CORBETT IN ORBIT

A Maritime Model for Strategic Space Theory

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Despite its growing importance, no comprehensive theory of space power has been formulated.

COLIN GRAY

Since the 1950s, there have been discussions concerning the need to develop a space power theory.[1] In their attempts to formulate such a theory, strategists have noted the similarities of space operations to those of air and naval operations. Consequently, many have attempted to derive a clearly articulated, all-encompassing space theory through analogy and comparison to either airpower or sea-control models. These efforts, however, as observers like the contemporary historian and strategist Colin Gray have noted, have not produced a theory addressing space operations and associated national interests.[2] Without such a strategic framework for space, some analysts fear that national resources and military force will be applied poorly or even counterproductively.

This article, accordingly, addresses the need to codify a space theory. Do space operations and national interests in space have in fact useful parallels in either air or naval operations? If air and naval models do not fully match the essence of space operations, is there one that does? Given a suitable historical model, what are the principles for a space strategy? Would the resulting space strategic model be borne out by contemporary observations?

We will argue that neither the air nor naval model embraces the breadth of space operations and strategy. However, by expanding naval theory to include broadly *maritime* concerns, which incorporate the interaction of land and sea, the scope of space operations can be

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adequately modeled. In fact, maritime theory already exists, in the work of Sir Julian Corbett, on the basis of which maritime strategy can be defined and then the principles of space theory developed. The resulting maritime-based space theory largely meets the test of current observations and ideas while highlighting significant areas that contemporary space literature has omitted.

The United States has developed space systems and doctrine quite well without the benefit of space theory; why bother deriving one? The reason is the adage, "You don't know what you don't know." A theory attempts to make sense of what would otherwise be inscrutable, to set forth "rules of the game" by which actions become intelligible.[3] According to the Prussian military strategist and theorist Carl von Clausewitz, theory "gives the mind insight into the great mass of phenomena and of their relationships, then leaves it free to rise into the higher realms of action."[4]

To achieve in connection with space the kind of insight of which Clausewitz wrote, this article will compare past strategic theories and use the most suitable model as a framework for a strategic space theory. Using historical theories as a guide increases the likelihood of developing a meaningful space theory beyond that which arbitrary choice, pure chance, or blind intuition would allow.[5]

CURRENT OPERATIONS AND NATIONAL INTERESTS

The United States has become increasingly reliant upon space. Space-based technology enters homes, businesses, schools, hospitals, and government offices through applications related to transportation, health, the environment, telecommunications, education, commerce, agriculture, energy, and military operations.[6]

Although the range is indeed broad, the nation's space activities can be divided into four major sectors—civil, commercial, intelligence, and military.[7] Civil space activities are those aimed at exploring space and advancing human understanding; the missions performed by the National Aeronautics and Space Administration fall into this category. Commercial activities are performed by private companies and industry for profit. The intelligence sector involves surveillance and reconnaissance missions conducted by such government agencies as the National Reconnaissance Office. Lastly, military activities are those promoting national security through offensive or defensive operations in and through space. Space-based systems may, consistently with international law, perform essential functions facilitating military activities on land, in the air, and on and under the sea.[8] Because of the diverse and pervasive nature of the space activities of the United States, its space operations have implications spanning all elements of national power—diplomatic, military, economic, technological, or information.[9]

NAVAL AND AIR MODELS

As Colin Gray has observed, space operations have more in common with the sea and the air than is widely appreciated.[10] For just as space operations utilize ground facilities, up-and-down links to vehicles in orbit, and the satellites themselves, so naval and air operations have bases at home and facilities abroad, as well as ships and planes. Like international airspace and waters, space is open to all nations; it is free from claims of sovereignty and national appropriation.[11] Because of these similarities, Gray declares, "the history of sea power and air power offers true precedents for developing a space strategy."[12] For that reason, many elements of current space power theory have been derived from various tenets of airpower and sea control theories.[13]

The Air Model

There is no single airpower theory of the comprehensiveness and universality of Clausewitz's work on land power.[14] Air Marshal Giulio Douhet of Italy is generally credited with developing the first of the theories of airpower that now exist.[15] In his *The Command of the Air* he contended that aircraft are the solution to strategic and tactical stalemates, and that all future wars could be won from the air.[16] He found the aircraft's superiority in its offensive characteristics—freedom of maneuver and speed—which accrue from operating in the air.[17] Furthermore, Douhet's formula for victory includes gaining command of the air and then neutralizing the enemy's vital centers.[18]

In a supporting view after the First World War, Brigadier General William "Billy" Mitchell declared, "As air covers the whole world, aircraft are able to go anywhere on the planet . . . [and] have set aside all ideas of frontiers."[19] Mitchell held that some air operations, such as strategic bombing, can achieve independent results, thereby winning wars through destruction of the enemy's war-making capability and will to fight.[20] The nation that wins the air war, Mitchell was convinced, is practically certain to win the entire conflict.[21]

Early thinkers on space forces considered them simply "high-flying air forces."[22] For example, U.S. Air Force space doctrine was first established merely by replacing the word "air" with the coinage "aerospace" in the literature.[23] According to aerospace integrationists, space power is no different from airpower, because it delivers similar products to users.[24] Consequently, in that view, no separate space power theory or definition is warranted, since aerospace power embraces space operations.[25]

Nevertheless, many critics have argued against combining air and space theories, pointing out that the respective propulsive, aerodynamic, and orbital-mechanics conditions and requirements make air and space quite distinct

media.[26] These differences are manifested in the differing ability of aircraft and space systems to maneuver and loiter.

If air and space are different media, however, they are made interrelated and interdependent by shared activities and mutual boundaries. For example, no space vehicle can ascend into orbit without traversing the air realm. The history and development of aerospace power theory is, consequently, useful for the derivation of strategic space theory, since it incorporates the interaction of media and forces. The point is that space theory should be "holistic," addressing the indirect effects of space operations on national strategy and nonspace activities.

The Naval Model

Some strategists, pointing to the similarities between sea and space operations, suggest that the best possible space theory would be achieved by simply substituting "space" for "sea" in naval strategy.[27] Naval theory, however, deals with ships, shipbuilding, war at sea, and military forces associated with navies.[28] Moreover, naval theory is primarily concerned with the means and methods of employing force at sea to achieve national goals while increasing national power and prestige. This emphasis on naval operations and fleet actions results in a "sea" and "navy"-centric perspective. Consequently, the applicability of the naval model to space is limited, since it does not adequately encompass the interaction and interdependence of other environments or military forces.

Both air and naval models are relevant to space operations and activities, but neither possesses the breadth needed for a strategic space theory. The air model, in its aerospace variant, takes into account the interrelationships of other forces and environments, but it has a primarily military focus. The naval model includes national interests, such as prestige and power, but is focused on naval engagements alone and tends to exclude other operations or forces. Yet there is a theoretical model that incorporates other mediums and forces, as aerospace power does, while including broad national interests, as the naval model does.

A MARITIME MODEL

The term "maritime," in contrast to "naval," connotes the whole range of activities and interests regarding the seas and oceans of the world, and their interrelationships: science, technology, cartography, industry, economics, trade, politics, international affairs, imperial expansion, communications, migration, international law, social affairs, and leadership.[29] Additionally, maritime theory includes the interaction between sea and land. Since many national and local economies have historically depended upon ports for trade and general

economic well-being, the need to protect maritime trade with fleets arose. Naval theory, therefore, is but a subset of maritime theory.

The maritime model, then, appears to match more closely the various issues of space operations than does either air or naval theory. But a number of major theoreticians have worked in this field. If maritime theory is to be the framework of a strategic framework for space, whose version should be used?

The work of Alfred Thayer Mahan, particularly *The Influence of Sea Power upon History 1660–1783,* has been frequently employed in this connection.[30] Mahan is credited with linking maritime and naval activities to national and international issues, as well as with laying out principles for the formulation of naval strategy.[31] His writings address national policy, sea power, sea control, offensive versus defensive operations, speed and mobility, communications, trade, concentration of force, and strategic position.[32] Indeed, Mahan is extensively quoted, especially in the United States, to promote a variety of ideas. In the search for axioms on strategy, his ideas have been "used, misused, superseded, broadened, and modified."[33] Mahan's strategic theory, properly understood, insists that the "proper sphere" of the fleet is offensive operations and gives little attention to matters, such as interaction with land armies, outside the direct action of navies and fleets. Consequently, Mahan's theory does not incorporate adequately for present purposes the interaction and interdependence of other mediums and forces. If not Mahan, then who?

Perhaps the answer is Sir Julian Corbett, whose work many (though not all) historians regard highly as a coherent and convincing exposition of maritime principles.[34] Sir Julian Stafford Corbett (1854–1922), acclaimed as Great Britain's greatest maritime strategist, is particularly renowned for his 1911 work *Some Principles of Maritime Strategy,* a "fusion of history and strategy."[35] Corbett took up many of the same issues as Mahan, but his writings are widely considered more accurate, more complete, and "more logically developed" than Mahan's.[36] Additionally, many historians regard Corbett as the deepest and most flexible thinker among either maritime or naval theorists.[37] Therefore, it is Corbett's ideas and principles, from *Some Principles of Maritime Strategy,* that we will use as a framework for deriving a strategic space theory.[38]

Corbett wrote of the implications for national power of maritime operations in both peace and war. Like Carl von Clausewitz—whom he cites extensively—Corbett recognized that both land and sea operations are influenced by national politics and interests. The object of naval warfare being in his view to control maritime communications, including commercial and economic aspects, Corbett held that naval action can influence the balance of wealth and power among nations.[39]

Nonetheless, Corbett acknowledged that sea and land operations are interdependent, that naval strategy and operations constitute only a subset of a nation's wartime operations. He repeatedly stated the necessity for the closest cooperation of ground and sea forces. In fact, in a departure from the conventional thought of his day, Corbett considered it of paramount importance that naval strategy work within the overall national strategy, since it is almost impossible for war to be decided by naval action alone (*Some Principles,* page 15). Therefore, the purpose of maritime strategy is to determine the "mutual relations of your army and navy in a plan of war" (page 16).[40]

Another theme of Corbett's work is "command of the sea," which he considers different from the occupation of territory by an army, for the high seas cannot be subjected to political dominion or ownership. The inherent value of the sea, in his view, is as a means of communication. Consequently, Corbett defines command of the sea as the "control of maritime communications, whether for commercial or military purposes" (94). He explicitly states, however, that to command the sea is a relative advantage, not an absolute; it does not mean that the enemy cannot act, only that it cannot seriously interfere with one's actions. The normal state of affairs, Corbett observes, is not a commanded sea but an uncommanded one—that is, command of the sea is normally in dispute (91).

Maritime communications pertain to those routes by which the flow of "national life is maintained ashore"; therefore, they have a broader meaning than land lines of communication and are not analogous to those traditionally used by armies (93, 100).[41] While maritime communications include supply and trade, they also include lines of communication that are of a strategic nature and are thus critical for a nation's survival. The objective of controlling maritime communications is protection of one's own commerce and interference with the enemy's economic interests, ultimately the defeat of the adversary's "power of resistance" (102). Corbett argues that the primary object of the fleet, therefore, is to secure sea lines of communication, putting the enemy's fleet out of action if it is in a position to render them unsafe (102).

For Corbett, offensive operations are called for when political objectives necessitate acquiring something from the enemy; as a more "effective" (his term) form of war than the defensive, offensive operations should be the preference of the stronger power (31). Notwithstanding the advantage of the offensive, however, even a superior naval force seeking a decisive victory will likely find the enemy in a position where he cannot easily be affected; throughout naval history fleets have been able to thwart attempts to force decisive battle by retiring to the safety of coasts and ports (158). Still, and despite this limitation, Corbett expressed concern that some naval professionals made a fetish of the offensive. Corbett argued that defensive operations should not be shunned or avoided;

they are, he held, specifically called for when political objectives necessitate preventing the enemy from gaining something (32). Moreover, defensive operations are the "stronger" form of war and, as a rule, should be resorted to by the weaker navy until it is strong enough to assume the offensive (310–11).[42]

Like Clausewitz, Corbett classified wars according to whether the object is limited or unlimited. Because of the nonescalatory nature of truly limited warfare, a nation initiating a limited war needs the "power of isolation" to defend itself against an unlimited counterstroke. Such "isolation" could be achieved by commanding the sea to such a degree as to make it effectively an "insuperable physical obstacle." In such a case, "He that commands the sea is at great liberty and may take as much or as little of the war as he will."[43]

Corbett envisioned several actions that may be taken by lesser naval powers to dispute command of the sea. A lesser naval force would be unlikely to win a decisive major fleet engagement, yet it could achieve significant results. Through minor naval actions—such as attacks on sea lanes and coastal raids (261–62)—it could contest a superior power's command of the sea and thereby accomplish at least limited political objectives. In such ways a lesser power could disturb enemy plans, regardless of its fleet's size, while strengthening its own national power and prestige (61).

A small navy could also effectively dispute command of the sea through the "fleet in being" concept (166).[44] A decisive defeat at the hands of a more capable navy would make one's fleet unavailable should the situation later develop in one's favor (211). Consequently, keeping its fleet actively "in being"—not merely in existence but in active and vigorous life—constitutes a defensive strategy for a relatively small maritime power (214).[45]

Corbett theorized that victory at sea is dependent upon the relative strength of one's force and the exploitation of one's "positions"—naval bases, commercial, and nearby focal areas where trade routes converge (106).[46] If correctly exploited, strategic positions allow a naval force to restrict the size of any enemy force, thus creating favorable conditions for battle (72). Corbett specifically considered it more effective to control ports and maritime choke points, thereby threatening the enemy's commerce and potentially luring his fleet into battle on one's own terms, than to seek out the enemy's fleet for a decisive action (185).

Relatedly, Corbett envisioned blockades, of two types, "close" and "open." The former closes the enemy's commercial ports. "By closing [the enemy's] commercial ports we exercise the highest power of injuring him which the command of the sea can give us"—the enemy must either submit to the close blockade or fight to release himself (185). In contrast, in an open blockade a fleet occupies distant and common lines of communication—a means for a stronger navy to force the enemy out of its harbors. "It is better to sit upon his homeward

bound trade routes, thus costing him his trade, or making his fleet come for a decisive battle," than repeatedly attempt to seek out an enemy who habitually retires to the safety of his ports (156–57).

The obverse of blocking maritime communications—in fact, the object of naval warfare, in Corbett's view—is protecting them. This was to be achieved by the "cruiser," a vessel of endurance and power sufficient for long, independent deployments to deter and thwart enemy commerce raiding and protect sea lines of communication. Corbett considered the importance even of the battleship secondary to that of the cruiser (114). Because of the wide expanses of sea and the numerous maritime routes and coastlines involved, cruisers had to be built in significant numbers.

Finally, if cruisers were to be dispersed to distant operating areas, naval forces had also to be able to concentrate rapidly and decisively when needed (132). Such a strategic combination of concentration and dispersal in warfare, Corbett argues, allows a fleet to engage the enemy's central mass when needed but in the meantime to preserve the flexibility necessary to control maritime communications and to meet minor attacks in several areas at once (133).

DERIVING A STRATEGIC SPACE THEORY

With this understanding of maritime theory as described by Sir Julian Corbett, it is possible to extrapolate and define a theory for space operations. Maritime operations are not the same as space operations; environmental, technological, and physical factors are definitively different. Nevertheless, many of their strategic aspects are similar, and therefore they may be presumed to share certain theoretical principles. We may attempt, therefore, to derive objectively a space theory in strict keeping with Corbett's original context and strategic intent, verifying the applicability of its principles against contemporary literature.

National Power Implications. Space operations and activities utilizing space-based assets have broad implications for national power in peace and war, implications that include diplomatic, military, economic, technological, and information elements. Furthermore, military operations in space are extensively interrelated with national and political interests, and any action in space, even minor ones, can impact the balance of wealth and power among nations.

Interdependence with Other Operations. Operations in space are interdependent with those on land, at sea, and in the air. Space warfare is just a subset of wartime strategy and operations; accordingly, space forces must operate in concert with other military forces. Moreover, space strategy should work within the overall national strategy, since it is next to impossible for space operations alone to decide a war's outcome.

Command of Space. Command of space is the control of space communications for civil, commercial, intelligence, and military purposes.[47] The inherent value of space is as a means of communications; therefore, space warfare must work directly or indirectly toward either securing command of space or preventing the enemy from securing it. Command of space does not mean that one's adversary cannot act, only that he cannot seriously interfere in one's actions. Additionally, the command of space will normally be in dispute.

Space Communications. Space communications are those lines of communications by which the flow of national life is sustained in and through space. These include strategic lines of communication, critical to a nation's survival, that serve the movement of trade, materiel, supplies, and information. By attack upon space communications, a nation can adversely affect another's civil, commercial, intelligence, and military activities, thereby reducing that nation's will to resist. The primary purpose of space warfare is to secure space communications; enemy forces that are in a position to render them unsafe must be put out of action.

Strategy of the Offense. Offensive operations in space are called for when political objectives necessitate acquiring something from the adversary. Generally speaking, offensive operations in space are reserved to the stronger space power. However, an offensive force looking for a decisive victory will likely not find it, since the enemy will usually fall back to a position of safety. Offensive operations must be decided upon with caution; space assets can be thrown away on ill-considered attacks.[48]

Strategy of the Defense. Despite the advantage of offensive space operations, the utility of defensive operations is substantial; offensive and defensive operations are mutually complementary, and any campaign must have characteristics of both. Defensive space operations are called for when political objectives necessitate preventing the enemy from achieving or gaining something. Defensive operations are inherently the stronger form of action and should be used extensively by lesser space forces until the offensive can be assumed.

The Power of Isolation. A nation wishing to initiate limited war in or through space requires a defensive capability adequate to protect itself against an unlimited counterattack. The "power of isolation" is made possible by commanding space and making it an insuperable physical obstacle, enabling one nation to attack another for limited political purposes without fear of a devastating counteroffensive. To paraphrase Corbett, "He that commands space is at great liberty and may take as much or as little of the war as he will."

Actions by Lesser Space Forces. Although a less capable space force is unlikely to win a decisive space engagement, it can still contest the command of space, thereby achieving limited political objectives. To this end the weaker force may seize local or temporary command in areas where the stronger force is not present. Additionally, lesser space forces can disrupt commercial or economic interests or interfere in minor ways with space-based systems. Both types of action are meant to disturb an enemy's plans while increasing the lesser nation's power.

Another effective method by which a lesser space force might dispute command is the "fleet in being" concept. It is important for relatively weak space forces to avoid decisive engagements with stronger ones, but they can be kept safe and active until the situation changes in their favor. Furthermore, while avoiding large-scale engagements with a superior space force, a lesser one can conduct minor attacks against space communications or space-related activities, thus preventing the stronger power from gaining general command of space.

Strategic Positions. Strategic positions include launch facilities, up-and-down link systems, space bases or stations, and focal areas where operations and activities tend to converge. If correctly exploited, strategic positions allow a space force to restrict the movement of the enemy forces or information, thus improving the conditions for military operations. Since it will prove difficult to force an adversary into a decisive engagement, it is better to control strategic positions and threaten commerce and operations, thereby forcing the enemy to action on favorable terms. By exploiting strategic positions through occupation of the enemy's space lanes of communication and closing points of distribution, we destroy elements of the enemy's "national life" in space.[49]

Blockades. Closely related to strategic positions are the methods of blockades, whether close or open. The close blockade for space operations equates to preventing the deployment of systems from launch facilities and to interfering with communications in the vicinity of uplinks or downlinks, as well as impeding the movement of vehicles near space-based hubs. Close blockade may be achieved by physical systems or vehicles or interference measures. In Corbett's model, suppressing operations at these distribution points obliges the adversary either to submit or fight. In contrast, a more capable space power can impose an open blockade, occupying or interfering with the distant and common space lines of communication, to force an adversary into action. Like the close blockade, methods include both physical systems and interference.

Cruisers. The object of space warfare is to control space communications, and therefore a means of establishing this control is required. Consequently "cruisers" are needed in large numbers to defend the vast volumes occupied by space lines of communication. One possible implementation of the "cruiser" concept

would be inexpensive micro-satellites designed to defend high-value space assets from attack or space-based interference. Space systems that perform purely offensive operations with negligible influence on space lines of communication are of secondary importance.

Dispersal of Forces. Space forces and systems should in general be dispersed to cover the widest possible area yet retain the ability to concentrate decisive force rapidly. Dispersal of forces will allow the protection of a nation's space assets and interests, thereby facilitating defensive operations or minor attacks wherever a nation's space interests are threatened. To defend against or neutralize a significant threat, however, space forces should quickly concentrate firepower or other destructive effects. This combination of dispersal and concentration preserves the flexibility needed to control space communications but allows an adversary's "central mass" to be engaged when necessary.

MEASURING UTILITY

Since the principles of the above space theory were derived from a historical framework, it is necessary to test them against current expert observations and space literature to measure the theory's potential utility. Two standards will be used: a recent study regarding space operations, and U.S. joint military doctrine.[50]

Standards

The 2001 *Report of the Commission to Assess United States National Security Space Management and Organization,* known as the Space Commission Report, covers a broad range of issues pertaining to U.S. space activity. The report lists current U.S. national interests pertaining to operations in space, including: promoting the peaceful use of space; using the nation's potential in space to support its domestic, economic, diplomatic, and national security objectives; assured access to space and on-orbit operations; space situational awareness; surveillance from space; global command, control, and communications in space; defense in space; homeland defense; and power projection in, from, and through space.[51] With the exception of promoting the peaceful use of space, the listed national interests are compatible with those of the diplomatic, military, economic, technological, and information national interests in the derived space theory model.

While the Space Commission Report does not explicitly state the need for offensive capability and strategy in space, it does imply this view. The report notes, "Weapons in space are inevitable," and "we know from history that every medium—air, land, and sea—has seen conflict. Reality indicates that space will be no different."[52] Given this virtual certainty of future combat operations, the report maintains, the United States must develop the means to "deter and to defend" against hostile acts in and from space.[53] Notwithstanding the use of the

word *deter,* the method of achieving this is compatible with offensive strategy as developed in the space theory.

Joint Publication 3-14, *Joint Doctrine for Space Operations,* primarily deals with establishing doctrine for space operations at the operational level of warfare; however, it does address some strategic security issues that can be compared with the space theory model.[54] Like the Space Commission Report, the joint publication states the need to protect U.S. space assets while denying the use of space assets by adversaries. This thought is comparable with the idea of commanding space to protect one's use of space communications. In fact, the joint publication's definition of "space control" is similar to ideas in the derived strategic space theory. The publication states:

> Space control operations provide freedom of action in space for friendly forces while, when directed, denying it to an adversary, and include the broad aspect of protection of U.S. and allied space systems and negation of enemy adversary space systems. Space control operations encompass all elements of the space defense mission and include offensive and defensive operations by friendly forces to gain and maintain space superiority and situational awareness if events impact space operations.[55]

Of note, the joint publication states that both offensive and defensive operations are needed, which is consistent with the maritime-based space theory.

Divergences from the Standards

The Space Commission Report discusses topics not within the scope of maritime-based space theory. These topics include reorganization and streamlining of different U.S. space-related agencies, and the need for the United States to invest its resources—both people and monetary investment—to ensure that it remains the world's leading space-faring nation.[56] Since the report is not attempting to develop space theory, the inclusion of bureaucratic organization and streamlining issues is understandable; certainly, the need to invest in space operations is implicit in space theory.

Differences between Joint Publication 3-14 and the space theory are primarily matters of semantics or due to the operational focus of the publication. Such differences include the use of "freedom of action," "space superiority," and "situational awareness," not found in the maritime-based theory we have proposed. The differences are, however, considered minor when comparing the strategic context of each.

Nevertheless, three ideas from the developed space theory are neither explicitly nor implicitly mentioned in popular space literature. These ideas are the "power of isolation" to prevent the escalation of limited wars, the use of "cruisers" to ensure command of space, and the dispersal of force as a general practice. These differences could mean one of two things: either that these points are

baseless or that they are pertinent but not adequately addressed by contemporary literature. Given the relevance of the majority of the principles of the maritime model, the remaining three ideas—which deal with securing space communications—are likely relevant as well.

This is a significant result: a maritime-based strategic framework points to an effective method of defending space assets and space lines of communications. Through the use of space "cruisers"— to protect critical space communications pertaining to the movement of trade, matériel, supplies, or information—a nation can protect its various interests against a space-based offensive. The physical form the space "cruiser" takes is not important, but its function is. Additionally, since the environment of space is vast but limitations on fiscal resources necessitate balancing desired capabilities against number of systems that can be procured, space "cruisers" should have a modest enough offensive capability to allow production in quantity. By dispersing these space systems yet maintaining the capability to concentrate firepower or other neutralizing effects, a threatening adversary can be decisively defeated while one's own assets and interests are protected.

"SO WHAT?"

A critic might well put that question. Using Corbett's maritime model to develop a strategic space model has merely substantiated ideas already known or written about. Indeed, much of this strategic space theory is consistent with the Space Commission Report and joint doctrine. Nonetheless, something of real value has been added.

First, we have seen that a historically based theoretical model promises to provide a useful framework for thinking about strategic issues in space. Second, a maritime model matches more closely than air or naval theory the essence of space operations. Third, the strategic space theory derived from a maritime model is congruent with current space-specific theory and observation. The maritime-based model, then, should be usable for predicting new concerns and developing new ideas—such as methods of dispersal and concentration.

Perhaps the thinking of maritime theorists other than Corbett is also pertinent for space theory. For example, the work of Charles E. Callwell, Wolfgang Wegener, Raoul Castex, and James Cable merits revisiting for this purpose.[57] In this way, space strategy and theory will have mined hundreds of years of maritime experience for insight into future operations in and through space.

Colin Gray once asked, "Where is the theory of space power? Where is the Mahan for the final frontier?"[58] The answer is that we have always had him—the maritime theorist Sir Julian Corbett.

NOTES

1. Some theorists have used the term *space power* theory, while others have used *space control*. In an attempt to remain objective and unbiased, the term *strategic space theory, space theory,* or *strategic model* will be used instead.
2. Colin S. Gray, "The Influence of Space Power upon History," *Comparative Strategy* (October–December 1996), p. 293.
3. Michael I. Handel, *Masters of War: Classical Strategic Thought,* 3d ed. (London: Frank Cass, 2001), p. 19.
4. Carl von Clausewitz, *On War,* ed. and trans. Michael Howard and Peter Paret (Princeton, N.J.: Princeton Univ. Press, 1989), p. 578.
5. John B. Hattendorf, "The Uses of Maritime History in and for the Navy," *Naval War College Review* 56, no. 2 (Spring 2003), p. 20: "Historical understanding and knowledge of past events is not the object but rather one of several means to improve the ability of professionals to solve problems more wisely than arbitrary choice, pure chance, and blind intuition would allow."
6. Report of the Commission to Assess United States National Security Space Management and Organization [hereafter Space Commission Report], 11 January 2001, p. 18, available at www.defenselink.mil/pubs/space20010111.html.
7. Peter L. Hays et al., eds., *Spacepower for a New Millennium: Space and US National Security* (New York: McGraw-Hill, 2000), pp. 2–3. Some have added the "international sector" to the list; see Dana J. Johnson et al., *Space: Emerging Options for National Power* (Santa Monica, Calif.: RAND, 1988), p. 18.
8. A. R. Thomas and James C. Duncan, eds., *Annotated Supplement to the Commander's Handbook on the Law of Naval Operations,* International Law Studies 73 (Newport, R.I.: Naval War College, 1999), p. 150. Notable legal restrictions on military activities do exist. A 1967 treaty banned nuclear and other weapons of mass destruction from space. Additionally, military bases, installations, and fortifications may not be erected, nor may weapons tests be undertaken on natural celestial bodies. Nevertheless, military personnel may be employed on natural celestial bodies for research and other activities related to "peaceful purposes," including self-defense or denial measures.
9. U.S. Joint Forces Command, "Joint Forces Command Glossary," available at www.jfcom.mil/about/glossary.htm. Diplomatic, information, military, and economic (DIME) areas of national power are leveraged in "effects-based" operations. *Information* refers to facts, data, or instructions in any medium or form, along with its transfer and its meaning assigned by humans. *Technological* has since been added to this list of national power elements, having become an area that significantly impacts the others.
10. Colin S. Gray, *The Navy in the Post–Cold War World: The Uses and Value of Strategic Sea Power* (University Park: Pennsylvania State Univ. Press, 1994), p. 126.
11. Thomas and Duncan, eds., p. 150.
12. Gray, *The Navy in the Post–Cold War World,* p. 133.
13. Gray, "The Influence of Space Power upon History," p. 305.
14. Bruce M. DeBlois, "Ascendant Realms: Characteristics of Airpower and Space Power," *The Paths of Heaven: The Evolution of Airpower Theory,* ed. Phillip S. Meilinger (Maxwell Air Force Base [hereafter AFB], Ala.: Air Univ. Press, 1997), p. 571n5. DeBlois writes, "One should note, however, that despite the publication of a variety of airpower theories, there is no comprehensive theory of airpower on par with the land power of Clausewitz or the sea power theory of Mahan."
15. Philip S. Meilinger, introduction to *The Paths of Heaven,* p. xiii.
16. Giulio Douhet, *The Command of the Air,* trans. Dino Ferrari (Washington, D.C.: Air Force Museums and History Program, 1998), pp. 15–29.
17. Ibid., p. 15.
18. Philip S. Meilinger, "Giulio Douhet and the Origins of Airpower Theory," in *The Paths of Heaven,* p. 1.
19. William Mitchell, *Winged Defense* (Toronto: General, 1925; repr. Mineola, N.Y.: Dover, 1988), p. 4.

20. Mark A. Clodfelter, "Molding Airpower Convictions: Development and Legacy of William Mitchell's Strategic Thought," in *The Paths of Heaven,* p. 79. See Meilinger, *The Paths of Heaven,* p. xxiv for more airpower models.
21. Ibid., p. 98n60. Original reference from William Mitchell, *Our Air Force: The Key to National Defense* (New York: Dutton, 1921), p. xix.
22. Thomas D. White [Gen., USAF], "Air and Space Are Indivisible," *Air Force* (March 1958), pp. 40–41.
23. David E. Lupton, *On Space Warfare: A Space Power Doctrine* (Maxwell AFB, Ala.: Air Univ. Press, June 1988), pp. 10, 16. Lupton notes that the primary difference between the 1955 AFM-1-2 and its 1959 successor was the replacement of the word *air* with *aerospace*.
24. M. V. Smith, *Ten Propositions Regarding Spacepower,* thesis, Air University, Maxwell AFB, June 2001, p. 109. "Aerospace integrationists" share General White's view (see note 22) that air and space are indivisible.
25. Exemplifying this point, *Air Force Basic Doctrine* describes the combined effect of air and space power as the synergistic application of air, space, and information systems to project strategic military power. See U.S. Air Force Dept., *Air Force Basic Doctrine,* Air Force Doctrine Document 1 (Washington, D.C.: September 1997), p. 78.
26. Smith, p. 109: "Aerospace integrationists frequently argue that spacepower is in no way different from airpower because it delivers similar products to users, as if aircraft can do what spacecraft can do. This is simply not the case."
27. Lupton, p. 65.
28. Hattendorf, "The Uses of Maritime History," p. 20.
29. Ibid., p. 19.
30. Rear Admiral Alfred Thayer Mahan (1840–1914) was an American naval officer, historian, and theorist who was commonly regarded at the time, and has been since, as the most important analyst of seapower.
31. Alfred T. Mahan, *Mahan on Naval Strategy: Selections from the Writings of Rear Admiral Alfred Thayer Mahan,* ed. John B. Hattendorf (Annapolis, Md.: Naval Institute Press, 1991), editor's introduction, p. ix.
32. Mahan, p. 130.
33. Hattendorf, "The Uses of Maritime History," p. 27.
34. Julian S. Corbett, *Some Principles of Maritime Strategy,* introduction and notes by Eric J. Grove (Annapolis, Md.: Naval Institute Press), p. xxxvi. Comments attributed to the *Times* (London).
35. Ibid., p. xxxvii. Comment attributed to Lt. Alfred Dewar in *Pall Mall Gazette,* 22 December 1911.
36. Ibid., p. xxxviii, as attributed to the *New York Evening Post*.
37. Ibid., p. xliv.
38. Corbett's "Green Pamphlet," which was issued to students at the Royal Naval War College, will also be used in laying the foundation, since it complements the book and is consistent with Corbett's ideas. The "Green Pamphlet" appears as an appendix in the edition of *Some Principles of Maritime Strategy* cited above.
39. Corbett, *Some Principles of Maritime Strategy,* p. 117. The remainder of this discussion draws upon this source, at pages indicated.
40. Similarly, in the "Green Pamphlet" Corbett states, "Naval strategy does not exist as a separate branch of knowledge. It is only a section of a division of the art of war. . . . The true method of procedure then is to get hold of a general theory of war and so ascertain the exact relations of Naval Strategy to the whole" (*Some Principles,* p. 307).
41. Corbett uses the term "military communications," meaning what is today called land-based "lines of operation and supply." However, he excludes fishing activities and fishery rights.
42. From the "Green Pamphlet." These thoughts are like those of Clausewitz.
43. Attributed to Francis Bacon (1561–1626), a prominent Elizabethan and Jacobean politician, lawyer, philosopher, and writer. Reference from *Essays 29,* "Of the True Greatness of Kingdoms."
44. Here Corbett counters the "seek out and destroy" school of thought.

45. The first execution of the "fleet in being" concept is attributed to Arthur Herbert, Earl of Torrington (1647–1716).

46. Examples of focal areas include "Finisterre, Gibraltar, Suez, the Cape, Singapore, and many others."

47. Civil and informational were taken from Corbett's model, since his theory implies these contemporary areas.

48. Corbett cautions that naval fleets are difficult to replace and should not be "thrown away in ill-considered offensives" when attempting to achieve a decisive victory.

49. Corbett, *Some Principles of Maritime Strategy,* p. 95. Taken from Corbett's thought that by exploiting strategic position through occupation of the enemy's maritime communications and closing the adversary's points of distribution, "we destroy [the enemy's] national life afloat."

50. The Space Commission Report was chosen instead of the Clinton administration's 1996 *National Space Policy,* National Security Presidential Directive (NSPD-15), even though the latter is the last official U.S. document on space policy. The 1996 report is somewhat dated but includes many of the ideas of the Space Commission Report.

51. Space Commission Report, p. xvi.

52. Ibid., p. x.

53. Ibid.

54. U.S. Space Command, *Joint Doctrine for Space Operations,* Joint Publication 3-14 (Washington, D.C.: Joint Staff, 9 August 2002), p. x. The publication lists four primary mission areas for space: space control, force enhancement, space support, and force application. Force enhancement includes intelligence, monitoring, communications, and navigation functions. Space support includes operations that launch, deploy, augment, maintain, sustain, replenish, de-orbit, and recover space forces. Space force application operations consist of attacks against terrestrial targets carried out by military operations in or through space.

55. Ibid.

56. Space Commission Report, x.

57. Charles E. Callwell, *Military Operations and Maritime Preponderance* (1905; repr. Annapolis, Md.: Naval Institute Press [ed. Colin Gray], 1996); Wolfgang Wegener, *The Naval Strategy of the World War* (1929; repr. Annapolis, Md.: Naval Institute Press, 1989); Raoul Castex, *Strategic Theories* (1931–39; repr. Annapolis, Md.: Naval Institute Press [ed. Eugenia C. Kiesling], 1994); and James Cable, *Gunboat Diplomacy: Political Applications of Limited Naval Force* (New York: Praeger, for the Institute of Strategic Studies, 1971).

58. Gray, "The Influence of Space Power upon History," p. 307. On Corbett's applicability for space strategy, see John G. Fox, "Some Principles of Space Strategy: Or Corbett in Orbit," unpublished paper, National War College, Washington, D.C., 2000.