Five Myths About the Term "Aerospace"

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"Simplify, simplify."
-- Henry David Thoreau

MYTH #1: "AEROSPACE" is a relatively recent invention.

FACT:

The word "aerospace" is not new to the US Air Force. As early as 1959, the Air Force defined aerospace as "**an operationally indivisible medium consisting of the total expanse beyond the Earth's surface**."

Twenty-five years later, Air Force doctrine still reaffirmed the single operational medium concept. The 1984 edition of Air Force Manual (AFM) 1-1 stated: "**Aerospace is the total expanse beyond the Earth's surface; it is the multidimensional operating environment where Air Force forces can perform all of their missions**."

The 1992 edition of the same manual continued the tradition: "**The aerospace environment can be most fully exploited when considered as an indivisible whole…Aerospace consists of the entire expanse above the earth's surface…Aerospace provides access to all of the earth's surface**."

This same volume expanded on the point:

> With the advent of the airplane, warfare entered a third dimension—aerospace. This vertical dimension has two related characteristics that differ significantly from those of the surface environment, First, the aerospace environment has only one distinct boundary—the earth's surface; no lateral boundaries restrict movement within it. Second, the environment extends from the earth's surface toward infinity. The key element in both of these characteristics is elevation above the surface which, in turn, leads to the qualities of aerospace power: perspective, speed, range, and three-dimensional maneuverability.

The most recent Air Force definition is contained in Air Force Doctrine Document (AFDD 2) (Organization and Employment of Aerospace Power"), dated 17 February 2000, and reads: "**Of, or relating to, the total expanse beyond the earth's surface.**"

MYTH #2: "AEROSPACE" is a parochial, Air Force-specific term.

FACT:

"Aerospace" is a *joint* term in that it is defined in Joint Pub 1-02, ("Department of Defense Dictionary of Military and Associated Terms"). The definition is as follows: "**Of, or pertaining to, Earth's envelope of atmosphere and the space above it; two separate entities considered as a single realm for launching, guidance, and control of vehicles that will travel in both entities**."

Lest anyone think that the presence of this term in the DoD Dictionary is an *anomaly*, there is a Joint Pub entitled **"*Aerospace* Defense of North America"** (Joint Pub 3-01.1, dated 1 November 1996) and a joint, multinational organization entitled **"North American *Aerospace* Defense Command**" (NORAD).

"Aerospace" also appears in thirteen additional JP 1-02 terms ("aerospace control operations," "aerospace defense," "aerospace projection operations," "air traffic control and landing systems," "coverage," "land, sea, or aerospace projection operations," "penetration aids," "satellite and missile surveillance," "surveillance," "surveillance," "ADCOM," "AGARD," "Da (aerospace drift)," "dea (aerospace drift error)").

It also appears (thirteen times) in the Universal Joint Task List and twice in the US Army keystone doctrine document, Field Manual 100-5.

Although the first phrase of the JP 1-02 definition of "aerospace" is grounded solidly in Air Force tradition, the second phrase—with it's mention of "two separate entities"—has been frequently misinterpreted. Since, as JP 1-01 *Joint Doctrine Publication System* (Final Coordination, 17 May 99) specifies, joint doctrine is to "be written to reflect existing capabilities," detractors often read the portion of the JP 1-02 definition referring to a "**realm for launching, guidance, and control of vehicles that will travel in *both* entities"** as necessarily excluding anything which does not literally and clearly travel in *both* air *and* space (e.g., practically everything other than Intercontinental Ballistic Missiles (ICBMs) or Expendable Launch Vehicles (ELVs). Yet, JP 3-01.1 makes quite clear that **"aerospace defense is designed to destroy or nullify attacking enemy *aircraft* and missiles, and also negate hostile *space* systems"** *(emphasis added)*, an interpretation mirrored in the JP 1-02 definition of the same term.

Similarly, JP 1-02 defines "land, sea, or aerospace projection operations" as the "employment of land, sea, or air forces, or appropriate combinations thereof, to project United States military power into areas controlled or threatened by enemy forces. Operations may include penetration of such areas by amphibious, airborne, or land-transported means, as well as air combat operations by land-based and/or carrier air."

Therefore, aerospace is not just limited to ICBMs or ELVs, but must also include air-*only and/or* space-*only* systems.

The "both entities" portion of the joint definition also may encourage definition of a boundary between air and space. Otherwise, how do you tell when a vehicle has transitioned from air to space or vice versa? However, the altitudes at which the effects of lift and drag become negligible, or at which a cabin or suit must have an independent supply of oxygen and pressure,

or at which turbojet engines become inoperable, are all different. In international law, the major space powers generally accept "the lowest perigee attained by orbiting space vehicles as the present lower boundary of outer space" but this is not universal. To date, the United States has not recognized any specific boundary.

It should also be noted that *aerospace* is defined outside of military circles. Webster's provides the following:

> **aerospace** *n.* **1**. space comprising the earth's atmosphere and the space beyond. *adj.* **2**. of or relating to aerospace, to vehicles used in aerospace or the manufacture of such vehicles, or to travel in aerospace.

A later edition of Webster's says:

> **aerospace** *adj.* **1.** Of, or designating the earth's atmosphere and the space beyond. **2.** Of or relating to the science or technology of flight.

MYTH #3: The "AEROSPACE" concept ignores the real differences between the separate physical environments or "air" and "space."

> **FACT:**

Some will imagine that the use of the term "aerospace" means pretending that there is no difference between operating in the air and operating in space, an obviously ridiculous assumption.

Current Air Force doctrine recognizes the differences between the air and space environments. The Sep 97 edition of AFDD 1 ("Air Force Basic Doctrine") states: "While airpower is primarily affected by aerodynamics, space power is guided by the principles of orbital mechanics and is not limited by the vertical extent of the atmosphere."

The 23 Aug 98 edition of AFDD 2-2 ("Space Operations") expands on this point:

> **While the Air Force believes that space and air are a seamless continuum, the space environment has different characteristics from the air environment. The characteristics of space are sufficiently different from air that a complete understanding of both is required to leverage their contributions.** Space-based forces operate in accordance with the laws of astrodynamics, while air forces operate in accordance with the laws of aerodynamics. Although there is no international agreement regarding the specific boundary between air and space, terrestrial-based forces generally operate below an altitude of roughly 100 kilometers; whereas, space-based forces operate above this altitude where the effects of lift and drag are negligible. Space-based forces operate in a harsh environment characterized by high-energy particles and fluctuating magnetic fields and temperatures. Air forces operate in the Earth's atmosphere, with its temperature, moisture, wind, precipitation, and pressure differences. Airmen must understand both environments as they create an integrated aerospace operation.

As one of the original authors of the term "aerospace," Lt Col Frank Jennings (USAFR ret.) wrote in a fall 1990 Airpower Journal article: "…whoever in the Air Force is proclaiming that satellites are much like airplanes, or that no boundary separates air from space, not only does not understand aerospace doctrine but has strayed far from the concept explained and expounded by Gen Thomas White and many others since the 1960s."

How does the Air Force's "aerospace" doctrine resolve itself with the real physical differences between air and space? Well, there are really two different perspectives as to the doctrinal view of the physical environment of space (and they are *not* mutually exclusive):

1. First, space may be viewed as a medium—like land, sea, and air—within which military activities can be conducted to achieve objectives. This view is particularly relevant at the *tactical* (i.e., operation of specific platforms) and *strategic* (i.e., space as a domain that must be protected and controlled) levels of war. The former is the level at which individual executing space squadrons operate while the latter, consistent with national policy, is the level at which the unified commands (specifically, in the functional case of space, United States Space Command) focus on, as tasked by National Command Authorities (NCA).
2. The second doctrinal view of space is "effects-centric" and is primarily relevant at the *operational* level of war. In theater applications, space capabilities can and do provide the same "high-ground" effects as air capabilities, albeit with different platforms and methods. This arena is where USAF *aerospace* doctrine is primarily focused.

Most of the functions performed today in the atmosphere by air-breathing systems may also be done in the future in space. As technologies evolve, and as it becomes possible to do the functions more efficiently, more effectively, and at less cost from space, then those functions will migrate to space. Doing so will provide enhanced capability, survivability and greater efficiency through multi-layering of systems. Today those migrated functions include weather, navigation, ISR and communications. In the future, Air Force missions such as close "air" support, interdiction, offensive counterair, defensive counterair, and strategic attack may *all* come from space.

MYTH #4: "AEROSPACE" is synonymous with "air AND space."

FACT:

Typically, "aerospace" has been defined as a noun. (A noun according, according to Webster's, is a "word that is used to name a person, place, thing, quality, or action and can function as the subject or object of a verb, the object of a preposition, or an appositive.") The JP 1-02 definition ("**two separate entities considered as a single realm**") and *previous* Air Force definitions ("**an operationally indivisible medium consisting of the total expanse beyond the Earth's surface**" and "**the total expanse beyond the Earth's surface; it is the multidimensional operating environment where Air Force forces can perform all of their missions**") all use "aerospace" as a noun—i.e., a *place*.

As a *noun*, "**aerospace**" is logically synonymous with "**air and space**," a unified term originally introduced into the Air Force lexicon to be "inclusive" and "evolutionary" but was instead used to drive a wedge between "air-breathers" and "space operators." Partially as a result, the arguments for a separate *Space Force* and space as an *Area of Operations* (AOR) were raised throughout the Air Force. In an attempt to repair some of the inadvertent damage caused by "air and space," the Air Force is returning to it's "aerospace" roots.

"Air" is a place. "Space" is a place. However, if we primarily define "aerospace as a *place*" (i.e., a noun) then inevitably we run into confusion regarding the different physical natures of the air and space environments. We become easily bogged down in consideration of *where* in *aerospace* a particular platform operates. By necessary implication, the issue of a boundary between air and space remains just that—an issue. Legal and policy issues aside, the boundary question raises many uncomfortable operational considerations for the future. For example, when you create boundaries, you often create command, control, and coordination problems (just look at the issue over placement of FSCL between the Air Force and the Army). Sometimes such boundaries, and their resultant C2 problems, are a necessary evil. But when you introduce such problems unnecessarily, then you create unnecessary friction, which unnecessarily undermines unity of command and unnecessarily leads to increased *fog of war*.

In this light, it is useful to again look at the definitions of "aerospace" provided in Webster's. Of the four variations of "aerospace" in Webster's discussed above, *only <u>one</u>* is a noun. The other three are *adjectives*. (An adjective, according to Webster's, is "any of a class of words used to modify a noun or other substantive by limiting, qualifying, or specifying.").

Significantly, the new Air Force definition of "aerospace" provided in the February 2000 edition of AFDD 2 gives the Air Force, for the first time, a definition of "aerospace" presented in an adjectival light: "**Of, or relating to, the total expanse beyond the earth's surface.**"

It is a definition that is not focused primarily on a platform-centric view of "aerospace as a place" but one that also keeps in mind the 1959 admonition of aerospace as "**an operationally indivisible medium consisting of the total expanse beyond the Earth's surface**." Interestingly, when defined in this way, we find that "aerospace" becomes doctrinally comparable (*not synonymous!*) to the word "*maritime*." Unlike "aerospace," "*maritime*" is <u>not</u> a defined stand-alone joint (or even naval) doctrinal term but it *is* used throughout joint and naval doctrine. Webster's defines it:

> **maritime** *adj*. **1.** Located on or close to the sea. **2.** Of or concerned with shipping or navigation. **3.** Of or suggesting a mariner.

The term derives from the Latin *mare*, meaning sea. (Incidentally, "aerospace" derives from a conjunction of the Latin terms for "air"—*aer*—and for "distance"—*spatium*.) The US Navy operates in the full range of physical environments—**sub-surface, surface-sea, shore, air, and space**—but "maritime" is the single *lens* (comprehensive but not necessarily continually all-inclusive in terms of environments) through which our Navy brethren look at who they *are* and what they *do*. Similarly, "aerospace" should be the *lens* (comprehensive but not necessarily

continually all-inclusive in terms of environments) through which we in the USAF look at who we *are* and what we *do*.

How should the term be applied in actual practice? Quite simple. Wherever the word "air," "space," or "air and space" is used in an adjectival context, the word "aerospace" (as we now define it) becomes a valid (not a *necessary*, but a *valid*) candidate for replacement. A few possible examples:

- "Air Component Commander" can become, in the Air Force's view, "Aerospace Component Commander." Why? The ACC does not actually command the "air" or "space" *physical environments* (except perhaps in a loose Douhetian sense!) but he *does* command forces that are "of, or relating to, the total expanse beyond the earth's surface" (just as the *Maritime* Component Commander commands forces "located on or close to the sea.")
- "Air Operations Center" becomes "Aerospace Operations Center," again for the same reason.
- "Air superiority" may remain as is. Ditto with "space superiority" (as defined in Air Force doctrine). Why? Because here we are talking of superiority in a particular physical environment. That is not to say that "aerospace superiority" is not a legitimate term—it *is*. But it may still be theoretically possible to enjoy "air superiority" without a corresponding "space superiority" (and vice-versa). These two things are the specific functions of platforms dependent on the specific physical environment of air and/or space. Undoubtedly, however, as our technology improves, the distinction between "air superiority" and "space superiority" will become less and less apparent.
- "Aircraft" and "spacecraft" also remain as they are. In these cases, "air" and "space" are integral parts of the nouns "aircraft" and "spacecraft." They define whether the craft operates according to aerodynamics (physical air environment) or orbital mechanics (physical space environment). The term "aerospacecraft"—while acceptable in a broad sense—is less descriptive (and thus less useful) than its "aircraft/spacecraft" antecedents, until we are flying spaceplanes that can maneuver conveniently in both the air and in space.
- "Close air support" also remains as is, for similar reasons. While "close aerospace support" would not be invalid, actual practice, common usage, and ease of phrasing suggests that there is no value-added in modifying this term.
- "Air Force" becomes "Aerospace Force." We are not evolving into an Aerospace Force, we already are one. We operate in the total expanse beyond the Earth's surface. Right now, we are the only Service encumbered with a specific physical environment ("air") in our organizational title (i.e., the Army is not called the US "Land" Force and the Navy is not called the US "Water" Force). Embracing our identity as an "Aerospace" Force—using our adjectival "aerospace" lens—allows us to escape from the doctrinal limitations of our current misnomer.

An adjectival notion of aerospace goes hand-in-hand with an "effects-based" paradigm of military power, rather than a "platform-based" model. In effects-based thinking, "platform" or "medium" are only marginally important. Similarly, in an adjectival notion of aerospace, the

relevant questions are not "where" (as in medium) or "what" (as in platform) but "why" (as in effect).

MYTH #5: The Air Force is using "AEROSPACE" as a budget power-grab tool and has no business promulgating the term in joint doctrine.

FACT:

It is not necessarily surprising that resistance to the term "aerospace" has manifested in the joint community. The perception exists (both inside and outside the service) that the Air Force is employing the term as a "power grab" for a greater share of the "space mission area."

Certainly, as with air, there are many civil, commercial, and military organizations involved in, and committed to, space, including the US Army and US Navy. Even though the *preponderance* of *military* space assets are funded, owned, and operated by the US Air Force—90% of the DoD space people, 85% of the DoD white space budget, 86% of the on-orbit DoD assets, and 90+% of the DoD space infrastructure—the Air Force recognizes that space is a critical enabler to the ENTIRE joint force. Accordingly, it should also be noted that Air Force does not shelter any of its space capability as "organic" nor do we claim any particular "ownership" of space. The Air Force does not see space as a region or AOR to be owned as land is currently divided up. Rather space is like air in that it is a physical environment where functional missions are conducted to achieve military objectives.

Interestingly, in terms of number of airframes, it should be noted that the US *Air* Force does not enjoy a preponderance of military *air* assets when measured across the board. The existence of a US *Aerospace* Force does not and would not preclude the use of space by the other Services any more than the existence of a US *Air* Force precludes their use of the air in the form of Apache helicopters and F-14 fighters.

Again, "aerospace" works best not as a "place," but as a "lens"— a way of thinking. The precedent has been set in the use of the term "maritime." "Maritime" is a unifying expression for the diverse and separate interests of the Navy and is used throughout joint doctrine. "Aerospace" can serve the same purpose for the Air Force. It is an *approved* joint term and the Air Force has the *right* to insist on its use in proper context.