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The Future of Trans-Pacific Airpower Interoperability:

Preparation for a Growing Anti-Access/Area Denial Environment

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EXECUTIVE SUMMARY

The year 2010 is an important milestone for the U.S.-Japan Alliance, marking 50 years since the signing of the U.S.-Japan Treaty of Mutual Cooperation and Security. Looking forward, the recently released U.S. 2010 Quadrennial Defense Review Report (QDR)[1] emphasizes the importance of working closely with allies, especially as regional security environments become more complex. In turn, the Government of Japan (GOJ) is currently developing new National Defense Program Guidance (NDPG)[2], which will deliver its 10-year strategic plan.

Given the concurrent themes that will likely be reflected in each document, interoperability between the military forces of the U.S. and Japan will again be at the center of how these nations might build a closer and more effective strategic partnership. This becomes all the more important given a growing anti-access/area denial (A2AD) environment and increasingly contested global and regional commons.

The key question, though, is not whether these two nations' forces "*should*" build greater interoperability, but whether they "*can*," and, if so, "*how*"?

Early concepts of interoperability were predicated largely on the need to own and employ the same types of weapons systems. This military cooperation served as a useful deterrent during the Cold War, but luckily was never tested in the cauldron of actual conflict. However, Operation DESERT STORM (ODS), the Balkans air campaigns, and the more recent conflicts in Iraq and Afghanistan have witnessed the operational use of coalition airpower and highlighted both advantages and key lessons learned on critical gaps in capabilities and more importantly, doctrine and policy.

As the leading innovator in terms of network-centric operations, the U.S. is unintentionally establishing a widening gap between its capabilities and those of its partners. It is unlikely that U.S. allies will be able to address this shortfall in the foreseeable future, placing doubts on their ability to maintain the interoperability necessary to meet the QDR's calls for greater cooperation with key allies.

An analysis of the current situation, as well as lessons learned from the U.S. air partnership with other forces, including the British Royal Air Force (RAF), the French Air Force (FAF), the German Air Force (GAF), and the Royal Australian Air Force (RAAF), can provide crucial lessons learned for how the U.S. Air Force

(USAF)-Japan Air Self-Defense Force (JASDF) relationship might more effectively solve the challenges of developing greater interoperability. Despite a number of capability gaps between those allied air forces and the USAF, they have been able to improve levels of interoperability while simultaneously utilizing their own niche capabilities and unique strategic environments.

This analysis highlights that:

(1) All allied air forces anticipate that the capability gap between their forces and the USAF will continue to widen. Allied air forces need to prioritize mission areas and functions that can enhance interoperability in a practical manner.
(2) Political considerations and national caveats will invariably limit the ability of allied air forces to conduct coalition missions and roles that will be entirely complementary to USAF operations, but they do not preclude interoperability.
(3) A three pillared approach composed of doctrinal alignment, capability development, and trust-building appears to be the most effective approach to strengthening interoperability.
(4) Information sharing at all levels remains key to interoperability.
(5) "Decisive interoperability-enhancer(s)" should be identified. It is possible that this equipment will be mandated as a minimum theatre entry standard for future coalition operations involving the USAF.
(6) A rational approach to more effective commonality and connectivity will reinforce interoperability without undermining the national industrial base or mandating unnecessary investment.
(7) Standardization is extremely beneficial.
(8) Training/exercises under likely scenarios and based on realistic assumptions are key to improving skill and enhancing mutual trust.
(9) Co-investment on resource-consuming projects leads to cost-effectiveness.
(10) Interoperability-specific multinational frameworks, as exemplified by the Air and Space Interoperability Council (ASIC), are very effective.

In sum, a "plug-and-play" architecture is the essential function that must be pursued to provide the "bridge-gap" to interoperability. But technology is not the only important element to developing and maintaining interoperability; equally important is the ability to build enduring human relationships between each force to ensure mutual respect and trust.

The JASDF certainly has constitutional constraints that limit its ability to mirror approaches taken by other allied air forces in such areas as extra-territorial operations. In the Asia-Pacific Theatre, however, closely coordinated air operations and air-surface (maritime) operations must be emphasized over other approaches. When considering the characteristics of A2AD environments,

ballistic missile defense (BMD) and cruise missile defense (CMD) should be prioritized. The three-pillared approach, consisting of doctrinal alignment, capability development, and trust-building, may provide a useful framework for effectively enhancing interoperability. In particular, the Sensor-to-Shooter (STS) loop, as well as the Sensor-to-Actor (STA) loop, needs to be underscored.

Given these concerns, the following recommendations aim to build greater interoperability for the benefit of both parties:

- Multilateral efforts: Stand up an ASIC-like "multilateral interoperability council in the Pacific region," with primary responsibility for:
  - Developing a shared strategic vision for the region, to include the appointment of JASDF and other allied nation officers to USAF strategic studies groups and following the RAF model of populating key Pentagon offices with RAF officers.
  - Developing a common vision of scenarios that may require a bilateral or multilateral response in the coming decades and share strategic and operational requirements in the air and space domains.
  - Identification of critical domains, mission areas, and functions where efforts may be prioritized to effectively enhance interoperability.
  - Developing a multilateral interoperability roadmap that establishes key milestones for progress.
  - Standardizing operational procedures, and concepts. In terms of coalition operations, North Atlantic Treaty Organization (NATO) standards may provide a sound basis for development.

- U.S. Efforts:
  - Release critical interoperability-related technology, especially those of a "plug and play" nature, to key allies in a timely manner.
  - Allow allied participation in interoperability-related studies and ongoing and future projects.

- Japanese Efforts:
  - Accelerate the fulfillment of network connectivity with key assets.
  - Secure information released by the U.S. Government (USG).
  - Classify those assets that are interoperable and non-interoperable to allow for more effective allocation of resources within a limited budget.
  - Consider balancing capability and the industrial base (indigenous production or import foreign equipment appropriately).
  - Commit to parallel interoperability-related studies and projects to the greatest possible.

Policy can change quickly in response to crises, but it takes a long time to develop the actual capabilities, mutual trust, and joint vision and doctrine upon which effective action is built. Therefore, if we care about our alliance and the interoperability that underscores its utility, we need to take action, and we need to do it right away.

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[1] U.S. Secretary of Defense, "Quadrennial Defense Review Report, February 2010," (Washington, D.C.: Office of the Secretary of Defense)

[2] The National Defense Program Guideline set forth the basic principle of Japan's security policy and the basic guideline for Japan's defense capability in the future, including its significance and role as well as the specific organization of the Self-Defense Force and the target level of major defense equipment to be built-up based on these principles and guidelines.

CHAPTER ONE
Transformational Interoperability

(DOD) 1. The ability to operate in synergy in the execution of assigned tasks.

(DOD) 2. The condition achieved among communications-electronics systems or items of communications-electronics equipment when information or services can be exchanged directly and satisfactorily between them and/or their users. The degree of interoperability should be defined when referring to specific cases. (Joint Publication -1-02)[1]

(DOD, NATO). The ability of systems, units, or forces to provide services to and accept services from other systems, units, or forces and to use the services so exchanged to enable them to operate effectively together.[2]

Characteristics of Interoperability

First, what does "interoperability" mean in military terms? A series of DOD documents address definitions, but interoperability has been changing in conjunction with the evolving nature of modern operations and advancing technologies.

Early concepts of interoperability were predicated largely on the need to own and employ the same assets. However, an intense focus in Europe during the Cold War on the need for a multi-national response, under the auspices of NATO, led to the development of procedures and doctrine that would allow for the combined military power of the nations involved to be used in concert despite a wide range of different military equipment. This military power served as a useful deterrent during the Cold War, but fortunately was never tested in the cauldron of military conflict against the Soviet Union and Warsaw Pact. However, in 1991 the ODS dramatically illustrated the value of shared procedures and doctrine in a coalition. For example, joint USAF and RAF operations over Iraq came out of planning and practice that occurred through NATO in Europe. This was particularly true in the operational use of airpower with coalition nations contributing to an orchestrated air campaign. Interoperability had moved from the practiced theories and rehearsals of the Cold War into operational reality.

Interoperability Challenges and Dilemmas

Interoperability is a shared undertaking; one side's effort alone cannot effectively improve interoperability. As Mr. Jeffery Bialos, the Executive Director at John Hopkins University's School of Advanced International Studies (SAIS), states, "Twenty-first century coalition war fighting is not like a pick up game of basket ball at the gym, where we choose sides on a given day and fight together- working out the roles and relationships as the game progresses. It will take years of planning, information sharing, cooperative development, the creation of interoperability bridges, and shaping plug-and-play architectures[3] to develop true coalition war fighting capabilities. We need to develop a doctrine for missions together, train, and have interoperable equipment to be effective in coalition operations."[4]

However, there are some challenges and dilemmas that impede progress towards more effective interoperability and improvements to interoperability require rationalization and balance between these inter-related impediments.

(1) Interoperability Challenges

The most fundamental challenge is the lack of sufficient motivation, particularly in the United States, to develop more effective interoperability with its allies. As the preeminent military power, the United States has a tendency to underestimate allies' capabilities and to field sufficient forces to enable it to operate in isolation. This results in a paradoxical situation where inferior nations place greater reliance on U.S. power and resign themselves to an inability to keep pace with advances in U.S. capabilities, especially in terms of rapid transformations in technology. This paradox inhibits U.S. and allied efforts to enhance interoperability.

The current economic climate, however, has raised the specter of budgetary constraints even for the U.S. military. Mr. Bialos states, "The United States simply cannot shoulder alone the global burden of providing all of the high level capabilities that could be necessary in the region, including lift, precision strike, and the like, and would benefit from back up and redundant capabilities."[5] But rather than accelerating the decline of investment in greater interoperability, it places greater priority on the ability of U.S. and allied forces to contribute effectively – by being interoperable – to joint operations.

(2) Interoperability Dilemmas

Arguments regarding interoperability dilemmas are more complicated. First and foremost, there is the issue over whether nations should protect or share

technologies with their allies. Nations possessing superior technology tend to minimize the release of sensitive technologies, even to their key allies. The worry is that the technology might be transferred elsewhere or even that the allies of today could somehow become enemies of tomorrow (as an example, the sale of advanced F-14 fighter jets to Iran before the 1979 Iranian revolution). Thus, as one report by RAND warned, "the United States (or its allies) might have to fight against its (their) own systems or may find that they have been exploited by hostile states to produce effective countermeasures."[6] However, in many cases, such technology is indispensable for allies if they are to remain interoperable.

Second, there is the question of whether U.S. forces should be independent (self-contained) or more interdependent. As long as the United States remains sufficiently capable to deal with a variety of situations independently, it can preserve its own freedom of action and flexibility. But, as budgetary constraints start to take effect, can the United States afford this luxury? If the United States were to place greater reliance on interdependence with its allies, it would need to engage in prior debate or consultation and to balance between greater cost efficiencies and reduced levels of flexibility. In Kosovo, for instance, it took two weeks for the allied nations to reach a consensus on one of the target lists. [7]

Finally, there is a debate regarding the development of indigenous weapons versus a reliance on cutting-edge U.S. assets. From the purely military viewpoint, in many cases, the most efficient and quickest way to achieve interoperability is to simply introduce combat-proven U.S. weapons. However, defense industrial base concerns within each allied nation may inhibit this option.

Interoperability in the 21st Century 'Network-Centric Age'

Information-sharing and connectivity provide the shared situational awareness that is fundamental to decision-making and executing operations irrespective of established command relationships. The central tenet of this conceptual bedrock is a "plug-and-play architecture"[8] that enables bilateral or coalition partners to share a real-time operational vision, and conduct synchronized operations despite different locations and the constraints of mutual command authority.

The period since ODS has seen significant advances in technology, and what some have called the 21st Century "Network-Centric Age" presents considerable challenges to the information-sharing and connectivity that underpin interoperability. These challenges are particularly stark for those nations allied with the United States. As the leading innovator in terms of network-centric operations, the United States is unintentionally establishing a widening gap between its capabilities and those of its partners. It is unlikely that U.S. allies will

be able to address this shortfall in the foreseeable future, placing doubts on the ability to maintain the interoperability necessary to meet the QDR's calls for greater partnering with key allies. In fact, some allied officers believe that interoperability between the United States and the rest of NATO in terms of airpower has been degraded or has become harder to maintain since Kosovo. One potential reason for this degradation is a combination of steady reductions in defense budgets, a factor now likely to affect even the United States, and a growing trend to invest more heavily in ground forces to appropriately respond to ongoing operations in Afghanistan and Iraq. However, these campaigns have also offered opportunities for increased interoperability in specific areas, such as air-land integration. This includes the use of Remote Operated Video Enhanced Receiver (ROVER)[9] and new tactics taken from operational lessons identified.

Given these circumstances, real-time information sharing and connectivity are the essential functions that must be pursued to provide the "bridge-gap" for interoperability. Still, the quest for greater 'connectivity' cannot ignore one of the most important elements to maintaining interoperability: mutual respect and trust. Network-enabled communications technology such, as video teleconferencing and Blackberrys, allow remote discussion of crucial issues, but face-to-face interaction and the ability to work side-by-side remain crucial elements of building trust and sharing information.

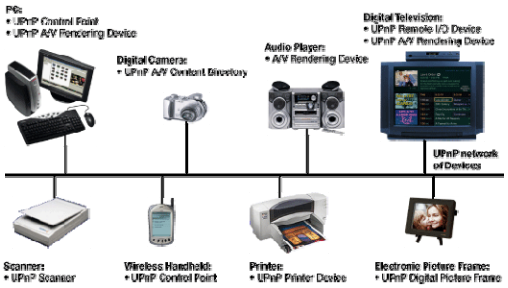
Why is "Plug-and-Play architecture (PnP architecture)" so important?

The term 'PnP architecture' was originally hardware-oriented, referring to common interfaces using cables and USB connectors to a variety of peripheral hardware such as computers, printers, and video cameras. Advances in technology transformed such architectures to a more software-oriented approach, and the introduction of wireless interfaces supported the creation of local area networks with an expanded number of peripheral devices and users. As wireless networks became the norm, a paradigm shift took place from "Plug-and-Play" to the concept of "Log-in-and-Play." Figure 1 shows transition of PnP architecture. [10]

Figure 1: Transition of PnP Architecture

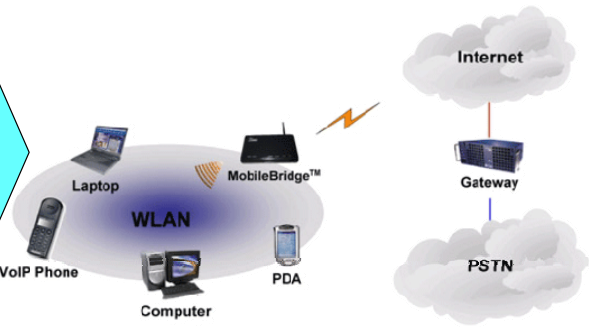
Hard-Wired

Wireless



Network at home

Game



This new paradigm had a marked effect in the military realm, spawning new architecture concepts such as STS loops, which comprise a variety of capabilities, including air and ground-based sensors and offensive platforms, such as maritime vessels, combat aircraft, and even individual soldiers. These components are inter-connected within a sophisticated command, control, and communication system linked to decision-makers- national command authorities and combatant commanders. Those operating within these constellation architectures can seamlessly share a common operational picture (COP), better distinguish friendly forces from adversaries, deliver efficient effects, and appropriately respond to fleeting or time-sensitive targets. As a result, such PnP architectures provide a quantum leap forward in the context of interoperability, as evidenced below:

Eight thousand miles away and ten time zones to the west, a U.S. Air Force captain was remotely operating a Predator UAV in the skies over Tikrit, north of Baghdad. The UAV's sensors were searching the ground for signs of Iraqi activity and sending the imagery via satellite back to the continental U.S. Ordering the Predator to zoom in on a suspicious object, the captain quickly identified an Iraqi SA-2 SAM systems that had moved into a position from which it would be able to threaten friendly coalition aircraft. Relaying this information over a secure communications link to the U.S. Air Support

Operations Centre (ASOC), the Predator continued to monitor the site. Having evaluated the data, including the precise target latitude and longitude, the ASOC ordered the Tornado GR4s to move north towards Tikrit. Meanwhile, a U.S. Navy EA-6B moved into position to jam the SA-2's radar system to mask the approach of the Tornados.[11]

This operational example highlights two significant features of the PnP architecture. First, the STS loop allowed each service and coalition partner (the U.S. Army's ASOC, the U.S. Navy pilot, and the RAF crew) to act as 'decision-maker' or 'shooter' with their own niche capability. Additionally, seamless connectivity among these components by advanced data links and satellite communications enabled them to conduct a time-sensitive task while sharing a real-time COP at a great distance.

Moreover, PnP architecture has brought a 'gap-filling effect' by:

(1) Bridging the Capability Gap

A PnP architecture provides greater flexibility when engaging in either bilateral or coalition operations. Utilization of partners' capability through the network allows an effective contribution to a wide range of missions while maximizing indigenous capabilities within the limits of governmental authorization. Therefore, connectivity to the network PnP architecture can revitalize legacy platforms and does not impose a burden on allies to create their own self-contained architecture or capability.

(2) Bridging the Language Barrier

In general, PnP architectures do not require militaries to communicate through language fluency. Rather, they require minimized communication and transmission of data to avoid being detected by an adversary. Hence, the ability to precisely understand what each display and symbol on those displays means in an operational and tactical environment allows allied partners, even those speaking different languages, to share the COP and contribute to the operation without any verbal communications.

(3) Bridging the Command and Control (C2) Gap

Before PnP architectures became practical, sharing such a COP in a timely manner mandated physical co-location. However, by utilizing networks, allies can share vital information in a timely manner no matter what type of command relationship they establish and no matter where they are physically located. A PnP architecture can therefore be regarded as a gap-filler in terms of command and control. All of these reasons will make common standards of information

assurance and cyber defense paramount as allies must ensure confidence in each other's cyber networks in order to share information.

How do we measure the level of interoperability?

As mentioned earlier, sharing the same situational awareness is the backbone of contemporary interoperability. Thus, the interaction between the level of information sharing and operational expectations is the crucial benchmark of interoperability. In a sense then, there are three levels of interoperability, as shown in Figure 2.

Figure 2: Level of Interoperability

	Level of Information Sharing	Typical Way of Cooperation
Level-1 **De-confliction**	Method ・***non***-secured communication, paper Contents ・***Minimum*** operational info. Time required: ***Days***	・Missions can be conducted and accomplished. However, in order to avoid midair collision and friendly fire, ***discrete airspace*** will be assigned. ・***Inflexible*** to the change of plan.
Level-2 **Coordination**	Method ・***Basic*** secured communication, data link Contents ・***Basic*** operational info. Time required: ***Hours***	・Both can conduct variety missions in the ***same airspace based upon pre-coordinated plan***. In addition, both can match up the ***operational tempo***. ・***Limited flexibility*** to the change of plan.
Level-3 **Synchronization**	Method ・***sophisticated*** secured communication and data link Contents ・***Sensitive*** operational info. Time required***: (near) Real-time***	・Both can conduct variety of missions in the ***same airspace in a closely and timely coordinated manner***. ・***Highly flexible*** to the change of plan

[1] Joint Publication 1-02, Department of Defense Dictionary of military Terms, [On-line]. URL: http://www.dtic.mil/doctrine/dod_dictionary/data/i/4931.html (Accessed, May 28, 2010)
[2] [On-line]. URL: http://www.answers.com/topic/interoperability (Accessed May 28, 2010)
[3] The notion of "plug-and-play architecture" is discussed later in the paper.
[4] Jeffrey P. Bialos, *Ideas for America's Future Core Elements of a new National Security Strategy*, (Washington, D.C.: Center for Transatlantic Relations, The Paul Nitze school of Advanced International Studies, The John Hopkins University, 2008), p.476.
[5] Bialos, p.466.
[6] RAND Project Air Force, "Interoperability: A Continuing Challenge in Coalition Air Operations, Chapter Two A BROAD DEFINITION OF INTEROPERABILITY," (Arlington, VA.: RAND Corporation, 2007) [On-line]. URL: http://www.rand.org/pubs/monograph_reports/MR1235/MR1235.chap2.pdf
[7] Dr Carlo Kopp, "Intelligence, Surveillance and Reconnaissance during Operation Iraqi Freedom," [On-lin]. URL: http://www.ausairpower.net/DT-ISR-OIF-04.pdf (Accessed on May.28, 2010)
[8] The notion of "Plug-and-Play architecture" is discussed later in the paper.

[9] ROVER is a system which allows ground forces, such as Forward Air Controllers , to see what an aircraft or unmanned aerial vehicle is seeing in real time by receiving images acquired by the aircraft's sensors on a laptop on the ground. There's little time delay and usage of ROVER greatly improves the FAC's on the ground reconnaissance and target identification which are essential to close air support. [On-line]. URL: http://en.wikipedia.org/wiki/ROVER, (Accessed on May 30, 2010)

[10] Plug-and-Play architecture, [On-line]. URL: http://www.deviceforge.com/files/article036/it06031_g2.gif, http://nicholaschinwaichoong.blogspot.com/, http://www.topglobalusa.com/images/j06.gif (Accessed on Jun.21,2010)

[11] United Kingdom Ministry of Defense, "Operation in Iraq: Lessons for the Future," (London, Directorate General Corporate Communication (DCCS), London, December, 2003), [On-line]. URL: http://www.mod.uk/NR/rdonlyres/734920BA-6ADE-461F-A809-7E5A754990D7/0/opsiniraq_lessons_dec03.pdf. (Accessed on Jun.4, 2010)

CHAPTER TWO
Current USAF and JASDF Interoperability

Turning to the USAF-JASDF relationship, it is only right to recognize the significant support provided by the USAF when the JASDF was stood up in 1954, which created a "special relationship" Between the forces. The JASDF has seen the USAF as a de facto teacher and advisor since its establishment, and U.S.-designed equipment, including fighters, air transport aircraft and munitions, have continued to form a major proportion of its inventory.

But defense cooperation extends beyond simple procurement and into the training and exercise arena. The JASDF has been engaged in variety of bilateral exercises and training with U.S. air forces since 1975. Such engagement has ranged across a variety of combat and non-combat roles, and continuous efforts in these areas enable Japan to upgrade and share the concepts of operations, procedures, and techniques to a large degree. However, JASDF forces have yet to conduct combat air operations with the USAF, either bilaterally or as part of a coalition. The contribution by the JASDF to enduring operations has been limited to a 5-year humanitarian and reconstruction assistance operation in Iraq utilizing its C-130 aircraft.

Political Considerations and Future Assumptions

This lack of key coalition combat experience is due to the legal framework and the defense policy under which the JASDF operates, centered on an "exclusively defense-oriented policy." The GOJ determined that the deployment of forces for overseas combat operations is prohibited by Japan's constitution. Furthermore, the GOJ has imposed a ban on exercising the right of collective self-defense. These defense policy and legal restrictions are unlikely to be relaxed in the near future. Hence, it is appropriate to assume that such legal frameworks will endure in the years to come. In this light, coalition practice and engagement in real humanitarian assistance operations (HA), disaster relief operations (DR) and the surveillance and defense of the global commons offer viable opportunities to enhance interoperability. Interoperability can be improved even when the political will is not present to participate in kinetic coalition warfare. In the end, due to the lengthy time required to establish interoperability and standardization amongst allies and the constantly changing nature of interoperability, it is prudent to engage in this activity prior to a crisis that may change the political will to take part in kinetic coalition warfare.

Current JASDF Force Structure

Before addressing the JASDF's interoperability with the USAF, it is necessary to outline the current JASDF force structure which does include kinetic airpower capabilities- a so-called high-intensity operation conducted mainly in the event of armed attack against Japan. The JASDF's force structure is designed primarily for air defense operations, equivalent to defensive counter air (DCA) in U.S. terms. Its Integrated Air Defense System (IADS) consists of three core functions: ISR, Command, Control, and Communication (C3) systems, and fighters augmented by double digit Surface-to-Air Missiles (SAMs). Most ISR assets are indigenous and complement airborne assets such as RF-4, AWACS, and E-2C. The central C3 system, namely the Japan Aerospace Defense Ground Environment (JADGE), is considered a system-of-systems. Focusing on shooters, a capable interceptor fleet is based around the F-15 J/DJ models, augmented by a limited number of F-2 fighters. In addition, SAM units, comprised of PAC-2, and PAC-3 batteries, are widely deployed to defend vital areas. The latter's primary role is to deny and defeat enemy naval/ground forces when and where necessary. There are no bombers or attack aircraft in the inventory.

The JASDF also operates what might be termed non-kinetic airpower capabilities, which are mainly utilized in the event of HA/DR. Search and rescue (SAR) assets, U-125 search aircraft and UH-65 rescue helicopters, are deployed to conduct SAR in or around Japan in a timely manner. Airlift capabilities are basically designed for domestic transportation, with the inventory composed of indigenous C-1 tactical airlifters and C-130s. Although the JASDF accomplished its first long-term mission in Iraq using C-130s, limitations in range and payload will continue to constrain its contribution until the C-2 indigenous airlifter enters service. In addition, the JASDF recently introduced the KC-767 air-to-air refueling tanker and transport aircraft.

What is the current level of USAF-JASDF interoperability?

Using the measurement system illustrated previously, what is the current level of the JASDF's interoperability with the USAF? From the viewpoint of information sharing, only a limited number of assets are equipped with secure communication systems and data links, devices often seen as prerequisites for real-time coordination. Most importantly, a COP cannot be shared in most of the Air Operation Centers (AOC). Although operational interoperability has been improving through advanced bilateral exercises, such as RED FLAG ALASKA[1] and COPE NORTH GUAM,[2] the JASDF believes that it has achieved a level of interoperability with the USAF at the high level 2 ("Coordination").

It is worth mentioning that ballistic missile defense (BMD) is the only exception. As North Korea's ballistic missile threat has become increasingly dangerous since 1998, the need for time-sensitive reaction has led to the accelerated establishment of a bilateral defense posture against ballistic missiles, both operationally and technologically. The USG's Ballistic Missile Defense Review (BMDR) states, "The United States and Japan have made considerable strides in BMD cooperation and interoperability in support of bilateral missile defense operations. Japan has acquired a layered integrated missile defense system that includes Aegis BMD ships with Standard Missile 3 interceptors, Patriot Advanced Capability 3 (PAC-3) fire units, early warning radars, and a command and control system."[3] As a result, the JASDF can assess this particular focused-function as low level-3 ("Synchronization").

With regards to hardware-oriented operability and Japan's industrial base, Japan has licensed production of U.S.-designed core weapon systems, such as fighters and missiles, since the formation of the JASDF. Simultaneously, some Japanese aerospace companies and their subsidiaries have produced aircraft based on indigenous designs and technology. This has allowed the GOJ/JASDF to achieve a balance between military capabilities and maintaining Japan's industrial base.

However, now that we have entered a 'network-centric age underpinned by transforming software-oriented technology,' these cutting-edge weapons systems have unfortunately become "disconnected" systems. Moreover, Japan's inability to participate in any multinational military programs, such as the Joint Strike Fighter[4] and the Multifunctional Information Distribution System[5] leaves it unable to keep pace with leading-edge technology and production efficiencies. Finally, the reduced national defense budget has also accelerated the decline of Japan's defense industrial base.

Why does USAF-JASDF interoperability need to be improved?

The strategic environment and Japan's geostrategic location indicate a clear requirement for greater interoperability between the USAF and the JASDF. First and foremost, the Asian-Pacific region, also referred to as the Western Pacific, faces a range of complex security challenges, particularly growing anti-access/area denial (A2AD) environments or contested commons. An A2AD environment demands greater investment of resources and time-consuming efforts to strengthen deterrence and expand potential response options. This environment could even put U.S. airpower into a severe defensive position. The USAF and the JASDF must therefore work closely to maximize the utility of sharing their respective capabilities – both kinetic and non-kinetic – in this theater of operations.

Three recently-released documents provide an overview on this unique strategic environment.

The QDR describes A2AD strategies as those that "… *seek to deny outside countries the ability to project power into a region, thereby allowing aggression or destabilizing actions to be conducted by the anti-access power.*"[6] While pointing out missile systems' increasing accuracy and range, the QDR emphasizes the increasing vulnerability of U.S. forces that are forward deployed: *"Air bases, ports of debarkation, logistic hubs, command centers, and other assets essential to high-tempo military operations could be at risk."*[7] Finally, a non-governmental organization, the Center for a New American Security (CNAS), gives us a similar warning in its paper, "Contested Commons:" " *The main operating bases in Okinawa, the main island of Japan, as well as the increasingly important base on the U.S. territory of Guam are already well within the striking distance of Chinese missile systems*." [8]

From an operational perspective, Dr. Krepinevich of the Center for Strategic and Budgetary Assessments (CSBA) articulates what an A2D2 environment looks like and what operational efforts are required to overcome it in his paper, "*Why AirSea Battle*?"

To sum up, early in any conflict the PLA[9] *would likely seek to deny the United States the ability to launch strikes from its bases in the region, such as Kadena Air Base on Okinawa, and (eventually) Andersen Air Base on Guam. The PLA's 2nd Artillery would launch massed salvos of ballistic missiles at these bases, followed by waves of PLAAF*[10] *strike aircraft. These strikes would target aircraft on the ground as well as runways, taxiways, fuel and munitions storage facilities and maintenance facilities. Similar strikes against major U.S. surface combatants operating in the Western Pacific would be undertaken by Chinese ASBMs, ASCMs*[11] *and strike aircraft. These would be supplemented by PLAN*[12] *submarine torpedo attacks. At the same time, Chinese air defense SAM batteries and fighter interceptor aircraft would seek to establish air superiority over the target of its military campaign. Any forward-deployed U.S. forces surviving such an attack, or reinforcements moving into the theater of operations might also have to operate with degraded or non-functional battle networks, the result of Chinese ASAT*[13] *and cyber attacks.*

As the great Chinese military theoretician, Sun Tzu, observed, the acme of generalship is being able to win without fighting. It appears the PLA is incorporating this philosophy in its efforts to create an A2/AD network, whose ultimate goal appears to be to raise the U.S. cost of power-projection operations in the Western Pacific to prohibitive levels, thereby deterring any American effort to meet its defense obligations to allies in the region while setting the conditions for a potential latter-day Chinese Greater East Asia Co-Prosperity Sphere of influence.[14]

Given such a scenario, Japanese soil would be attacked or an attack would become imminent. Under such circumstances, it is obvious that the GOJ would legitimately authorize the Self-Defense Force to exercise the right of self-defense. Furthermore, the situation would call for the USAF and the JASDF to conduct bilateral air operations in or around Japan. Therefore, at a minimum, the JASDF must be interoperable with the USAF and one of the U.S.'s key allies.

Second, the future geographic environment of the Asian-Pacific region will also likely require greater interoperability between the USAF and the JASDF. As recent catastrophic tragedies prove, Asian-Pacific nations are frequently hit by massive earthquakes, sometimes followed by devastating Tsunami. Such natural disasters often require international timely support, including military assistance such as HA/DR. As the situation after the earthquake in Haiti showed, the USAF and the JASDF need to be able to react promptly to such events and coordinate at peak levels in order to save lives.

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[1] RED FLAG is an advanced aerial combat training exercise hosted at Nellis Air Force Base, Nevada and Eielson Air Force Base Alaska. Since 1975, air crew from the United States Air Force (USAF) and other U.S. military branches and allies take part in the exercises, each of which is two weeks in duration. [On-line], URL: http://en.wikipedia.org/wiki/Red_Flag_(USAF) (Accessed on Jun. 13, 2010).

[2] Cope North is a regularly scheduled joint/bilateral exercise held by the United States and Japan. The purpose of the exercise is to provide a venue for bilateral cooperation and to improve capabilities for the defense of Japan. This exercise will be the first for the Japanese Air Self Defense Force's F-2 to participate in an exercise outside of Japan. The first Cope North was held Nov. 27 to Dec. 1, 1978, at Misawa Air Base, Japan. Cope North exercises are scheduled up to two times each year. [On-line], URL: http://www.globalsecurity.org/military/library/news/2007/06/mil-070604-afpn04.htm, (Accessed on Jun. 13, 2010).

[3] U.S. Secretary of Defense, "BALLISTIC MISSILE DEFENSE REVIEW REPORT, February 2010," (Washington, D.C.: Office of the Secretary of Defense).p.32.

[4] The Joint Strike Fighter (JSF) Program, formerly the Joint Advanced Strike Technology (JAST) Program, is the Department of Defense's focal point for defining affordable next generation strike aircraft weapon systems for the Navy, Air Force, Marines, and our allies. The focus of the program is affordability -- reducing the development cost, production cost, and cost of ownership of the JSF family of aircraft. [On-line]. URL: http://www.jsf.mil/program/ (Accessed on Jun. 2, 2010)

[5] MIDS is the NATO name for the communication component of Link-16.One commonly used instantiation of an MIDS is the MIDS-LVT (MIDS Low Volume Terminal) which has been funded by the United States, France, Germany, Italy, and Spain and developed by MIDSCO, a JV shared by Thomson CSF, GEC, Siemens, Italtel and Enosa. Another such terminal is the MIDS Joint Tactical Radio System, which is currently under development by the United States. [On-line]. URL:http://en.wikipedia.org/wiki/Multifunctional_Information_Distribution_System (Accessed on Jun. 2, 2010)

[6] Ibid, p.31.

[7] Ibid, p.31.

[8] Abraham M. Denmark and Dr. James Mulvenon, "Contested Commons: The Future of American Power in a Multipolar World," (Washington, D.C.: Center for a New American Security), p.95.

[9] People's Liberation Army.

[10] People's Liberation Army Air Force.

[11] Anti-Ship Ballistic Missile, Anti-Ship Cruise Missile.

[12] People's Liberation Army Navy.

[13] Anti-Satellite.

[14] Andrew F. Krepinevich, "Why AirSea Battle?" (Washington, D.C.: Center for Strategic and Budgetary Assessments, 2010), p.25.

CHAPTER THREE

Case Studies: What Can Other Allied Air Forces Teach Us?

The Royal Air Force Model

In discussions of interoperability, one of most crucial case studies is the British Royal Air Force and its relationship with the USAF, often described as "unique." Despite a number of capability gaps between RAF and USAF equipment, the RAF has been able to maintain high levels of interoperability with the USAF.

Operation ALLIED FORCE (OAF), a notable air campaign conducted mainly in Kosovo in 1999, made painfully clear many of the overwhelming 'capability gaps' between U.S. military forces and their European allies. Shortly after OAF, Retired RAF Air Vice Marshal R.A. "Tony" Mason stated: "There are two kinds of airpower- the United States' airpower and everybody else's."[1] Using the previously cited chart (Figure 1), the level of interoperability between the RAF and USAF during OAF was assessed at "Level-2 (Coordination);" the RAF could coordinate its missions within the overall USAF construct but could not be said to offer synchronous activity with superior U.S. assets. Furthermore, a number of capability gaps placed additional challenges on the ability of allied air forces to contribute effectively to missions planned and conducted during the campaign, and to be inter-operable with U.S. forces.

However, by the opening days of "Operation ENDURING FREEDOM (OEF)" in 2001 and "Operation IRAQ FREEDOM (OIF)" in 2003, the RAF demonstrated convincingly that it had made significant efforts to reduce the identified capability gaps and, in turn, re-establish its ability to maintain interoperability with the USAF. This moved the RAF towards interoperability "Level 3 (Synchronization)," as depicted in Figure 1.

So how exactly did the RAF make such progress? Analysis suggests that it took a three-pillared approach to rebuilding its interoperability credentials: doctrine, capabilities, and trust-building.

In the first pillar, the RAF refreshed its doctrinal documents to ensure coherence with U.S. air power capability developments. In particular, it embraced common language and terminology referring to new concepts, such as Effects Based Operations (EBO) and Network Centric Warfare (NCW). This was combined

with a network of over 250 RAF officers attending U.S. staff schools and filling exchange posts in the United States; reciprocal programs did the same with U.S. officers in the UK. Thus, the two sides were not just speaking the shared English language but also a common doctrinal language.

Under the second pillar, the RAF identified that the so-called "sensor-to-shooter loop (STS Loop)" had become a key element of 21st century air campaigns and that it needed to address a number of critical capability shortfalls in this area. This included all-weather precision guided munitions, secure communications, and tactical data links. Intensive efforts were made to fill such shortfalls with the introduction of new hardware and the operational training required for its successful employment. Importantly, the RAF achieved these increases in capability through indigenous development of new capabilities, using close coordination with its industry partners to enhance the UK's industrial base. The argument over "Indigenous" or "Cutting-edge U.S. assets" is one of the more crucial interoperability dilemmas. Although the UK chose the indigenous option in this matter, their approach proves that the dilemma and the notion of interoperability are not mutually exclusive.

Under the last pillar, the RAF leveraged the long and robust relationship it has enjoyed with the USAF, which had been further reinforced by the 12-year campaigns that composed Operation SOUTHERN WATCH and Operation NORTHERN WATCH. These operations, conducted in south-western Asia, established especially strong and fruitful relationships at the senior officer level, which proved extremely valuable in later operations during the planning and execution of complex and time-sensitive missions that demanded high levels of interoperability.

This analysis highlights that successful interoperability is not simply a matter of having the right technology and hardware. Mutual understanding and trust, so-called "hearts and minds" activity and the ability to share information by using common terminology are just as crucial to operational effectiveness. Some in Japan might regard the U.S.-U.K., and in turn the USAF/RAF, relationship as a "special relationship" that can be maintained without significant effort. However, it is clear that both nations, and their air forces, work extremely hard to maintain their close relationships, as demonstrated by the significant presence of exchange personnel in both countries and a wide range of combined exercise and training activity. Figure 3 shows the outline of UK/RAF model.

Figure 3: UK/RAF Model

Level of Interoperability	**Level: 3**
Focused Mission	• Integrated Air-to-Ground • Combat ISTAR (Intelligence, Surveillance, Target Acquisition, Reconnaissance)
Doctrinal Alignment	• Strategic Concept of Operations • Doctrine • **CSAF SSG** **(Chief of Staff of the Air Force, Strategic Study Group)**
Capability Development	• Sensor-to-Shooter loop • Remote Operated Video Enhanced Receiver (ROVER) • Exercises (Green Flag/Red Flag)
Trust-Building	• **International Security Assistance Force (ISAF)** • **12 year-long operations (Operation Southern/Northern Watch)**
Interoperability Enhancer	• Current: ROVER/ASTOR/Reaper • Future: F-35
Industrial Base	Well-Considered
Personnel	260


ROVER


ASTOR


Reaper(MQ-9)


F-35


Typhoon

The French Air Force (FAF) Model

Turning now to France, the French Air Force (FAF) has made a great effort to refine so-called "Day-1" operations by maintaining close coordination with USAF and other NATO allied Air forces. For instance, it has adopted Link 16 and developed C2 assets, including airborne platforms, cruise missiles, all weather munitions, Special Forces and helicopters. Although these components may be few in number when compared to the United States, they are sufficient to enable participation in the planning of operations and provide French influence. France is also well-known for its sophisticated indigenous technology; its development of a precision strike capability using the "SCALP" home-designed cruise missile is a good example. In addition, the introduction of modern systems such as Rafale, A400M and the future tanker, which all meet NATO standards, will reinforce future interoperability. As a result, the FAF feels that it has achieved a level of interoperability with the USAF at the high level 2 ("Coordination") or lower level 3 ("Synchronization"). Historical reluctance over greater intelligence sharing between the two nations, however, remains a limiting factor. Even in Afghanistan, for example, U.S. and French air forces do not share a fully common operating picture. Figure 4 shows the outline of France/FAF model.

ARMÉE DE L'AIR

Figure 4: France/FAF Model

Level of Interoperability	**Level: 2+ 3-**
Focused Mission	Integrated Air-to-Ground **Deployable C2 (Command and Control)** ISR
Doctrinal Alignment	• Strategy • Concept (US Doctrine-like) • **CSAF SSG**
Capability Development	• Sensor-to-Shooter loop • Remote Operated Video Enhanced Receiver (ROVER) • Exercises (Green Flag/Red Flag)
Trust-Building	**International Security Assistance Force (ISAF)**
Interoperability Enhancer	• Current: ROVER, LINK16 • Future: Not Applicable
Industrial Base	Well-Considered
Personnel	**20**


FAF in Afghanistan


FAF in Afghanistan


Dassault RAFALE


SCALP

The German Air Force (GAF) Model

As in the JASDF case, the German Air Force's efforts toward achieving interoperability with its allies are challenged by a number of constitutional constraints. Although German forces are conducting their first long-term overseas deployment in Afghanistan as a part of the International Security Assistance Force (ISAF), Germany's security policy remains defense-oriented. Given their unique circumstances, and with fiscal constraints in mind, Germany chose to focus on specific functions and assets, termed "National Critical Areas, which are to be highly interoperable. The GAF has pursued this strategy by incorporating state-of-the-art technology, often indigenously produced, into combat-proven U.S. platforms, including space and ISR assets. The GAF operates its own highly capable and state of the art satellites that contribute to the national awareness. The Eurohawk, a variant of the U.S. high altitude and long endurance unmanned vehicle "Global Hawk," with a German indigenous sensor, is a notable example. Through such projects, the GAF will be able to retain significant ISR capability, interoperable with the USAF, while fostering the German industrial base. Unlike the RAF and FAF, however, the GAF has no intention of possessing a Day-1 fighter capability meant to penetrate highly capable, well-integrated air defense systems.

More important for GAF officers and airmen, interoperability with the USAF is a day-to-day business. An inability to conduct high-profile aerial training over German soil because of limited air space encourages the GAF to move not only basic training activity to the United States, but also advanced training, including fighter continuation training. Approximately 1,500 personnel of all ranks are regularly stationed at U.S. bases, which has the additional benefit of enhancing interoperability in terms of alignment of airpower doctrine.

From a capability viewpoint, however, the GAF regards the gap between its capabilities and those of the USAF as one that has been widening. One GAF officer commented that "While the GAF takes one step forward, the USAF takes three steps. Therefore there is no way to catch up."

The GAF feels that it has achieved a level of interoperability with the USAF at the high level 2 ("Coordination") or lower level 3 ("Synchronization") in the focus-functions mentioned above. Remaining functional areas are assessed as level-2 ("Coordination"). Figure 5 shows the outline of German/GAF model.

Figure 5: German/GAF Model

Level of Interoperability	• **Overall: Level: 2** • **Selected: 2+ 3-**
Focused Mission	• Integrated Air-to-Ground • **ISR**
Doctrinal Alignment	• Strategy (the German language only) • No National Doctrine but NATO Air Doctrine • NATO Standard
Capability Development	• ISR (**Satellite, UAV**) • ROVER • Exercises (Red and Green Flag)
Trust-Building	**International Security Assistance Force (ISAF)**
Interoperability Enhancer	• Current: ROVER • Future: Not Applicable
Industrial Base	Well-Considered
Personnel	**1,500**

Luftwaffe

Eurohawk

GAF in Afghanistan

The Royal Australian Air Force (RAAF) Model

The RAAF has undertaken four remarkable interoperability efforts. First, like the UK/RAF, Australia has taken a three pillared approach. The 11 September 2001

attack on the United States was viewed as a trigger event. The Australian Government invoked the Australia-New Zealand-U.S. (ANZUS) Security Treaty for the first time and upgraded the RAAF to the next stage of interoperability. Long-term military involvement in Afghanistan also enhanced interoperability in terms of capability and trust-building. For instance, the RAAF was able to verify NATO procedures and rapidly procure the ROVER system, viewed as indispensable equipment for highly integrated air-to-ground operations. In addition, Australia's *Defense White paper 2009, "FORCE2030"*[2] is trying to use the same or similar terminology as that used in U.S. doctrine.

Second, Australian/RAAF efforts are integrally based upon its geographic characteristics. Situated in the southern hemisphere and surrounded by oceans, its strategic environment lacks relatively close rogue nations that possess strong airpower. This is evidenced by Australia's selection of the F/A-18F to replace its aged F-111s, a unique programmatic decision because the aircraft was originally developed to replace the F/A-18D, operated mainly by navies. This decision, based not on a service-oriented mindset but purely on operational requirements, allows the conduct of roles ranging from air-to-air to anti-ship missions, including maritime surveillance, and all while maintaining interoperability with U.S. forces.

Third, selective investment and cost-effectiveness deserve mention, particularly with regards to its ISR approach. Australia has committed to funding the sixth satellite in the U.S. Wideband Global Satellite constellation,[3] which will provide cost effective access to the entire constellation and a robust communications capability.

Fourth, like Japan, Australia has made a significant contribution to U.S. national security by hosting or supporting some of the U.S.'s most sensitive and critical strategic capabilities. These include systems related to intelligence collection, ballistic missile early warning, submarine communications, and satellite-based communications.

In short, recent Australia/RAAF interoperability efforts are timely, significantly strategic and meaningful. The RAAF currently achieves a high level 2 ("Coordination") and in some areas a low level 3 ("Synchronization") of interoperability with the USAF but is progressing towards full level 3("Synchronization") interoperability through its investment in interoperable C2 systems and capabilities, such as the F/A-18F Super Hornet and F-35A Joint Strike Fighter. Figure 6 shows the outline of Australia/RAAF model.

AIR FORCE

Figure 6: Australia/RAAF Model

Level of Interoperability	• **Overall: Level: 2+** • **Selected: 3-**
Focused Mission	• Integrated Air-to-Ground • Maritime Operations
Doctrinal Alignment	• Strategy • Bilateral Standard (NATO-like)
Capability Development	• **C4ISR (COMSAT)** • **FA-18F** • ROVER • Exercises (Red Flag, Talisman Sabre)
Trust-Building	**International Security Assistance Force (ISAF)**
Interoperability Enhancer	• Current: ROVER • Future: **C2/FA-18F/F-35**
Personnel	260


SATCOM


FA-18F


C-17w/Fire Fighter


Surveillance Radar


F-35A

Multinational Efforts

(1) Air and Space Interoperability Council (ASIC)

According to some USAF and allied air force planners, the most long-standing and meaningful multinational interoperability effort is the Air and Space Interoperability Council (ASIC), established in 1948. This council consists of five air forces: the USAF; the RAF; the Royal Australian Air Force (RAAF); the Canadian Air Force (CAF); the Royal New Zealand Air Force (RNZAF); and the U.S. Navy. Its principal objective is to ensure that member nations are able to fight side-by-side in joint and combined operations. Perhaps more importantly, it is a low-profile and purely military-to-military organization that is not affected by fluctuating political situations. This feature has been key to ensuring stable progress in its goals. [4]

(2)The Global Community of Airmen

The Global Community of Airmen (GCA) is another significant framework to ensure that allies speak together to exchange ideas and initiatives. The objective of the GCA is to share beliefs and develop a common purpose that will foster communication and an exchange of ideas to promote air capabilities among

participants. The GCA consists of 13 nations, including Australia, Belgium, Canada, France, Germany, Greece, Guatemala, Italy, Kingdom of Morocco, Netherland, Norway, United Kingdom and United States. The primary motive behind the GCA's creation was the idea that no single nation can overcome the global challenges of violent extremism, regional instability and humanitarian distress. The focus therefore is placed mostly on non-kinetic airpower, such as airlift, SAR, and medical evacuation (MEDEVAC), rather than kinetic airpower. The group prioritizes cross-border linkages through airmanship rather than individual ethnicities, nationalities, cultures, or social status. Shared training, experience, and problem-solving situations are provided for all members, offering a foundation for interoperability in terms of capability and mentality.[5]

Summary of Allied Air Forces Experiences

The survey highlights some crucial lessons learned:

(1) All allied air forces anticipate that the capability gap between their air forces and the USAF will continue to widen. Allied air forces need to prioritize mission areas and functions so that they can enhance interoperability in a practical manner. When doing so, strategic environments, defense policy, operational requirements, technological advancement, and the industrial base must be considered.

(2) Political considerations and national caveats will invariably limit the ability of allied air forces to conduct coalition missions and roles that will be entirely complementary to USAF operations, but they do not preclude interoperability.

(3) A three-pillared approach composed of doctrinal alignment, capability development, and trust-building appears to be the most effective approach to strengthening interoperability.

(4) Information sharing at all levels remains key to interoperability. This places a premium on development of more effective connectivity and accessibility, including among different platforms and C2 systems.

(5) "Decisive interoperability-enhancer(s)" should be identified; the use of ROVER for ongoing operations in Afghanistan is a good example. Similarly, operations over Kosovo demonstrated the critical need for secure communications and data-links (link-16). It is possible that such equipment will be mandated as a minimum theatre entry standard for future coalition operations involving the USAF.

(6) A rational approach to more effective commonality and connectivity will reinforce interoperability without undermining the national industrial base or mandating unnecessary investment. In some cases, however, pursuit of greater commonality by procuring the same hardware may provide the most effective solution, particularly if the requirement is urgent or if technological constraints are involved.

(7) Standardization is extremely beneficial.

(8) In wartime, sharing burden and risk promote mutual trust. In peace time, training/exercises under likely scenarios and based on realistic assumptions are key to improving skill and enhancing mutual trust.

(9) Co-investment on resource-consuming projects can lead to cost-effectiveness.

(10) An interoperability-specific multinational framework, namely ASIC, is truly effective. Figure 7 shows the summary of the survey of Allied air forces.

Figure 7: Summary of Survey of Allied Air Forces

Nation/Service	UK/RAF	France/FAF	Germany/GAF	Australia/RAAF
Type of Alliance	NATO and Bilateral	NATO	NATO and Bilateral	ANZUS (Bilateral)
Level of Interoperability	Overall: 3 Selected: N/A	Overall: 2+ - 3- Selected : N/A	Overall: 2 Selected: 2+ - 3-	Overall: 2+ Selected:3-
Focused Mission	-Integrated Air-to-Ground -Combat ISTAR	-Integrated Air-to-Ground -Deployable C2/ISR	-Integrated Air-to-Ground -ISR	-Integrated Air-to-Ground -Maritime Operations
Doctrinal Alignment	-Strategy/Concept -Doctrine -CSAF SSG (HQ USAF)	-Strategy -Concept (US doctrine-like) -CSAF SSG (HQ USAF)	-Strategy (German language) -NATO Doctrine/Standard -Extensive Training	-Strategy -Bilateral Standard (NATO-like)
Capability Developing	-STS loop (PGM/LINK/COMM) -ROVER -Exercises (Green/Red Flag)	-STS loop (PGM/LINK/COMM) -ROVER -Exercises (Green/Red Flag)	-ISR (Satellite, UAV) -ROVER -Exercises (Green/Red Flag)	-C4ISR(COMSAT) -FA-18F -ROVER -Exercises (Red Flag, Joint Exercise)
Trust-Building	-ISAF (Afghanistan) -12 year-long operations (ONW/OSW)	-ISAF (Afghanistan)	-ISAF (Afghanistan) -Basic/Continuation Training	-ISAF (Afghanistan)
Interoperability Enhancer Current/Future	ROVER/ASTOR/Reaper	ROVER/ILINK16	ROVER	ROVER
	Future: F-35	N/A	N/A	FA-18F/F-35
Personal	260	20	1,500	150
Industrial Base	Well-Considered	Well-Considered	Well-Considered	N/A
ASIC	YES	N/A	N/A	YES
Feature	-High-end Relationship -Day-1 Capability -Close C2 Relationship	-Day-1 Capability -Compact/Self-Contained Force	-Defense-Oriented Policy -ISR-centered (Satellite, UAV)	-Complement in Southern Hemisphere -Co-Investment

NOTES:

N/A : Not Applicable
ISTAR : Intelligence, Surveillance, Target Acquisition and Reconnaissance
C2 : Command and Control
CSAF SSG : Chief of Staff of the Air Force's Strategic Studies Group
HQ USAF : Headquarters USAF
ISR : Intelligence, Surveillance, Reconnaissance
UAV : Unmanned Aerial Vehicle
PGM : Precision Guided Munition
LINK : Data Link
Comm : Communication
ROVER : Remote Operated Video Enhanced Receiver
COMSAT : Communication Satellite
ISAF : International Security Assistance Force
ONW : Operation NORTHERN WATCH
OSW : Operation SOUTHERN WATCH

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[1] JAMES W. CANAN, *THE LESSONS OF KOSOVO*, Aerospace America Online, [On-line]. URL: http//www.aiaa.org/aerospace/Article.cfm?issuetocid=100&ArchiveIssueID=15 (Accessed on Jan.7, 2010)

[2]Australian Government, Department of Defense, "DEFENDING AUSTRALIA IN THE ASIA PACIFIC CENTURY: FORCE 2030," p.68.

[3] Australian Government, Department of Defense, "AUSTRALIA TO JOIN WITH UNITED STATES IN DEFENSE GLOBAL SATELLITE COMMUNICATIONS CAPABILITY." (On-line). URL: http://www.defence.gov.au/minister/NelsonMintpl.cfm?CurrentId=7126, (Accessed on May 30, 2010)

[4] Air and Space Interoperability Council, [On-line]. URL: http://www.dtic.mil/asic/index.htm (Accessed on Apr.12, 2010)

[5] U.S. Air Force, [On-line]. URL: http://www.globalcommunityofairmen.af.mil/shared/media/document/AFD-090728-090.pdf (Accessed on May 25, 2010)

CHAPTER FOUR

Why is Interoperability Desirable for the USAF and JASDF?

Afghanistan must serve as a prism to view the future, not as a prison for our thinking.

-Air Chief Marshal Sir Stephan Dalton, Chief of the RAF[1]

The ability of the JASDF to mirror the exact approach taken by other allied air forces to develop improved interoperability with the USAF is limited by its unique legal framework and policy constraints. However, the three-pillared approach, consisting of doctrinal alignment, capability development, and trust-building, may provide a useful framework to solving such challenges. Before considering how best to apply this three-pillared approach to the JASDF, the interoperability goals will be clearly stated and the core missions will be appropriately prioritized.

JASDF goals regarding interoperability

As assessed in Chapter 3, the JASDF's current level of interoperability is a level-2 ("Coordination") except in the ballistic missile defense (BMD) mission. Over the next decade, the JASDF aspires achieve level-3 ("Synchronization") across a broad spectrum of operations. Although capability gaps may continue to widen, as is the case with other allies, the JASDF should prioritize missions and functions relevant to the strategic environment, advancing technology, and other Japan-unique features, allocating appropriate priorities according to its limited budget. This recognizes that neither political constraints nor shrinking budgets are peculiar to Japan.

On which mission areas should the USAF and JASDF focus?

Although integrated air-land operations have been highlighted in the ongoing campaign in Afghanistan, closely coordinated air operations and air-surface (maritime) operations must be emphasized in the Asian-Pacific Theater. First, taking the characteristics of A2AD environments into consideration, BMD and cruise missile defense (CMD) should be prioritized. A robust bilateral BMD and CMD posture and capabilities will provide effective means to deter and deny any

aggressive tendencies or capability development. Secondly, air-to-air operations, particularly those used to gain and maintain air superiority against adversary fighter interceptors and long-range bombers, should also be carefully examined. In the Asia-Pacific region, both land-based aircraft and carrier-based aircraft might be denied access or negated by the presence of A2AD environments; given such circumstances, air superiority would not be guaranteed, even by U.S. airpower.

JASDF-Unique Three-Pillared Approach

(1) Doctrinal alignment

As the first step to strengthening interoperability with the USAF, the JASDF must examine its doctrinal foundation to focus on equivalence with USAF basic air power doctrine and other concepts of operations. It might also examine its service strategies, which articulate its mindset, core values, and ethos. Doctrinal documents need to be translated into English and to be accessible to the USAF. As the UK/RAF and France/FAF have found, sending appropriate personnel to the USAF strategy-development branch in the Pentagon might offer an effective way to gain practical understanding of American thought processes and the development of high-level national security documents. The lessons learned from this approach could then be incorporated into JASDF processes. Standardizing tactics, techniques, and procedures (TTPs) proved to be effective for enhancing interoperability in other allied Air forces, and the JASDF might benefit from greater standardization of procedures with the USAF while referring to NATO standards. Furthermore, the JASDF should consider a commitment to the ASIC, one of the key frameworks regarding interoperability and standardization.

(2) Capability Development

Based upon the critical missions defined above, which capabilities need to be reinforced? The ultimate goal is to establish a bilaterally synchronized air defense system (BSADS) that is able to deter and defeat any adversary's aerial strike. Undoubtedly, STS loops will remain a core competency in terms of the PnP architecture of the BSADS. However, there will be key differences between the STS loop suitable for the Afghanistan Theater and one required in the Asia-Pacific region. The STS loop in the Asian-Pacific region must be capable of dealing with ballistic missiles, cruise missiles, and traditional air breathing targets while faced with a contested cyber and Electronic Warfare (EW) environment.

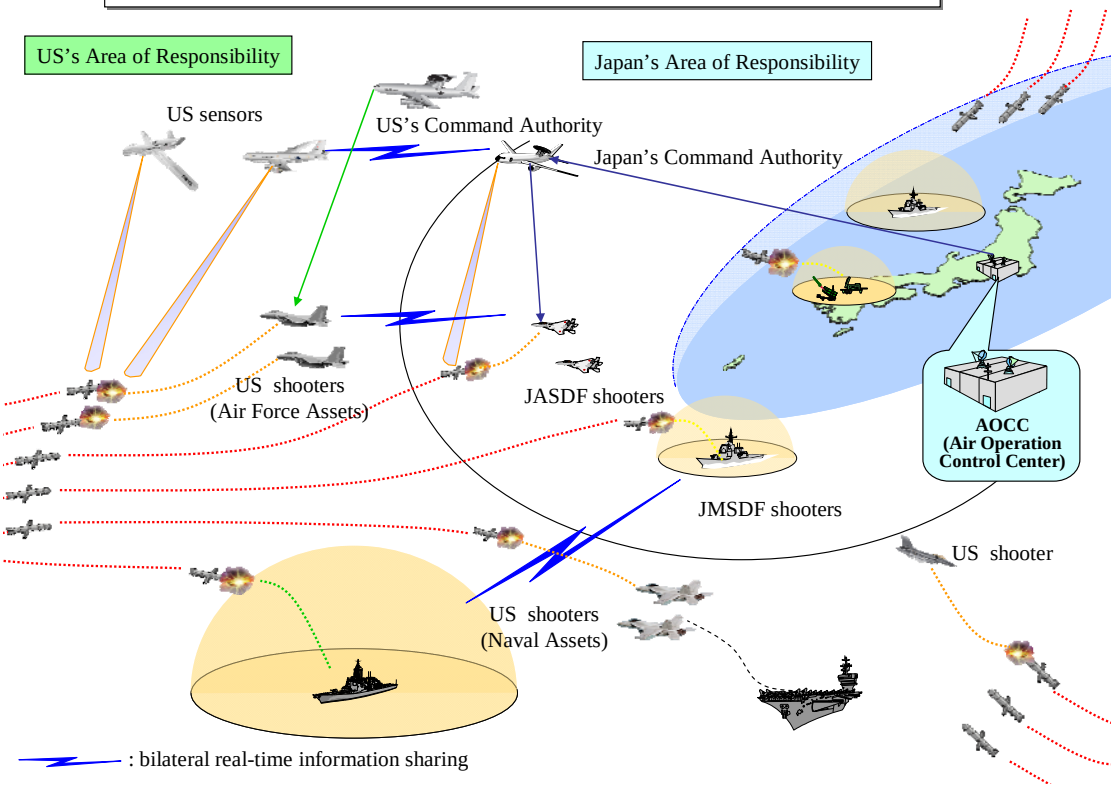
The other geostrategic requirement in the Asia-Pacific region is more effective response to emergency situations that occur frequently in the region and which require the use of non-kinetic airpower. Hence, "actors" consisting of rescue assets, airlifters, and tankers, are expected to play a meaningful role. Consideration of the need for a "Sensor-to-Actor (STA) loop," rather than a more traditional (and politically more controversial) STS loop, might be warranted. This would also include concepts for how to develop sophisticated "PnP" architectures in both the STS and STA loops.

- **Sensors (ISR):** Intelligence, Surveillance, and Reconnaissance (ISR) capabilities underpin a broad range of air operations. Intensive efforts in response to the North Korean ballistic missile threat have seen rapid improvements in bilateral ISR and have contributed to steady improvements in interoperability. However, the ability to detect and track high-speed and low observable targets such as cruise missiles at long range, remains a technological and operational challenge. It is imperative to establish a multi-layered ISR architecture, composed of ground, airborne, and space assets, to address such challenges. Building such an architecture, however, is extremely costly and time-consuming, placing further premium on the enhancement of connectivity between existing USAF and JASDF assets. JASDF shortfalls in persistent airborne ISR capabilities, including long-endurance remotely piloted aircraft (RPAs) and space assets able to conduct ISR missions beyond line-of-sight (over-the-horizon), could be offset by USAF capabilities in return for meeting U.S. requirements for establishment of ground-based surveillance capabilities in the Asia-Pacific region. The complementary nature of such capabilities could provide the most effective solution to improving – in terms of both quality and quantity – regional ISR capabilities. In addition, it may also offer useful avenues for coordinated future ISR capability investment and development, making the notion of a bilateral ISR architecture a feasible solution. The Australian/RAAF efforts with regard to satellite investment provide a good example of such activity, as do German efforts in RPA/UAV development. Moreover, a bilateral ISR architecture could provide a precursor for a trilateral/multi-lateral architecture with other close allies in the region.

- **Shooters (Fighters and SAMs):** "Shooters" must be capable of intercepting and neutralizing a wide range of targets. With regard to BMD, PAC-3, in conjunction with Aegis Cruisers equipped with SM-3 missiles, will remain core equipment in the Japan Maritime Defense Force (JMSDF). However, neither the USAF nor the JASDF can effectively respond to the cruise missile threat. Hence, in order to establish a bilateral CMD shield, both the USAF and the JASDF must accelerate enhancements in this area. The combination of fighter interceptors, equipped with high resolution radars

and the most advanced air-to-air missiles, and SAMs may provide the most effective force mix. Response to any adversarial use of high performance fighters will require effective allocation of roles and airspace between U.S. and JASDF fighters to appropriately allocate responsibility according to respective capability and authorizations. Figure 8 shows a rough sketch of bilaterally synchronized air defense.

Figure 8: Rough Sketch of Bilaterally Synchronized Air Defense



- **Actors (SAR, Airlift, and AAR):** Putting kinetic airpower aside, what other actors need to be interoperable? SAR assets can be meaningfully operated in both A2AD environments and for natural disaster response. Despite a large USAF inventory in the Asian-Pacific region, its SAR capability is relatively limited and it relies on JASDF SAR assets. The JASDF therefore needs to make its SAR capability interoperable with the USAF, which will also add to an atmosphere of trust. A focus on hardware, as demonstrated by the rapid acquisition of ROVER for current operations, provides an immediate response. From the operational viewpoint, sending experts to U.S. Combat Search and Rescue (CSAR) School is a rational, long-term approach.

  In past and ongoing air campaigns, airlift and AAR assets are invariably identified as shortfalls in the theater of operation. Owing to large tracts of

international airspace in the Asia-Pacific region and the great distance between the continental United States (CONUS) and the region, inter-theater and intra-theater airlift requirements are likely to be significant. As the JASDF's contribution in Iraq showed, interoperable airlift is often taken for granted. Under A2AD conditions, adversary attack aircraft can deliver weapons at ranges beyond 850nm. Therefore, enabling fighters to intercept such strikers beyond weapon launch ranges would demand highly interoperable AAR assets, which would be indispensable in light of operational effectiveness and survivability. Simultaneously, with their greater endurance, AAR assets will be expected to act as communication and data-link relay platforms. From the operational viewpoint, respective qualification on AAR and airlift should be mutually reinforcing.

- **C3 (Command, Control, and Communication):** An effective C3 system must be capable of dealing with sensitive information in a timely and secure manner while conducting the full range of operations, including BMD, CMD, and air-to-air operations. It also must enable decision-makers and military planners to synchronize actions. In this regard, developing fully interoperable C3 systems is indispensable. With the full operation of Japan's state-of-the-art indigenous C3 system, JADGE, this challenge could easily be solved in terms of hardware. In procedural terms, sending air staff to USAF Air Operation Centers (AOCs) will lead to development of coherent TTPs. Such efforts promote redundancy and resilience and contribute to the minimizing of vulnerabilities.

(3) Trust-Building

The inabilities of the JASDF to involve itself in ongoing combat operations make it impossible to boost confidence and trust through the sharing of risk on current battlefields. The JASDF therefore needs to seek and utilize other means to reinforce this area. In this context, relocation of the headquarters of JASDF Air Defense Command, the counterpart of Air Combat Command, and Pacific Air Force to Yokota Air Force Base in Japan could serve to strengthen day-to-day interactions and enhance bilateral relationships at all levels.

This co-location, however, is not the bilateral goal, but only a starting point for developing closer relationships to enable more effective responses to future challenges. More efficient methods of operation that allow commanders and air staffs to appreciate respective fundamental concepts, develop robust personal relationships, and overcome different organization cultures must be established as soon as possible. Through consistent and solid performance, as demonstrated in long-running bilateral exercises such as "RED FLAG" and "COPE NORTH," the JASDF can successfully prove its skills and ability to operate effectively

under U.S. procedures. A USAF colonel, who has several tours in Japan, underscores, "Exercises are the only way to determine our capabilities, status, and way ahead in peacetime, but exercises take valuable manpower and resources from our already stretched forces. Nonetheless, we have to make the effort to exercises regardless of how painful." From such aspect, the participation to "RED FLAG NELLIS"[2] should be seriously considered. In addition, the establishment of a Tactical Leadership Program[3]-equivalent, one of the notable NATO training programs used to build mutual confidence, could provide a meaningful framework.

Possible decisive interoperability enhancer(s)

As mentioned earlier, ROVER appeared to be a decisive interoperability enhancer for real-time information sharing in Afghanistan. Additionally, UAVs has been playing crucial role as "game changer." The nature of likely operations in the Asia-Pacific region make high-end connectivity centered on advanced data-links and secure communication a potentially critical enhancer. More importantly, very low-observable (VLO) advanced fighters such as the F-22 or F-35 would be mandated as a "minimum theatre entry standard" when conducting particular operations, even in or around Japan. Taking the Australian perspective as an example, the F-35 is seen as a "level-3 interoperability enabler." Lack of such capabilities might severely restrain the JASDF's ability to conduct effective bilateral operations with flexibility. For instance, the JASDF might be grounded despite the fact that decisive air combat operations are taking place around Japan just because of capability shortcomings. The JASDF therefore needs to carefully consider the status of the USAF's most advanced technologies and determine to what degree it should build-up its own capabilities when reshaping its force structure.

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[1] Air Chief Marshal Sir Stephan Dalton, Chief of the RAF, "Dominating the Information Space: The Comparative Advantage of Air and Space Power in Future Conflict," (London, United Kingdom, International Institute for Strategic studies (IISS), Feb.15, 2010)

[2] The Red Flag Nellis exercise includes the use of enemy hardware and live ammunition for bombing exercises within the Nellis complex. [On-line]. URL: http://www.dreamlandresort.com/info/flags.html (Accessed Jun.22, 2010)

[3] The Tactical Leadership Program (TLP) is an organization formed under a Memorandum of Understanding between 10 NATO nations. The objective of the TLP is to increase the effectiveness of allied tactical air forces through the development of leadership skills, tactical flying capabilities, mission planning and tasking capabilities, and conceptual and doctrinal initiatives. TLP is based at Albacete Air Force Base in Spain and its two operational branches - Flying Branch and Academic & Concepts and Doctrine Branch- are staffed by experienced personnel from the member nations. [On-line]. URL: http://www.tlp-info.org/ (Accessed May 31, 2010)

CHAPTER FIVE
Recommendations

Given these concerns, the following recommendations aim to build greater interoperability for the benefit of both parties.

Bilateral and Multilateral Efforts: Stand up an ASIC-like "multilateral interoperability council in the Pacific region," with primary responsibility for:

- Developing a shared strategic vision for the region, including by appointing JASDF and other allied nation officers to USAF strategic studies groups, following the RAF model of populating key Pentagon offices.
- Developing a common vision of scenarios that may require a bilateral or multilateral response in the coming decades.
- Identification of critical domains, mission areas, and functions where efforts may be prioritized to effectively enhance interoperability.
- Develop a multilateral interoperability roadmap, establishing key milestones for progress.
- Standardizing operational procedures, concepts. In terms of coalition operations, NATO standards may provide a sound basis for development.

U.S. Efforts:

- Release critical interoperability-related technology to key allies in a timely manner, especially those that bolster the PnP architecture vision. For example, participation in advanced combat identification systems and the joint tactical radio system would be meaningful.
- Allow allies' participation in interoperability-related studies and projects, both ongoing and future. For instance, early participation in the ongoing "Air-Sea Battle Discussion"[1] would be extremely significant and appropriate.

Japanese Efforts:

- Accelerate fulfillment of network connectivity with key assets such as fighters, tankers, and ISR assets.
- Secure information released by the USG.
- Classify those assets that are interoperable and non-interoperable to allow more effective allocation of resources within a limited budget.

- Consider balancing capability and the industrial base (indigenous production or import foreign equipment appropriately).
- Commit to parallel interoperability-related studies and projects as much as possible (U.S.-led, International-led). The GCA could provide an appropriate framework.

[1] QDR, "Develop a joint air-sea battle concept: The Air Force and Navy together are developing a new joint air-sea battle concept for defeating adversaries across the range of military operations, including adversaries equipped with sophisticated anti-access and area denial capabilities." p.32.

CHAPTER SEVEN
Conclusion

Interoperability is key if alliances are to be able to act together effectively when it matters most. Allied air forces such as the RAF, RAAF, the FAF, and the GAF have been sharing the burden in Afghanistan and enhancing interoperability with the USAF over the course of long-term campaigns through strategic and personal relationships. The JASDF, however, cannot rely on the ongoing campaign in Afghanistan as a way to improve interoperability with the USAF. Therefore, the JASDF must seek and develop Japan-unique avenues on the basis of the lessons learned from the U.S. air partnership with those allied air forces.

This issue becomes all the more important when examining the emerging security environment as explored in documents like the QDR and the NDPG. The military's involvement in Afghanistan was optional for the GOJ and the JASDF, but preparation for a growing A2AD challenge in our geographic environs is mandatory. Therefore, the ability to work with the USAF in a synchronized manner in such an environment is a minimum requirement for the JASDF as an allied airpower. Whether the JASDF becomes involved in future coalition operations in the region is a political decision at that time. But preparatory efforts to ensure the JASDF is sufficiently interoperable with the USAF to be effectively at that time must be initiated by the JASDF itself now. These efforts are consistent with Japan's defense policy, legal framework, and the capabilities that have been built since the JASDF was stood up. It stands to reason that the USAF and the JASDF must be able to work together to effectively deter and respond to any aggression, particularly in terms of A2AD activities, in the Asia-Pacific commons in the next 10-15 years.

In conclusion, policy can change quickly in response to crises, but it takes a long time to develop the actual capabilities, mutual trust, and joint vision and doctrine upon which effective action is built. Therefore, if we care about our alliance and the interoperability that underscores its utility, we need to take action and we need to do it right away.

GLOSSARY

AAR	Air-to-Air Refueling
AOC	Air Operations Center
ANZUS	Australia-New Zealand-U.S.
ASAT	Anti-Satellite
ASIC	Air and Space Interoperability Council
A2AD	Anti-Access/Area Denial
BMD	Ballistic Missile Defense
BSADS	Bilaterally Synchronized Air Defense System
CSAR	Combat Search and Rescue
CMD	Cruise Missile Defense
CONUS	Continental United States
COP	Common Operational Picture
C2	Command and Control
C3	Command, Control, and Communication
DCA	Defensive Counter Air
DOD	Department of Defense
DR	Disaster Relief
FAF	French Air Force
GAF	German Air Force
GCA	Global Community of Airman
GOJ	Government of Japan
HA	Humanitarian Assistance
IADS	Integrated Air Defense System
ISR	Intelligence, Surveillance and Reconnaissance
ISTAR	Intelligence, Surveillance, Target Acquisition and Reconnaissance
JADGE	Japan Aerospace Defense Ground Environment
JASDF	Japan Air Self-Defense Force
MEDEVAC	Medical Evacuation
NATO	North Atlantic Treaty Organization
NDPG	National Defense Planning Guidance
PLA	People's Liberation Army
PLAAF	People's Liberation Army Air Force
PLAN	People's Liberation Army Navy
PnP	Plug-and-Play
QDR	Quadrennial Defense Review
RAAF	Royal Australian Air Force
RAF	Royal Air Force

ROVER	Remote Operated Video Enhanced Receiver
RPA	Remotely Piloted Aircraft
SAR	Search and Rescue
STA	Sensor-to-Actor
STS	Sensor-to-Shooter
TTP	Tactics, Techniques, and Procedures
UAV	Unmanned Aerial Vehicle
USAF	United States Air Force
USG	United States Government
VLO	Very Low Observable

ABOUT THE AUTHOR

Colonel Hiroaki Uchikura served as the 2009-2010 International Security Fellow with the 21st Century Defense Initiative at the Brookings Institution. He graduated from the National Defense Academy, Japan, and flew F-15's for over two decades, during which he commanded the 306th Fighter Squadron at Komatsu Air Base, was an action officer of Joint Staff J-3, was deputy of F-X program office, which is responsible for the F-4EJ's replacement. His most recent assignment was as section chief of the Air Staff Office that is in charge of mid-term and long-term force planning. He has previously spent time in the United States as an exchange cadet of U.S. Air Force academy, a student in the USAF F-15 Undergraduate Instructor Pilot Course, and as a student at the USAF Air Command Staff College.

The views expressed in this academic research paper are those of the author(s) and do not reflect the official policy or position of the Government of Japan or Japan Ministry of Defense.