablers include current capabilities but vastly expanded RPA/UAV capabilities and sensors deployed into cyber terrain
- Other enablers include EW capabilities, PNT, Communications capabilities, C2 nodes

Doolittle Series 18 Execution

After presentation of the scenario and JFC guidance, each team then had two days to produce their deliverables. These deliverables consisted of an outbrief and other documents presented in Appendices A thru C.

Each team had 18 participants with subject matter experts from cyberspace, electromagnetic spectrum, space, air, ISR, nuclear operations, legal, and Air Force special operations. There was one participant from the Royal Air Force and the Royal Australian Air Force on each team. Finally, there was one Army officer participating on Team #1 team.

Each team had a facilitator and a retired senior officer role who filled the J5 role of providing insight to the planning team. See the table below.

Team	Facilitator	J5
Team #1 ("Kick-n-Mules")	Matthew Neuenswander, Col, USAF, Ret'd	Stanley T. Kresge, Lt Gen, USAF, Ret'd
Team #2 ("Thunderbirds")	James G. Sturgeon, Col, USAF	Norman R. Seip, Lt Gen, USAF, Ret'd
Team #3 ("Enders")	Jeffery S. Burdette, Col, USAF	Steven J. DePalmer, Brig Gen, USAF. Ret'd

Doolittle Series 18 Assessment and Data Collection

After-action analysis focused on informing proposed C2 improvements for multi-domain operations as well as identifying paths to follow-on efforts including subsequent iterations of the Doolittle Series.

LeMay Center Lessons Learned personnel interviewed the three teams, Royal Air Force and Royal Australian Air Force contingents, and Adjunct Senior Faculty. The interviewees answered questions crafted to provide the player's rationale and insights gained from their decisions to achieve DS18's objectives. The non-attribution interviews also provided each team's "why" and "what is needed" to modify the operational chain of command to achieve integrated MDO at the operational level. The questions and their link to the objectives follow.

- What was your logic/rationale for modifying the operational chain of command to achieve integrated MDO at the operational level? [Objective 2]

- What did you seek to achieve with authorities delegated to each node of the chains of command? (Seeks to know why OPCON/TACON/Support was delegated/retained/used/etc.) [Objective 1]
- How do you think your C2 structure meshes and speeds the air/space/cyber tasking process? [Objective 3]
- What were the key enablers to your new C2 structure? [Objectives 2 and 3]
- What resilience did you build into your C2 structure? [Objective 1]
- What did we not ask that you think we should know/consider/act on to achieve viable C2 of MDO? [Objective 1, 2, and 3]

In addition to the interview, the participants were asked to complete surveys to gauge DS18's conduct. However, the comment sections and inserted notes provide further information to shape the content to the next Doolittle event.

Cross-Cutting Observations

Analysis of the interviews conducted with game participants and comments made during the game and by senior facilitators found three cross-cutting observations.

OBSERVATION 1: Invest in a shared data "cloud" backed by resilient/reliable/secure communication network.

Discussion: The two teams with freedom to maneuver from the Status Quo both cited the need for a shared data network, even Team #1 team emphasized the need for reliable communication networks and nodes to secure and enhance current C2 operations. The backbone of any system discussed during this exercise was access to and manipulation of large amounts of information. Terms used to describe these data networks were "robust" and "self-healing", a network back by multiple nodes with multiple machine-to-machine access points. Team members stressed the need for "cloud" based data storage, machine learning, algorithmic targeting solutions effects pairing with tasks, an application-based interface, and a common data standard. The use of Artificial Intelligence (AI) was emphasized to automate many, if not most, AOC processes, and a robust global communication network would need to be in place for this to be possible.

OBSERVATION 2: There is a need for highly trained and operationally experienced personnel in Command and Control.

Discussion: It is important to understand current C2 structure in order to build future C2 structures, and a first and key enabler to exercise MDO is training. Observations across the teams during this exercise showed an apparent lack of knowledge of the overall C2 structure and, specifically, an overall lack of familiarity and experience with C2 processes in domains players are not familiar with. For example, a cyber-player did not understand Space C2. A senior leader commented that many players had a lack of understanding of the processes in an AOC and resulting products. Much of the discussions on the first day focused on gaining a shared understanding of the current C2 structure. As the exercise progressed, players consistently commented on the need for larger exercises to integrate multi-domain operations. The integration of multi-domain operators in large exercises should foster support for and training on MDO while providing participants needed experience. In addition to large exercises, a global communications system could provide training in a real-time environment. Teams suggested that training should consist of less white cards and more realism.

Observation 3: The capability to integrate Coalition partners needs to be built into new MDC2 hardware and software from the beginning.

Discussion: Coalition access to data and the network was identified as key. The teams thought that this would require addressing classification, access to the network and the "cloud" from coalition locations, and a mechanism to allow easy, yet selective, access to information of varying levels of classification. The teams thought that coalition capabilities/effects need to be "baked in" when planning operations rather than "tacked on." To accomplish this may require significant policy changes where a standing Alliance is formed rather than ad-hoc coalition to

deal with an unplanned crisis. However, there are things the US military can do to improve coalition integration into MDC2. For example, when Team #3 group proposed new command relationships, the terminology and definitions were modified to use terms and concepts understood by the RAF and the RAAF. In addition, the post-DS18 surveys pointed out that there may be a situation where the US is not the lead in an operation, and how the US would integrate its MDC2 into that coalition's command and control.

OBSERVATION 4: Push capabilities and authorities to the lowest level possible.

Discussion: All teams stressed the need for a fast and agile C2 structure to quickly respond and counter threats from a peer competitor. In order to increase the speed of their C2 structure, teams recommended pushing capabilities and authorities to the lowest level possible. Pushing authorities down to trained personnel who understand the employment risks allows those personnel to perform C2 faster. Currently there are a lot of unknown risks in the MDO environment and those risks need to be quantified, with the potential for holding some risks at a higher level. This could lead to a structure built on conditions-based authorities and allow quick reaction to known scenarios.

In order to push authorities to the lowest level capable of integrating MDO, those authorities and supported/supporting relationships need to be defined. All teams said that supported/supporting relationships are not well-understood. In a global fight, with multiple problems, the relationships between combatant and functional commanders is very important.

OBSERVATION 5: Each team included a Multi-Domain Operations Center (MDOC).

Discussion: Each team saw a need to incorporate various forms of a Multi-Domain Ops Center into their command structure. Team #1 placed an MDOC directly under the Joint Forces Air Component Commander. The MDOC would operate as a planning cell in direct support of the JFACC to integrate effects. This MDOC would include liaison officers from the functional combatant commands. Team #2 designed a virtual MDOC using cloud-based technology and limited use of Artificial Intelligence. This virtual MDOC would combine inputs from all planning levels to build an integrated battle plan. Users could make inputs and adjustments regardless of location as well as have a common picture of the battlespace. Team #2's focus was on unity of effort rather than unity of command. Team #3 incorporated an MDOC at the Global Command level with MDOC functions replicated at lower echelons. Various functions of this future MDOC would be fully automated and led by advanced Artificial Intelligence, with a human in control of critical decisions. This AI-led MDOC would continuously calculate COAs based on current conditions and support various Mission Task Groups.

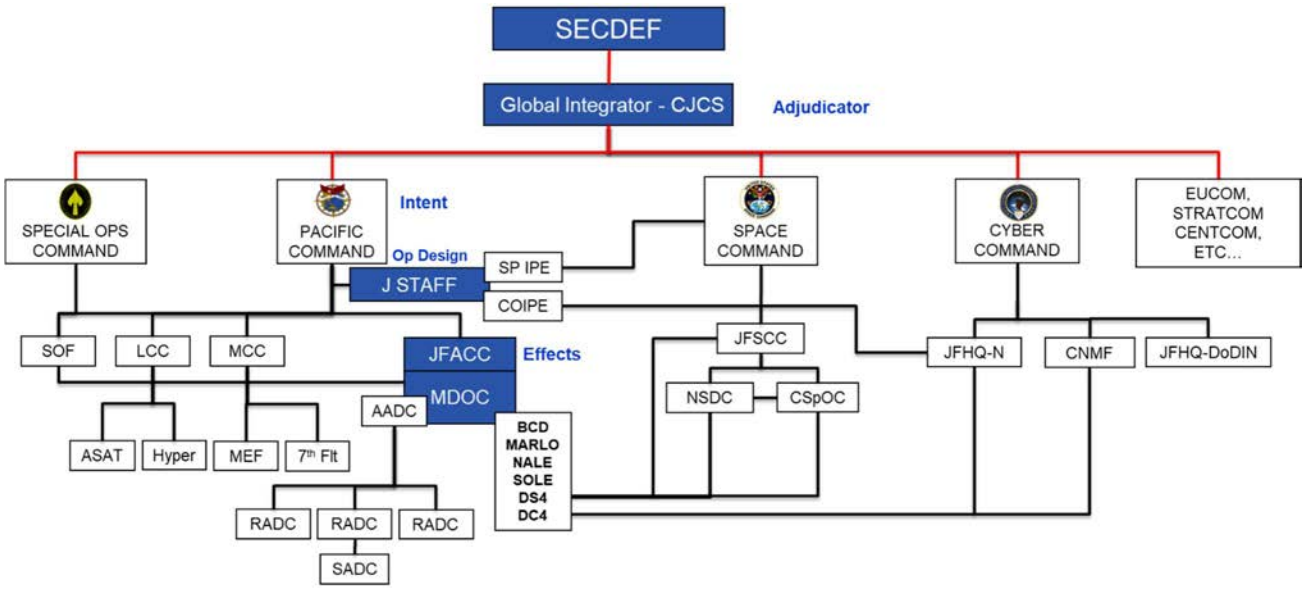
TEAM #1 RESULTS

Question 1: What was your logic/rationale for modifying the <u>operational</u> chain of command to achieve integrated MDO at the operational level? [Objective 2]

Discussion: Team #1, referred to as the "Kick-n-Mules", was tasked with evaluating the strengths and weaknesses of the current C2 construct and making recommendations to enhance this model. They found that a logical functioning process is in place in Joint Doctrine and executed by Geographic Combatant Commands where the AF Component Commander serves as the theater JFACC, Area Air Defense Commander, Air Coordination Authority (ACA), and Space Coordination Authority (SCA). While the current process is doctrinally sound, inclusion of a functional command's capabilities makes Geographic control difficult. There is a need to better incorporate the functional Commands into the planning process.

Question 2: What did you seek to achieve with authorities delegated to each node of the chains of command? (Seeks to know why OPCON/TACON/Support was delegated/retained/used/etc.) [Objective 1]

Discussion: The assumption was made that there is a requirement for a Global Integrator with authority to direct capabilities amongst the combatant commands. The current model is theater centric which creates global seams and friction. The Geographic commander will fight in their AOR, and if they do not have Operational Control then there needs to be explicit "Supported" and "Supporting" relationships established and requisite control authorities delegated to the lowest level inside that command. The group discussed how this would work with the current construct. Geographic Combatant Commanders are Joint Force Combatant Commanders that the Force has matured through practicing joint warfighting, whereas Global Combatant Commanders (i.e. Space and Cyber) have not been through this maturing process.



Status Quo Organization Chart

The team asked who is the global "adjudicator" when addressing a theater problem that produces global effects. Communication problems between Combatant Commands can be seen from a recent Lessons Learned report, *Senior Leaders' Lessons from USAF Response to 2017 Hurricane Season*. One observation from this report noted that as Hurricane Irma crossed USSOUTHCOM and USNORTHCOM borders several times, "the limited Cross-GCC coordination led to confusion regarding response efforts of tasked assets, and resulted in inadequate, unsynchronized or duplicated efforts between different military, Department of State and non-governmental organizations."

Question 3: How do you think your C2 structure meshes and speeds the air/space/cyber tasking process? [Objective 3]

Discussion: There needs to be established processes and organizations that mimic the BCD (Battlefield Coordination Detachment) and AAMDC (Army Air & Missile Defense Command). Create these organizations for Cyber and Space and a process to integrate them into planning and execution. Somewhere within the Combatant Command must reside a cyber-coordination authority (CCA) and Space Coordination Authority (SCA). CCA/SCA could work best in the AOC similar to the Airspace Control Authority (ACA) to normalize cyber and space into the planning process. They will be part of the normal day-to-day processes in support of the Combatant Commander.

Question 4: What were the key enablers to your new C2 structure? [Objectives 2 and 3]

Discussion: The key enablers to the current C2 structure are people and systems. However, it was discussed that these are potential weaknesses of the current system. There is currently a high manpower bill with a reliance on background experience and Liaison Officers (LNOs) rather than specific processes. The group shared the feeling that present day LNO requirements have gotten out of hand and the LNOs are sometimes used solely to fill IT, equipment, and protocol duties.

The current system also has a high comm/IT bill to maintain current IT systems to support and automate processes. While these systems work great once they are up and running, there is a training cost to familiarize new personnel with the system's processes. This can be costly with a high turnover rate.

Question 5: What resilience did you build into your C2 structure? [Objective 1]

Discussion: The current model exists and does not require extensive research or expense to put in place. It is positioned for steady-state, day-to-day operations. It has a flexible foundation that will allow it to grow and it currently encompasses Coalition partners, Interagency, and Service components. JFACCs currently have a JOA wide perspective to support this model. However, there is currently little resilience to protect communications systems, servers, and nodes from attack or even natural disasters. There was also some discussion and concern as to whether AF Component Commanders currently even have the equipment necessary to perform C2 duties as Area Defense Commander, Airspace Control Authority, and Space Control Authority. Building resiliency into the current system would require that commanders have the proper tools.

Question 6: What did we not ask that you think we should know/consider/act on to achieve viable C2 of MDO? [Objective 1, 2, and 3]

Discussion: The team noted that the current C2 system and ATO cycle is slow-moving and unable to execute a high-velocity, operationally agile fight. Decisions, actions, and operations are not executed rapidly. There needs to be a discussion of how fast is fast enough to win. Finally the current C2 structure is theater centric. Someone in the group said, "A fight anywhere is a fight everywhere" to describe how future fights will be global. This highlights the need for global control of assets and effects. The current system creates friction with space and cyber assets because they can have global effects and are not necessarily theater specific.

The team noted several DOTMLPF considerations (See chart below). Doctrine should establish an MDOC under the JFACC and coordinate with LNOs from each domain including space and cyber. Training should be integrated into COCOM exercises that use actual systems and processes in a contested environment with a "red team." Exercises should strive to include multi-domain realism and less "fairy dust".

DOTMLPF	*Space Coordinating Authority*	*Cyber Coordinating Authority*	*OPS Integrator "MDOC"*
Doctrine	SCA authority remains with JFACC for theater specific Space effects. Push execution authority to lowest level. Pre-prioritized conditions based authorities.	BPT establish CCA authority within COCOM for theater specific Cyber effects. Push execution authority to lowest level. Pre-prioritized conditions based authorities. (JFACC?)	Activities coordinated though an ITO, with support to/from external Functional Space/Cyber OCs
Organization	Joint focused and manned DS4 staff	Joint focused and manned cyber coordinating element (DC4?)	Establish MDO coordination within liaison teams (e.g. SOLE, NALE, BCD)
Training	Live/Virtual/Constructive integration with COCOM exercises that use actual systems and processes within contested environment. (Space)	Live/Virtual/Constructive integration with COCOM exercises that use actual systems and processes within contested environment. (Cyber)	Realistic MDO exercises that use actual people/systems/processes at all Ops Centers
Materiel Solutions (Information Priority)	Assured information (access and communication) with reach back to CONUS space functions (Ex: NSDC, CSpOC)	Assured information (access and communication) with reach back to CYBERCOM	Assured worldwide data and application platform to enable accurate and reliable shared situational awareness Logistics - Increased velocity and security is needed
Leadership/Education	Add Multi-Domain realism to Exercises, Training, Education	Add Multi-Domain realism to Exercises, Training, Education	Add Multi-Domain realism to Exercises, Training, Education. Grow MDO leaders.
Personnel	DS4 staff support to SCA needs to be organically more robust	More robust cyber coordinating element at AOC and COCOM	Increased cyber defense forces Increased LNO footprint
Facilities	Existing facilities	Existing facilities	TBD

In addition, an observer proposed research into the feasibility of an initial and incremental step to improve MDC2 by placing Air Force and Army space and cyber personnel together in a Joint Air Ground Integration Center (JAGIC) at the Divisional level. To implement this would require an Army determination as to whether the Corps is a tactical echelon and subsequent Air Force actions on how best to effect air-ground integration. A draft JAGIC TTP is due to be published and mentions the potential, if required for specific missions, for space and cyber component liaisons in the Air Support Operations Center, but does not mention Army space and cyber positions.

TEAM #2 RESULTS

Question 1: What was your logic/rationale for modifying the operational chain of command to achieve integrated MDO at the operational level? [Objective 2]

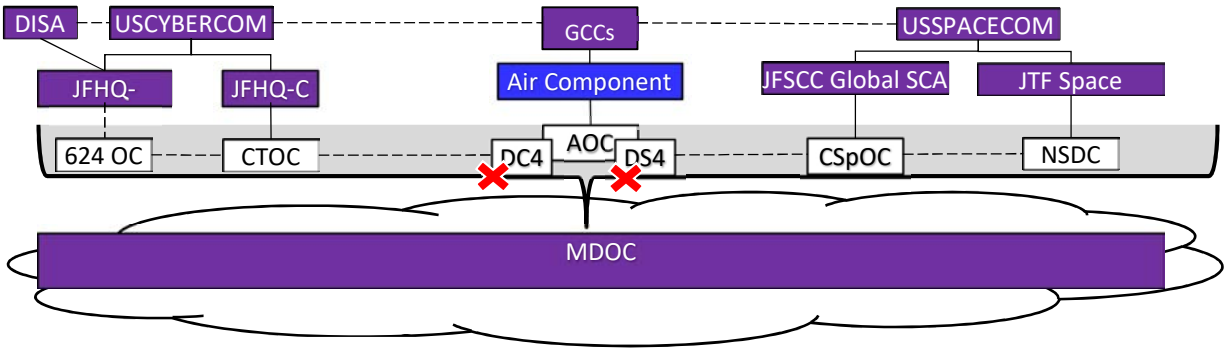
Discussion: The current operational chain of command was retained with the team maintaining the Unified Command Plan and the definitions of Combatant Command, Operational Control, and Tactical Control. That said, the interviews revealed that some participants thought the current command and control construct was too vulnerable and the processes are too slow to enable high velocity MDO operations.

However, there were discussions as to whether another echelon below the JFACC was needed for the scenario presented. If a JFACC was supporting two separate JTFs, then create subordinate AETFs aligned with the JTFs to perform the C2 function of controlling operations with the COMAFFOR/JFACC retaining OPCON of USAF forces and retaining theater strategy/planning for the air forces. In this scenario, MAAP or multi-component attack planning could be done at the JTF. Maybe the JOC is the appropriate level for MDO planning vs the JFACC's AOC. Participants noted the need to further define who has MDC2 responsibilities for various [types of] operations within the AOR. Also, they thought there should be a look at moving ops C2 to a subordinate AETF, if JFACC has to support multiple tasks; otherwise keep it at the JFACC level.

Team #2's focus was on achieving unity of effort vice achieving unity of command and chose to rely on existing supporting/supported relationships. The Support command relationship doctrine was deemed adequate and flexible enough to warrant keeping the existing chain of command. In a global fight with multiple engagements, the relationships between geographic and functional combatant commanders was deemed crucial. There was a consensus on the importance of the support relationship and how it gives flexibility to joint force component commanders to include the changing from supported to supporting during combat.

There were additions to the chain of command. First was the virtual Multi-Domain Operations Center (MDOC). (See the C2 construct diagram below) An MDOC would be cloud-based and using a new Virtual Multi-Domain Operations Environment (VMOE) with software and hardware to generate plans. (See the VMOE diagram below) The VMOE would increase planning speeds by use of artificial intelligence that would place "the man on the loop" to provide/assess output and input vice "the man in the loop" laboriously producing the plan. It was thought the VMOE would eliminate the need for a DS4 and DC4 as information provided by those individuals would be embedded in the planning process.

The second addition or class of additions was alternate air operations centers to create a network of C2 nodes to continue operations in anticipation of an adversary attacking current AOCs. In addition, out of the joint operations area AOCs would be structured to provide backup as required.

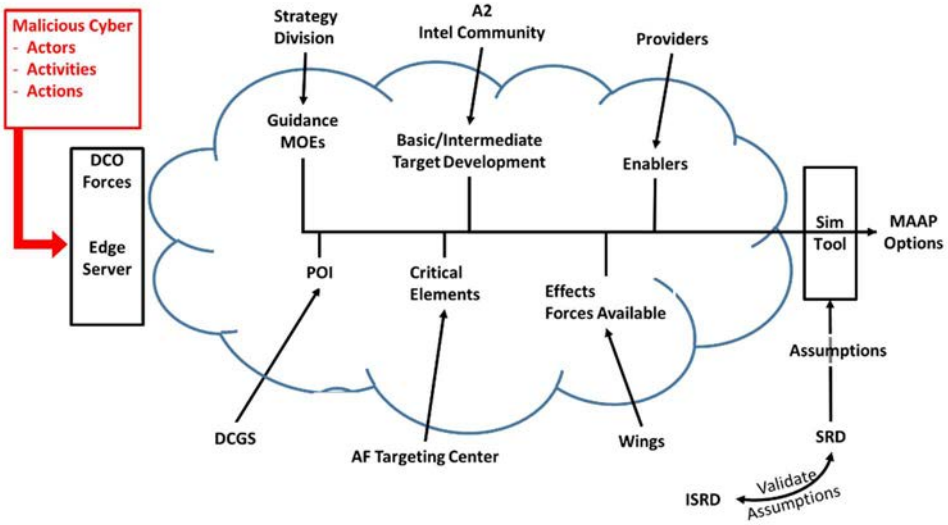


Coord / Support Operational

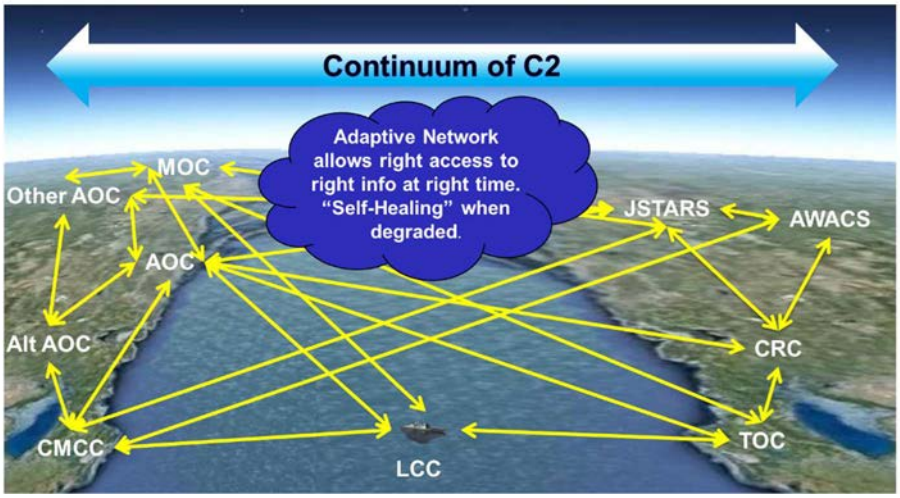
Key Assumption: Joint Force can conduct high velocity MDC2 through Unity of Effort
Key Enablers: People, Processes, Resources

NEW
- Global virtual planning
- Authorities
- AOC links/tech
- 13O
- Alt "OCs" (multiple)

Status Quo Enhanced C2 Construct



Virtual Multi-Domain Operations Environment



Distributed Command and Control Network

Question 2: What did you seek to achieve with authorities delegated to each node of the chains of command? (Seeks to know why OPCON/TACON/Support was delegated/retained/used/etc.) [Objective 1]

Discussion: Authorities now retained at high levels are not sufficient to support MDO. Participants thought cyber and space authorities now held at higher levels should be delegated down to JTF level. In addition to the delegation of certain Cyber Defensive Operations forces, there was agreement that JTFs or subordinate organizations should have conditional authorities to execute Cyber Offensive Operations. There was the same desire for conditional delegation of authorities for certain space-based systems and desired effects.

Overall, the team wanted trained personnel who have an understanding of the risks associated with space and cyber effects knowing that this knowledge would enable authorities to be pushed down to allow faster execution. This empowerment of subordinates requires trust in those lower echelons that would come from training and exercises. However, the delegation of authority and accompanying risk need to be quantified with some analysis to determine which decisions to hold at a higher level. There needs to be an understanding that there is no guarantee that we will get this right as MDO is a new area and the risks are not now known. Participants noted that space and cyber leadership would not push some authorities down. However, authorities must be pushed down to speed up the cycle.

There is a need for a conditions-based degradation plan for authorities retained at higher levels. This needs to be a dynamic and graceful degradation. The discussion on degradation raised questions. If there are three commanders in the chain of command and one loses the node connectivity, should the next commander (at a wing) assume command? Where would this be documented, and if the supporting communications network is instantaneous and self-healing, the organization assuming command would be hard to identify.

Participants thought resolving the tension between vertical and horizontal elements of the chain of command was needed to ensure success in a degradation scenario. The idea was whoever has the best situational awareness should be the organization to assume command and it would make sense to transition some vertical authority with to horizontal echelons. The goal in this case would be on achieving coordinated effects with authorities at the appropriate level to do so.

Question 3: How do you think your C2 structure meshes and speeds the air/space/cyber tasking process? [Objective 3]

Discussion: The current AOC structure does not support the desired MD ops end state. VMOE will help to integrate weapons and planning considerations. The VMOE could accelerate the ATO process- maybe six hours, or during a pause in execution to reevaluate and then re-execute. Dynamic targeting could be accelerated.

The VMOE will speed and improve deliberate planning and execution with lots of machine to machine interfaces, “human on the loop” and strategically placed “human in the loop,” "if, then" algorithms, big data etc. Artificial Intelligence machines with oversight will not only produce

guidance in AOD but also mission orders. For example, the new software would develop a JIPTL based on inputs, then develop a MAAP, run it through a model [similar to the intent for the ambitious, but failed 1990s JWARS model] to determine possible outcomes, tweak the MAAP, and come up with COAs and then present to the JFACC for decision. VMOE also looks at what is being executed currently and would feed assessment back into the planning processes. This would require the identification of MOP/MOE when actions are proposed. This is a situation that may call for "human in the loop." The machine to machine should help with the difficult assessment of effects. Alternatively, software could be written to determine if MOE/MOP were met.

Question 4: What were the key enablers to your new C2 structure? [Objectives 2 and 3]

Discussion: A resilient, adaptable communications network that ensures access to data is key to achieving MDO. A key enabler is a robust network that is self-healing or with redundant pathways, and data in multiple locations to compensate if links and nodes are cut. Coalition access to data and the network is key for effective operations. If there is a capability for security/event tags to allow access based on a particular operation, then coalition partners can better participate in MDO.

Create a development environment. Needed is a full and ongoing analysis of the command and control system's information layer with experiments and exercises to develop and analyze the data flow/information process. The goal would be to see how the system integrates multi-domain effects at the component, joint force (geographic), and global levels. This ongoing analysis would likely drive modification to the command and control structure to achieve the needed levels of coordination.

MDO would rely on the use of conditional delegation of authorities. To plan and practice this would be a lot of the work, but in-place and practiced guidance would lead to quick [timely] decisions should the network degrade or fail.

Finally [and probably most important], trained and in-place Airmen who can execute MDO.

Question 5: What resilience did you build into your C2 structure? [Objective 1]

Discussion: In addition to a foundation of defensive cyber operations, the team sought to make C2 more resilient by having redundant communications paths for data over a distributed network. In other words, MDO relies on assured communications and would also need to use multiple locations such as alternate AOCs, machine to machine, and multiple access points to the network. In addition, the group thought C2 aspects of the PACAF Agile Combat Employment concept could improve resiliency.

Question 6: What did we not ask that you think we should know/consider/act on to achieve viable C2 of MDO? [Objective 1, 2, and 3]

Discussion: There is a need to go horizontal with our data, absorb the cost, and follow the Google/Amazon model. Need to have these enablers, and need to treat it as a core function of the Air Force.

The first MDO systems developed must be capable of using the fifth generation fighter capabilities. Also its development needs to be focused on being effective against a peer competitor vice being efficient, i.e. low cost.

Interviewees stated there was a need for a "cultural shift" to achieve MDO. There was a perceived need for a paradigm change in thinking about the integration of the non-kinetic scheme of maneuver in operations and the decisions to favor kinetic over non-kinetic actions. This would change training as well as require revised Joint Operations Planning that facilitates MDO. Furthermore, interviewees stated the AF needs to start today preparing the future generation of leaders to conduct MDO.

Part of the "cultural shift" is accepting the premise that trust doesn't require physical presence. While Airmen generally are more comfortable in a virtual environment, all-domain operations requires work with joint partners. Some joint partners and older Airmen are not comfortable trusting someone they have never met physically. Younger generations today are much more trusting in virtual relationships and VMOE success relies on "virtual trust building". Therefore, this "cultural shift" is essential to good planning for all-domain operations.

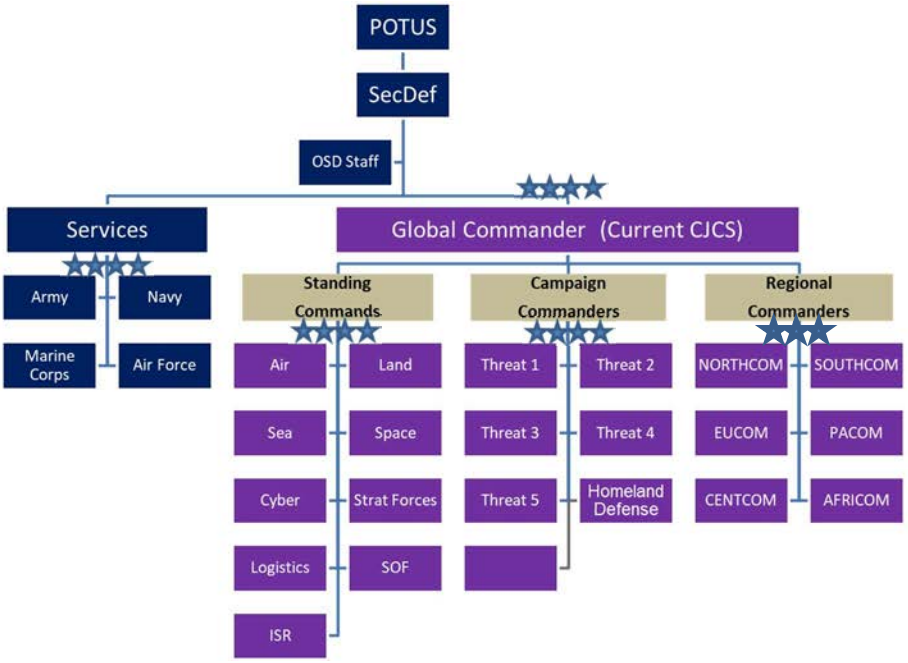
Several cautions were expressed. Participants noted that multi-domain operations need to include SOF, land, maritime, commercial/other government agencies, and coalition capabilities in addition to the integration of air, space, and cyber capabilities at the Air Component. Participants wanted to know where the operational artist sat in this construct. There would be a need to assess the impact on achieving MDO if space and cyber become their own services.

TEAM #3 RESULTS

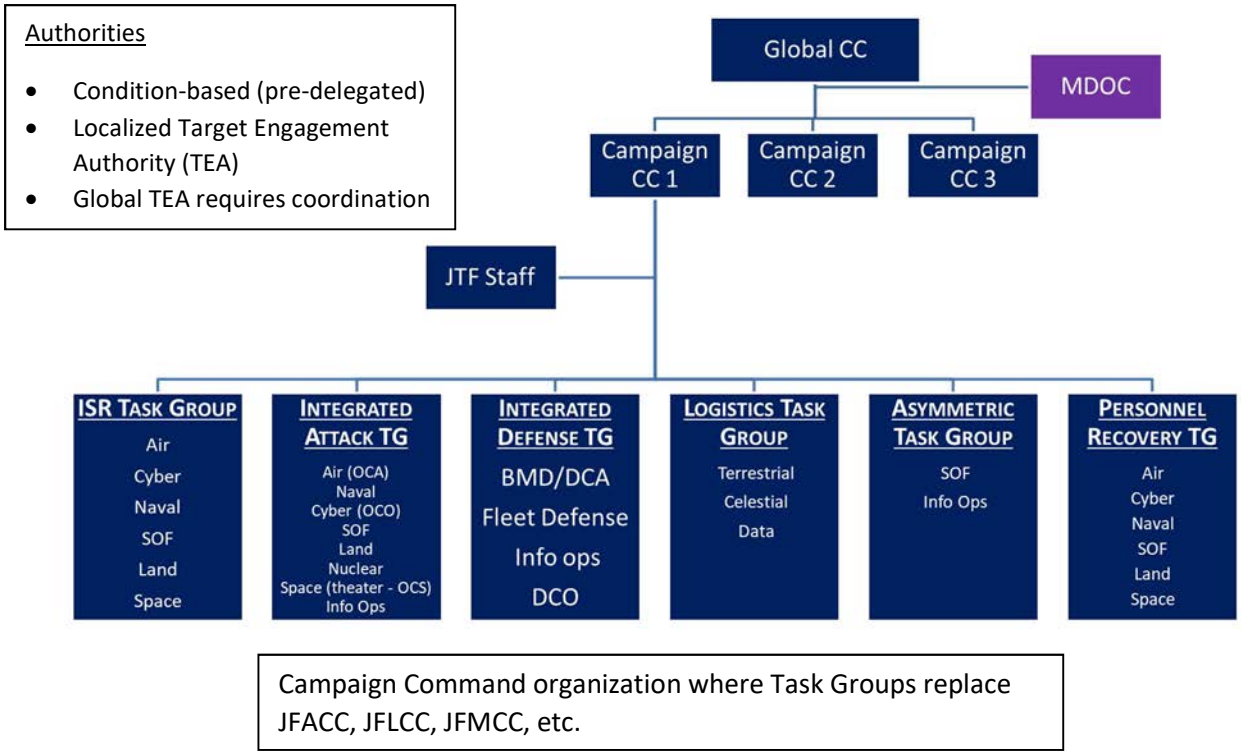
Question 1: What was your logic/rationale for modifying the operational chain of command to achieve integrated MDO at the operational level? [Objective 2]

Discussion: The current structure of our operational chain of command fails to account for all the domains. Geographic commands are focused on their AORs and do not address the global concerns of cyber and space. They are not set up to effectively produce MDO. Team #3 felt this needed to be addressed by examining how the US prepares and presents forces to unified commanders by approaching the problem from the top down instead of the bottom up.

The team changed the current UCP functions below the SecDef to support integration. The proposed organization was designed to build forces that can work in parallel with each other Services will raise, organize, train equip, and sustain forces and present them to a rebranded Global Commander who has military command authority over new Standing, Regional, and Campaign commanders. These Standing Commanders have broad, enduring, global, and functional responsibilities and receive joint forces assigned from the Global Commander. Additionally, they organize joint forces in their respective domain to present forces to the Campaign Commanders during threat based planning and operations, establishing a more fluid campaign and not being constrained by geographic boundaries. Team #3 believed this could help to foster the change in service culture needed to support MDO. Services would be working in parallel in their domains to support force packaging of effects-based operations for the joint Campaign Commanders.



Team #3 C2 Structure (Revised UCP Perspective)



Question 2: What did you seek to achieve with authorities delegated to each node of the chains of command? (Seeks to know why OPCON/TACON/Support was delegated/retained/used/etc.) [Objective 1]

Discussion: There is a need for more independence within authorities. Decision making needs to be delegated to the lowest level to support the mission. The focus should be on the effect and allowing planners to choose capabilities. To establish this, new terms were created to enhance authorities. Current terms such as Operational Control (OPCON), Tactical Control (TACON), and support are not sufficient terms for tomorrow's fight and need to be reexamined. These new terms are Operational Command (OPCOM), Battle Control (BATCON), and Regional Command (RCOM). OPCOM authorizes the Global Commander to prioritize and allocate forces and capabilities to fight within a campaign. BATCON authorizes the Campaign Commander to draw presented forces and capabilities to execute a campaign. RCOM authorizes the Regional Commanders to lay the ground work in the AOR. They build access and support from regional allies along with force protection and RSOI for staged service members. They maintain the readiness of the regional force. Team #3 also believed this could be an easy connect for our coalitions since they also understand these terms and would need to be integrated into the fight.

Question 3: How to you think your C2 structure meshes and speeds the air/space/cyber tasking process? [Objective 3]

Discussion: Parallel processes help generate global effects. With support from Artificial Intelligence (AI), automation can be synchronized to help communication and integration. This is the backbone for the Multi Domain Operation Center (MDOC). AI would inform the C2

structure and provide continuous updates to three main areas in the MDOC: determination and communication of intent, information management, and effects to support the Mission Task Groups. Determination and communication of intent would help determine the intent and risk appetite with AI continuously calculating and assessing possible COAs based on current situations. Information management would be mostly automated with dynamic collection plan and tasking, providing mission data to subordinate elements, real time generation & monitoring of CCIRs/PIRs, and battlespace management. Effects would be AI led with real time ATO/ MAAP/ GAT planning, operational assessment, analysis of authorities, synchronization of activities, and coordination with other MDOCs. These AI maintained combat plans and orders enable reduced planning cycles, flexible targeting, and faster data to decision making. This will help to break down barriers to focus on domain integration and support faster tasking processes.

Question 4: What were the key enablers to your new C2 structure? [Objectives 2 and 3]

Discussion: To support these future requirements, Team #3 relied heavily on the assumption of an AI system in place by 2030 that could automate much of the processes built by humans today. There would also be the need for a robust and redundant global communication system which would allow AI and the C2 to be more fluid. This would also go hand and hand with investment in the Global Data Cloud. Building on this structure would allow for continuous operations because nodes would be globally connected, and if one node is destroyed its function could be moved to a second.

Team #3 also believed their structure was an enabler in itself. The new structure would allow Campaign Commanders to have options for execution based on desired effects. MDO would be at the lowest level. This would allow for updated planning and increased tempo. This structure also would champion joint integration and the integration of coalition forces. The flexibility of responses was also an enabler.

Question 5: What resilience did you build into your C2 structure? [Objective 1]

Discussion: This structure calls for robust communications, a neural net, and a cloud. With systems standardized and common data platforms, there is now an interoperability of information. This advances systems from a single point of failure and connects operations centers globally.

Team #3 also built resiliency into their organizational chart. The creation of Mission Task Groups would allow domain experts to integrate effects around mission types, such as the ISR Task Group or Integrated Attack Task Group. The Task Group Commanders would hold the authority to coordinate, integrate, and synchronize effects in support of the Campaign Commander's intent without owning assets. The Campaign Commanders can delegate battle coordinating authorities to Task Group Commanders based on pre-designated conditions. Additionally, the Task Group Commanders will provide mission area experts to the MDOC to ensure continuity of planned effects through execution and assessment. This construct allows integration of multi-domain effect options to the Campaign Commander unavailable through today's Component Commander construct and provides a resilient capability in the event of degraded operations.

Question 6: What did we not ask that you think we should know/consider/act on to achieve viable C2 of MDO? [Objective 1, 2, and 3]

Discussion: There needs to be a massive culture shift. It is necessary to break down the barriers and stovepipes that have been built in each discipline. The key to this is to actually exercise MDO. This begins with training and the integration of people who will support and foster MDO. This is a joint problem, not just a single service's. This also needs to be addressed with our coalition partners and we need to find ways to allow ourselves to be more trusting. MDO calls for global data integration, understanding the proper security protocols, and getting away from programmatic channels.

This exercise showed the importance of building high fidelity models and sims for synthetic exercise. There is a need to exercise all levels of command. We can put together virtual Red Flags to exercise what these rapid packages would look like. However, this requires us to shift away from individual services and understand that this has a joint answer. The CSAF could use this opportunity to inform policy and champion these MDO exercises. These changes may take congressional approvals but are a must to truly become multi domain.

There is also the need to define what AI means to MDO. What are the tasks we want it to do? There has to be an analysis of the dangers of forfeiting decision making to a machine based on the need for the sake of speed alone when not needed. AI can evolve the process, however, AI is still a huge leap of faith. There is a need to recognize the requirement for a human in the loop and place it in the proper caveats. We need the capabilities to speed up decision making, but we need well thought out decisions.

GAME CONDUCT SURVEY RESULTS

This section summarizes the survey data given to participants to evaluate game conduct. 45 out of 60 paper individual surveys were collected at the end of DS18. Most responses required the person to circle a 5-scale Likert rating (Strongly Agree, Agree, Neither, Disagree, or Strongly Disagree). Some questions had sub-questions with space for comments. The written responses were broadly reviewed for overarching themes that are presented below.

Question 1: The objective was well defined and centered on the Air Force's MDC2 needs for a conflict in 2030.

Overall 84% (37 people) agreed or strongly agreed that the objective was well-defined and centered on the AF's MDC2 needs. There were zero disagrees or strongly disagrees.

Sub-question: "What other objectives should be explored in future Doolittle Spirals?"
Approximately 53 suggestions were offered (some respondents made more than one suggestion). Those suggestions broke down into the following broad themes:

1) "Broader Scope" objectives to include more collaboration with joint/coalition/interagency/industry partners to further explore MDO with other said partners:
    a. Further exploration of coalition delivery of effects within MDO.
    b. How to integrate with joint partners and coalition where we've not been leading.
    c. Dealing with the same adversary situation in 2022, (and 2026 and 2030 for other groups). Can coalition MD effects be "baked in" rather than "tacked on"?
    d. The access/ability to utilize MDC2 assets across services and industry partners, etc. (NASA, NRO, CIA ...)
    e. "We were constrained to assume the AF should be the MDO[?] C2 authority which affected our flexibility to enhance."

2) "New Direction" to include an assortment of ideas related to the MDC2 effort. This may be drastically different than the one just accomplished, and require a different direction than continuing forward with C2 structures:
    a. Development of the 13O Professionals
    b. TFI Strategy for enablement of MDC2
    c. Dir of Nat'l Strategy or A2/6 Strategy to enable the 'GONC' Virtual Multi-domain Ops/Plan Environment
    d. Human Machine Teaming to improve operational art
    e. DOD logistic support and integration.
    f. How to manage the information layer of a multi-domain force
    g. IADS take down through kinetic and non-kinetic means.
    h. What is the AF's theory of victory for conflict in 2030?"

3) "Dive Deeper" objectives that are similar to the ones the Doolittle Series originally set out to research, but with an "add-on" to either further stress the C2 structures developed or objectives that seek to run things to the tactical level. Each one is listed out, verbatim when possible, and is further grouped.
    a. MDC2 processes and execution TTPs
    b. The details of C2 at the operational level and below, especially during contested and degraded ops. What is required and how do we do distributed control.
    c. Tactical Execution (i.e. after orders received)
    d. I recommend developing the deep dive C2 to coord synchronized effects, and develop target vignettes to walk thru the process of bringing all domains into the planning, JTLB, JIPTL and execution processes.
    e. C2 is a continuum. Might need to explore tactical/strategic C2 and enabling tech.
    f. Blue Team/Red Team (War-game) of the three concepts just produced / "test" the defined roles, authorities, command relationships, and responsibilities with players from combatant commands/other services.
    g. MDC2 in a highly degraded great power conflict in which command relationships as well as command and control of conventional and nuclear operations are explored
    h. ISR to enable MDC2. HAF/A2 is working a new concept to "replace" PED called SIAS (Sense Integrate Analyze Share) that needs to be integrated with MDC2.
    i. I think the scenario allowed for a longer planning process to incorporate MDC2 and the geographic location may have handcuffed ideas. I think just providing/asking for a C2 design to handle Day 4 of an MCO[?] to exercise MDC2 in a rapidly changing threat environment.
    j. Leadership plan campaign events to achieve national objectives using MDO (synchronized and integrated) events.

Question 2: "The C2 academics were useful for the purpose of this event."

Overall 70% of Surveyed Participants agreed (23 people) or strongly agreed (8 people) that the C2 academics were useful for the purpose of the event, however <u>only 50% of Team #1 team agreed.</u>

1) Although no space was offered, 11 respondents felt inclined to provide comments:
    a. C2 Academics should have been provided as a <u>Read-Ahead before Day 1</u>. (5 respondents) as well as…
        i. Should have focused more on the current C2 Structure (2 respondents)
        ii. Doctrine was repetitive of PME and constrained thinking (1 respondent)
        iii. OPS Scenario was irrelevant (1 respondent)
        iv. C2 academics was not extensively used (multiple respondents)

    b. Additional Information/Briefing was needed on …
        i. SCA and Cyber Authorities (1 respondent) and

ii. Global Integration from CJCS's viewpoint (1 respondent) and,
iii. Real Intel Briefings needed from each domain (same respondent as above)

Team #1, who supposedly were the "old hats" and presumed to know C2 lexicon and current C2 "as is" (since they were the group "put in the box"), were the most responsive on this question. This Likert-scale rating question did not have space for commentary, but Team #1 members were more inclined to write something down in the margin to reflect on this question.

Question 3: The 'Paragraph 5' and 'Annex J' for the C2 construct was a beneficial vehicle for envisioning and discussing MDC2 for 2030.

57% (25 people) agreed that the 'paragraph 5' and 'Annex J' was beneficial, however 18% (8 people) disagreed, 21% (9 people) circled 'Neither', 1 person strongly disagreed, and 1 person did not circle. [Note that Paragraph Five and Annex J referred to in the question are the templates from CJCSM 3130.03]

Discussion: The survey question should have asked whether people used it, and then if they used it, if they found it useful. For example, the one respondent that stated "Strongly Disagree" wrote in the margins "this [Paragraph 5, Annex J] was never discussed," so he was saying he strongly disagreed it was a beneficial vehicle *because they never discussed it*, not because it wasn't useful. Yet two other respondents in the same group, with the same instructions, stated "Strongly Agree". The only group not to disagree was Team #2.

Appendix A

Team #1 Outbrief Slides and Documents

Doolittle Series `18
Kick'n Mules Outbrief

"Enhanced Status Quo"

8 Nov 2018

Col Jack Fischer, AFSPC/A3/6/S

Cell 1: Kick'n Mules Strengths / Weaknesses

Strengths – It exists

1) **Flexible foundation from which we can grow**

2) **It currently encompasses Coalition partners, Interagency, and service components**

3) **JFACCs currently have JOA wide perspective to support this model**

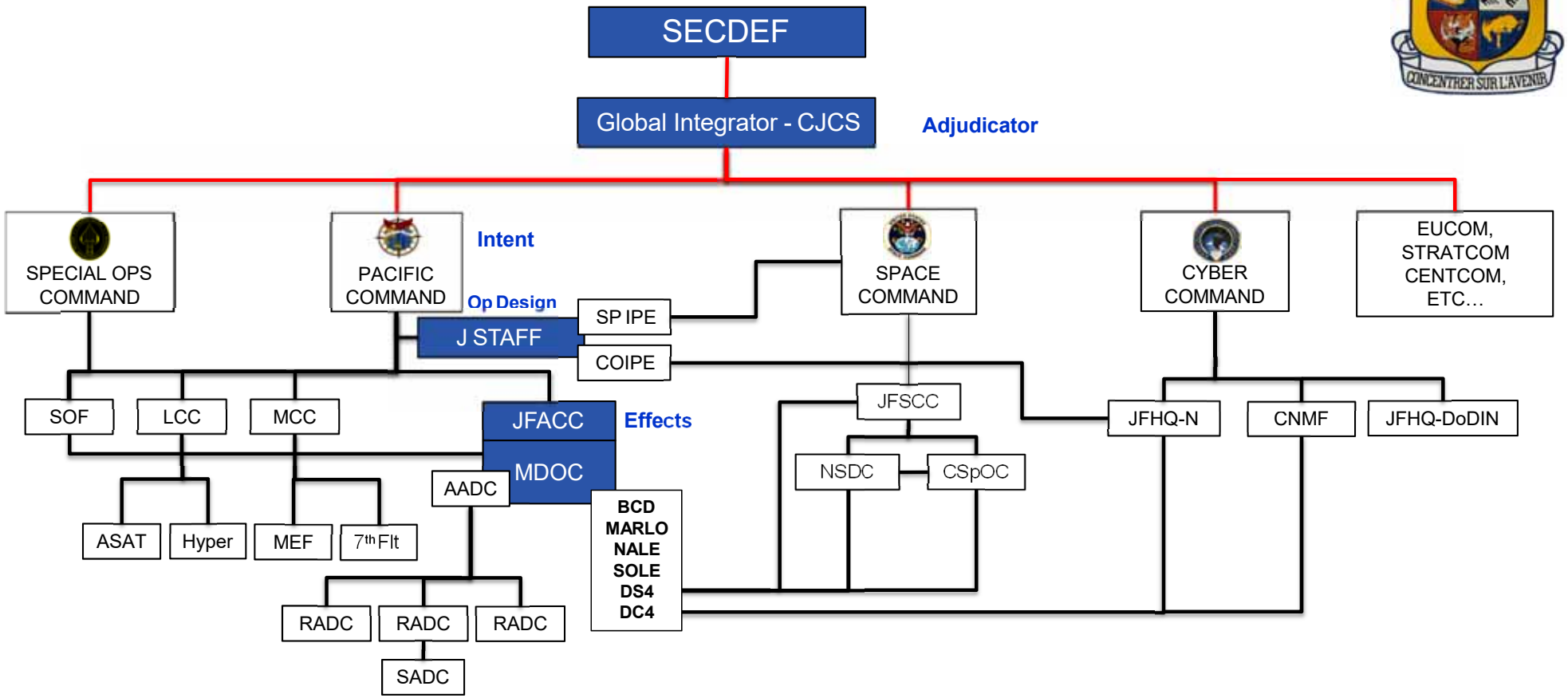
Weaknesses – Unable to execute a short notice, high velocity, operationally agile fight tonight

1) **High manpower bill – agility/flexibility because of people, not process**

2) **High comm / IT requirements to enable required automation**

3) **Current C2 structure is theater centric, creating global seams and friction**

Cell 1: Kick'n Mules Visual Construct



DOTMLPF	*Space Coordinating Authority*	*Cyber Coordinating Authority*	*OPS Integrator "MDOC"*
Doctrine	SCA authority remains with JFACC for theater specific Space effects. Push execution authority to lowest level. Pre-prioritized conditions based authorities.	BPT establish CCA authority within COCOM for theater specific Cyber effects. Push execution authority to lowest level. Pre-prioritized conditions based authorities. (JFACC?)	Activities coordinated though an ITO, with support to/from external Functional Space/Cyber OCs
Organization	Joint focused and manned DS4 staff	Joint focused and manned cyber coordinating element (DC4?)	Establish MDO coordination within liaison teams (e.g, SOLE, NALE, BCD)
Training	Live/Virtual/Constructive integration with COCOM exercises that use actual systems and processes within contested environment. (Space)	Live/Virtual/Constructive integration with COCOM exercises that use actual systems and processes within contested environment. (Cyber)	Realistic MDO exercises that use actual people/systems/processes at all Ops Centers
Materiel Solutions (Information Priority)	Assured information (access and communication) with reach back to CONUS space functions (Ex: NSDC, CSpOC)	Assured information (access and communication) with reach back to CYBERCOM	Assured worldwide data and application platform to enable accurate and reliable shared situational awareness Logistics - Increased velocity and security is needed
Leadership/Education	Add Multi-Domain realism to Exercises, Training, Education	Add Multi-Domain realism to Exercises, Training, Education	Add Multi-Domain realism to Exercises, Training, Education. Grow MDO leaders.
Personnel	DS4 staff support to SCA needs to be organically more robust	More robust cyber coordinating element at AOC and COCOM	Increased cyber defense forces Increased LNO footprint
Facilities	Existing facilities	Existing facilities	TBD

Cell 1: Kick'n Mules Takeaways

Current structure is not optimized for the Multi-Domain fight and is only possible if we:

1) **Develop coalition compatible, Multi-Level Security, shared Multi-Domain SA technical solutions**
2) **Pre-coordinate a well-defined matrix of conditions based authorities and global prioritization**
3) **Resource robust Multi-Domain integration elements in MDOC and CCMDs (people enabled by technology)**
4) **Mature the authorities, processes, and battle rhythm for world-wide synchronization**
5) **Add Multi-Domain realism to Exercises, Training, Education, and Experiments**

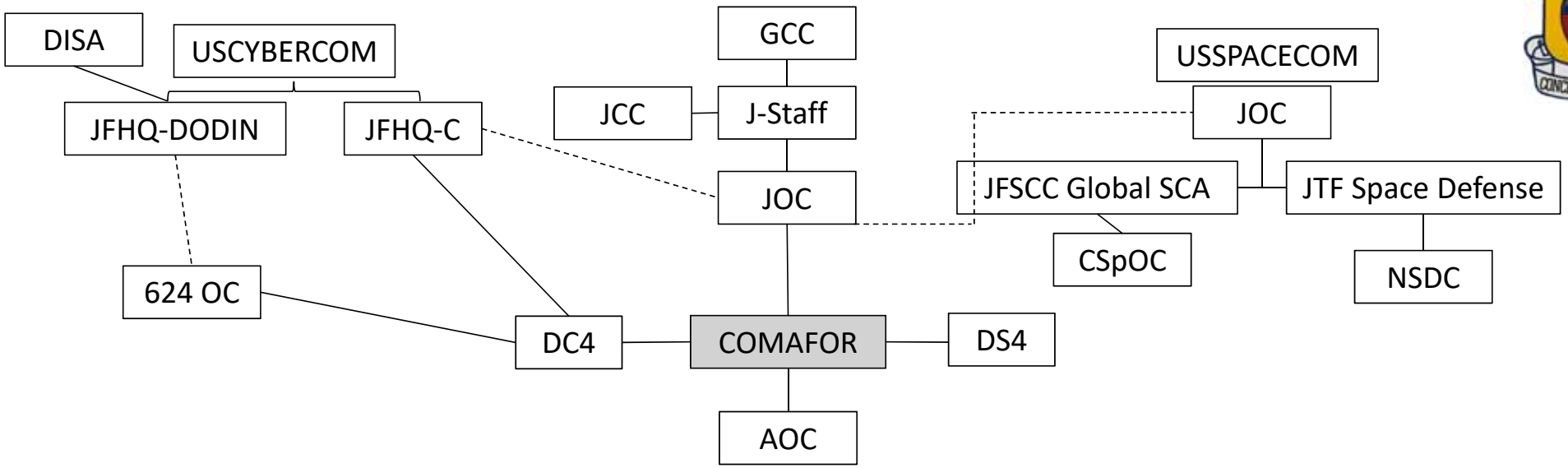
Appendix B

Team #2 Outbrief Slides and Documents

Doolittle Series `18
Thunderbird Outbrief

8 Nov 2018

Brig Gen Bradley C. Saltzman, HAF/DA3

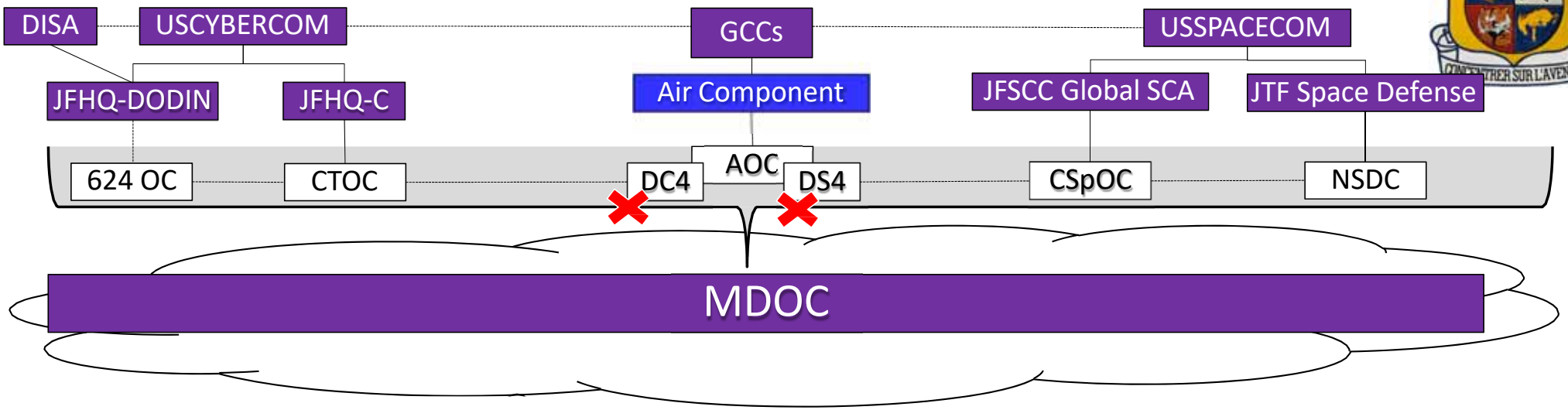


Forces
- Air, Land, Maritime, Space, Cyber
- US, Coalition, Commercial

OLD
- AOCs
- Space/Cybercom
- Supported/Supporting

NEW
- AOC links/tech
- 13O
- Authorities
- Global virtual planning
- Alt AOCs (multiple)

Cell 3: Thunderbirds' C2 Construct



Coord / Support ·····

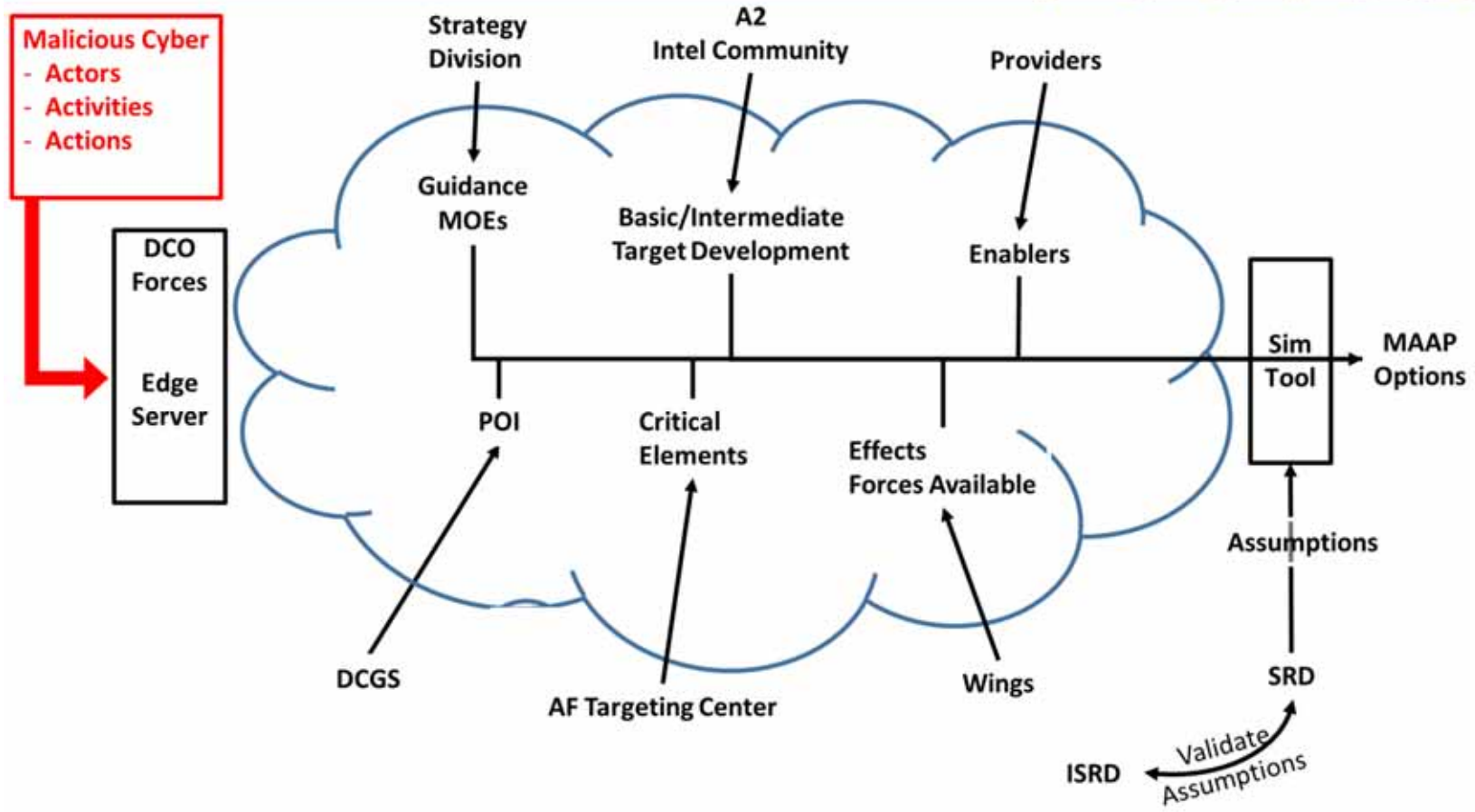
Operational ——

Key Assumption: Joint Force can conduct high velocity MDC2 through Unity of Effort

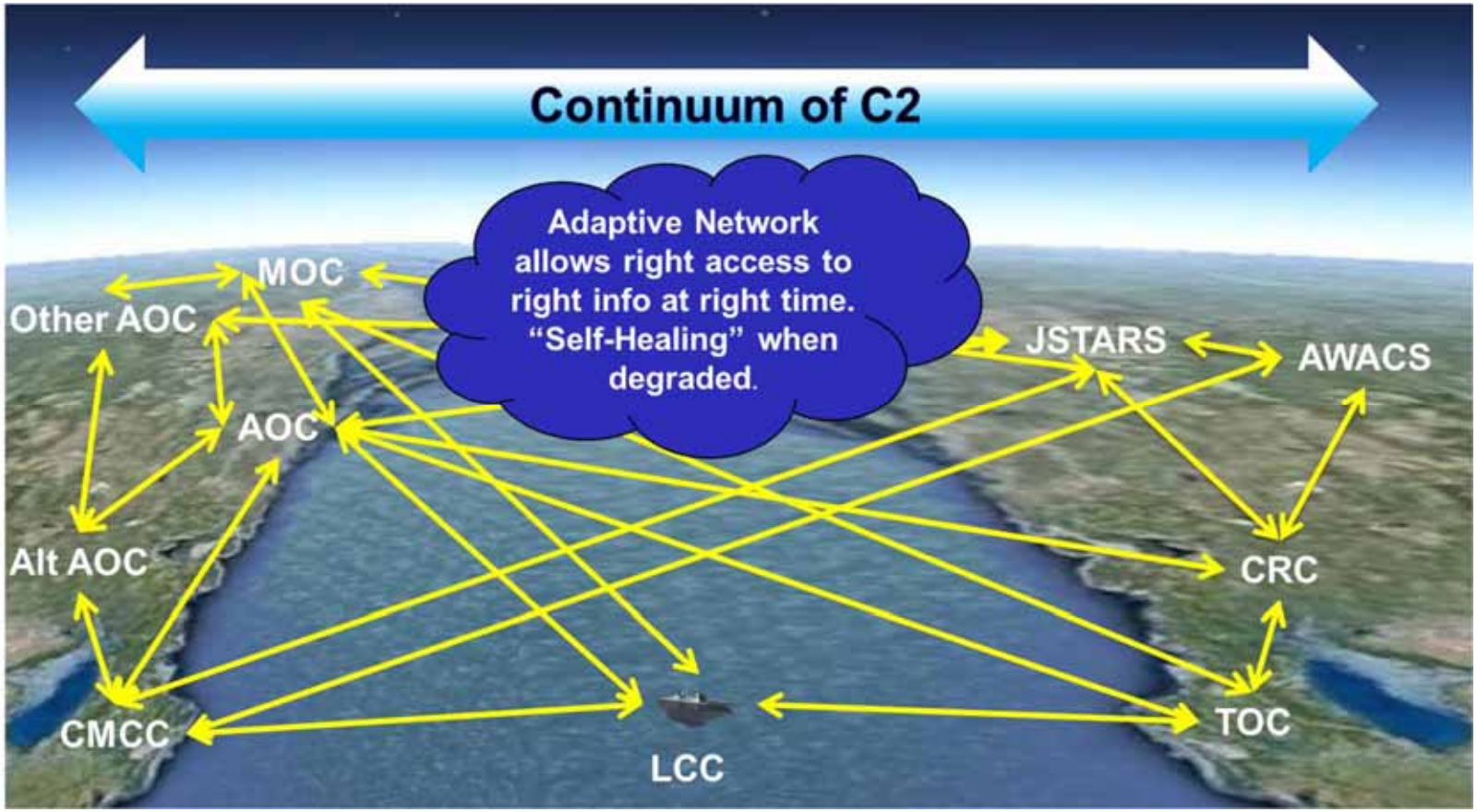
Key Enablers: People, Processes, Resources

NEW
- Global virtual planning
- Authorities
- AOC links/tech
- 13O
- Alt "OCs" (multiple)

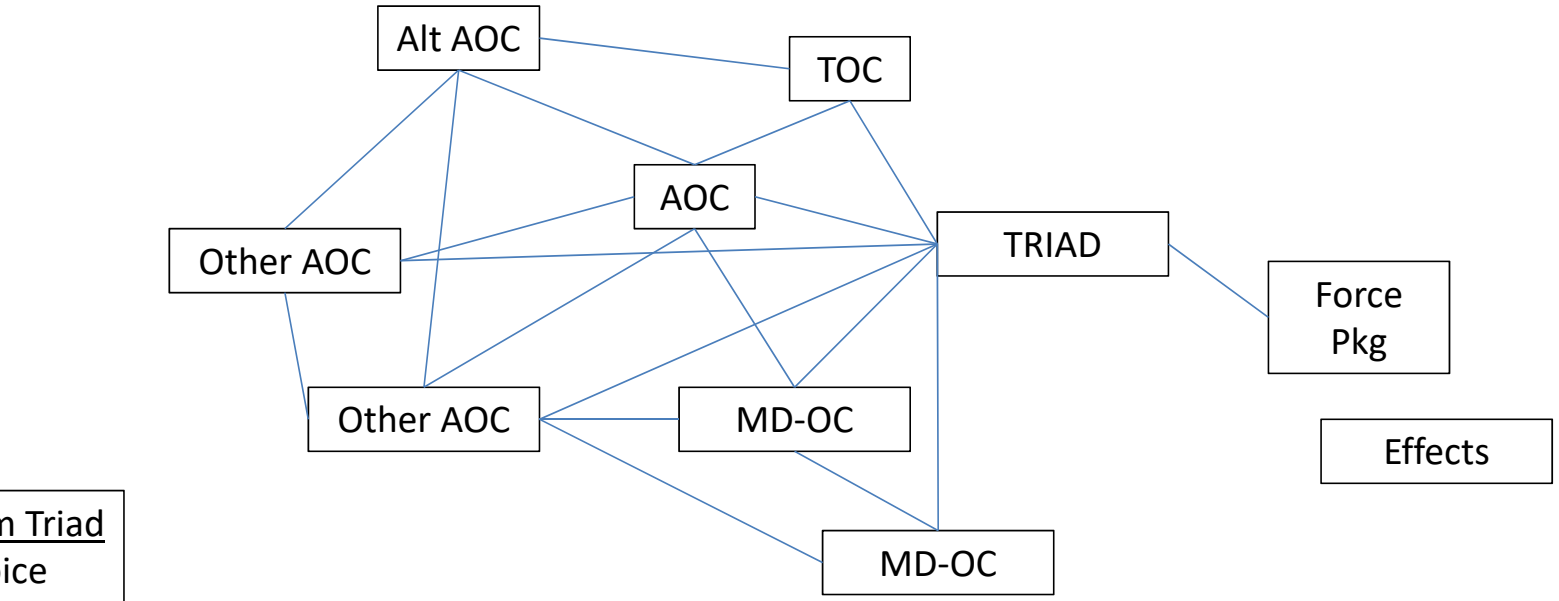
Cell 3: Thunderbirds' Virtual MDO Environment (VMOE)



Cell 3: Thunderbirds' Distributed C2



Continuum



Comm Triad
- Voice
- mIRC
- Data

Cell 3: Thunderbirds' Strengths/Challenges/Insights

Strengths

1) Resiliency
2) Adaptive
3) High Velocity

Challenges

1) Virtual Multi-Domain Ops Environment (VMOE) Network Protection
2) Ops Assessment
3) Risk to Force/Mission

Staus Quo Redesigned group's "IF, Then" Chart detailing what new or enhanced capabilities could provide to Multi-Domain Operations

"If" _____…	**"Then" this can be done…**	**Process**	**Resources (Enabling Tech)**	**People**	**Post-Game Assessed DOTMLPF-P Implications**
"If" force presentation…					
DCO Force Assigned	Optimize Defense Multi-Domain Force Packaging	X		X	Doctrine, Organization, Policy
ISR and Effects Distributed, Access Enablers Assigned	Optimize Offensive Multi-Domain Force Packaging	X		X	Doctrine, Organization, Policy
"If" command authorities…					
Authorities/Network Extended	Distributed C2	X	X		Policy, Material
ROEs & Authorities Space/Cyber detailed/delegated	Execute High Velocity MDO	X			Doctrine, Leadership and Education, Policy
Succession (PACE) for Authority	Distributed C2	X	X		Organization, Material, Policy
Notification/Conditions Process for Success Roles/Spt Relationships	Distributed C2	X		X	Leadership and Education, Policy
"If" personnel...					
ID Minimum Force for Physical Presence to perform C2	Distributed C2			X	Material, Personnel, Policy
Integrate Trained/Educated 13Os w/ Mission SMEs	Replace DS4/DC4 construct	X		X	Doctrine, Leadership and Education, Organization, Personnel, Policy
JACCE and Support Relationships Established	Support CYBERCOM or SPACECOM-led OPLANS	X			Doctrine, Leadership, Personnel, Policy
13O SME Physically/Virtually Available & Trained/Educated	Supported/Supporting Relationships Work	X		X	Leadership and Education, Personnel
Culture Enables Virtual Trust	Distributed C2			X	Doctrine, Leadership and Education, Policy
"If" communications...					
Persistent connectivity available	Virtual/physical coordination by SMEs	X	X	X	Material
Trusted Communications	Significantly Reduced Physical Presence at C2 Nodes		X	X	Personnel, Organization, Material, Policy
"If" planning tools...					

Permission-enabled, Cloud architecture supported, crowd-sourced target development w/ Target/Effects pairing with SRD Guidance	Enhanced, rapid MAAP Development	X	X		Doctrine, Training, Leadership and Education, Material
Modeling/Simulation Technology applied to distributed Target Development with ability for SRD to adjust via Assumptions	Enhanced, rapid MAAP Development	X	X		Training, Material, Policy
Planning tools integrated into planning suite	MDO Integrated Planning	X			Material, Policy
"If" VMOE adopted...					
Early engagement with Coalition/Partners for VMOE adoption	Optimize coalition/joint planning processes for enhanced, rapid MAAP Development	X		X	Leadership and Education, Policy
Training, education for VMOE focused on how it works	Enhanced trust with global VMOE	X		X	Training, Leadership and Education
Identity management within VMOE through multi-factor authentication and identity-associated "trust/reliability scores	Enhanced virtual trust with global VMOE	X	X		Material, Policy
Data-Tagging strategy to implement information sharing through technology solutions (tag via source/method, rather than classification	Optimize information sharing and VMOE participation for joint/coalition partners	X	X	X	Material, Policy

Appendix C

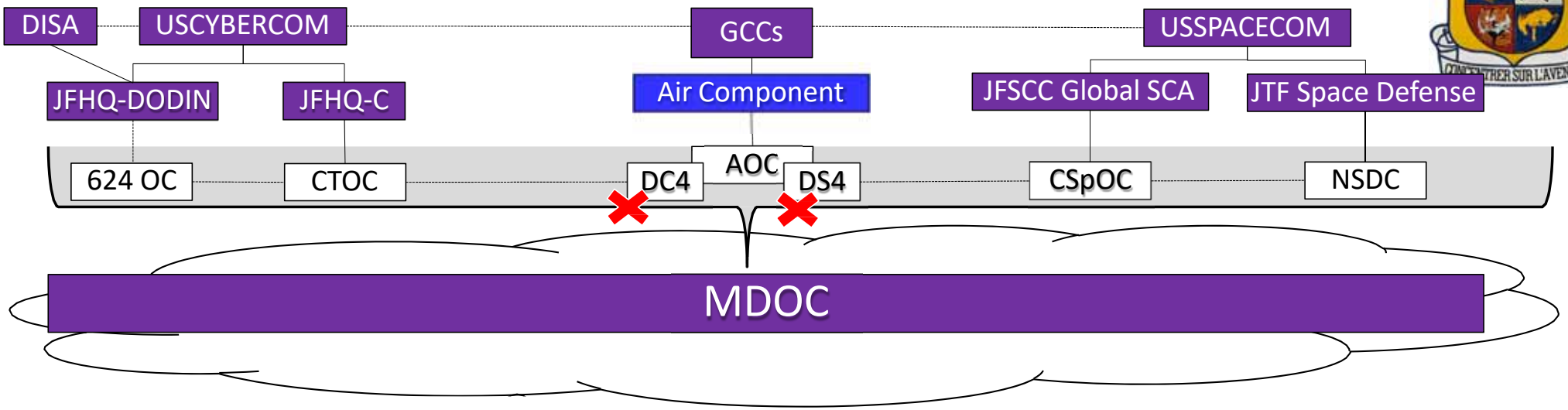
Team #3 Outbrief Slides and Documents

Doolittle Series `18
Ender Outbrief

8 Nov 2018

Briefers:
WGCMDR Paul Kendall
Maj Neil "Peaches" Fournie
Maj Kenneth "Slash" Grosselin
Capt Cara "ALAMO" Treadwell

Cell 3: Thunderbirds' C2 Construct



Coord / Support ·····

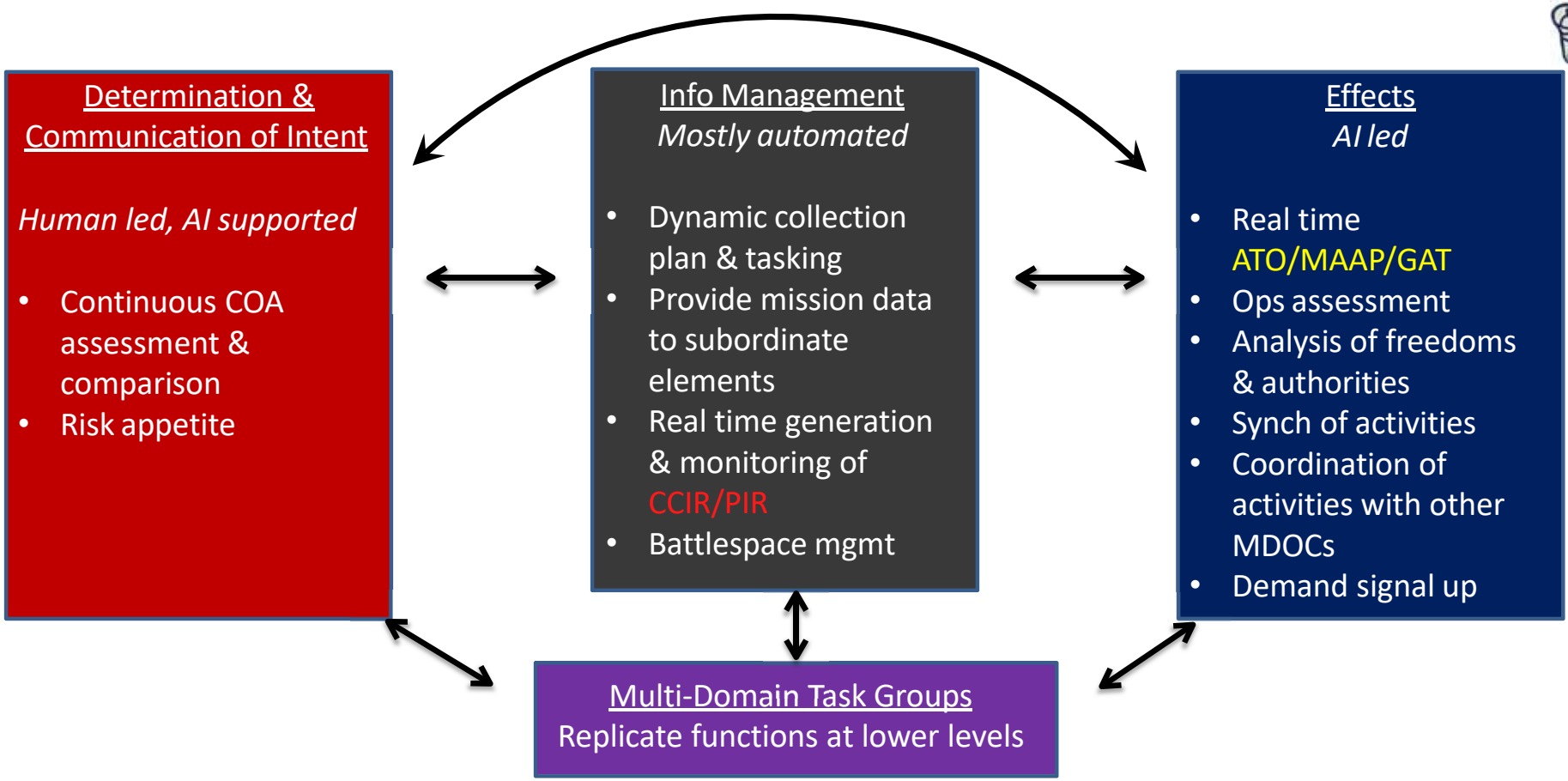
Operational ——

Key Assumption: Joint Force can conduct high velocity MDC2 through Unity of Effort

Key Enablers: People, Processes, Resources

NEW
- Global virtual planning
- Authorities
- AOC links/tech
- 13O
- Alt "OCs" (multiple)

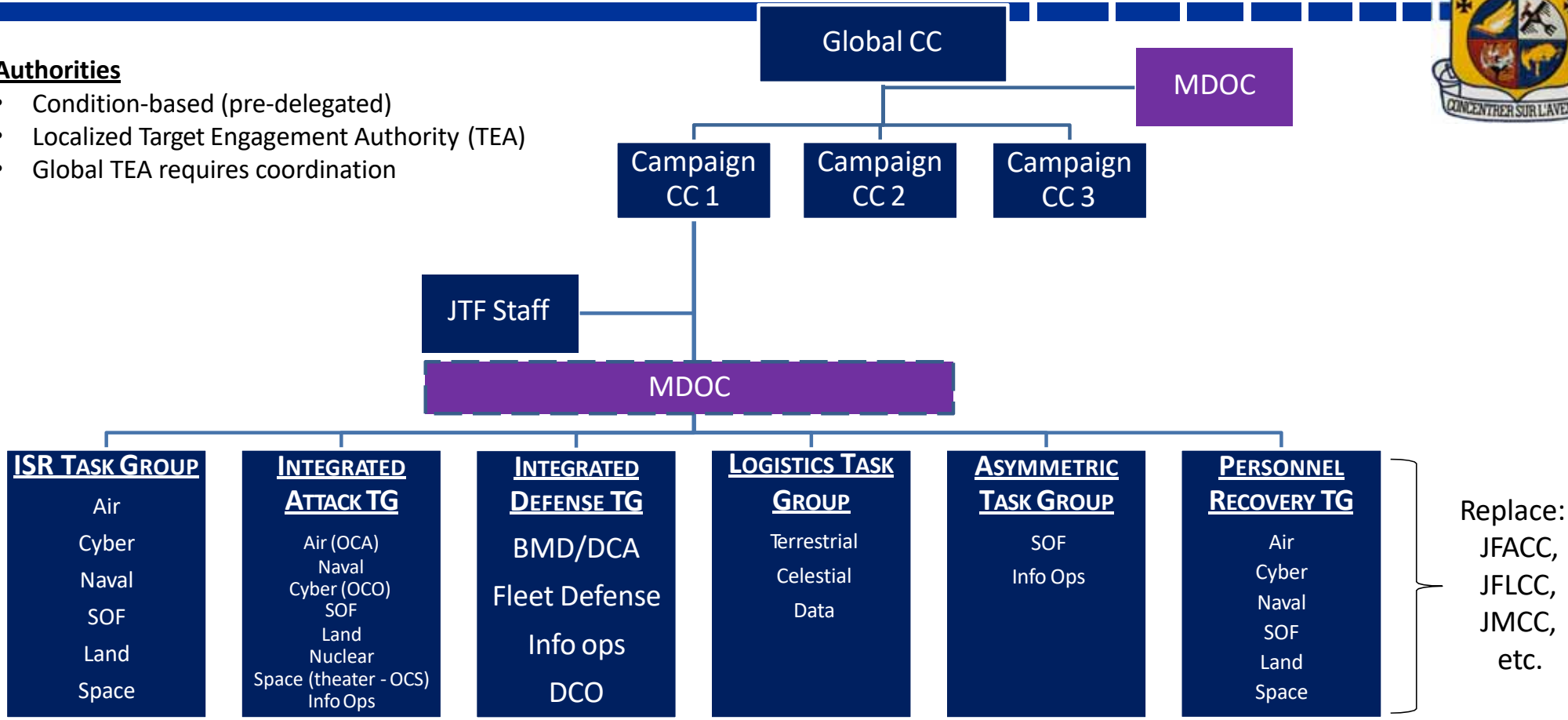
Cell 3: Ender Multi-Domain Op Center



Cell 3: Ender Visual Construct

Authorities

- Condition-based (pre-delegated)
- Localized Target Engagement Authority (TEA)
- Global TEA requires coordination



Cell 3: Ender

Overall insights

1) **Traditional command authorities (OPCON, TACON, support) inadequate for global MDO**
2) **Global functional commands strengthen joint ops culture at the expense of service culture**
3) **MDC2 functions, roles, responsibilities and tasks must be developed before tech solutions**

Strengths

1) **Campaign CCs are unconstrained by geographic boundaries**
2) **AI-maintained combat plans and orders enable reduced planning cycles, flexible targeting, faster data-to-decision makers, and iterative simulation war-gaming**
3) **Effects-driven execution of flexible, tailored, and AI-informed operations across all levels of competition and conflict, integrates allies, and encompasses all domains**

Weaknesses

1) **MDOC network infrastructure introduces additional COG critical dependency**
2) **Risk to Mission / Force are distributed between standing and campaign commanders**
3) **Congressional support required to facilitate changes (Goldwater-Nichols Act Equivalent)**

Cell 3: Ender

Overall conclusions and takeaways

1) **MDO requires additional effects- and mission-based command authorities**

2) **The DOD must establish a multi-domain integration exercise that presents and challenges air, cyber, land, maritime, space, and C2 simultaneously**

3) **Effects and capabilities must be presented at the lowest possible classification and made releasable to allies (ACGU) for more seamless integration, so that Multi-Domain Solutions can be presented from all parties**

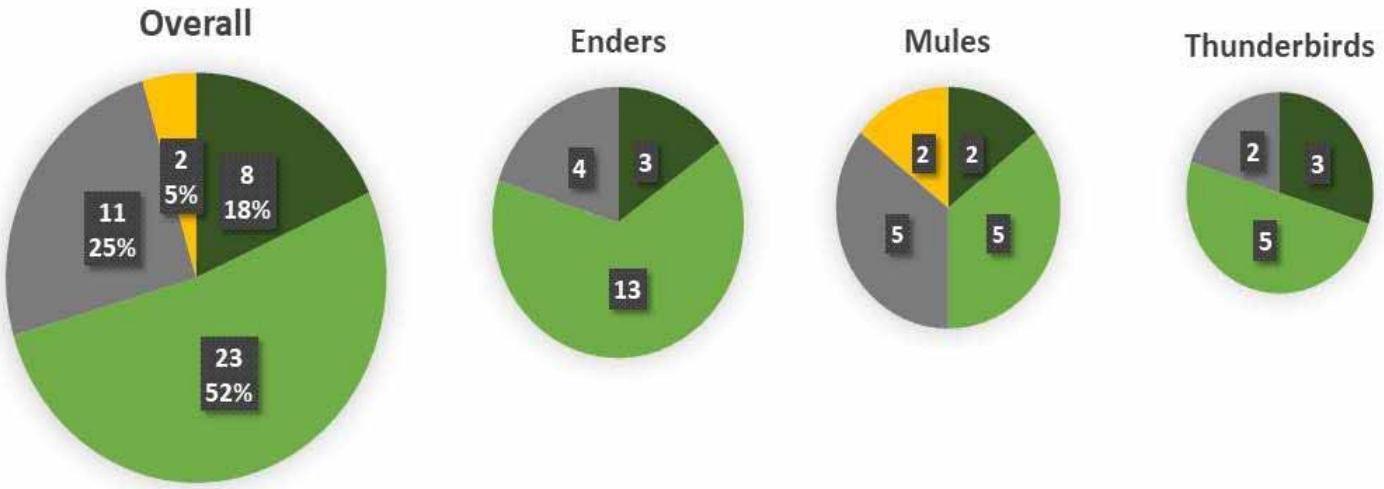
Appendix D

Game Conduct Survey Analysis Graphs

- The objective was well defined and centered on the Air Force's MDC2 needs for a conflict in 2030

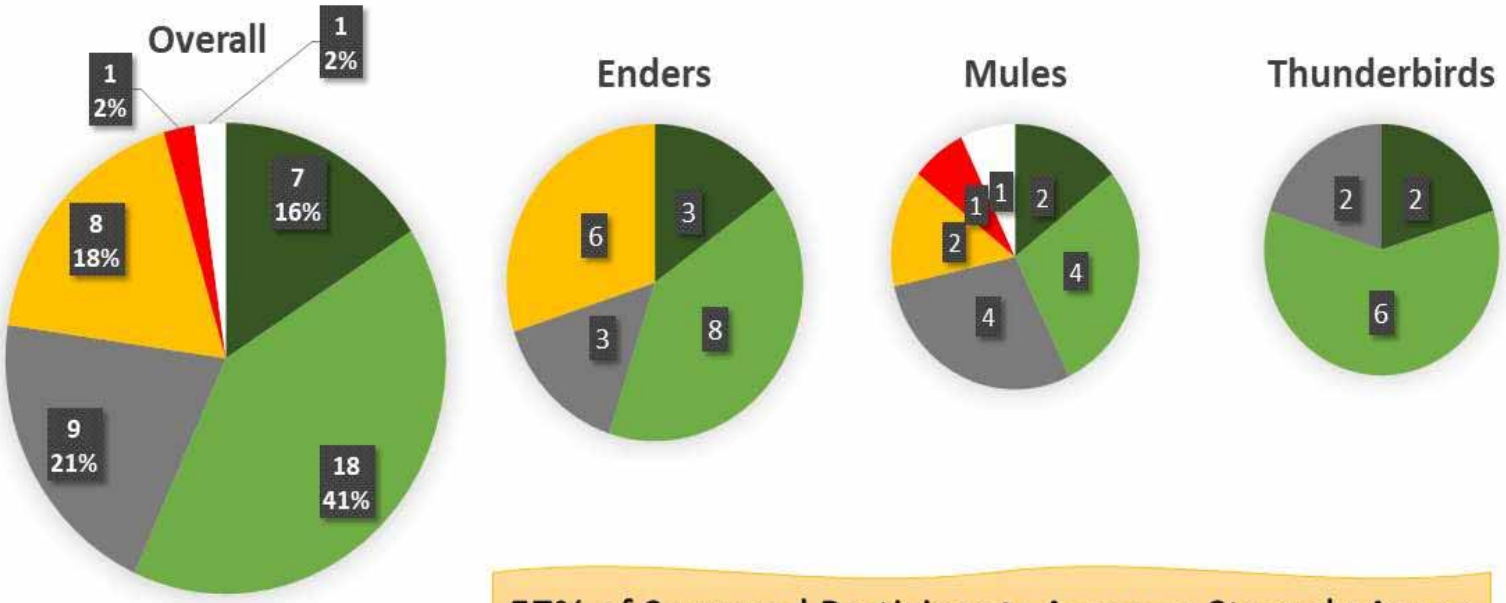
84% of Surveyed Participants Agree or Strongly Agree

- The C2 academics were useful for the purpose of this event



70% of Surveyed Participants Agree or Strongly Agree

- The use of “Paragraph 5, Annex J" useful for the purpose of this event



57% of Surveyed Participants Agree or Strongly Agree

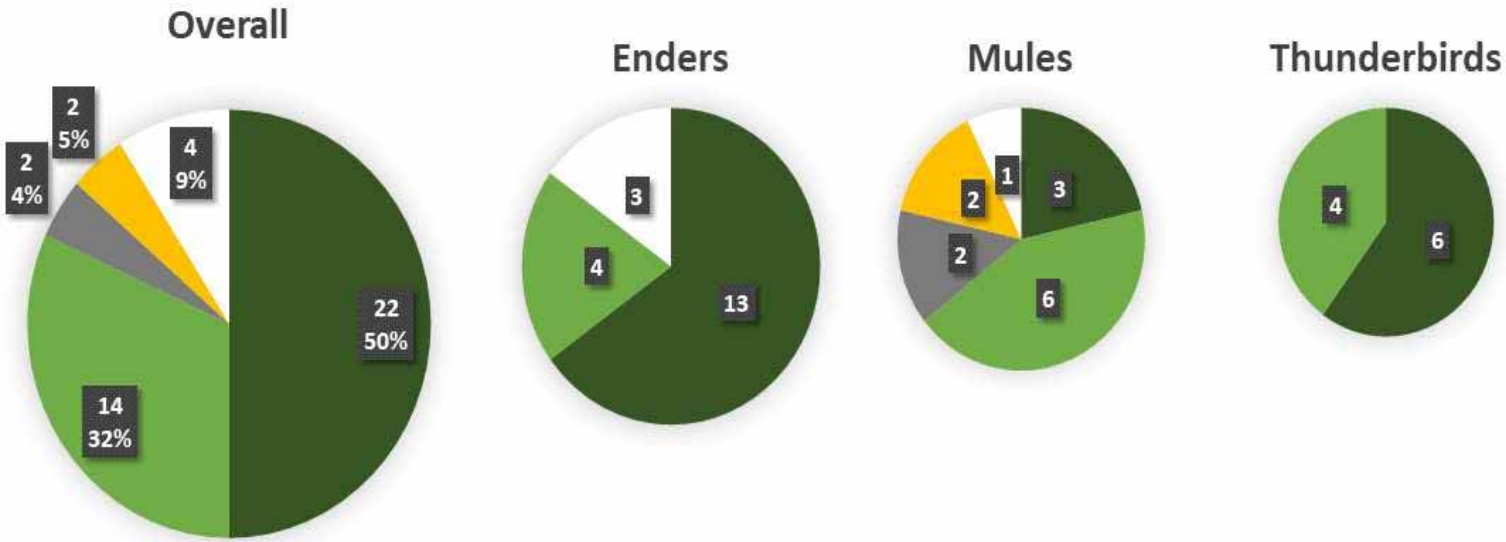
- The time provided was adequate to build a credible C2 Construct

86% of Surveyed Participants Agree or Strongly Agree

- A second front successfully stressed our C2 construct

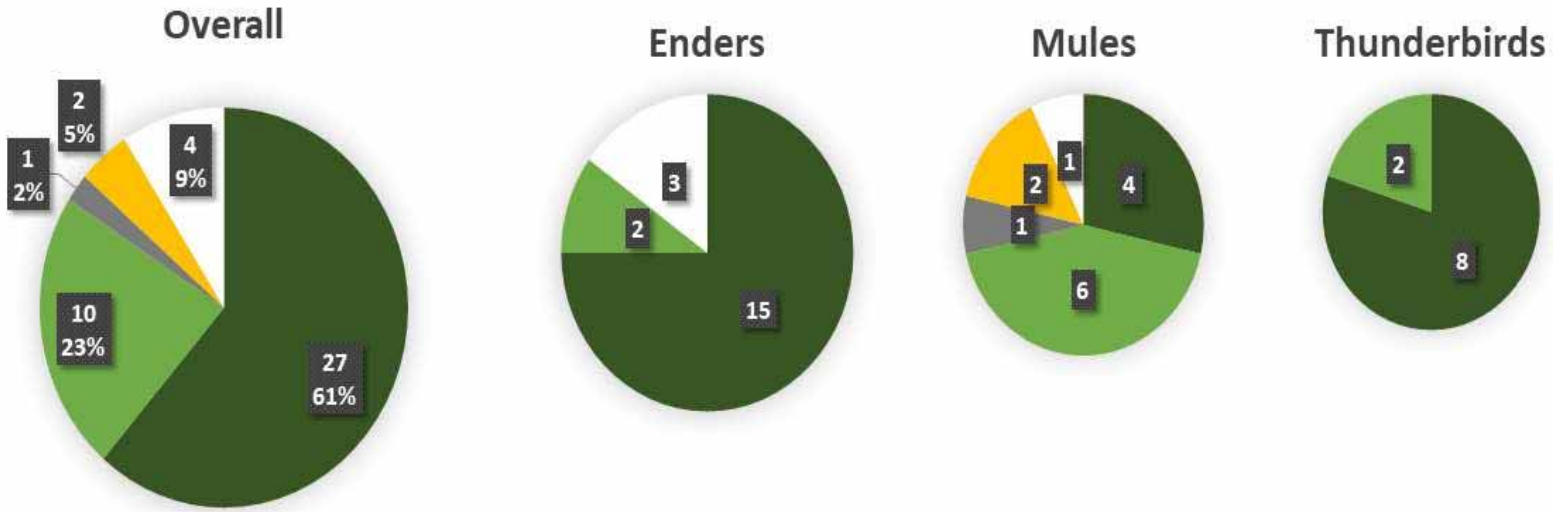
57% of Surveyed Participants Agree or Strongly Agree

- Facilitator's questions and examples were accurate and relevant



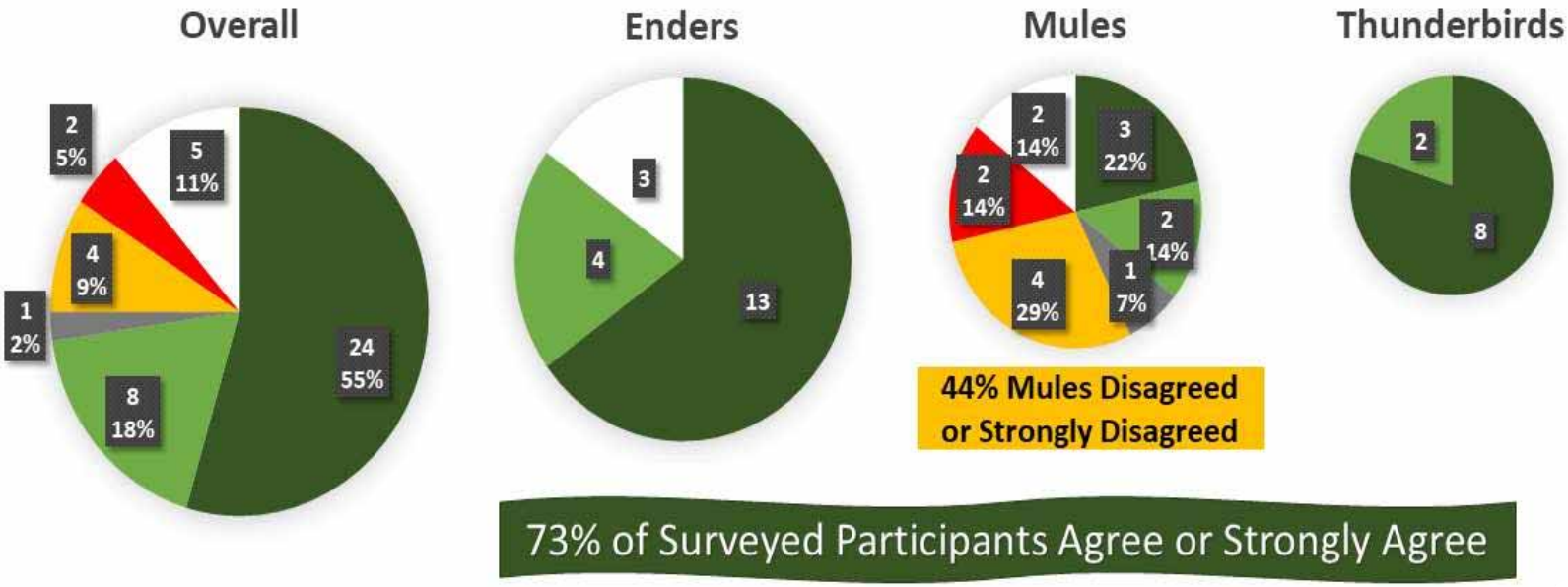
82% of Surveyed Participants Agree or Strongly Agree

- The facilitator presented the material in a professional manner



84% of Surveyed Participants Agree or Strongly Agree

- The facilitator ensured relevant ideas and concerns were addressed to further the discussion.



73% of Surveyed Participants Agree or Strongly Agree

Appendix E

C2 Summit Update (MDC2) Briefing

C2 Summit Update (MDC2)

U.S. AIR FORCE

Brig Gen Saltzman
AF SIG

Flight Plan

- **Doolittle Series Background & Methodology**
- **What The Players Learned**
- **What's Next**

Key Questions on MDC2

- How is C2 of space and cyber forces accounted for in the absence of Service Components dedicated to these domains?
- What are the prerequisites to integrated Multi-domain Ops?
  - Integrated planning, shared COP, assignment of forces, unity of command?
- Is Unity of Effort sufficient to build and execute an integrated MDO plan?
- Can domain control (superiority) of a relevant warfighting domain be "outsourced" by a JFC?
- Does current component structure inhibit effective MDO?
- Can space and cyber forces be executed for MDO in current components structure of a JFC?
- Should space and cyber C2 be designed like air, land or maritime forces?
- Is a continued evolution required…from TACS to TAGS to Global All-domain Control System (GACS)?

Teams & Facilitation

- **JFC/CC: Adjunct Professor (AJP) – General "Speedy" Martin**
- **Facilitators: Colonel/GS-15 with AJP retired GO's (Seip, Kresge, DePalmer)**
- **Team Composition:**
  - **Hand-picked domain experts in Air, Space, Cyber, EW/EMS, Intel, Nuke, Acquisition**
  - **Joint & Coalition Partners, Academia, Interagency**
  - **MDOS from ACSC**

Team 1

"Kick'n Mules"

Team 2

"Ender"

Team 3

"Thunderbirds"

Team 4/5

"Tigers"

C2 Planning Guidance to Players

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- Design a C2 structure that supports an operational concept (designed by “J3" OPT Tigers) to take advantage of all US military capabilities.
- 3 Teams designing C2 structures to accelerate assessment of options/factors
  - Kickin Mules – Enhanced Status Quo
  - Thunderbirds – Status Quo Redesigned
  - Enders – Clean Sheet Unconstrained
- Military capabilities can be presented by services as required by C2 design
  - OPCON, TACON or through support relationships
- JFC Component structure can be modified (J5’s will apply constraints by team)
- UCP will be adhered to…but raise issues/opportunities to JFC

Commander's Intent

- **OPERATION CONSTANT SWIRL (OCS) operations will make intentions clear to the adversary…stop all hostile actions, respect national sovereignty, restore stability in the region or we will compel you to do so.**
- **Because of the necessity for Multi-domain Operations, we will design a multi-domain force and concept of operations to achieve our national security objectives as outlined in the Strategic Guidance.**
- **We will challenge hostile actions with military power.**
- **We will leverage high velocity operations in, from and through all domains creating simultaneous dilemmas for our adversary at a tempo they cannot match.**
- **There will be no sanctuaries for the adversary in any domain.**

Strategic Guidance & Scenario

(As Fragged to Players)

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- **South China Seas (SCS): Our adversary's hostile actions in the SCS and adjacent countries have destabilized the region, disrupted economic flow, threatened partner nations' sovereignty and therefore must be stopped.**
- **To that end, US Forces will organize to conduct operations necessary to meet national security objectives, specifically:**
  - **Deter the adversary from taking any further actions in the SCS, adjacent countries or elsewhere that would exacerbate unstable conditions in the area or escalate the conflict.**
  - **Challenge and compel the adversary to take actions necessary to restore stability to the region consistent with conditions prior to hostilities.**
  - **Be prepared to defeat adversary forces, defend partner nations, protect critical infrastructure and deny the adversary the ability to escalate hostilities.**
- **Because the adversary has demonstrated the capacity and will to conduct hostile actions in all domains, commanders will have responsibilities and authorities to conduct offensive and defensive operations in, from and through all warfighting domains as necessary to achieve military objectives.**

Doolittle Players' Outbrief

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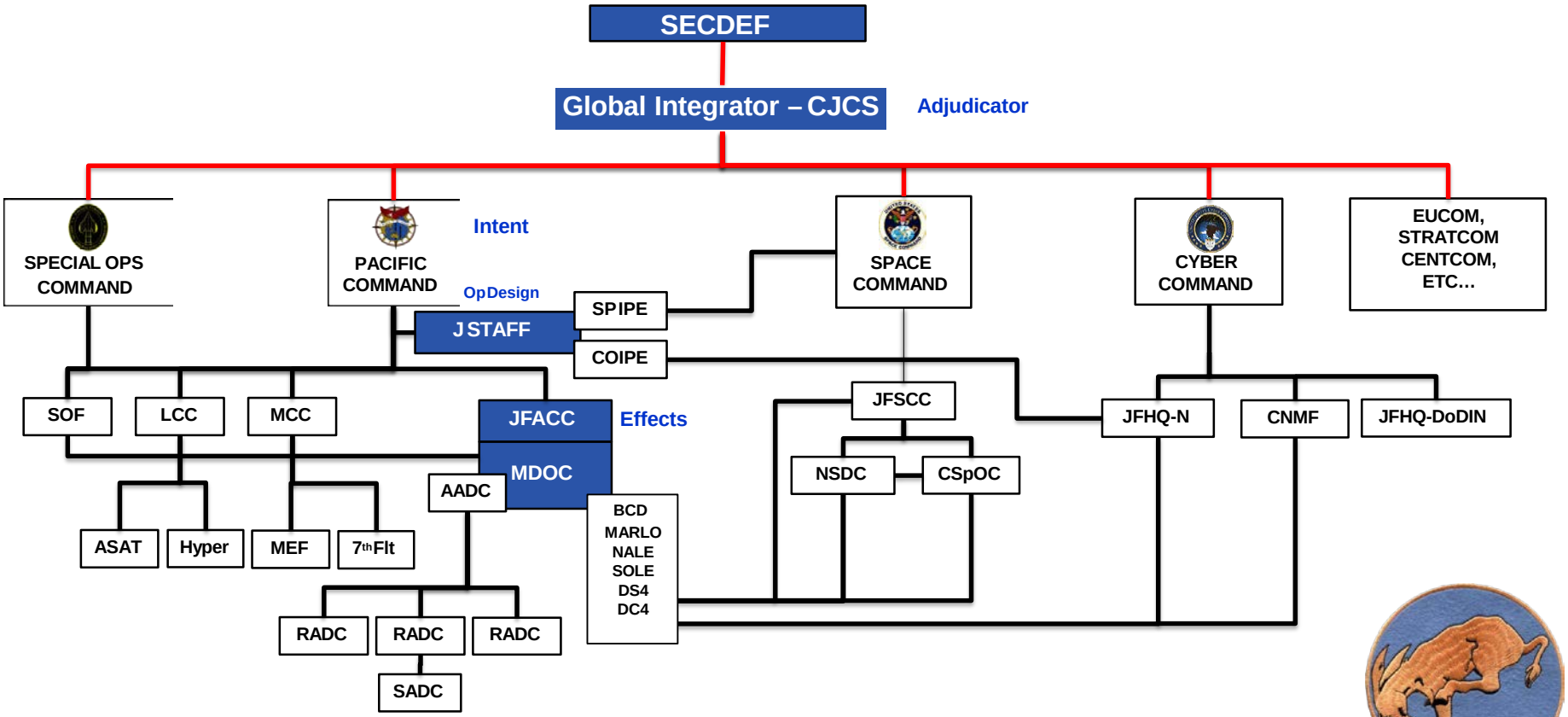
Kick'n Mules C2 Construct



Kick'n Mules' Strengths/Weaknesses

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<u>Strengths</u>: Current structure already exists

1) Flexible foundation from which we can grow

2) It currently encompasses Coalition partners, Interagency, and service components

3) JFACCs currently have JOA wide perspective to support this model

<u>Weaknesses</u>: Unable to execute a short notice, high velocity, operationally agile fight tonight

1) High manpower bill – agility/flexibility because of people, not process

2) High comm / IT requirements to enable required automation

3) Current C2 structure is theater centric, creating global seams and friction

Kick'n Mules' Takeaways

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Current structure is not optimized for the Multi-Domain fight and is only possible if we:

1) **Develop coalition compatible, Multi-Level Security, shared Multi-Domain SA technical solutions**

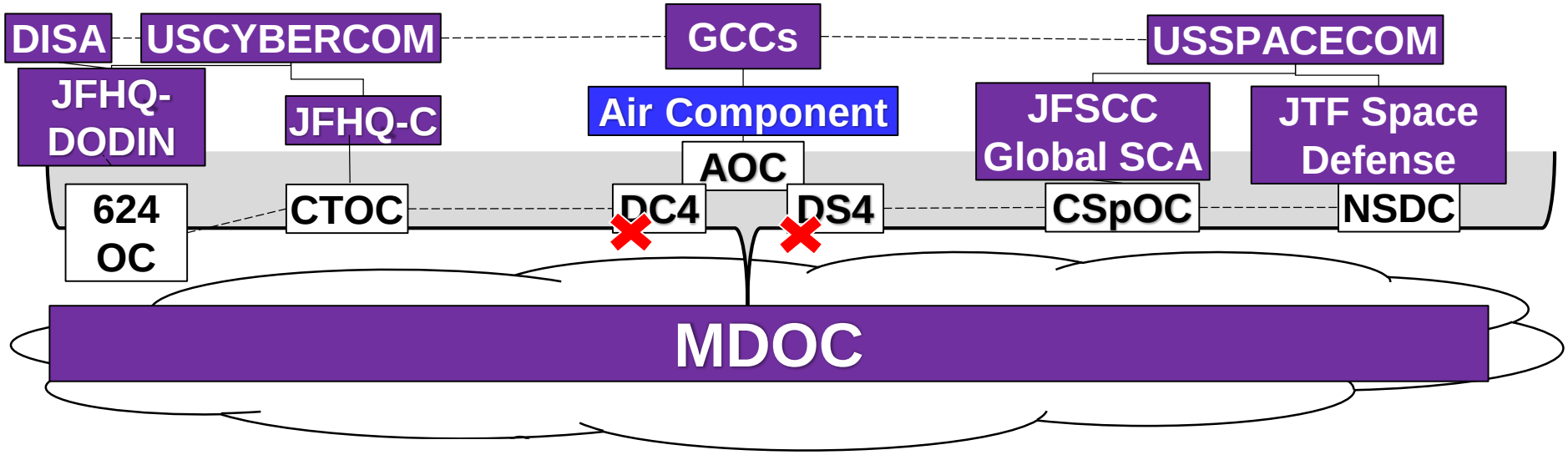
2) **Pre-coordinate a well-defined matrix of conditions based authorities and global prioritization**

3) **Resource robust Multi-Domain integration elements in MDOC and CCMDs (people enabled by technology)**

4) **Mature the authorities, processes, and battle rhythm for world-wide synchronization**

5) **Add Multi-Domain realism to Exercises, Training, Education, and Experiments**

Thunderbirds' C2 Construct



Coord / Support Operational

Key Assumption: Joint Force can conduct high velocity MDC2 through Unity of Effort

Key Enablers: People, Processes, Resources

NEW
- Global virtual planning
- Authorities
- AOC links/tech
- 13O
- Alt "OCs" (multiple)

Thunderbirds' Virtual MDO Environment

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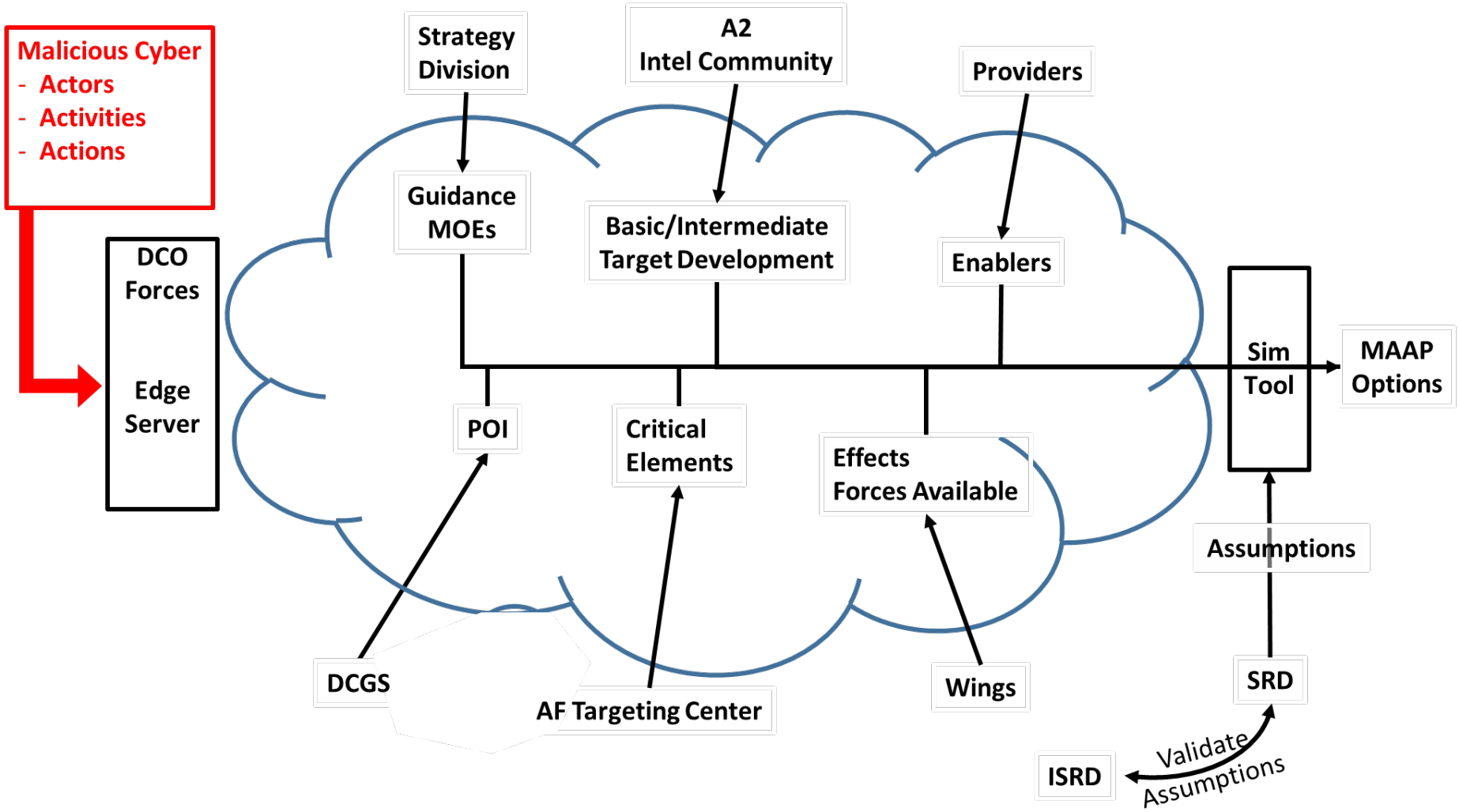

"Integrated Multi-Domain Operational-Level Command and Control"

Thunderbirds' Evaluation / Takeaways

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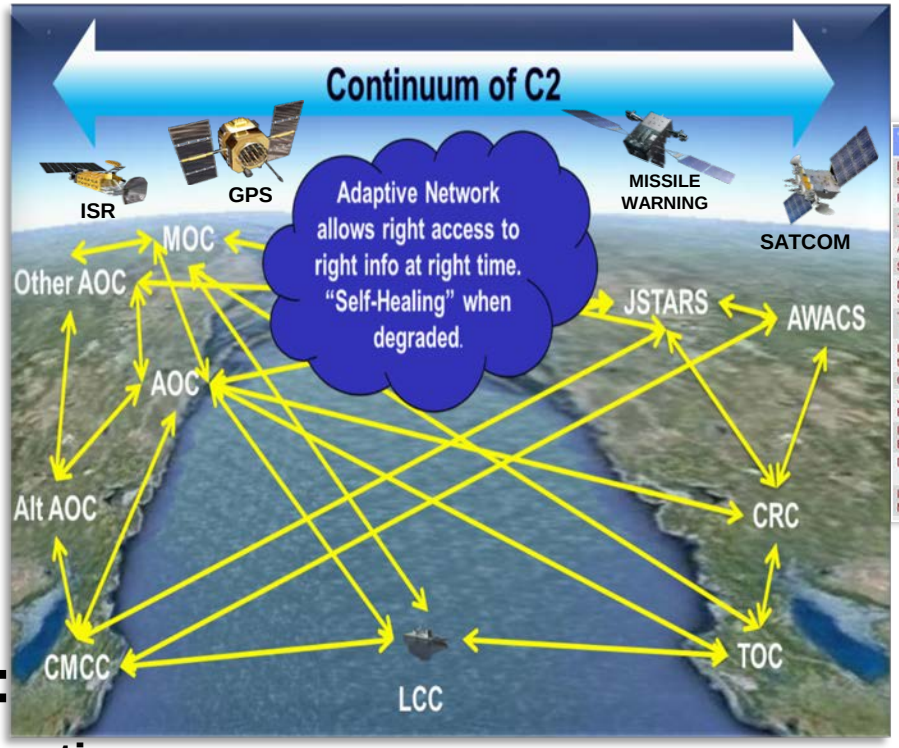
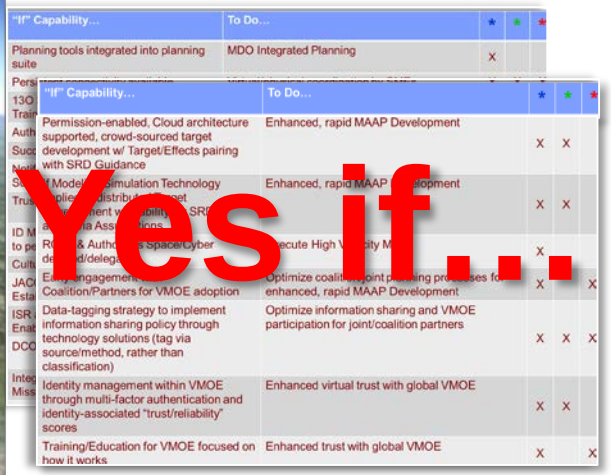
Strengths:

1) Resilient
2) Adaptive
3) High Velocity





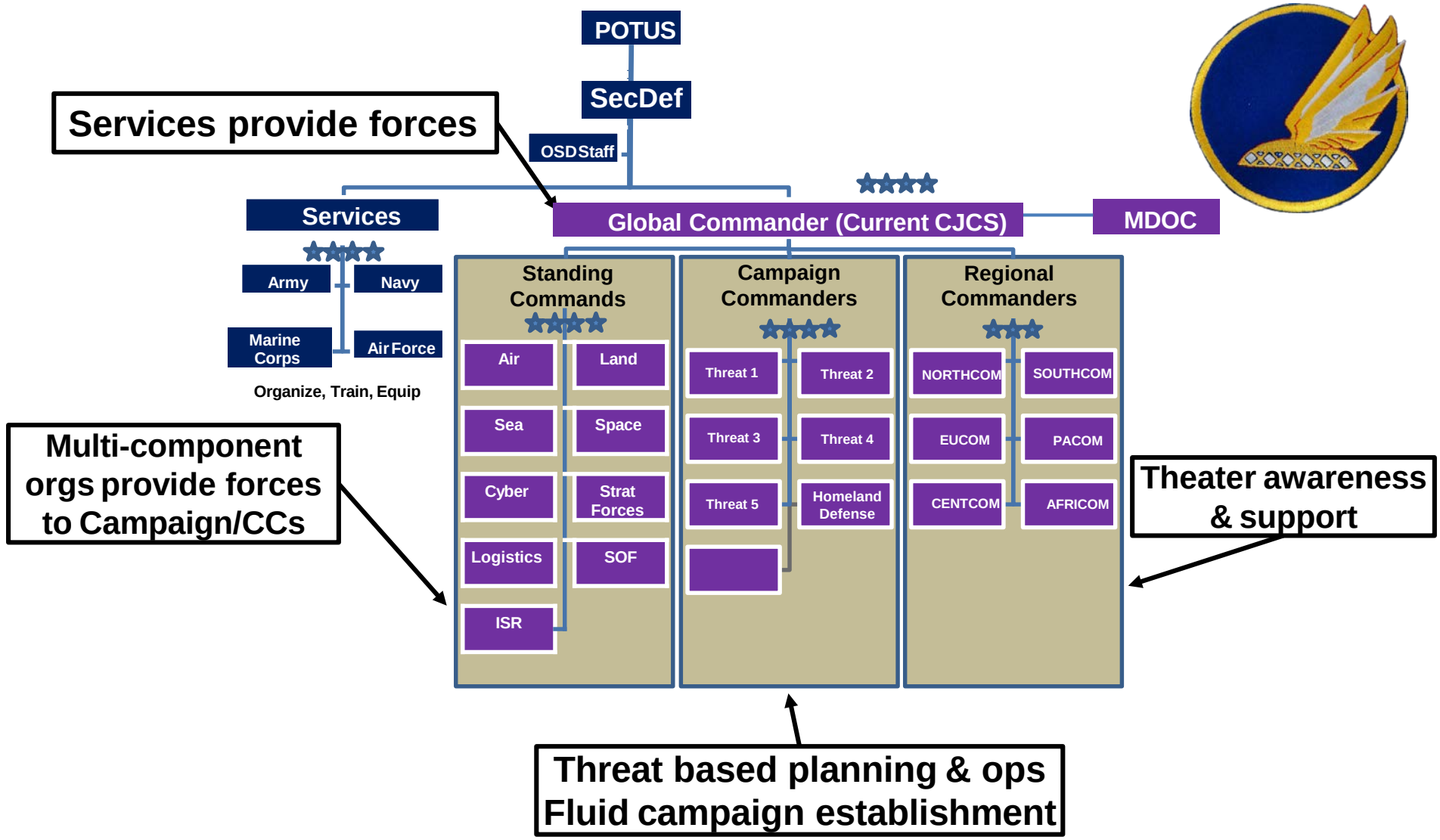
Yes if...

* People
* Processes
* Resources (Enabling Tech)

Challenges:

1) Network Protection
2) Roles Management
3) Risk to Force/Mission

Enders' C2 Construct



"Integrated Multi-Domain Operational-Level Command and Control"

Enders' Strengths/Weaknesses

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Overall insights

1) Traditional command authorities (OPCON, TACON, support) inadequate for global MDO
2) Global functional commands strengthen joint ops culture at the expense of service culture
3) MDC2 functions, roles, responsibilities and tasks must be developed before tech solutions

Strengths

1) Campaign CCs are unconstrained by geographic boundaries
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3) Effects-driven execution of flexible, tailored, and AI-informed operations across all levels of competition and conflict, integrates allies, and encompasses all domains

Weaknesses

1) MDOC network infrastructure introduces additional COG critical dependency
2) Risk to Mission / Force are distributed between standing and campaign commanders
3) Congressional support required to facilitate changes (Goldwater-Nichols Act Equivalent)

Enders' Multi-Domain Ops Center

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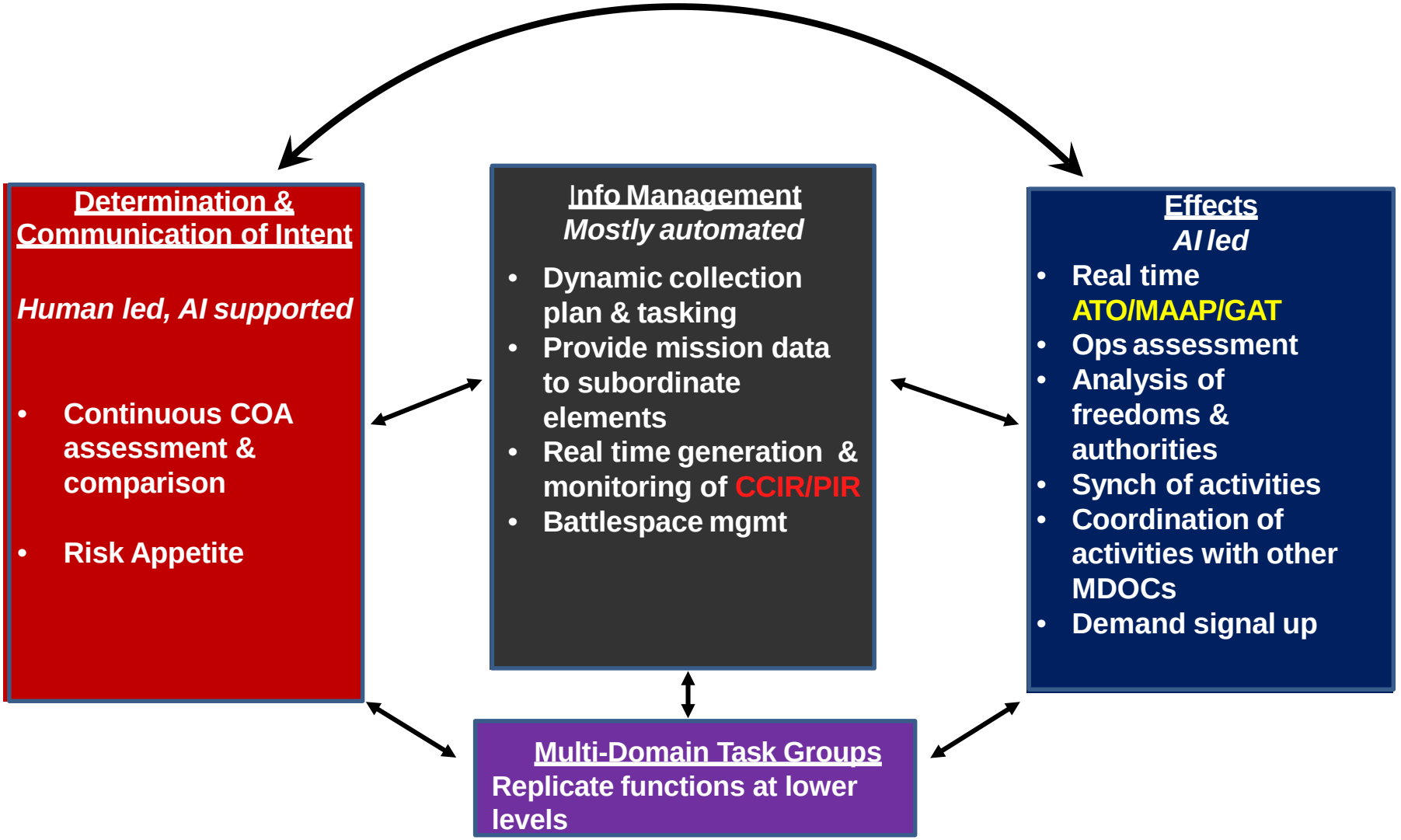


"Integrated Multi-Domain Operational-Level Command and Control"

Enders' Conclusions

1) MDO requires additional effects and mission-based command authorities

2) The DOD must establish a multi-domain integration exercise that presents and challenges air, cyber, land, maritime, space, and C2 simultaneously

73

3) Effects and capabilities must be presented at the lowest possible classification and made releasable to allies (ACGU) for more seamless integration, so that Multi-Domain Solutions can be presented from all parties

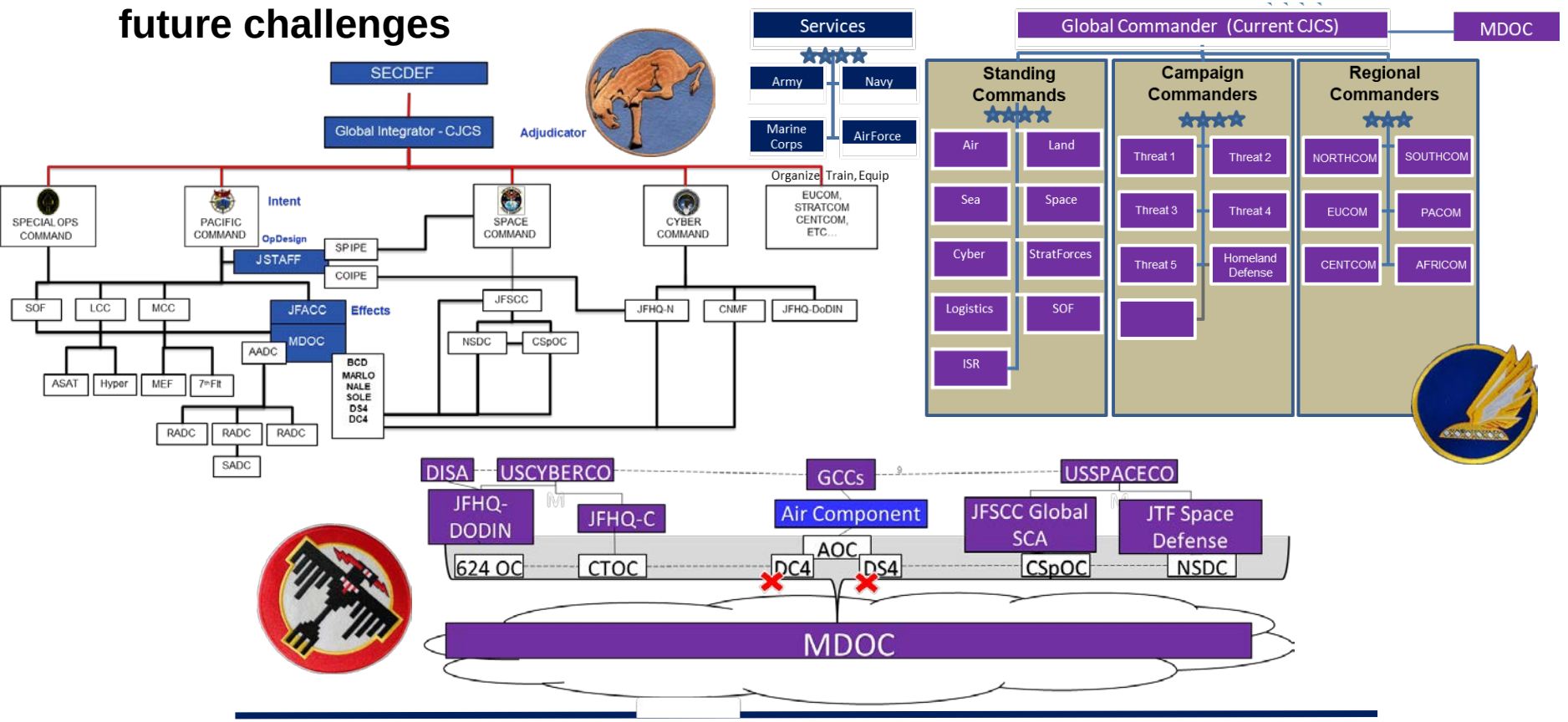
So What?

- Unique "first of its kind" war game…added value to MDC2 operational concepts
- We learned – In far more detail – the factors which make MDC2 complex & nuanced
- Lessons for operational concepts go "hand-in-glove" with technology lessons

1. **Develop expertise: both MDO and C2 (13O)**
2. **Improve our MDC2 operational concepts**
   - Necessity for a "C2 Global Integrator" → Unity of Command (risk to mission) v. Unity of effort (risk to force)
   - Conditions-based Authorities (COOP)
3. **Advanced technology is required to compress the OODA Loop (Experimentation)**
   - Our Network = Center of Gravity
   - AI, Machine Learning & Automation are pre-reqs to MDC2 data management
   - Multi-level security solutions are mandatory for effective info sharing

So What (Doolittle)?

1. ***Every group*** **saw a need for a Multi-Domain Operations Center run by MDC2 experts and built their C2 construct around this need**
2. ***Every group*** **saw a technology gap in our ability to freely access operationally relevant data that would feed a future MDOC**
3. ***Every group*** **saw the current force presentation construct, as ill-suited to future challenges**



"Integrated Multi-Domain Operational-Level Command and Control"

A Conflict Anywhere…is a Conflict EVERYWHERE

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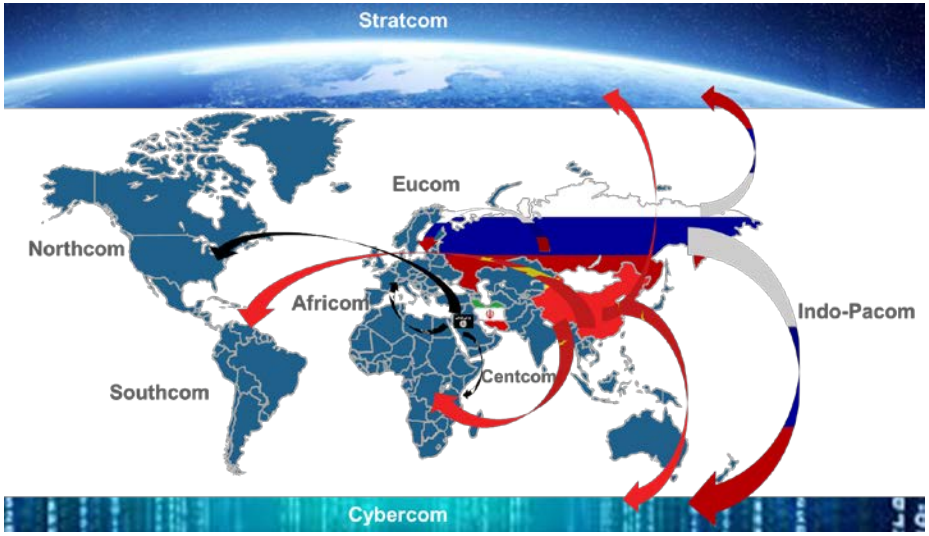
- In the era of great power competition, a conflict anywhere will be a conflict everywhere
- To fight globally, a JFC must rely on support relationships to ensure unity of effort in all domains and regions
  - Ex. Space Forces in USSPACE, Cyber effects from USCYBER, support effects from other Geographic CCMDs
- Disparate mission responsibilities, finite resources, risk management, etc., create tensions in support relationships



If a Global Campaign requires Global Coordination, what processes, products and people will the person responsible for this authority have to execute it?

****MDC2 capability requires experts and advanced technology****

The Global Coordination Challenge

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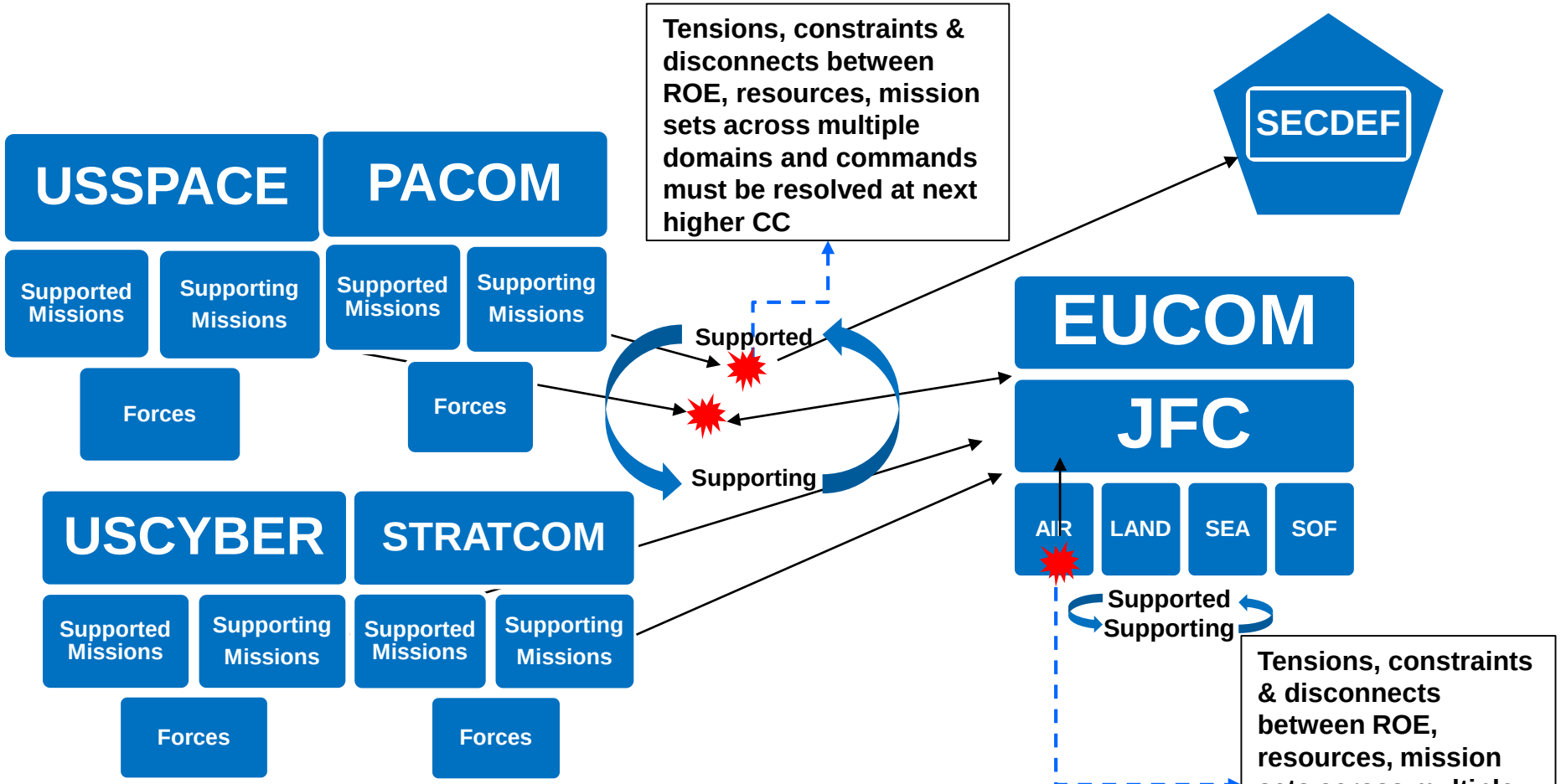

Global Coordination

(ADOC capability to perform this function)

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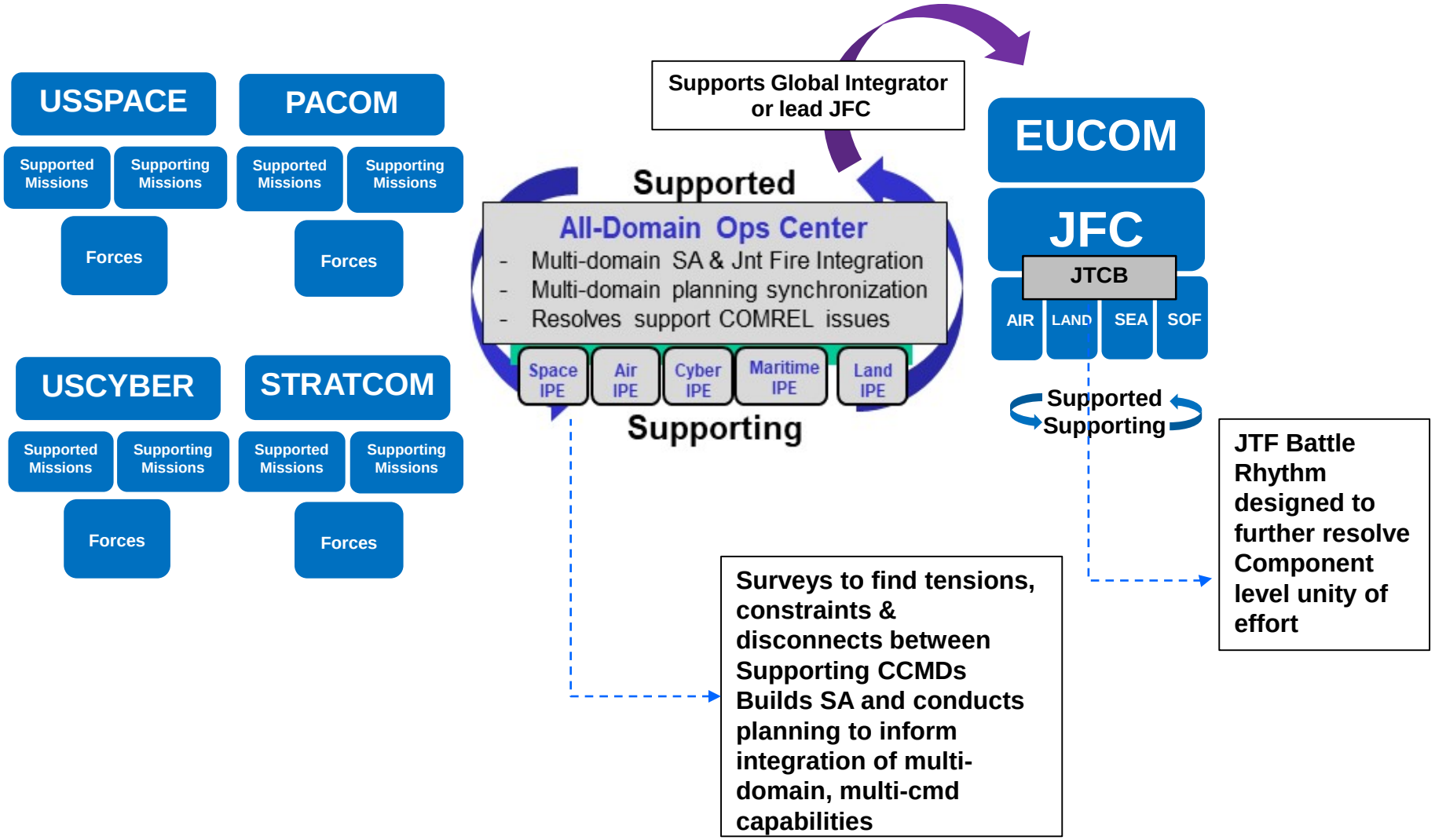

All-domain C2 Integration

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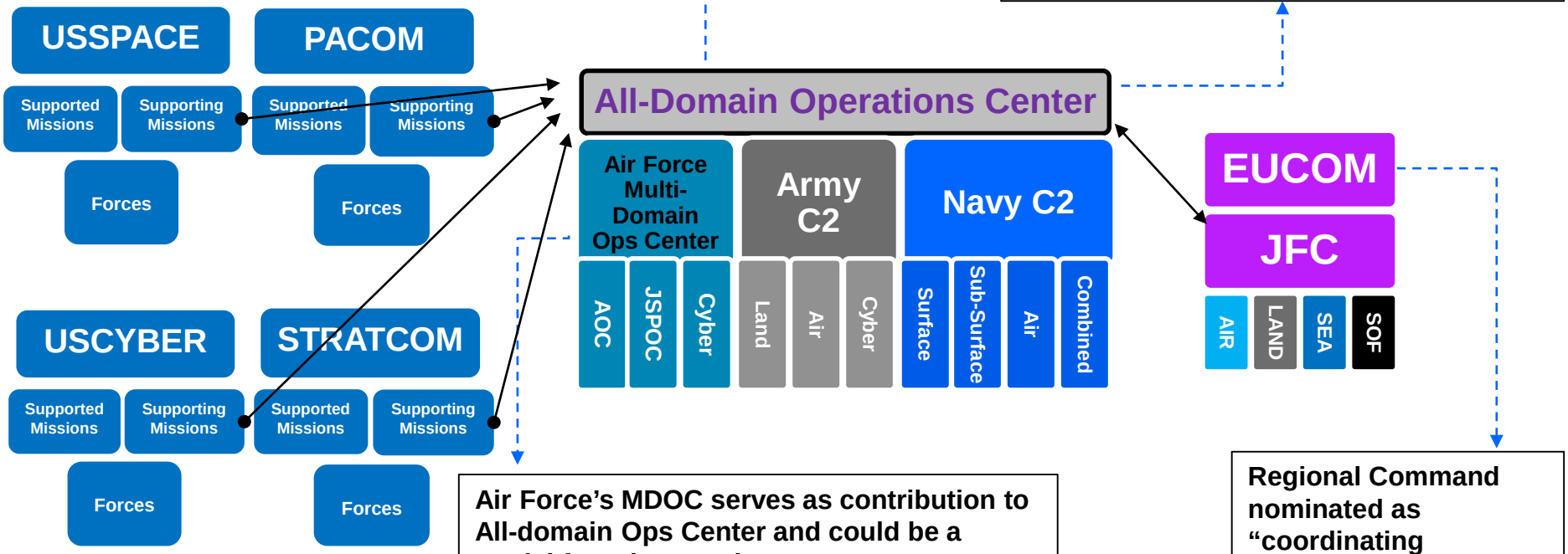
CJCS grants authority to Joint Fires Integration Center to adjudicate between supported and supporting command requirements

Provides a MDC2 "mechanism" to rapidly collect, assess, develop mitigation options for issues that arise as a result of this reliance on complex support relationships



Air Force's MDOC serves as contribution to All-domain Ops Center and could be a model for other services

Regional Command nominated as "coordinating authority" for planning

Converging on a Multi-Domain Ops Center

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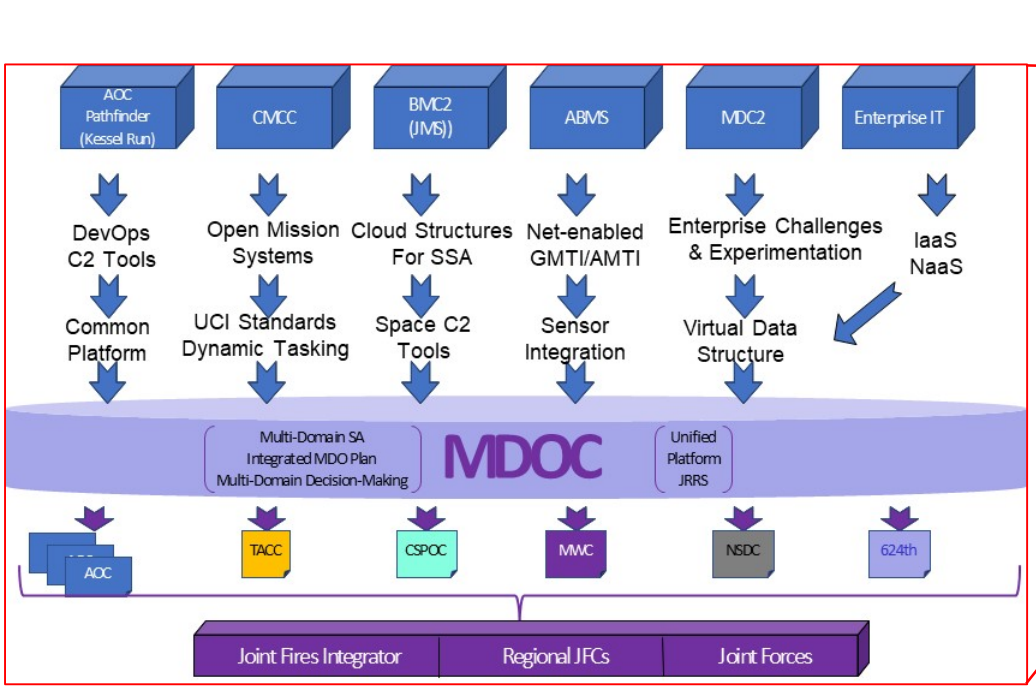

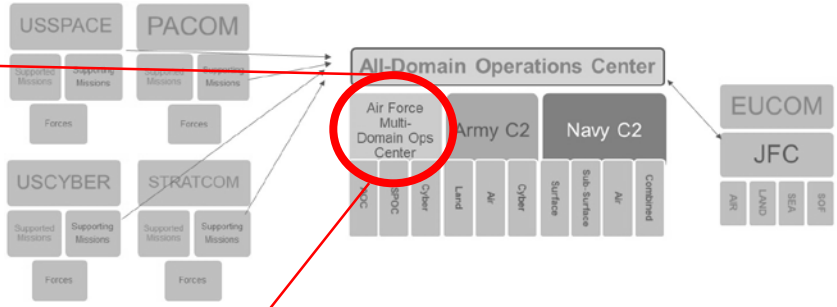

Converging programs on an "MDOC" synergizes and integrates effort and allows convergence of disparate technologies/initiatives to make multi-domain operations dynamic and seamless

"Integrated Multi-Domain Operational-Level Command and Control"

Way Ahead

- **Planning Starts for Doolittle ‘19 in Feb (recommend focus on MDOC)**
- **Establish OPT to assess/align requirements for MDOC Program convergence**
- **Outline Comprehensive “Wargame Framework”**

A Conflict Anywhere…. Will be a Conflict EVERYWHERE

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