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Coalition operations frequently generate a lot of flightline activity.

IMPROVING AIRCREW INTEROPERABILITY IN COALITION WARFARE: EXAMINING THE HUMAN DIMENSION OF THE AIR POWER EQUATION

by Colonel Greg Matte

Introduction

...the commander must accept the fact that he has certain human material with which to work and that everything must be built around the reality of these forces...¹

Despite the stunning results of relatively recent offensive air operations, such as those witnessed in *Desert Storm*, the planning and execution of an effective coalition air campaign in a modern combat theatre can be a tremendously complex interoperability challenge. Not only must the Coalition Force Air Component Commander (CFACC) bear the weight of the combined political expectations of minimal losses, precision targeting, low collateral damage and rapid decisive results, he is expected to rapidly and seamlessly integrate the disparate elements of multinational contributions assigned to the air operation into an effective fighting force.

Given that the maximum exploitation of air power is achieved through a unified approach to the air campaign under a centralized command and control system, and through the flexible, integrated assignment of tactical forces to the dynamic taskings of the unfolding operation, the requirement for interoperability among multinational participants is crucial to the effectiveness of an air campaign. Although the need to focus on interoperability from a technical perspective is self-evident, interoperability among aircrew must not be overlooked, for the human dimension of the air power equation will ultimately determine the success or failure of the overall air campaign plan.

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A Canadian Hercules from 8 Wing Trenton taking off during *Maple Flag 2005*.

Coalition Air Warfare in Perspective

In contrast to the detailed planning and preparation permitted within the static environment of the Cold War era, the emerging trends for modern coalition warfare exemplify controlled chaos at best.² Paradoxically, the era of the “peace dividend” resulted in a plethora of operations against a broad range of diverse threats in unexpected regions of the globe, applying rapidly devised and improvised campaign plans. Concomitant with this dramatic change in the global security environment has been the preference for ephemeral “coalitions of the willing” comprising either a subset of the partners to traditional alliances such as NATO, or a mix of such nations participating with non-traditional allies.³ *Operations Desert Shield* and *Desert Storm* were the most poignant examples of this sudden emergence from the Cold War paradigm.

Although coalition warfare is certainly not new, the difference today from previous coalition conflicts, such as the World Wars and Korea, are the elements of timely response and complexity of modern warfare that demand higher unit readiness and greater technological sophistication, as well as increased personnel skills, training and education.⁴ By their very nature, coalition operations are *ad hoc* in nature and diverse in composition. Typically

created on short notice to deal with an unexpected crisis on the international stage, prior planning or collective preparation for the mission is minimal, in contrast to the inevitable political expectation for quick and effective military solutions to the *problem*. Furthermore, such coalition operations usually result in an unpredictable mosaic of multinational participants brought together temporarily for a variety of parochial national interests, unified more by a superficial political cause than a lasting military commitment.⁵

While political leaders may view the strength of these hastily assembled *ad hoc* “coalitions of the willing” in terms of the numbers and diversity of the participating countries, the opposite effect could easily prevail at the operational level, given the inevitable differences in equipment, training and capabilities among the participants. Consequently, coalition warfare presents problems of time and structure that combine to create very complex challenges for those who are assigned the responsibility to plan and execute the military solutions. Ultimately, the Coalition Joint Force Commander (CJFC) and his Component Commanders (CCs) must apply a new dimension of operational art wherein particular attention must be given to the timely reconciliation of the multinational differences within a workable command

and control structure, so as to quickly establish a harmonized fighting force that can respond effectively to the international crisis.

Arguably, the CFACC, of all the CCs, has the greatest *initial* challenges to overcome with respect to the constraints of time and the requirements of structure to the success of his air campaign plan. Since the beginning of the Second World War, history has repeatedly demonstrated that air superiority is both a vital requirement for successful defensive operations and an essential prerequisite for victory in offensive combat operations.⁶ In other words, success in stemming further aggression by the enemy or in shaping the battlefield advantage for offensive operations must be achieved quickly and effectively by the CFACC before other CC objectives can be fully prosecuted. Consequently, time is not a luxury in the air campaign – rather, it is an imperative that significantly compresses the planning, preparation and execution phases of the coalition operation, depending upon the urgency of the crisis.

Furthermore, the CFACC views the theatre airspace as an indivisible whole that is best managed by a centralized command and control structure, since experience has repeatedly proven that this approach maximizes the responsiveness, mobility and versatility of aircraft while permitting the most effective surveillance, control and defence of the entire airspace.⁷ Given that such a command and control structure requires the integration of disparate national forces into a collective pool of resources with which the CFACC can prosecute the air campaign, interoperability will be the decisive factor in determining the degree of integration achievable.

Interoperability: A Double-Edged Sword

In its simplest form, the air power equation is built upon a triad of structure, technology and people. The integrated, centralized command and control structure places a high premium on interoperability with respect to the technological and human dimensions of the air power equation. Given that air forces exist to support flying operations, and that aircraft are the focal point of these activities, it is not surprising that any concerns regarding interoperability would begin with a focus on the technological dimension. But how much emphasis should be placed on the technological dimension in relation to the human dimension?

From a strategic perspective, the establishment of air superiority would be a primary sequencing objective for the CJFC, thereby giving the CFACC the least amount of time among the three environmental CCs to rectify his technological interoperability problems in relative terms. Secondly, given the number of aircraft involved in a campaign in relation to the number of naval vessels or army formations (battalion-sized or larger), the statistical probability of interoperability breakdowns would be greater for the CFACC. Finally, there is an imbalance in experience

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that must be considered. While senior officers with many years of experience normally command ships and battalions, most individual aircrew are relatively junior by comparison.

So what does this brief analysis mean for the CJFC? Quite simply, it means that at the individual level, a disproportionate

amount of reliance falls upon aircrew as it pertains to the success of the overall coalition campaign. Despite having the least amount of career experience of the key individuals executing the tactical missions in the respective environmental campaign plans, they face some of the more complex technological interoperability challenges and bear a greater probability of failure, given the volume of sorties generated and the subsequent frequency of tactical engagements in relation to operations on land or at sea.

Thus, in returning to the air power equation, it is clear that while attention must be given to the requirements of the technological dimension, aircrew feature prominently in determining the results achieved with the warfighting technology. Consequently, if the full potential of interoperability is to be realized, additional attention needs to be focused on where and how coalition aircrew interact as a team.

Aircrew Interoperability: The Crucial Enabling Force

The integration of resources into a centralized command and control structure lends itself to the creation of temporary teams at the tactical level through the process of assigning units to mission taskings through the daily Air Tasking Order (ATO). In turn, each unit will assign aircrew to each specific tasking, depending upon their own internal scheduling process. It is within this ‘mix-and-match’ approach that interoperability among aircrew becomes significant, since there is little likelihood that the same aircrew will all fly together as a team under the same circumstances, particularly earlier on in the campaign when the threat level requires robust countering air armadas.

The CFACC’s operations staff will task units for each new mission, based in part upon the specific requirements of the mission (aircraft capabilities and munitions employed), as well as the availability of necessary aircraft from the collective pool of assigned units. Although some units and aircraft may be assigned to relatively simple, low-risk missions (i.e. *intra*-theatre transport flights over friendly territory), others will be needed to participate in complex, higher risk missions that involve “packages” of numerous aircraft of various roles and capabilities, brought together for the prosecution of offensive air operations into enemy territory.

Given the dynamic nature of these taskings, the requirement for aircrew interoperability is primarily limited to and concentrated within the activities of planning and executing the mission, since the team is only formed upon

the publication of the daily ATO, and terminates when the mission is completed.⁸ The degree of interoperability required by this team will be determined by the mutually interdependent elements of *complexity* and *risk*, which in turn would be proportional to *number of aircraft* assigned to the package for a given mission and the *threat level* expected. The mission demands rise to yet a higher level when such package missions are flown at night and/or in marginal weather conditions, which is often the case. Finally, the tactical advantages of synchronization must be balanced with adequate in-flight deconfliction to avoid inadvertent mid-air collisions or fratricide.

The fundamental requirements for such packages to be employed safely and effectively are *common understanding* and *coordinated execution*. In other words, each member of the participating aircrew must be able to work as a team in the preparation and execution of the mission. But to work effectively as a team, they must work on the same wavelength. However, unlike during the mission-planning phase, there is little time for explanation or reconciliation of misunderstandings once in the air, due to the limits of inter-aircraft communications. The consequences in the air can range from *nothing*, through *mission failure*, (i.e. failure to attack the target) to outright *tragedy* (i.e. fratricide).

For the CFACC, mission failure at the tactical level might be acceptable if it is infrequent and inconsequential, but it will certainly impact negatively on the air campaign plan if such failure occurs repetitively. Conversely, for the CJFC, the strategic implications of a tragic outcome, such as unacceptable collateral damage (i.e. mistaken targeting of a wagon train of civilians during the Kosovo air campaign) may be immediate and highly consequential, resulting in a drop in public support, or a breakdown in a coalition's will to pursue the air campaign plan in its current form.⁹ While incidents of inadvertent bombings and fratricide are not new to air warfare, the expectations of politicians and the general public have changed considerably since *Operation Desert Storm*. The combined effects of casualty and collateral damage aversion, near-real time media coverage, and the spectacular precision of modern munitions have heightened expectations to an unrealistic level, and these issues add additional burdens to field commanders.¹⁰

In the final analysis, much hangs in the balance of mission outcomes at the tactical level, and relatively junior officers bear the responsibility for fulfilling what may be unrealistic expectations of successful, error-free results. Consequently, a thorough understanding of the impediments to aircrew interoperability, particularly as they pertain to understanding each other and effectively coordinating their collective in-flight actions, is essential to help mitigate potential problems while simultaneously seeking to improve the collective effectiveness of the disparate contributions to coalition air operations.

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From Common Intent to Coordinated Execution

Canadian Defence scientists Pigeau and McCann's notion of “common intent,” which is defined as “...the sum of shared explicit intent plus operationally relevant shared implicit intent” is fundamental to understanding the impediments to aircrew interoperability at the tactical level in coalition air operations.¹¹ Unfortunately, their analysis falls short of exploring the realm of actual mission execution, for this is the domain where preparation combines with action to produce outcomes.¹² In other words, the effectiveness of this coordinated action is inextricably tied to mission results, for better or for worse. But how much of an impact does mission preparation have on developing a high level of *common intent*?

In the land environment, where the decentralized command and control framework necessitates unequivocal understanding of the theatre-level “Commander's Intent” to guide the subsequent actions of his subordinate formation commanders, significant emphasis is invested in this area as the basis for establishing *common intent*.¹³ However, in the air environment, the direct impact of the high-level *Commander's Intent* on aircrew interoperability is relatively minimal, due to the centralized command and control construct of the air campaign. Although the formal intent of the CJFC will set the tone for the objectives, priorities and the military end state for a coalition operation, it will be explicitly stated and very limited in content.

Conversely, the CFACC will typically provide an overwhelming amount of guidance to shape the general conduct of the air campaign – such as an overview of the Operations Plan, Rules of Engagement and Airspace Coordination Measures and Orders, as well as Special Instructions to address particular concerns. As with the CJFC's mission intent, the CFACC's orders are explicit in nature and directive in purpose, to ensure the controlled application of lethal force. They serve primarily to orient the preparation and execution of the tactical missions assigned through the Air Tasking Order.

In practice, it is during tactical, mission-specific planning that the establishment of *common intent* becomes fundamentally important as a precursor to successful mission execution. However, while some aspects of misunderstanding will be immediately apparent to the assigned package lead,¹⁴ other impediments to achieving *common intent* may be more subtle, remaining undetected until the weight of their consequences are felt in the air. A key area of concern is doctrine: the “what, how and why” that guides the mission planning. Defined as “...beliefs distilled through experience...codified practices on how best to employ ...airpower,”¹⁵ doctrine shapes the tactics and procedures applied to mission planning, and, more importantly, mission execution. As clearly identified by Pigeau and McCann, the development of the tactical pre-mission *common intent*

will also rely heavily on *implied intent*.¹⁶ Consequently, the potential differences in the implicit unspoken understanding of what is really meant, caused by differences in national doctrine, should be recognized as a potential source of in-flight problems.

Recalling that doctrine is built on beliefs and experience, the role of implicit intent cannot be underestimated as it pertains to how people subjectively perceive things. Research has demonstrated the impact of childhood development in the shaping of an individual's belief system, and how this retains a strong influence on the way things are perceived throughout one's adult life.¹⁷ Similarly, the socialization process that occurs during aircrew training and early flying tours has a lasting influence on doctrinal beliefs regarding the tactical application of airpower. The sum effect of these strong influences is a subjective misinterpretation of the implicit intent of other aircrew, or a divergent perspective on unfolding events during mission execution.¹⁸

Further compounding of the subtle yet detrimental impact of differences in implied intent is caused by limited attendance at the force package lead's planning session, as well as at the pre-mission brief, with those absent receiving incomplete briefings on a second-hand basis. The problem may be further confounded by geography in circumstances

where units are operating from dispersed air bases throughout a theatre, or by last minute changes to a flying schedule. Given the disproportionate importance of tactical mission planning and collective briefings for the establishment of tactical *common intent* prior to flying, what is the overall impact of unresolved misunderstandings or second-hand briefings? This is hard to quantify, but one need only consider a scenario in which a fighter pilot tasked with a close escort mission avoided engaging a nearby threat, either because of a misperception of the threat it posed, or due to a misunderstanding of the tactics to be applied, thereby leaving more vulnerable fighter-bombers to deal with the consequences of his failure to secure local air superiority.¹⁹

While one might find comfort working with traditional allies in such venues as the Tactical Leadership Program (TLP), or participation in "Flag" exercises such as *Maple Flag*, *Red Flag* and the like, a word of caution is still in order. Despite the fact that the NATO alliance is now more than 55 years old, it has witnessed an unprecedented expansion in membership in recent years, growing from 16 to 29 member nations since 1999. The inclusion of such new members in a future air campaign could lead to similar problems – unless significant, deliberate and continuous effort is made to train collectively while using a common doctrine.²⁰



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Pilot Hans Bergstrom from the Swedish Air Force inside a C-130 Hercules. Photo taken during exercise of *Maple Flag 2005* over Cold Lake Air Weapons Range, Cold Lake.



Aboard a NATO AWACS aircraft based out of Geilenkirchen, Germany during *Maple Flag 2005* in Cold Lake, Alberta. Airmen from Greece, the United States and Canada study radar screens in preparation for the afternoon launch of *Maple Flag* during the first week of the exercise.

The True Test of Aircrew Interoperability

While the tactical *common intent* established during the mission preparation and briefing phases is an essential precursor activity, the true test occurs once the aircrew get airborne. To begin, one must examine the notion of individual situational awareness (SA) to see its role in developing in-flight common understanding of the ever-changing situation. Defined by Vietnam Ace Randall Cunningham as "...a three-dimensional sense of awareness and feel (for) time, distance and relative motion...only if you have a feeling for what is going on around you can you take action and make correct decisions." Air historian Michael Spick's conclusion at the end of his research was that the mastery of situational awareness at the individual level has been the single most important contributing factor to success in aerial combat operations throughout the history of aerial warfare.²¹

The sharing of individual SA among the aircrew within a force package of aircraft allows for coordination action in response to a dynamically changing threat environment, whether it be the air superiority fighters committing on an enemy aircraft, first detected as a threat to the package by an AWACS controller, or to a specialized attack aircraft responding to a SAM threat that is menacing some of the tactical fighter-bombers. The

common intent established by the package lead during mission preparation would have addressed the roles and priorities of specific aircraft within the formation, and the sharing of this individual SA permits the mission to be executed accordingly in a coordinated and effective manner.

The key enabler to developing and sustaining this common understanding of the dynamically changing environment are in-flight communications – and the interoperability of the inter-aircraft communication systems is mission-critical. However, despite the advent of improvements to inter-aircraft communication suites (i.e. encryption/decryption and anti-jam capabilities, satellite communications, and multiple radio sets), these media remain quite limited in capacity for in-flight discussions, particularly when numerous aircraft are operating on a common frequency.

Consequently, communication discipline among formation members is absolutely vital to ensure that critical information (descriptive or directive) can be shared in a timely manner without undue delay. Recognizing that an aerial engagement can occur suddenly and end in a matter of seconds,²² degraded communications can culminate rapidly in tragic outcomes. Not surprisingly, in collective, multi-national training exercises, such as *Maple*

Flag and other combined exercises with NATO allies, the “need for better communications” is a recurring theme emerging from the post-flight debriefs, particularly for missions that experienced difficulties with a coordinated response to simulated surface and/or air threats.²³

The use of “communications brevity” words, a specialized lexicon that has well-defined and specific meanings attached to each word, tends to alleviate most problems when they are properly applied.²⁴ The value of these words is that they have specific meaning, even if devoid of a complete sentence or added context. Unfortunately, the incorrect understanding or application of these key brevity words can have immediate, unintended consequences, even within the lesser challenge of joint operations within the same military.²⁵ Under circumstances of personal stress, or when a threat situation is complex, the disciplined use of both the radio transmissions and communication brevity words can quickly deteriorate.

Reconciling Differences

In the context of coalition air operations, differences in doctrine, language and culture can contribute to the degradation of the inter-aircraft communications, thereby eroding the effectiveness of the coordinated execution of the mission. The primary concern is related to the fact that the means by which people communicate is highly subjective. The selection of words to express one’s thoughts, combined with the use of non-verbal communication, such as gestures and tone, are a matter of personal choice. In some cultures, such as French, Italian and Spanish, the use of gestures is an important means of communications that cannot be underestimated. Similarly, listening is also a highly subjective process and it too is influenced by many factors, including the listener’s own unconscious interpretation of the words chosen and the level of understanding of not only the message content and context, but also by a correct interpretation of the speaker’s tone and body language.²⁶ Recognizing the powerful influences of subjectivity, as well as the absence of body language in inter-aircraft communications, the use of standardized communications brevity words becomes extremely important to establish a reasonable common understanding. But what are the impacts of different linguistic upbringings on clear and concise communications?

When aircrew are operating in a language other than their mother tongue, the risk of misunderstanding is rather likely, particularly if the aircrew are not accustomed to the communication brevity words in use for the operation – or other non-standard, potentially ambiguous words are applied to describe or direct coordinated execution.²⁷ Additionally, there exists the potential for mispronunciation or grammatical errors in the way the words are combined into a message, as well as the risk of a subtle yet significant error in translation. For example, a French fighter pilot

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locked onto a fast moving radar contact would describe it as a contact of *haute vitesse*. During the ensuing translation, particularly in a situation of heightened stress, this same pilot might describe the contact as “high speed” or “high fast” since the word “fast” is a commonly accepted NATO brevity word. Regardless, it is within the realm of reasonable possibility that the other members of the package would take the word “high” in a different sense, since it is one of four commonly used brevity words applied to signify altitude.²⁸

The consequences of such a seemingly benign error of translation could be that the other members of the force package are misled into focusing their radar and visual search patterns into the upper portion of an airspace. If the original radar contact was somewhere else in the sky (i.e. low altitude), it is quite possible that an enemy aircraft could close to within weapons firing range without being targeted by one of the air superiority fighters. Although this is only a figurative example, it serves to highlight the potential for language differences among coalition aircrew to inadvertently create unnecessary confusion to the collective understanding of a dynamic air picture. Even if the error is detected, the additional communications needed to correct the problem may not be possible, given the increased radio use needed in rapidly evolving situations – such as the prosecution of or reaction to an enemy air threat in the immediate vicinity.

Next is the element of culture. Assuming that all the coalition aircrew are relatively fluent in the common language being used, could differences in culture have a negative influence on in-flight communications? Although perhaps more subtle than previous discussion about the impact of language differences, the primary impact of cultural differences is most likely to transpire within the implicit domain of communications.²⁹ The impact on the collective common understanding of the ever-changing air picture during an actual mission would tend to arise from the potential for differences in interpretation, and possibly even the unconscious filtering out of things that are not recognizable within the individual’s cognitive framework and established belief system.³⁰ In the case of misinterpretation, confusion could manifest itself, both with the individual, through a misunderstanding of what was heard, or propagated throughout the formation, through transmission of the misleading information or directives, due to misinterpretation on the part of the aircrew transmitting the message. What may be perceived as significant to one member of the formation may be perceived as insignificant, or less significant, by another member. In the case of key elements of a transmission failing to register (i.e., inadvertent selective hearing), depending on the circumstances, the consequences could be dramatic, particularly if this occurs in proximity to a threat. Similarly, it could lead to mistaken identification of a friendly aircraft, resulting in fratricide.

The final consideration is doctrine. Apart from the implicit “beliefs” that are associated with national or allied doctrine is the simple aspect of familiarity. Flying high performance aircraft within a package formation in a high threat environment is extremely demanding, pushing aircrew to their physical and mental limits. Under such circumstances of high stress, aircrew tend to revert to habit patterns in managing the many demands of flying their aircraft, working their sensors (i.e. radar, infrared targeting pods, and so on), and interacting with other aircrew to achieve the coordinated execution of the mission. Such habits are built upon hours of training and are reinforced through experiences provided in quality collective training, or through previous operational experience. For coalition aircrew flying the more demanding package missions in high threat environments, unfamiliarity with the tactics and procedures associated with the doctrine in use would be analogous to flying an aircraft with exceptional structural limitations. At the critical moments of mission execution, when the quality of the coordinated action will significantly influence the outcome, the results could be disastrous.³¹

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Limitations and Solutions

Clearly, differences in doctrine, language and culture can degrade aircrew interoperability, during both mission preparation and mission execution. But what can be done to mitigate the potential negative consequences? Once the problems are identified and the causes understood, the challenges in finding workable solutions can be quite significant, as noted by senior army officers in recent coalition operations.³² While some of the problems can be adequately reconciled in the short term through deliberate educational efforts, the majority require longer-term solutions.³³ Consequently, the CFACC and his staff will be faced with limited options and hard choices early in a campaign, but they may be able to improve aircrew interoperability over time. Conversely, the longer-term solutions will require a crystal ball to accurately forecast the non-traditional allies that are likely to be drawn together for a common cause.

Common doctrine and communications are at the heart of the matter. Doctrine provides the foundation for building tactical *common intent* and the habitual skills necessary for intense flying environments. It is, unequivocally, the single most important determinant affecting aircrew interoperability in joint, combined and coalition air operations.³⁴ Communications are the means by which ideas are exchanged, challenged and reconciled, and through which coordinated execution is achieved in flight. The key to successful solutions when an *ad hoc* coalition is cobbled together on short notice is for a CFACC to make a deliberate attempt to proactively assess the likely symptoms and treat the causes, before they result in tragic, unintended consequences. This article has attempted to bring attention to the potential impediments to achieving effective aircrew interoperability, with respect to both causes and likely symptoms.

The issue of improving *common intent* during the mission preparation phase boils down to taking the necessary measures to ensure that a sufficient level of understanding has been achieved. This equates to ensuring that participating aircrew are given the maximum opportunity to develop, question and reconcile their individual comprehension of the specific tactical intent for the assigned mission. It will likely necessitate a decrease in the tempo of taskings to allow more time for the crucial establishment of tactical common intent, and it may also require limiting force package participants to those aircrew based in close proximity to one another, as was done in the early stages of *Desert Shield*.³⁵ Awareness of cultural issues that could impact operations could also be adequately reconciled in relatively short order through the application of intelligent, sensitive measures. If the language skills of certain nations or aircrew are cause for concern, language testing could be applied to ensure that a minimum acceptable skill level is upheld.

Additional measures could be taken in theatre to reinforce the essential elements of tactical *common intent*, such as conducting mandatory mass debriefs following each mission, conducting periodic tactics seminars, and through the internal circulation of lessons learned by other coalition aircrew during recent missions. The benefits of these measures would be to increase individual understanding and to improve the collective implicit intent. Research has demonstrated that the process of internally testing one’s cognitive belief system is the fundamental means by which an individual can reject or modify existing beliefs or introduce new beliefs, the result being an improved capability for more accurately understanding and interpreting one’s environment.³⁶ Similarly, socialization activities are instrumental in improving implicit intent.³⁷ Although such measures would require a reduction in operational tempo to create the necessary time for such mass debriefs and seminars, it could be an excellent investment towards improving tactical outcomes during mission execution.

Conversely, given that integration of forces is fundamental to a centralized command and control structure, the CFACC could opt to restrict the missions assigned to nations with inadequate interoperability for high-risk offensive operations in particular package formations. Such an approach was taken by the CFACC during *Operation Deliberate Force*, wherein some aircraft were assigned to roles of lower risk and/or less requirement for other capabilities.³⁸ However, if time permits, the CFACC could request additional time for collective training in-theatre to work out the aircrew interoperability issues. Although the timing of *Desert Storm* was decided by other strategic factors, *Desert Shield* provided the CFACC with several valuable weeks to develop and refine the collective training of his coalition forces into a highly effective fighting force prior to the commencement of the offensive air campaign.³⁹

Realistically, the solutions to significant doctrinal differences can only be reconciled properly over time through education and collective training, with particular emphasis on multinational flying exercises such as *Red Flag*, *Maple Flag* and the like. By way of example, the quest for an effective reconciliation of joint doctrine among the various United States armed services took many years, and so the significance of the challenge cannot be underestimated.⁴⁰ However, if it is possible to accurately forecast probable allies in future *ad hoc* coalition air operations, it is well worth the effort. While the detailed post-conflict analysis of the Gulf War strongly reinforces this conclusion, the stunning results of *Operation Desert Storm* speak for themselves.⁴¹

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Conclusion

The planning and execution of an effective coalition air campaign in a modern combat theatre can be a tremendously complex challenge, particularly within the centralized command and control construct that continues to demonstrate significant advantages, despite its clear disadvantages. Central to the disadvantages are the

requirements for effective interoperability to enable the full exploitation of this integrated approach to air warfare. While the need to focus on interoperability from a technical perspective is self-evident, a CFACC would be well advised not to overlook the human dimension of the total air power equation.

The disproportionate role of relatively junior aircrew in the outcome of the air campaign and the overall coalition operation demands great care in evaluating the potential impediments to aircrew interoperability that will inevitably manifest themselves in multinational environments. In particular, a CFACC should evaluate carefully the differences in doctrine, language and culture among the participating aircrew, then take proactive measures to mitigate the consequences of such differences, while applying creative means to enhance the situation in order to retain the greatest flexibility in the application of air power. Either way, failure to address these impediments could well sow the seeds for tragic loss of life and mission failure at the operational level.



German and Belgian aircraft fill the ramp at *Maple Flag 2005*.

NOTES

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13. Peder Beausang, *The Role of Intent and the Ideal Command Concept in Military Command and Control – Canadian and Swedish Commanders' Perspectives* (Stockholm: FOI Swedish Defence Research Agency, 2004), pp. 21-22. In the context of contemporary discussions, the term *Commander's Intent* is applied to the planning process in shaping the commander's objective(s), the overall approach and applicable concerns/constraints that define the parameters for acceptable action.
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23. *Exercise Red Flag* is conducted at Nellis Air Force Base in Nevada and *Exercise Maple Flag* is conducted at 4 Wing Cold Lake in Alberta.
24. "Comm Brevity" is the accepted short terminology for communications brevity.
25. Michael Smith, "Doctrine and Training: The Foundation of Effective Coalition Operation," in *Problems and Solutions in Future Coalition Operations*, pp. 71-72.
26. Thomas G. Banville, *How to Listen – How to be Heard*, (Chicago: Nelson-Hall, 1978), pp. 10-17.
27. MLJ Abercrombie, *The Anatomy of Judgement – An Investigation into the Process of Perception and Reasoning* (London : Hutchinson & Company, 1965), pp. 106-107. In this instance, the author is describing the creation of confusion arising from the use of words of multiple connotations and alternative interpretations.
28. The other altitude descriptors being low, medium and very high.
29. Maurer, pp. 55-63.
30. Jervis, pp. 143-154.
31. Mark D. Mandales, Thomas C. Hone and Sanford S. Terry, p. 151.
32. RA Dallaire, "Command Experiences in Rwanda," In Carol McCann and Ross Pigeau (eds.), *The Human in Command – Exploring the Modern Military Experience*, p. 35; and Alan Ryan, "The Strong Lead-nation Model in an ad hoc Coalition of the Willing: *Operation Stabilise* in East Timor," in *International Peacekeeping*, Vol. 9, No. 1 (Spring 2002), p. 35.
33. Ryan, p. 41.
34. Mark D. Mandales et al., p. 151.
35. Peter C. Hunt, *Coalition Warfare – Considerations for the Air Component Commander* (Maxwell AFB, Alabama: Air University Press, 1998), p. 28.
36. Abercrombie, pp. 60-62.
37. Carol McCann and Ross Pigeau, "Redefining Command and Control," pp. 168-172.
38. Hunt, pp. 41-42.
39. Library of Congress, "Volume II – Operations and Effects and Effectiveness," In Eliot A. Cohen, (Director) *Gulf War Air Power Survey*. Washington, 1993.
40. Maurer, pp. 101-103.
41. Mark D. Mandales et al., p. 151, and Library of Congress, "Volume II – Operations and Effects and Effectiveness," in Eliot A. Cohen.