



Machine gunner with Weapons Company, 1<sup>st</sup> Battalion, 1<sup>st</sup> Marine Regiment, Marine Rotational Force—Darwin prepares to provide security during Exercise Hamel at Cultana Training Area, South Australia, Australia, July 2016 (U.S. Marine Corps/Osvaldo L. Ortega III)

# Center of Gravity Analysis “Down Under”

## The Australian Defence Force’s New Approach

By Aaron P. Jackson

---

Dr. Aaron P. Jackson is a Joint Operations Planning Specialist in the Joint and Operations Analysis Division of Australia’s Defence Science and Technology Group. The views expressed in this article are the author’s own and are not necessarily those of the Australian Department of Defence or any part thereof.

Given Australia’s position as a key U.S. ally and a much smaller military power, as well as the array of cultural similarities between the two countries, it should come as no surprise that U.S. developments have regularly influenced Australian Defence Force (ADF) thinking about armed conflict.<sup>1</sup> Center of gravity (COG) analysis, a lynchpin of campaign and operation planning, is no exception.

The ADF has recently reviewed its equivalent to the U.S. Joint Operation Planning Process, called the Joint Military Appreciation Process (JMAP), and as a part of this review it has updated its approach to COG analysis. Ongoing Australian evaluations of the previous ADF approach to COG analysis in light of contemporary operational requirements prompted this update. The publication in the United States of



Amphibious assault vehicles carrying Company G, Battalion Landing Team 2<sup>nd</sup> Battalion, 7<sup>th</sup> Marines, 31<sup>st</sup> Marine Expeditionary Unit, charge onto Freshwater Beach during Exercise Talisman Sabre 2011, Queensland, Australia (U.S. Marines/Garry J. Welch)

several new theoretical developments subsequently constituted a key input during the development of the updated approach, although the approach itself has adapted the theory to suit Australia's national conditions and the ADF's requirements. As a result, the ADF's new approach to COG analysis constitutes an innovation in its own right. This article summarizes this new approach to COG analysis as well as elaborating its origins and the influences on its development.

### **COG Analysis Requirements for Today's ADF Operations**

The term *center of gravity* entered Australian Army doctrine in 1992 and ADF joint doctrine in 1998.<sup>2</sup> The definition of COG that featured in the 1998 interim edition of JMAP doctrine remained essentially unchanged between then and the recent review:

“The key characteristic, capability or locality from which a military force, nation or alliance derives its freedom of action, strength or will to fight at that level of conflict.”<sup>3</sup> Analysis of critical vulnerabilities (CVs) was introduced at the same time as the term COG.

By the early 21<sup>st</sup> century, the ADF joint approach to COG analysis had become better developed. For example, the ADF's joint approach to COG analysis expanded in 2002 to include critical capabilities (CCs) and critical requirements (CRs).<sup>4</sup> Staff would first identify adversary and friendly COGs based on a broad analysis of the operational environment. Doctrinal guidance about precisely how to do this was minimal, and the process of determining COGs had a tendency to degenerate into a planning group “educated guess” (or, in some cases, to be decided based on force of personality

within a planning group). Once the COG was identified, doctrine provided better guidance for the subsequent development of a “COG analysis matrix” for each COG, which broke the COG down into CCs, the CCs into CRs, and the CRs into CVs.

Later in the JMAP, courses of action were developed by arranging decisive points along one or more lines of operations that collectively led to the defeat of the adversary's COG. Although decisive points could be linked to achieving effects that were broader than defeating the adversary's COG (or protecting one's own), the need to sequence them on a line of operations running toward defeat of the adversary's COG tended to limit their focus. Furthermore, at no stage in the JMAP were planners required to determine operational objectives or the desired operational endstate. Even though they

were required to determine the joint force's mission, the positioning of defeat of the adversary's COG at the end of all lines of operation made this implicitly synonymous with achieving the desired operational endstate. This method of COG analysis and operational planning was theoretically workable and was well suited to conventional warfare scenarios.

In practice, however, conventional warfare is almost the only kind of operation that the ADF has not conducted so far this century. Since 2001 the ADF has conducted dozens of operations, including unconventional warfare and stabilization in Afghanistan and Iraq; peace enforcement in Timor Leste; peace-keeping in the Solomon Islands; truce monitoring in the Sinai and South Sudan; provision of humanitarian assistance and disaster relief throughout the Asia-Pacific; and provision of ADF assistance to domestic authorities during major natural disasters and major sporting events such as the 2006 Melbourne Commonwealth Games. In total, the ADF has conducted at least 48 different operations since 2001, most of which have been unopposed.<sup>5</sup> The nature of these operations has meant that COG analysis often had to be applied more flexibly than the JMAP doctrine seemed to intend (for example, by being applied to nonadversarial actors within an area of operations). That this regularly occurred is a testament to the initiative of staff officers and planners across the ADF; however, it was also a key indicator that the doctrine was ready for an update.

Beginning in 2008, a half-dozen evaluations of the ADF's application of COG analysis were published, mostly written in response to conceptual developments appearing in U.S.-based publications. These evaluations offered several recommendations about how the ADF might approach COG analysis in light of these conceptual developments, although the recommendations themselves varied significantly between publications. At one end of the spectrum, then-Lieutenant Colonel Trent Scott asserted that COG was a "flawed concept," stating that "what does invalidate the centre of gravity is the reductive hypothesis that

underlies the practical application of the concept." His key concern was that COG analysis reduces complex systems to a single point of focus and subsequently leaves staff open to a confirmation bias.<sup>6</sup> At the other end of the spectrum, Professor Michael Evans of the Australian Defence College emphasized his view that COG analysis remains highly relevant and advocated the introduction of a U.S.-style approach to operational design into ADF doctrine as a way to modernize the force's approach to COG analysis.<sup>7</sup> Regardless of the variety of these conclusions, the debate itself reinforced the need for an evolution of the ADF's doctrinal approach to COG analysis.

### The Existential Question

The recent review of the JMAP commenced in accordance with the ADF's joint doctrine review cycle, which stipulates that all publications should be reviewed every 3 to 5 years.<sup>8</sup> The first question facing the ADF was whether to keep COG analysis in doctrine at all. This question was relatively easy to answer. All of the major stakeholders in the JMAP doctrine publication wanted the concept retained (these stakeholders included operational-level headquarters and professional military education institutions). Indeed, this aspect of the review showed that culturally, the ADF—the army in particular—is wedded to the COG concept to the extent that removing it from doctrine altogether would have resulted in insurmountable "sales resistance" to the point where the revised iteration of JMAP doctrine likely would not have been applied.<sup>9</sup> As a result, COG analysis remains prominent within ADF joint doctrine.

### The Methodological Question

The second issue facing the ADF was more difficult: What form should COG analysis take, and where should it be positioned within the planning process? When the review of the doctrine commenced, recent theoretical development of COG analysis had already led to pedagogical changes at the Australian Command and Staff College. Fortu-

nately, this theoretical work was also available to assist in the development of the doctrine, as was comprehensive data about Australia's recent operations. The final decision about how to fit COG analysis within the JMAP resulted from a thorough evaluation of ADF operational requirements and the theoretical literature, supported by extensive consultation with key stakeholders.<sup>10</sup>

The result of the review was twofold. First, the role of COG analysis relative to other components of the JMAP was altered. Second, there was an update to COG analysis itself, including key definitions and the method used to determine COG.

Regarding the relative position of COG analysis to the other components of the JMAP, the COG analysis methodology included in the new edition of the JMAP doctrine states that defeating the adversary's COG could be explicitly linked to either a decisive point, an operational objective or the desired operational endstate (determining the desired operational endstate and constituent operational objectives are now explicit components of the JMAP).<sup>11</sup> This means that defeating an adversary's COG is no longer implicitly linked to achieving the desired operational endstate—although the option to make this link remains available in the revised methodology, so that there will be no problems applying COG analysis to conventional operations or training scenarios in the same manner as it was applied in the previous iteration of the JMAP.

In other types of operations, the flexibility of the revised JMAP allows the defeat of an adversary's COG to be linked to only one of several operational objectives or to one or more decisive points along a single line of operations. This has resulted in the new edition of the JMAP doctrine more closely mirroring recent practice. Furthermore, the new edition of the JMAP doctrine also establishes that in unopposed operations, a COG analysis may be completed for a nonadversarial threat that would prevent mission accomplishment if not adequately addressed. Ultimately, in this revised approach it is up to the commander to determine how to approach COG analysis for any particular

**Table. New Definitions of Center of Gravity and Related Critical Factors**

Term	Definition
Center of gravity	The primary entity that possesses the inherent capability to achieve an objective or the desired end state.
Critical capabilities	An action (verb) done by the center of gravity that enables it to achieve an objective or the desired end state.
Critical requirements	A thing (noun), resource, or means that is essential for a critical capability to enable a center of gravity to function.
Critical vulnerabilities	Those critical requirements, or components thereof, that are inherently targetable and vulnerable to neutralization, defeat, or destruction in a way that will contribute to undermining a center of gravity.

Source: Australian Defence Force Publication 5.0.1, *Joint Military Appreciation Process*, 2<sup>nd</sup> ed., Amendment List 1 (Canberra: Defence Publishing Service, February 25, 2016).

operation. This approach had previously been common *in practice*, but had not been addressed in previous editions of the JMAP doctrine. The new doctrinal flexibility regarding the relative position of COG analysis within the JMAP therefore means that the doctrine is now able to provide guidance for the commander and staff regardless of the commander's chosen operational approach.

The second result of the doctrine review, the update to COG analysis, had two aspects. One of these was definitional and the other structural. A decision to revise the definition of COG was made due to the very broad "catchall" nature of the previous definition, which was sufficiently open as to allow almost anything to be deemed a COG. In addition to wanting a narrower definition that could be more easily linked to either an operational objective or the desired operational endstate, it was decided to limit the interpretation of a COG to something tangible at the operational and tactical levels. Eliminating intangible COGs such as "will to fight" or "force projection" has resulted in a more prominent focus on capabilities (such as those that can achieve force projection), making the link between the COG and its CVs more explicit and resulting in targeting lists more directly connected to undermining the adversary's COG.

The revised definitions supporting this new approach to COG analysis were determined following a thorough evaluation of the methodologies proposed within the recent theoretical discourse. The table shows the ADF's new definitions of COG and related CCs, CRs,

and CVs. In deriving these definitions, theoretical works published by Dale C. Eikmeier, Joseph L. Strange, and Richard Iron were particularly influential, albeit that the approaches to COG analysis advocated by these theorists were modified to be simpler and more strongly interlinked before the final ADF definitions were determined.<sup>12</sup> Despite their origins in theoretical papers, it must be noted that these definitional changes were only implemented as the result of stakeholder suggestions about how the doctrine could best address their operational and instructional needs.

The structural aspect of the change to COG analysis involved an amendment to the way in which the COG and the related CCs, CRs, and CVs are determined. Here, Jan L. Rueschhoff and Jonathan P. Dunne's approach to identifying COG "from the inside out" shaped the doctrine's recommended methodology for conducting COG analysis starting with the identification of CC and then "working left and right" to determine the COG as well as the other critical factors.<sup>13</sup> Such a tool for deriving COG was not included at all in the previous edition of the JMAP doctrine; hence, its inclusion within the new edition constitutes one of the most significant methodological changes therein. Because this approach results in staff first identifying tangible capabilities and then deriving the COG by linking these to the ability to achieve an operational objective or desired operational endstate, it greatly eliminates the educated guess factor from the process of determining COG.

The ADF first incorporated COG analysis into its joint doctrine in 1998, and the concept has been broadly useful as a component of ADF joint operations planning. Since 1998, the ADF methodology for conducting COG analysis, as well as its definition of COG and related terminology, underwent only minor changes until the recent review of the ADF's JMAP doctrine. In light of stakeholder requirements and operational lessons, supported by theoretical development of the concept, it was determined during this review that the ADF approach to COG analysis required revision, which was undertaken accordingly. The result is an updated approach to COG analysis that is well suited to contemporary joint operations. No operational concept or idea exists in a vacuum, however, and it is therefore expected that at an appropriate point in the future, the ADF approach to COG analysis will again be revised in response to the conditions of the day. Until then, an approach to COG analysis that reflects the most up-to-date thinking available has postured the ADF for continued operational success. JFQ

## Notes

<sup>1</sup> The similar positions and common grouping of the United States and Australia on the Inglehart-Welzel Cultural Map is a key indicator of the cultural similarities between them. See World Values Survey Database, "Findings and Insights," undated (but including data from 2014), available at <[www.worldvaluessurvey.org/WVSContents.jsp](http://www.worldvaluessurvey.org/WVSContents.jsp)>.

<sup>2</sup> Michael Evans, *Forward from the Past: The Development of Australian Army Doctrine 1972–Present* (Canberra: Australian Army Land Warfare Studies Centre, 1999), 43; Australian Defence Force (ADF), *Joint Military Appreciation Process [JMAP]: A Guide to Planning at the Operational Level: Interim Edition* (Canberra: Defence Publishing and Visual Communications, 1998).

<sup>3</sup> ADF, glossary.

<sup>4</sup> The ADF's original definitions of the terms *critical vulnerabilities*, *critical capabilities*, and *critical requirements* are not important for the purposes of this article. The ADF's new (that is, current) definitions are listed in table 1.

<sup>5</sup> John Blaxland, *The Australian Army from Whitlam to Howard* (Melbourne: Cambridge University Press, 2014), 374–377.



U.S. Marines move toward objective during Exercise Hamel at Cultana Training Area, South Australia, Australia, July 2016 (U.S. Marine Corps/Mandoline Hatch)

<sup>6</sup>Trent Scott, *The Lost Operational Art: Invigorating Campaigning into the Australian Defence Force* (Canberra: Land Warfare Studies Centre, February 2011), 41–45.

<sup>7</sup>Michael Evans, “Centre of Gravity Analysis in Joint Military Planning and Design: Implications and Recommendations for the Australian Defence Force,” *Security Challenges* 8, no. 2 (Winter 2012), 81–104.

<sup>8</sup>The previous edition of the JMAP doctrine was published in 2009. The revised (current) edition was developed during 2014 and published in February 2015. Following assessments of the revised edition undertaken during its application, a minor amendment was published in February 2016. At the time of writing of this article (September 2016), a second minor amendment is forthcoming; however, this will not include any changes to center of gravity analysis.

<sup>9</sup>Christopher Bassford asserted that “sales resistance” to new doctrine is “often stimulated by overt attempts to introduce a new paradigm.” In this case the opposite action, the complete removal of a familiar paradigm from the doctrine, would likely have had the same result. See Christopher Bassford, “Doctrinal Complexity: Nonlinearity in Marine Corps Doctrine,” in *Maneuver Warfare*

*Science* 1998, ed. Frank G. Hoffman and Gary Horne (Washington, DC: Department of the Navy/U.S. Marine Corps, 1998), 11.

<sup>10</sup>Relevant theoretical works include Dale C. Eikmeier, “Center of Gravity Analysis,” *Military Review* (July/August 2004), 2–5; Celestino Perez, Jr., ed., *Addressing the Fog of COG: Perspectives on the Center of Gravity in U.S. Military Doctrine* (Fort Leavenworth, KS: U.S. Army Combat Studies Institute Press, 2012); Dale C. Eikmeier, “Give Carl von Clausewitz and the Center of Gravity a Divorce,” *Small Wars Journal* 9, no. 7 (July 2, 2013), available at <<http://smallwarsjournal.com/jrnl/art/give-carl-von-clausewitz-and-the-center-of-gravity-a-divorce>>; James P. Butler, “Godzilla Methodology: Means for Determining Center of Gravity,” *Joint Force Quarterly* 72 (1<sup>st</sup> Quarter 2014), 26–30; Lawrence Freedman, “Stop Looking for the Center of Gravity,” *War on the Rocks* (blog), June 2014, available at <<http://warontherocks.com/2014/06/stop-looking-for-the-center-of-gravity/>>. To ensure interoperability, another influential source that was thoroughly evaluated was Joint Publication (JP) 5-0, *Joint Operation Planning* (Washington, DC: The Joint Staff, August 11, 2011), which contains the latest iteration of U.S. joint doctrinal thinking on the subject.

<sup>11</sup>All references to JMAP doctrine and the ADF’s revised approach to COG analysis made in this section of this article are to Australian Defence Force Publication (ADFP) 5.0.1, *Joint Military Appreciation Process*, 2<sup>nd</sup> ed., Amendment List 1 (Canberra: Defence Publishing Service, February 25, 2016); for COG analysis, see 3.6–3.17.

<sup>12</sup>Dale C. Eikmeier, “Redefining the Center of Gravity,” *Joint Force Quarterly* 59 (4<sup>th</sup> Quarter 2010), 156–158; Eikmeier, “After the Divorce: Clausewitz and the Center of Gravity”; Joseph L. Strange and Richard Iron, “Center of Gravity: What Clausewitz Really Meant,” *Joint Force Quarterly* 35 (October 2004), 20–27; and Joseph L. Strange and Richard Iron, “Understanding Centers of Gravity and Critical Vulnerabilities,” unpublished paper, available at <[www.au.af.mil/au/awc/awcgate/usmc/cog1.pdf](http://www.au.af.mil/au/awc/awcgate/usmc/cog1.pdf)>; and <[www.au.af.mil/au/awc/awcgate/usmc/cog2.pdf](http://www.au.af.mil/au/awc/awcgate/usmc/cog2.pdf)>.

<sup>13</sup>Jan L. Rueschhoff and Jonathan P. Dunne, “Centers of Gravity from the ‘Inside Out,’” *Joint Force Quarterly* 60 (1<sup>st</sup> Quarter 2011), 120–124.