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The Combined Air Operations Center
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Bettering National Response by Effectively Using
The Combined Air Operations Center

Introduction

When surrounded by chaos, you are not consigned to confusion. Understanding the principle of unity of command and the tenet of centralized control and decentralized execution allows and encourages a ready made solution set. Eliminating operational confusion requires a universally understood organizational structure to support joint and multinational/multi-organizational operations throughout the entire spectrum of national need. While Combined Air Operations Centers (CAOCs) have performed well in classical high-tempo force-on-force major theater operations, the marked increase in low-end conflicts and non traditional military operations supporting diverse National goals produces significant challenges. Today's challenge is day-to-day steady state operations for low-end of the spectrum engagements with a capability to "ramp up" to provide the capabilities of air power in both probable and ad hoc scenarios. Continually engaged CAOCs no longer focus on shifting from one relatively rare major combat operation to the next. The resulting requirement is to properly delegate and coordinate all functions necessary for command and control of air, space, and information operations under a variety of workloads and time constraints.

To meet these challenges, US forces require flexible, scalable, tailorable C2 processes and supporting systems that rapidly adapt to the level of need, including conflict, by connecting with worldwide capabilities, including joint, coalition force, Other Governmental Organizations (OGO), and Non Governmental Organizations (NGO). The stress of multiple geographically separate conflicts on manpower requires reliance on highly trained personnel. Therefore, in any operation involving air power, a single commander will be designated as the responsible member for air power forces assigned and attached. In a theater-size military campaign, as many as 2500 people inside the CAOC move massive amounts of information across various communication networks. The CAOC provides the Commander the capability to direct and supervise activities of assigned, supporting, or attached forces and monitor the actions of both enemy and friendly forces. The command element supporting the operational commander must be an appropriately sized staff housed in adequate command and control (C2) facilities like the AOC. Only when the operational level command organization is in place can it direct and support fielded tactical forces and interact with strategic level leaders and other organizations. Today, the Air and Space Operations Center (AOC[1]) AN/USQ-163 Falconer military C2 data center node is the senior element of the Theater Air Control System on the battlefield. It is a high value, low availability asset established over an extended period. The Air Force plans to field five permanent Falconers worldwide. Operational level C2 facilities like the AOC must expediently respond to any calamities. Today, it is ready to deal with any force-on-force situation. The CAOC, if effectively used, can eliminate the chaos that often exists at tactical level entities by providing a comprehensive process and equipment to sort out National level problems and respond to them with the speed and capabilities organic to air and space power. As Colin Powell said, "The military is a great hammer, but not every problem is a nail." A well trained and equipped CAOC can only address the problems in which solutions can be resourced. The planning and operation

[1] For the purpose of this article, the terms CAOC and AOC as well as JFACC and CFACC are synonymous

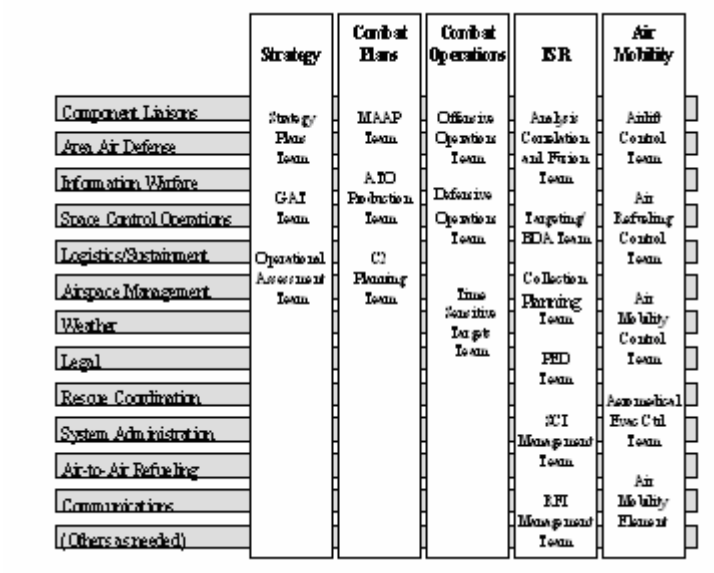
of the CAOC revolve around creation and execution of an Air Tasking Order (ATO) and associated documents. In the past, these documents were only associated with combat (kinetic) air power. This paper will look beyond the current structure and thought processes chained to our history and explore how the totality of air and space power can be operationally employed for the betterment of the nation state.

Walking into any of the five worldwide CAOCs for the first time is an extraordinary experience. It's just what you expect to see as the nerve center of the most powerful Air Force on earth. Huge projection screens show the exact location of every military aircraft flying over the theater of operations, CNN/FOX, and other news organizations and other situation displays. Rows of professional warriors operate computer screens and banks of telephones communicating worldwide, while absorbing vast amounts of information from organizations across the planet. In most CAOCs, the battle cab is a sensitive compartmented information facility (SCIF) for high level security. The Combined Force Air Component Commander (CFACC) sits in a room with his key staff around him. Video and data screens show live feeds from various sensors over the battlefield. Chat rooms abound on other screens at Top Secret, Secret and Unclassified level. Within easy reach of the CAOC is a sophisticated organization (Intelligence, Surveillance, and Reconnaissance Division [ISRD]) with multiple security layers that provides intelligence information from National agencies and Services across the globe to satisfy the commanders need for information. We have created a magnificent weapon system to control the air and space power of many nations as never before, now proven in recent and still continuing combat. It should be remembered, look at any site with a jaundice eye, there is an ancient Chinese expression: "There is only one most beautiful baby in the world, just ask any mother." Each CAOC is not always engaged in combat operations.

As with any military organization that is a Corps[2] or above headquarters, the structure (manning, equipment and training) is designed to accomplish a given mission and can flex as responsibilities, goals, and the situation change. The starting organization of CAOC as represented in current Tactics, Techniques and Procedures (TTP) documents is organized into five core divisions and specialty teams. There has not been very much written about the specialty team notionally described as "(Others as needed)". If exploited, this is where the power of the nation state can employ all airpower resources by correlating providers of air power with those who need the capabilities. Too often in the past, without positive intervention, the military goal becomes the product, not the capability. In the case of the CAOC, the goal was to be able to produce and execute the ATO-not to employ all available air and space assets to achieve a full range of National goals. It is easy to understand why this was the case. Employing large scale operational combat (kinetic) airpower effectively is extremely difficult for any organization and, given limited training time and resources, commanders wisely chose to concentrate on their most militarily difficult task.

The traditional concept of the product vs. the capability is reinforced by the construct of the primary training event, "Blue Flag," for US-based Air Force operational organizations. All models and simulations used in a Blue Flag support a force–on-force only scenario. The training audience is not encouraged to explore operational C2 concepts that would be used in Military Operations Other Then War (MOOTW).

[2] The CAOC is the Air Force equivalent to an Army Corps Headquarters.



The Traditional CAOC Organization

If we analyze how Operational Air and Space power has been used in the last 20 years, it quickly becomes evident that the number of days of continued combat air power used proportional to the number of days that the non-kinetic capabilities of air and space power have been used; the number of days of combat air power is disproportionately small. Recent hurricanes, earthquakes, natural disasters, and other events show clearly the need to effectively use the nation's air and space power by better execution at the operational level.

MOOTW are likely to be increasingly prevalent in the future. It is essential for the Nation to have the capabilities to undertake these type of operations quickly and effectively. In general, MOOTW are multifunctional operations and there is a need for the military to work with organizations not relevant in a warfighting scenario. The operations aim is to give civilian participants the secure environment and space they need to resolve the cause of the conflict. There are few, if any, models that capture these aspects of MOOTW. Doctrinally, there are a number of principals fundamental to success in such operations and many do not apply to combat air power. There are political, economic, social, religious organizations that provide information and need the non combat capabilities of Air Power. When considering MOOTW scenarios, we expect human and political issues to dominate and these may mask the effects of changes not considered in traditional air power concepts. Intelligence regarding location and movement of protagonists (human or natural forces) will be less revealing of the situation on the ground than in a warfighting scenario. Information flow is vital, moving from top to bottom to unify the force responding; from bottom to top to monitor execution; and laterally among adjacent forces and organizations to maintain unity of effort. The primary mechanisms that provide operational information for scenarios involving non-warfighting organizations will be commercial tools like cell phones, e-mail, MS office applications, web-based applications, text chat, Voice over IP (VoIP), and others like video teleconferencing, and faxes. This paper will address three constraints required to make the AOC a National resource to respond to all air power needs by providing a "right size" area to absorb NGOs/OGOs and others, infrastructure required, and training scenarios for probable and ad hoc future events.

Right Size the Area

Effective planning will mean the difference between panic and continuation of operations if and when ad hoc event strike an area an AOC is responsible for. A compressive plan can provide confidence and a tool to react and recover quickly and painlessly. IT planning and contingency planning strategies must respond to varied problems and circumstances. However, creation and maintenance of a sound plan is a complex undertaking. After the totality of Air Power capability is made available for planning, the plan itself must be constructed - no small task. That plan must be maintained, tested, and audited to ensure it remains appropriate to the needs of the Nation.

The first challenge in developing a new mission capability for the AOC is to determine the size of the expected response. Size will have two primary components: sizing the operational floor for personnel and sizing the communication infrastructure. Physical sizing for unknown events can easily result in over or under building. Each Falconer has developed an operations floor to conduct military operations based on need expected. The floor for new operators in an unclassified environment should be as large as the current combat floor.

One of the primary reasons to right size the virtual infrastructure is for record keeping. Historical records of the Department of Defense created in day-to-day and emergency operations are of enduring historical significance for US and world history and have been indispensable in rendering complete, accurate, and objective accounts of the Government's activity to Americans. Records play a vital role in management and operation of Air Force activities over time. They are a historical memory for the organization, record of past events, and basis for future actions. Commanders and their staff at all levels must implement records management programs to comply with Air Force Instruction and public law and protect the rights of the Government and persons directly affected by governmental actions. Air Force units at all levels must manage records systematically to ensure they are complete, accurate, trustworthy, and easily accessible. Today, there are very few records that are not electronically stored at some point in their life cycle. Centralized storage provides a venue for all electronic data to be sorted, delivered to National Archives, and processed as needed in a standard routine manner. In the past, operational records provided the basis for studies and analyses of policies, plans, operations, technology, logistics, and personnel that provided invaluable benefits for the National defense. It is of the utmost importance; therefore, that we preserve the historical records of current experience pertaining to any contingency or operational facility and derive from it information that can be applied in planning, shaping, and implementing the National defense in the future. To this end, the Secretary of Defense has directed that we identify, collect, organize, and preserve records, including paper, electronic media, imagery, and recorded information pertinent to activities in connection with current and projected operations. Centralized storage will make this easier.

An AOC function often discussed, but seldom accomplished, is in-depth operational analysis of all available data. Stored data could be made available for in-depth operational analysis. Operational Analysis is a subjective process occurring throughout the planning and execution cycle. The primary purpose is to provide the commander a comprehensive and timely status report of the campaign regarding established Air and Space objectives. Rigorous analysis is a critical input to all aspects of AOC operations. The output of analysis feeds the entire CAOC process, primarily through strategy. Analysis requires massive amounts of data from all networks stored over time to fully assess operational effectiveness.

A single central facility for data storage of electronic information will create in the minds of individuals responsible for National response planning that they are getting the most "bang for the buck." The central facility must be optimized to meet their precise needs - from performance to availability, consolidation, and more. The Falconer location must provide specific solutions to maximize use of existing storage resources, drive cost down, minimize complexity, and increase service by consolidating IT resources. Storage consolidation is an excellent cost-cutting, efficiency-boosting, availability-enhancing solution for organizations of all types and sizes in any industry or geographic location. It should be an integral part of our approach to delivering operational capability that maximizes the utility of the AOC.

The Infrastructure Required

When plentiful supplies of oil were discovered just over a century ago, this exceedingly cheap source of energy transformed industrial civilization. A century and a half earlier it was wood, coke, and coal provided the energy to launch the Industrial Revolution. Low cost, convenient, transportable, energy dense oil achieved a major change in the energy equation and made possible, more than any other factor, the world in which we live today. Few appreciate the magnitude of the energy density of oil. A barrel of oil (42 gallons), now selling for about US $100.00 after refining cost, is reported to contain energy equal to ~ 25,000 hours of human physical labor or 12 men working as farm laborers for a year. Measured against today's price of oil, human physical work is worth about 4 US cents a day. The average American consumes about 27 barrels of oil a year, which translates into each receiving the work equivalent of over 300 humans. As we move into the information age, communication density will be a reflection of capability.

Technology will not provide all required capabilities. It is necessary to ensure that investment in technology is directed at providing the maximum utility. Organizations increasingly depend on computer-supported information processing and telecommunications. This dependency will continue to grow with the trend toward decentralizing information technology to individual organizations throughout the global environment. The increasing dependency on computers and telecommunications for operational support poses the risk that loss of these capabilities could seriously affect overall performance and organizational response. Over and over again, plans are created that blend people and organizations in a very logical construct to probable or ad hoc scenarios and these plans fail because information processing and telecommunications infrastructure is not in place.

The current AOC information environment is comprised of data collection mechanisms, data and information stores, and knowledge bases produced and maintained by separate systems on networks segregated by security. This paper does not posit a solution to all information problems, but does address sharing knowledge between providers of air and space power with those needing that resource. The technology will be distributed client-server to deliver lots of functionality in a short time on a PC running Windows on some other desk for quick fix process. Traditional client-server denotes a distributed model where PCs interrogate database servers on the local area network. The distributed client-server architecture adds an entire layer of process or many layers of data and support to any system architecture if incorrectly built. Client-server is great for office programs, mail and workgroup connectivity solutions, and locally administered limited systems. As a rule of thumb, the more you distribute data, the larger an administrative

and security nightmare. Client-server requires support for servers and databases in addition to the PC and host systems already administered by each C2 node. The AOC must incorporate all users of Client-server information system. To meet this need, the AOC should have 50% available space within their unclassified server farm and the ability to absorb and store 50% more data than generated without NGOs/OGOs and other ad hoc partners.

The current environment cannot support shared data strategies because it has no enforced or prescribed data, storage, and accessibility standards or information generation requirements. The closest to a universal standard available is whatever "standard" current Commercial Off The Shelf (COTS) products use. All users cannot rapidly store, search, retrieve or automatically receive information and that impacts mission execution. A member cannot share produced information readily available to global partners across the networks aggregated by security classification. Thus, incomplete information exists across the enterprise and decisions are based on less then optimal situational awareness. Because of these facts, MOOTW events will be executed in an unclassified environment using the internet and COTS products. Information sharing that cannot be accomplished via machine-to-machine interaction due to the military security can be marginalized by human interaction because all members are located in the same facility. Therefore, requirements for initial bed down of joint, coalition, OGO and NGO are:

- Internal AOC networks must be able to quickly expand. Initial bed down should be accomplished by new users bringing provided IP addresses in conjunction with their own client computers. If possible, wireless technology should be explored. Ideally, additional expansion should only take as long as is necessary to physically hook up wires or expand the network with minimal configuration of software. AOC networks should support services that enable data transfer such as VoIP and support for collaboration tools.
- AOC networks must be agile enough to deal with addition and subtraction of needed organizations. By accomplishing the MOOTW event on the unclassified internet, addition of new members that may not be cleared for all information available is eliminated. Appropriate information will be shared face–to-face.
- By sharing information face–to-face, relevant information from US-only sources can be quickly and easily transferred. Most information will be unclassified, but working face-to-face, the time it takes to approve information for release can become less cumbersome.
- In rare cases, the AOC may have to provide restricted access to SIPRNET for organizational officers and embedded staff members. Some have a valid need to access information on SIPRNET in support of their duties. However, organization officers will never be granted unfettered access. This could limit their effectiveness. Other partners' staff members are in a similar situation in that they can't be as effective if they can only access an unclassified network (given current problems with putting relevant but unclassified information residing on classified networks quickly on unclassified networks). By executing event response, unclassified SIPRNET challenge should not hamper the operation
- Have in place 50% physical available space in hardware racks for new user provided unclassified hardware and allow new joining personnel to establish and maintain extended network. Some organizations will need data storage, therefore 50% available unclassified virtual space is required.

AOC data facilities, like other commercial enterprises, need increasing storage capacity and the ability to quickly and securely access tremendous amounts of data and information from any location. To meet these needs, new storage networking technologies such as storage area networks (SANs) and network-attached storage (NAS) can be used. The primary challenge of providing a centralized data storage facility is not technical (difficult but solvable); it is to place in the mind of highly independent organizations the desire to use it. Three tasks are needed to implement this strategy because humans will go to where the needed data is available.

- Data transfer must be automatic and require very limited manpower.
- Data transferred must remain under the control of the creating organization and the sending organization should receive "value" for his effort
- The receiving organization must able to use the data to support the overall effort beyond current capability

Networked storage helps enterprises speed access to data and reduce administrative overhead. As the amount of data stored increases, both businesses and government place greater demands on storage management, specifically enterprise backup/restore. The requirement for continuous access, coupled with the complexity of the growing disk "farms," demands strategies to meet time objectives. Data loss is unacceptable and continuity of operations mandatory. Because backup software is so widespread, the enterprise backup market is fairly mature and COTS products readily available, data storage should be a key to integrating OGOs and NGOs. The long-term requirement is as follows:

- Provide the ability for any member to use one unclassified network that provides immediate access to the information they require and are cleared to receive. The AOC must begin work now with our closest OGO/NGO and other partners. The long-term solution to information sharing over a single unclassified network cannot be solved by the AOC alone. Certain enabling technologies must be developed in tandem with our closest partners and most likely responders. The AOC cannot develop these enabling technologies in a vacuum and end up with an interoperable solution.

The plan for Operation "Torch," the World War II plan to invade North Africa, was 147 pages long. Technology has changed significantly since WW II. Today, we cannot write the technical specifications to build and connect two major C2 centers in 147 pages.

The US military and responsible OGOs/NGOs have stood up many small client server farms to achieve mission goals with various COTS and GOTS hardware and software.

In the context of most PowerPoint slides presented on the subject, an organization in an ideal state would be one in which connected computers cooperate with one another in a manner transparent to users. Information Technology (IT) architecture is evolving daily. The prevailing computing model of the current era is called client/server computing. A client is a single-user computer that provides (1) user interface services and appropriate database and processing services, and (2) connectivity services to servers (and possibly other clients). A server is a multiple-user computer that provides (1) shared database, processing, and interface services, and (2) connectivity to clients and other servers. In client/Server computing, an information system's database, software, and interfaces are distributed across a network of clients and servers that

communicate and cooperate to achieve system objectives. During initial standup, some organizations will want to bring their servers as well as their clients. That is one reason 50% unclassified server rack space should be always available.

Despite initial successes in the early 1990s of military C2 nodes transiting from standalone applications to a client-server environment, many are self destructing beneath the weight of data and systems requirements, which accumulate as a direct result of being successful. Prior to the proliferation of commercial IT to the military, a C2 node like the Air Operations Center (AOC) could lumber along with process changing very little from one conflict to the next. Now each C2 node responding to an event has coalesced as part of a large operating entity and create their own empires of data, processes, and C2 systems with devastating impact to the overall fielded forces in terms of efficiently accomplishing assigned tasks. The quantity of information is driving all National response to communication dense nodes. The impact of multiple information processing infrastructures and information distributed systems is a nation state that suffers from intrinsic loss in its ability to communicate and be productive with the quantity information available. Multiple definitions for data and systems within the current military force and OGOs/NGOs and other partners makes it nearly impossible to consolidate data or apply analytic metrics to measure lost or squandered opportunities.

There is a limited ability to establish global communications for distributed collaborative operations and process and move information in required timelines. Current WAN architecture cannot provide global connectivity when, where, and in a form needed quickly from a dead start. Global communications are not robust enough to support near real-time and real-time dissemination, retrieval, and processing of all critical information. Information latency imposed by the current communications transport infrastructure does not support true integration of automated capabilities in decision cycles. AOC operators employ separate physical and logical architectures to gain access to needed information at all security level.

The effectiveness/value of the unclassified network to MOOTW responders will rest on the quality of data housed on the system. As such, participants must create operationally-pertinent data sources compatible with expected users. Since MOOTW events are likely to be fluid from situation to situation and will need to be assembled rapidly for each new operation, commonly understood standards will be critical for success. They will be needed to support interoperability with a potentially wide range of partners and facilitate rapid assembly and deployment of communication infrastructure. Fortunately, the commercial IT market provides much of the capability for basic networking, collaboration, and communication. The AOC must remain current with commercial standards. The worst thing that can happen from a financial or coalition prospective is orphan standards or technology. To minimize confusion that can result from “bleeding edge” standards, CAOC unclassified networks should pursue the following actions:

- Begin building COAC systems and gaining experience with commercial specifications that are stable over time.
- Follow commercial specifications under development and influence various organizations to produce standards that satisfy understood CAOC needs. The COAC, as part of the DoD user community, has specific needs that are often consistent with requirements in the wider community, to which the vendors are expected to respond.

- Only contract to design and build systems that can make effective use of standards but are flexible enough to incorporate standards efforts in progress or that can reasonably be expected in the future.
- If possible, delay purchases of software that support sophisticated security approaches (e.g., federated identity). Purchase software that supports the stable standards. Avoid purchase of proprietary solutions or products that lock into only one vendor or suite of specifications.

Exercise and Train Together

At present, no one headquarter organization within the Air Force has made surfacing and solving these NGOs, OGOs and first responder operational problems a priority. The Air Force Major Commands (MAJCOMs) and their subordinate Numbered Air Forces (NAFs) have focused (understandably) on maintaining and improving their own performance in accomplishing essential tasks. Allowing NGOs, OGOs and other partners to fully participate in mission planning and execution is thought by some to detract from the training value of these exercises for military forces. Given current limitations, this view is correct to the extent that inclusion of ad hoc partners impedes the efficient use of the full array of US capabilities and data. On the other hand, excluding partners fosters an inaccurate perspective of our ability to operate effectively in real-world operations that likely will be fought in a MOOTW. The agencies that expend Air Forces resources have generally used their assigned resources to solve, "Air Force" problems, "Joint" problems, then "coalition" problems, OGO/NGO problems and first responders in that order. The overarching problem will be trying to rearrange that predefined mindset.

At least four major types of "training" events occur to train the operators in an operational Falconer: Innovation, Experimentation, Exercise, and Formal testing.[3] In each of these non-combat "training" events, a limited number of sub-systems and a greatly reduced number of people accomplish the processes used in a combat AOC. In "training events," personnel respond to artificial stimuli provided by modeling and simulation (M&S). The flow of information from M&S systems to be acted on by users and AOC sub-systems and then returned to M&S systems is a closed or semi-closed system.[4] As the AOC transitioned from a "family of systems" to a formal weapon system, a significant amount of documentation about processes, systems, and data flow was created. Simulated "training" events do not include robust information infusion from radio, non-database parsed message, text chat, e-mail, webpage download, telephone, VTC, or personal interaction between military commanders or civilian leadership that are present in the Falconer under traditional (kinetic) combat conditions.

Force on force training consists of various threads woven into an overall scenario to accomplish the objectives of a diverse training audience. Normally, the time span is limited to three to five days, in which Combat Operations will work only 12 hours a day. The overall goal of the event is to have participants perceive a well-orchestrated play. Data for player decisions is robust and "White Cell"[5] intervention is minimal. Orchestrating "training" events includes months of

[3] For brevity's sake; the term "training event" will be used instead of the four listed event types.
[4] Semi-closed because a limited number (<5%) of injects may be provided by virtual or live aircraft.
[5] "White Cell" is a term used to describe Subject Matter Experts (SMEs) and organizers that ensure desired training is accomplished and limitations of M&S mitigated.

planning and numerous conferences (Initial Planning, Mid Planning, Final Planning, and Live Fly Planning) in which participating organizations are continually engaged. The continual cycle results in a massive expenditure of manpower and financial resources. Although conferences accomplish their goal of getting diverse organizations to understand their nodal roles and responsibilities, systemic synergistic engineering level decisions seldom are addressed.

For the AOC to enter a new world of response to execute all National airpower would require standing up simulation models to provide the training. Simulated "training" events would include robust information infusion from radio, non-database parsed message, text chat, e-mail, webpage download, telephone (including VoIP), VTC, and personal interaction between military communities or civilian communities. Most force on force events start with "bad" country invading "good" country. To train for other types of events, the scenario would need to start with rendering a major population center unsustainable. The first few events would require extensive White Cell involvement. Modern M&S techniques could aid in overcoming current limitations because these training events are in a closed system. Robust simulation would encourage all responders' precipitation.

Conclusion

The primary objective of initial planning is to ensure AOC and all or part of its operations and/or computer services are usable to handle initial bed down of NGOs, OGOs, and others until long term planning and execution can accrue. Preparedness is key. The plan should minimize disruption of operations, ensure organizational stability, and provide an orderly implementation of any needed expanded communication services. Other objectives of initial interrogation planning include:

- • Providing a sense of security
  • Minimizing risk of delays
  • Guaranteeing the reliability of standby systems
  • Providing a standard for testing the plan.
  • Minimizing decision-making during a nation scale response event

The success of planning will foreshow the outcome of the integration of OGOs and NGOs in the first critical hours. The standing Unclassified floor should be somewhere between a "hot site" (A hot site is an operationally-ready data center that offers specific hardware platforms for immediate availability. Hot sites traditionally can be used for up to eight weeks in a continuous mode) and a "cold site" (An empty environmentally-conditioned computer room). Even after 9/11 and recent military and civilian calamities, some organizations refuse to accept data center infrastructure planning as a permanent function. Three to seven years ago, military planners began to understand the scope of effort required for military data center planning. A military data center like the AOC depends on management's ability to develop a plan to minimize disruption of critical functions, and capability to support all types operations expediently. The NGO/OGO bed down plan should be a comprehensive statement of consistent actions to be taken before, during, and after any probable or ad hoc event. The plan should be documented and tested to ensure continuity of operations and availability of critical resources. In the past, middle management response to detailed data center planning has often been "Why bother? We had the operating system functioning, some telecommunications, a few applications ran successfully - what more could we need?"

The greatest obstacle to success in any contingency plan is lack of commitment. If you don't have commitment, you don't have a plan. To get that commitment, management must understand the scope of what needs to be done to develop a completely functional contingency plan. The further one digs into the puzzle of recovery the dirtier it gets!

Initial planning will involve more than off-site storage recovery and backup processing. Each AOC location would develop and maintain a written plan for each Falconer that addresses all critical operations and functions required to execute any air power need. The plan would include documented and tested procedures that, if followed, ensure availability of critical resources and continuity of operations. A goal of the AOC Weapon System has been standardization of all Falconers. The probability of a disaster occurring is a highly unpredictable, and equally probable, event. A plan to integrate all responding parties is similar to liability insurance: it provides security in knowing that, if a catastrophe occurs, it will not result in operational disaster. The centralized planning team must respond in a few hours what had taken many years or decades to construct. They must have comprehensive knowledge. The team must be able to communicate on all levels within and outside of AOC to coordinate the proposed path of recovery.

Increasingly, the transnational challenges of today's environment dictate the need for effective multi-organizational operations. Ad hoc organizational roles in leading and supporting operations will continue to grow. Moreover, implementing these new concepts in partnership will further emphasize the need for effective AOC operations. Now, more than ever, military and non-military leaders require rapid automated means to share information and make decisions collectively and with their partners. A recent Ford television commercial touts their communication density as an enabling fact to their global success.

Infrastructure, systems, processes, and training must be shared and integrated to the maximum extent possible while ensuring the integrity and unity of command of all missions are maintained. This design will maximize response while promoting the independence and flexibility necessary to support complementary, but not identical, missions executed under unexpected conditions. This collaboration will provide an understanding from which interested parties can build a roadmap for further development and corresponding acquisition and modernization strategies.

The US Air Force has begun migration to a transformational network-enabled force. At the same time, collaboration with global partners has become increasingly important in warfare for political, access and overflight, and operational capabilities. However, new systems and technologies that enable effective networked operations are not always available or affordable to all partners. Adequate realistic training of US forces and many partners is not always undertaken. Instituting more effective net centric operations will require the appropriate communications, including data links; collaboration with new partners to best take advantage of their capabilities; exploitation of network capabilities compensate for inadequacies of participating partner systems. An evolutionary and affordable network-based collaborative planning and execution capability for both the US and its partners can be designed and implemented, which will, in turn, yield a more effective total force in future operations.

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