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**NAVAL WAR COLLEGE
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**NAVAL TACTICAL AVIATION IN THE CONTAMINATED BATTLESPACE:
CONSIDERATIONS FOR THE JOINT FORCE COMMANDER**

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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ABSTRACT

Weapons of mass destruction (WMD) are a leading security issue for the United States and present enormous challenges to its military. In light of joint and naval doctrine, this paper examines the chemical, biological, radiological (CBR) defense capabilities of U.S. Naval tactical aviation. Through an assessment of real-world practice, it concludes that current capabilities do not meet the doctrinal demands for sustained operations in the WMD environment. The paper also examines why this is so, and addresses some operational ramifications in order to provide considerations and recommendations for a Joint Force Commander.

Joint and naval doctrine, although somewhat unrealistic regarding unique shipboard conditions, need not be deliberately revised downward, as doing so would send the wrong message. Instead U.S. Navy tactical aviation must grow some very limited, non-zero capability to conduct strike operations in a “remote” CBR environment. This would afford the Joint Force Commander additional options to preemptively address a WMD threat early on in conflict, before other assets could be brought to bear in theater. Additionally, it would serve as a baseline for growth, and as technology improves, future CBR defense capabilities may permit limited operations in a “local” CBR environment. Until this limited capability is attained, however, commanders and their staffs must be aware of the shortfall in order to avoid false expectations in the planning or execution of WMD scenarios.

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"Whether or not gas will be employed in future wars is a matter of conjecture. But the effect is so deadly to the unprepared that we can never afford to neglect the question."
-- Gen. John J. Pershing, circa 1920¹

INTRODUCTION & THESIS

The National Security Strategy affirms weapons of mass destruction (WMD) as a leading security issue for the United States. Appropriately, this highly complex threat is prominently addressed in the National Defense Strategy, National Military Strategy, and other guiding documents which drive our military doctrine. The National Strategy to Combat Weapons of Mass Destruction is founded upon three pillars: Non-Proliferation, Counter-Proliferation, and Consequence Management. *Deterrence* is considered to be a subset of the Counter-Proliferation² pillar and logically includes the concept of overwhelming retaliation. Other important elements of deterrence, however, include credible "active" and "passive" WMD defenses³ which serve to minimize the vulnerability of U.S. forces.

Unsurprisingly, the conduct of military operations in a chemical, biological, or radiological (CBR) -contaminated environment presents enormous challenges. Our actual experience with CBR weapons, however, is limited; hence much of our doctrine for this dimension of warfare is based upon conjecture as to how individuals will react.⁴ Consequently, the operational commander must plan and act amidst substantial uncertainty.⁵ Numerous defensive precautions, for example, were taken for Operation Iraqi Freedom. During the push to Baghdad, coalition *land* forces at times received much media attention as soldiers and marines endured the grueling discomforts of their protective suits. To some degree, this visibly demonstrated their preparedness for

fighting in the CBR environment, but what can be said of the CBR defense (CBR-D) capabilities for *air* or *sea* forces?

U.S. Naval tactical aviation (USN TacAir) – air power from the sea – uniquely represents both domains. This paper examines its CBR-D capabilities in light of joint and naval doctrine. An assessment of real-world practice supports the thesis that *current USN TacAir CBR-D capabilities do not meet the demands of doctrine for sustained operations in the WMD environment*. The paper also examines why this is so, and addresses some operational ramifications in order to provide considerations and recommendations for a Joint Force Commander (JFC).

Scope & Terms

The severity of any WMD scenario is highly dependent upon the specific characteristics (lethality, persistence, transmission) of a particular weaponized agent, and upon the environmental conditions (wind and weather) in which it is employed. This paper employs general, plausible scenarios, but does not cover the infinite “what-ifs.” Necessarily then, it is broad in scope, and unless otherwise noted, assertions are speculative judgments by the author. For our purposes here, it is not only convenient, but also valid⁶ to regard an admittedly complex and highly disparate class of weapons as posing essentially the same operational problem – that of a *contaminated environment*.

The term “CBR” is used most frequently throughout this paper; however, many similar terms, such as “CB”, “NBC”, “CBN” or “CBRNE”[†], are commonly found in relevant documents and may be considered synonymous. The term “USN TacAir” refers here to carrier-based fixed-wing strike aircraft (such as the FA-18 or EA-6B). As such, the context of carrier *flight* operations, including aircraft launch and recovery, should be

[†] Variations using C/B/R/N/E: Chemical / Biological / Radiological / Nuclear / high-yield-Explosive.

affixed to the terms “CBR-D” and “IPE” (individual protective equipment); MOPP[†] Level IV is an additional element of this important context. Finally, the term “JFC” is considered to include key subordinates, such as Air/Land/Maritime Component Commanders (A/L/MCC), and principal staff members responsible for operational planning and execution.

DISCUSSION

Doctrine - What Capabilities Do the Pubs Demand?

Joint. Joint Publications (JP) 3-40 and 3-11 (Joint Doctrine for Combating WMD, and for Operations in NBC Environments, respectively) make it clear that if an adversary employs WMD, the U.S. military intends not only to minimize its effect, but also to continue combat operations right on through the event.

JP 3-11, for example, states outright that we “must be prepared to conduct prompt, sustained and decisive combat operations in NBC environments,”⁷ and subsequently devotes an entire chapter entitled “Sustained Combat Operations.” JP 3-11 aspires to enable JFCs to plan for, train forces for, and execute assigned missions across the full range of military operations and against a varied set of NBC-capable adversaries.⁸ It further asserts that continued training and visible exercises, which demonstrate capability to operate and succeed in NBC environments, are essential elements of deterrence. It places responsibility for such training with the Combatant Commanders and Services.⁹ Additionally, JP 3-11 states that NBC defense is paramount for effective sustained air operations.¹⁰ Offensive air operations may of course be required to support the concept of *active* WMD defense (e.g. pre-emptive strike), as described by JP 3-40.¹¹

[†] Mission Oriented Protective Posture.

The Universal Joint Task List is replete with WMD-related tasks which are intended to support the doctrine. For example, the task “Coordinate Passive CBRNE Defense in the Joint Operations Area” (OP 7.3)¹² seeks to ensure protection through a variety of methods, including individual protection. IPE for tactical aircrew has direct relevance to this task.

Navy. As one might expect, the preponderance of Navy doctrinal verbiage also implies that combat operations will continue through any CBR problem.

The Chemical and Biological Defense NATOPS[†] Manual provides an excellent example of this mindset. The motto on the NATOPS cover says it all: “...TO FIGHT THROUGH & FIGHT AGAIN IN A CB ENVIRONMENT.” It states up front that the threat “requires that all USN/USMC aviation units be prepared to survive, operate, and remain effective in a chemical and biological (CB) warfare environment”; it goes on to describe the manual’s overarching purpose as to provide the information, tactics, techniques and procedures needed to do just that.¹³ Furthermore the CBD NATOPS emphasizes the essential need to reinforce its study with practical training and drills¹⁴ and even *mandates* such training for the launch and recovery of aircraft for prolonged periods.¹⁵

The CBD NATOPS was recently revised as part of a greater post-Desert Storm effort by the CNO’s office to strengthen and modernize CBR capability Navy-wide. The OPNAV (N78) “CBRND Master Plan” describes the effort in detail and seeks, for example, to make certain through proper training that use of IPE, detection, and decontamination systems will become a “seamless” part of operations on board aviation-capable ships.¹⁶ Also from the CNO’s office, OPNAVINST 3400.10F articulates Navy

[†] NATOPS: Naval Aviation Training and Operating Procedures Standardization

CBR-D policy; that it is imperative U.S. forces be prepared to operate effectively in WMD-contaminated environments, with the goal that CBR weapons not be a decisive factor in any operation.¹⁷

The Universal Navy Task List, like the joint and Service doctrinal publications that it supports, contains frequent references to WMD. For example, one of the Measures for Task OP 6.2.8 (Establish NBC protection in the Joint Operations Area) is the percent of operational forces trained and equipped to operate in an NBC environment.¹⁸ In describing the Task NTA 6.1.1.1 (Protect Individuals and Systems) it includes “providing for passive defense in NBC environments” and specifically uses naval aircraft as an example.¹⁹ Under the task “Coordinate Chemical and Biological” Defense (TA 6.6) is ART 5.6 which is entitled “Execute Tactical Operations.”²⁰

Additional citations are unnecessary to further illustrate that both Navy and joint leadership expect combat operations to persist under CBR conditions. To be fair however, it is important to note that the publications do acknowledge the realities of reduced combat effectiveness while units are under the burdens of CBR defense.[†] Naturally, specifically quantifying that degradation is impossible, but clearly, the insinuation is that it should be minimized in order to permit the uninterrupted application of combat power.

Practice – What Capabilities Are Realistically Demonstrated?

In short, none. USN tactical aircrews simply do not train for flight operations in the CBR environment.[‡] Currently, Commander Naval Air Forces does not have any

[†] For an example see JP 3-11, II-7.

[‡] USN air wing personnel, while embarked as members of the ship’s crew, do routinely participate in some CBR-D training; however, this “ground” training does not involve the launch/recovery of aircraft and is not considered relevant to this discussion.

formally standardized CBDRT[†] training requirement²¹, perhaps because the majority of squadron ROC/POE[‡] documents do not specify CBR-D in sufficient detail.²² IPE is available by request²³ but is not routinely issued to squadrons or air wings for training or deployment. Informal interviews with 13 strike aircrew confirmed that CBR-D training does not occur in the fleet. This survey included two air wing commanders and accounted for over two hundred man-years of career experience, yet not one naval aviator had ever flown in IPE for CBR-D training.

It is useful to make a brief comparison with the other Services. The same survey included 11 USAF/USMC tactical aircrews and accounted for over 190 man-years of career experience. A cursory analysis of these interviews indicates an average of one to two CBR-D training sorties *per career*. USAF pilots tended to have a handful of simulator experiences as well. Clearly the USMC and USAF TacAir communities do conduct limited training from their land bases, but the capability should not necessarily be considered robust. Many pilots made speculative comments indicating a general inability of their Service to conduct *sustained* operations. The take-away here is that, unlike the Navy, its sister Services demonstrate at least some *non-zero* capacity for air operations in the CBR environment.

ANALYSIS

Why Does Practice Not Meet Doctrine...And So What?

If USN carrier aviation has assumed an institutionalized training routine which foregoes the capability to conduct aircraft launch and recovery operations in a CBR

[†] CBDRT: Chemical and Biological Defense (Supplies and Training) Type Readiness Report Code.

[‡] ROC/POE: Required Operational Capabilities / Projected Operating Environments.

environment, it may be very well justified. The gap, however, has not gone entirely unnoticed by the force providers of “Big Navy.” The spotlight on WMD in recent years has driven significant effort and resources towards closing it. Unfortunately, the solution has proven to be elusive in the face of technology limits, competing fiscal requirements and the arguably dubious nature of the threat. A short discussion of some key roadblocks follows.

Practicality and Safety. The shipboard setting is unique. The sheer density of personnel and equipment denies one of the most intuitively fundamental resources needed to conduct CBR defense – *space*. Typically CBR defense in any setting requires special stations for various tasks, such as donning, doffing, decontamination, access control and so on. Aircraft carriers are designed with some designated (and sometimes dedicated) working spaces, to accomplish these CBR-D tasks, but overall the “elbow room” is quite limited. Storage space is also always at a premium. Structural alterations to the carrier fleet have been considered, and may be required to provide (or rather, “reclaim”) enough designated IPE stowage areas²⁴, but this represents an expensive tradeoff. Furthermore, the carrier flight deck is necessarily one of the most crowded, dynamic and dangerous environments in all of aviation, even without the hindrances of CBR-D. To follow the lengthy and detailed procedures proscribed in the CBD NATOPS would realistically exclude any ability to conduct normal cyclic operations[†] – sortie generation would plummet to a mere handful. Admittedly, this is conjecture in that, to the author’s knowledge, sustained cyclic flight operations in a full CBR-D environment have never been attempted; however, the CBD NATOPS does acknowledge that a

[†] Periodic, high tempo aircraft launch and recovery evolutions between deck re-spotting and minor aircraft maintenance (re-arming, re-fueling); cyclic operations permit the aircraft carrier to maximize sortie generation while minimizing its time “into the wind”.

substantial drop in combat effectiveness would occur.²⁵ To attempt full scale CBR-D training would likely bring to a halt many other vital functions of the ship's operation, and excessively consume another precious commodity – *time*. Frequently, “fly days” at sea are too scarce to meet all the commander's needs for conventional training and proficiency, so absorbing a significant drop in ship-wide productivity could cripple CVN/CVW[†] readiness in core areas. Similarly, a large-scale CBR training scenario would likely “hijack” any major exercise and would therefore be incompatible with the IDRC milestones[‡] that involve *at-sea* training for air wings.

CBR protective ensemble designs impose serious limitations on any user, even the basic infantryman; but the severity of these limitations can be magnified by the flight environment, and even further exacerbated by the carrier setting. Marked physiological effects, such as heat build-up or decreased vision, hearing, and mobility, are to be expected by cumbersome and physically demanding IPE. These translate into numerous aero-medical and safety concerns such as excessive pilot fatigue during nighttime carrier landings, or even basic aircrew survivability in over-water ejection scenarios (because IPE is not watertight²⁶). For cold-water operations, otherwise mandatory anti-exposure suits are not compatible with existing IPE for CBR-D²⁷; therefore the unique remedies for each hazard are mutually exclusive. IPE improvement programs (such as JPACE and JSAM)[‡] are ongoing; however they face an uncertain future, nor are they likely to provide a quantum leap in overcoming the majority of impracticalities.²⁸

[†] CVN: Aircraft Carrier (Nuclear). CVW: Carrier Air Wing.

[‡] IDRC: Inter-Deployment Readiness Cycle; “COMPTUEX” (Comprehensive Training Underway Exercise) and “JTFX” (Joint Task Force Exercise) are both exemplary of routine IDRC milestones.

[‡] JPACE: Joint Protective Air Crew Ensemble. JSAM: Joint Service Aircrew Mask.

Furthermore, because of corrosion concerns, there is no “Navy-approved” decontamination solution available for direct aircraft wash-downs; rinse-water run-off must be collected and decontaminated separately (if not just washed over the side).²⁹

CBR-D technology is simply not mature enough to fully support the desired capability, and considering the above hazards, any institutional reluctance to even *attempt* CBR-D training is easily understood. In summary, the phrase “it’s just too hard” probably provides an accurate assessment -- but that is more likely to be overheard in a ready-room discussion than to appear in official policy.

Threat and Risk. General Pershing’s remark has enduring relevance here. If the conduct of aircraft launch and recovery operations at sea is fraught with impracticalities and safety concerns, then it comes down to an issue of risk management. Risk is an expression of *likelihood* and *severity*, but neither is easily quantified for many WMD scenarios. Essentially, there are two basic situations which must be addressed -- the aircraft carrier as the target of a WMD attack, and that its aircraft conduct a mission into some distant contaminated area; or said another way, “*local*” and “*remote*” contamination.

Local Contamination. Delivery can be one of the greatest challenges³⁰ to any potential adversary wishing to employ WMD, but of course, aircraft carriers are inherently mobile. As such, a ship’s maneuverability is considered critical to its CBR defense and relatively low vulnerability.³¹ On the other hand, ships are not immune, and once contaminated, its compact nature becomes a liability. Regardless of CBR-D training policy, it is possible that *all* air operations would have to be ceased so that maximum effort could be directed towards decontamination and preventing the spread of

CBR hazards inside the skin of the ship. In other words, some argue, if the ship suffers a real CBR attack, flight ops may be entirely out of the question until decontamination is completed, thus there is little point in *training* to fly in that scenario.

Remote Contamination. If the local scenario is characterized by a moving ship, then the remote scenario embodies “everywhere else”. Comparatively then, remote is less severe, but more likely.

Away from the ship, airframe surfaces can become contaminated by flying through a CBR cloud. Inside the cockpit, aircrews are at risk because strike aircraft are air-breathers; outside air is used for cabin pressurization and often to generate breathing oxygen. Generally, however, the higher the aircraft’s altitude, then the lower its risk of contamination³² -- presumably because the concentration of contaminant will be lower. One school of thought considers the risk *at altitude* to be negligible³³, but without concrete scientific study, the argument is as fallible as it is plausible. Given the range of possible agents, concentrations and environmental conditions, there appears to be no definable “safe altitude” above which IPE need not be worn.

Once contaminated, whether inadvertently or deliberately, returning aircraft must either be recovered or diverted. Recovering the aircraft for decontamination may risk the spread of contaminants to an otherwise “clean” ship, especially as the number of aircraft to be processed rises. Divert fields are not always available, and moreover, sending aircraft to shore bases may quickly deplete the carrier’s striking power.

Ramifications. Alongside the practical concerns and resource constraints, the debate over threat and risk assessment frames the essential but unanswered question: does the Navy *really* intend to fight its carriers “dirty”? For the time being, the *de facto*

answer is that Navy TacAir “doesn’t do windows.” So, what are the implications to the JFC, his Component Commanders, and their staffs? As long as doctrine is not supported by real-world capabilities, there are several potential problems.

The first potential problem is that of false expectations. As Commander of USPACOM, Admiral Thomas Fargo stated that CBR concerns pose “significant operational risk to Major War OPLAN execution”³⁴, so it is unlikely that *anyone* expects “ops normal” following a WMD event near U.S. forces. According to doctrine, however, the JFC will be planning to maintain a significant operational tempo during any WMD incident. To what extent remains to be seen, but the concern here is the assumption of some non-zero capability.

It is conceivable that many joint force leaders are simply unaware of the gap. A USAF-raised ACC, for example, may be predisposed to equate USN TacAir CBR-D capabilities with that of his own “native” service. Based on *perceived* operating capabilities then, there exists the potential for flawed calculations with regard to the planning or execution of operational moves and counter-moves in the CBR environment.

The second potential problem lies in the offensive element that air power brings to the Counter-Proliferation pillar of WMD strategy. In Operation Desert Storm, USAF F-111F fighter-bombers were sent to destroy Iraqi WMD sites; the risk of contamination required the aircrew to wear IPE.³⁵ Similar scenarios may present themselves in future conflict, and aside from air power, the JFC may have several options (e.g. TLAM[†]) at his disposal to neutralize an enemy’s WMD capability. Having *more* options, however, is generally better, and is particularly so in the dimension of *time*.

[†] TLAM: Tomahawk Land Attack Missile.

In the typical construct of any crisis response, the aircraft carrier is generally relied upon to provide the lion's share of air power *early on*. Unfortunately, WMD are not tools of last resort; they are tools of the weak against the strong and their use should be expected *early on* in conflict.³⁶ Often observed in war games, early use of WMD is an adversary's means to offset the tremendous U.S. advantage in conventional combat power.³⁷ Ports and airfields are considered to be choice targets because they are typically vulnerable to CBR attack³⁸, and the resulting effect is likely to seriously impede the U.S. ability to deploy its forces. For this reason, it is conceivable that a JFC might desire to preemptively strike at an enemy's WMD capability as *early* as possible as part of his active WMD defense. If, however, a particular WMD target is likely to contaminate the strike aircraft, then USN TacAir might not be available for the job during this critical period.

The third potential problem is simply the effects of lost sortie generation. On a good day at any Air Operations Center, it seems, there are rarely enough assets to satisfy every "customer", and this trend does not promise to improve. The transformational U.S. Army, having reduced its emphasis on organic artillery, has declared that it will place greater reliance on ACC's for airborne fires.³⁹ How then, if a (remote) WMD event should contaminate some future battlespace ashore, will the ACC re-apportion his already limited sorties? Land-based air will likely suffer a reduced capacity for sorties but Navy TacAir will be unable to compensate by shifting its efforts or surging in accordance with ACC needs. Furthermore, the ACC must also consider how to cope if Navy TacAir is unable to play altogether. Contamination of the carrier at sea (local) may eliminate not

only the Navy's strike-fighter sorties, but also the commonly show-stopping EW[†] sorties of its low-density, high-demand EA-6B (or FA-18G) aircraft.

RECOMMENDATIONS

Given *any* gap between doctrine and capability, there are essentially three possible general courses of action: revise the doctrine, improve the capability, or accept the status quo. Alone, none of these will provide a neat, clean solution to an admittedly wicked problem; however, they are worthy of some discussion in that order.

Doctrine Revision? Although doctrine is generally always under revision, a special deliberate effort is *not recommended* here. To close the gap through a revision of the doctrine is simply a way to meet the standard by lowering the bar. A deliberate softening of the language in myriad joint and Service documents would require an enormous administrative effort, and while words certainly do matter, the energies of staffers could probably be better employed for more critical tasks. At the end of the day, a doctrinal downgrade would not truly solve the CBR-D problem. Most importantly, such revisions would in fact have detrimental effects by sending the wrong message. The current doctrine expresses U.S. *intent*, but if the doctrine is weakened, it would be less deterring in the minds of potential adversaries who surely read it. Furthermore, the current doctrine also expresses requirements, which much be leveraged to improve capabilities.

Capability Improvement? Improving the capability is easier said than done. Doing so will incur additional costs, to include training time if not just funding. CBR-D technology may or may not eventually overcome the many real-world impracticalities

[†] EW: Electronic Warfare.

associated with the shipboard environment. A pragmatic approach is therefore warranted.

JFCs should seek to advance USN TacAir CBR-D capability from “none” to “limited.” This incremental improvement could be achieved on two fronts; first, by expressing support for ongoing and future technology improvements across the spectrum of CBR-D, to include IPE and decontamination materials.

Second, by voicing support of realistic CBR-D requirements for USN TacAir; for instance, to provide “X” counter-WMD sorties per day for “Y” days. Both “X” and “Y” would likely have to be very small numbers (say eight and two), but would provide a basis for future growth. In the near term, training to such a modest standard would be achievable only by limiting the number of trained aircrews to be maintained (say two or three per squadron) and by specifying a “permissive environment”. This approach would vastly reduce the otherwise prohibitive level of effort required, to include training time, volume of gear to be fielded, and number of qualified flight deck/maintenance personnel required. Moreover, it addresses, to some extent, the concern that the threat is not worth the expense, effort and tradeoffs required to attempt a more robust (but perhaps unachievable) capability involving *all* aircrew and support personnel.

For even this limited counter-WMD sortie generation concept, a “permissive environment” for the ship is likely to mean daytime, warm[†] water, and no *local* contamination. This would address some significant safety concerns, and better permit returning aircraft to be decontaminated organically. However, to do this even under optimum conditions may still be at the significant expense of conventional sorties.

[†] Typically, aircrew anti-exposure suits are not required for water temperatures above 60 °F.

Obviously, this presents a serious tradeoff to the JFC. It would, however, provide him additional *options* which he might not otherwise have -- such is the point of the recommendation. Alternatives may be attractive when the seriousness of a WMD threat demands immediate offensive action from the sea before the preponderance of other forces can be deployed.

This is not to say that the ability to fly in a locally contaminated environment can be ignored. The local scenario is more severe than the remote scenario, but is arguably less likely to occur. It should therefore be accepted as a secondary, longer-term goal for growth and, as technology and procedural know-how improve, should be pursued only after demonstrating an initial capability for remote scenarios.

Status Quo? Lastly, notwithstanding the current efforts of USN force providers, the gap between doctrine and capability is not likely to be closed quickly. Accepting the status quo is therefore at least a short-term necessity for the JFC. The recommendation here then, is simply to *promote awareness*. Otherwise, it is feasible that commanders and planners may assume a capability exists where there is none. Greater awareness will ensure that expectations are better in line with reality, and will facilitate improved risk mitigation efforts, or perhaps even viable workaround solutions, both in the deliberate planning process and during crisis response.

CONCLUSION

As the U.S. military transforms its “joint-ness” from mere de-confliction to real interoperability, and further still toward interdependence,⁴⁰ a Joint Force Commander must seek to minimize his uncertainty in the WMD arena. Advanced consideration of the

above recommendations will improve his ability to recover from, or avoid, WMD events during conflict. A realistic understanding of *current* Naval TacAir capabilities is essential to better shape *future* capacity in the joint CBR environment.

Joint and naval doctrines both demand that U.S. forces maintain the capability to sustain combat operations in the CBR environment. Currently, however, the U.S. Navy's carrier-based tactical aviation forces do not meet these expectations. At the root of this shortfall lie harsh realities of the unique shipboard operating environment, and the limitations of current CBR-D equipment. For now, the desired capabilities are perhaps un-executable, at least on any large scale, and leaves open the question of how, or even if, the Navy is to fight and fly in a contaminated battlespace. The doctrine is therefore somewhat unrealistic, but it need not be deliberately revised downward, as doing so would send the wrong signal to potential adversaries.

Instead U.S. Navy tactical aviation must grow some very limited, non-zero capability to conduct strike operations in the remote CBR environment. This would afford the Joint Force Commander additional options to preemptively address a WMD threat early on in conflict, before other assets could be brought to bear in theater. Furthermore, it would provide a foundation for future growth toward viable operations in the local CBR environment. Until this limited capability is attained, however, commanders and their staffs must be aware of the shortfall. Whether in deliberate planning or in crisis response, they must consider the potential impact of lost USN TacAir sortie generation in a variety of WMD scenarios.

Finally, CBR-D is a dirty problem which really only offers the promise of dirty solutions. *Any* improvement in CBR-D can only have a positive deterrent value, but we

must accept some risk while guarding against the over-commitment of resources to CBR defense in our zero-sum world. Given the intrinsic difficulties of CBR-D in all battlespace domains, this particular doctrine-capability deficit for naval aviation is likely to be only *one among many* for U.S. forces across the board. Together, their intangible -- but surely negative -- net effect on deterrence highlights the critical importance of the other elements of our greater strategy to counter WMD.

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