THE FORCE DIVISOR

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June 1989

P-7553-RGS

I. THE FORCE DIVISOR

INTRODUCTION

As a coin has two sides, so also has military technology. Although many technological advancements have vastly improved our military's ability to wage war, many others--because of high costs, extreme complexities, severe shortcomings, and outright failures--have fallen far short. Technologies which were originally promised as assets have instead emerged as practical liabilities both in terms of real costs and in terms of opportunity costs. Correspondingly, many of our armaments, although initially touted as being technological 'Force Multipliers', have instead become 'Force Divisors'.

This paper will examine the latter concept from several different perspectives. In evolving the concept of a Force Divisor, and in extrapolating the effects thereof, the author has called upon his not insignificant experience as a military user, a military developer, and civilian developer. To the extent of the author's knowledge, a major portion of this material is original (the author coined the term 'Force Divisor').

THE FORCE DIVISOR

Before we examine the Force Divisor effect, it is appropriate to first review the concept of a Force Multiplier, the concept from which the term evolved.

The term 'Force Multiplier' is deeply embedded in the military technologist's lexicon; it implies that modern technologies can provide combat leverage in a synergistic, multiplicative manner. The term itself, and the concept behind it, is a valid one; it infers that technology can enhance our defense capabilities while simultaneously requiring less in terms of manpower and in terms of improving the survivability of that manpower. In the abstract theoretical limit, wars could be fought and won by remote control with only a few well-protected participants.

This paper identifies and focuses upon the 'flip side' of the Force Multiplier effect, i.e., upon the Force Divisor effect, and suggests that the latter be investigated and quantified, if possible. Such an investigation and quantification, if feasible, would help identify and establish a better balance amongst high-tech weapons programs, help better answer the question of 'how much is enough', and would overall enhance defense capabilities in times of austere budgets.

Examples of the Force Divisor effect abound; integrated bomber systems--systems replete with equipments which were designed and built to enable aircrews to rapidly and accurately attack mobile targets deep within an enemy's territory--cannot fulfill their mission because their offensive and defensive subsystems mutually interfere with one another, thus precluding hostile airspace penetration. Guided missile frigates--designed for anti-air warfare on the high seas--perform but marginally in restricted waters and erroneously engage civilian targets. Similar vessels, also designed to provide anti-air missile protection for the battlefleet, are themselves vulnerable to air attack.

The list is not limited to operational deficiencies; maintenance deficiencies also abound. Few military technologists will fail to recall recent instances wherein high tech weapons which, although they were highly effective when properly maintained, could not perform when exposed to combat-like maintenance conditions--whether be it on land, at sea, or in the air. Other weapons, too complex to be maintained by uniformed technicians, have required on-site 'grooming' by expensive civilian technicians--technicians who would likely be absent during combat.

The Force Divisor not only manifests itself in respect to systems which are obviously flawed, it also manifests itself in another especially insidious respect because it is found in systems which have otherwise been deemed 'successful'. As we shall see, this manifestation occurs because of a serendipitous form of 'technological addiction' which in turn generates a propensity for 'technological overreach' (the insertion of technology largely for technology's sake). As shall be seen, this technological overreach has in turn an especially onerous implication for our defense capabilities because its overall effect, although large,

is but marginally visible and remains largely unnoticed and, as a consequence, the lost opportunity costs are high. Stated more succinctly, the high-tech weapons community--from the user to the developer--has sought and attained within many of its weapons systems a degree of technological content which significantly exceeds that actually needed and, in doing so, has wasted substantial dollars which could and should have been better spent elsewhere. It's therefore worthwhile that we pause at this juncture to examine this aspect.

Perhaps the classic example of technological overreach is found in the case of the Mach 2.5 fighter. Aviation buffs recall that, as contrasted with today's fighter aircraft, earlier jet fighters were required to reach and maintain the airspeed equivalent of Mach 2.5. The assumption was, given airplanes could fly that fast, that they would fight that fast. The user, seeing that it technologically could be done, determined that it should be done, and thus established Mach 2.5 as a requirement, a requirement which was ultimately met by industry but only at great expense. As we see next, this was largely a case of technology for technology's sake.

Today's jet fighter designs are no longer strapped with that difficult and costly requirement; the Vietnam War demonstrated that the contribution provided by such a high airspeed was marginal at best and essentially nothing at all in respect to close-in dogfighting where most combat occurred. Many of our older aircraft in operation today, having been designed prior to this revelation, can attain Mach 2.5 but are never called upon to do so; they're prime examples of having embraced technology principally for technology's sake and of the excessive costs of technological addiction.

The impact and occurrence of this particular type of Force Divisor is widespread but, sadly, it is but marginally recognized; its existence and impact are hidden from view because, by and large, the need for scrutiny and analysis has gone undetected. If the marketeer said it could be done, and the user said it should be done, it was done, and no one else was the wiser. This was, and is, somewhat akin to an unquestioned, open-ended expense account--one of which can be particularly expensive whenever addiction is concerned.

We find today numerous examples wherein technological excesses exist, but it requires a sharp eye to detect them lest they otherwise appear as true requirements. Modern cockpits and consoles, for instance, are filled with multifunctional displays and controls which, to the unexperienced or naive, appear to give to the user an unlimited increase in fighting capacity. The hundreds of thousands, if not millions, of switch combinations and permutations contained therein would, otherwise, seem to enable him to fight under innumerably different combat conditions and situations.

Unfortunately, the existence of such a vast capability is often the perception rather than the reality because the truth of the matter is that the user is simply unable to maintain proficiency in operating all of the system's features. Facing the 'opportunity' of innumerable modus operandi, the user, because of his own human limitations, must instead choose a limited number of functions, say a dozen, and then concentrate on building and maintaining proficieny in these. To confirm that such is the case, we must merely note that today added sensors, controls and displays--all touted as increasing a pilot's capabilities--in reality saturate and overwhelm him and thus mandate yet additional systems to sort and mitigate the overload; the Force Multiplier has indeed metamorphasized into the Force Divisor.

Many other examples of this sort of high-tech Force Divisor would otherwise exist today but don't because, during the development phases, they abysmally failed and didn't make it at all--quite often an excessive degree of 'technological overreach' led to their demise. Unfortunately, in the becoming failures, these examples extracted a terrible penalty in terms of costs and in delayed defense capabilities; the spectre of 'what could have been' often looms large indeed. Advanced gun systems, ICBM programs, lethal defense suppression systems, and the like, are included in the list. Not only do these failures impact upon themselves, they also create an impact upon other defense programs in terms of opportunity costs and, importantly, in terms of strained credibility.

We thus see that a key hypothesis inherent in this and other aspects of the Force Divisor is that we have been guilty of being technological gluttons. Whether the Force Divisor manifests itself in respect to systems which are poorly designed and/or maintained, or through successful systems which contain excessive technological content, or by simply being outright failures, they all have the same hallmark; too much technology at too much cost. How did we get ourselves into this circumstance, and, importantly, how do we set things straight?

SEEKING ANSWERS

Assuming that the Force Divisor effect is real, we must consider what its causes are and, better yet, what its solutions are. There are likely many of each, but time and space considerations permit us to address but a few.

First--and to a large extent, foremost--before we can solve this problem, we need to recognize that the Force Divisor, with all of its elements and impacts--and in and of itself--exists; to date we have largely failed to do so and thus continue to waste significant energies. It is at this initial juncture--in recognizing the source and its causes--where we must begin; we must accept that the problem lies largely within our own technological domain and is largely of our own making.

Importantly, we must overcome an almost institutional bias wherein we, with our technological propensities, tend to remain blind to the cause and, in fact, often exacerbate situations by attempting to solve our technological failures with even more technologically exquisite solutions--we're attempting to fight fire with gasoline! Furthermore, we must recognize that even when we overcome our blindness--and not too unlike early alchemists and/or sorcerers attempting to stem a plague--we often instead allege and exorcise the wrong demons and/or torture the wrong victims.

Today, we can no longer afford this luxury of neglect; we must perform our witchhunts from within and not from without. As a respected combat veteran has noted, "we may be 'killing our warriors with

kindness' by attempting to equip them with high tech weapons which are costly to buy, which fail to perform consistently given the vagaries of the 'fog of war', which are difficult to use by the less trained or less proficient, and which are difficult to maintain in fighting form. To paraphrase Walt Kelly's "Pogo", "We have met the technological enemy and they is us." Force Divisor indeed.

Before proceeding further, it should be noted that none of the foregoing should be misconstrued to advocate or even hint that we forego modern technologies in our weapon systems. Given the high-tech adversaries which we could possibly face such would be absurdly irresponsible, if not wishful, thinking. No, what is instead advocated is that we proceed more carefully and diligently in determining the technological content of the weapons we design and build. We must accept that we could indeed, with the best of intentions, be 'killing our warriors with kindness'; the author once maintained a framed inscription upon his desk which read, "If it's old, it's gotta be good. If it's new, it's gotta be better. Two useless statements". The underlying message and wisdom remains valid today.

Given that we should proceed more carefully in establishing the technological content within our modern systems, a second element arises; how do we do so? Specifically, by which yardstick (or yardsticks) do we measure and establish the line of demarcation beyond which the negative effects of the Force Divisor overwhelm the technological contributions of the Force Multiplier? At what point of technological content does the metamorphosis occur?

This is indeed a difficult questions because its answer will likely involve numerous, simultaneous, quantitative and qualitative elements of which many may be but barely known or understood. Further, to determine and validate these elements, it will likely require a synthesis of information and data on a scale which likely would be unprecedented, but yet elusive.

In an example, we note that the Force Divisor recently raised its ugly head in the Persian Gulf by requiring the crews of the *USS Stark* and *USS VIncennes* to bypass and/or override their sophisticated

equipments to meet what they perceived to be the most important tasks at hand. Would it have been possible, in advance, to determine at which point(s) the crews would have had to override their systems? What about afterwards; would it be possible to reconstruct the exact sequence of events so as to determine the line of demarcation wherein the Force Divisor dominated the Force Multiplier?

What were the exact elements in each of these circumstances? Would they have been different at a different time of day, or in a different location, or with a different sea state? How was the similar demise of the *HMS Sheffield* in the Falklands related, if at all, to the damage incurred by the *USS Stark* (both were hit by Exocet missiles)? Would the crew of the *USS Stark* have reacted differently had they been operating in the South Atlantic, as had been the *HMS Sheffield*? Under such circumstances, would the *USS Stark's* high tech Force Multipliers have transformed into Force Divisors, or would they have met the tasks at hand?

These questions, and the variables they intertwine, loom large indeed. Such is not to say, however, that they present insurmountable obstacles and it is therefore a major theme of this paper to advocate that systematic research be undertaken to attempt to validate (or invalidate) the Force Divisor hypothesis, and then to determine its technological point of onset. First would be the attempt to ascertain if the phenomenon is real and can be isolated and then, if it exists, to determine the extent to which various elements contribute to the sum such that each contributor's impact could be quantified.

Also, one specific goal of such research would be to ascertain the threshold beyond which technological content tends to become disfunctional. Stated differently, the goal would be to identify the 'knee in the curve' beyond which technological content confounds rather than contributes. Ideally, for each class or category of weapon system, it would be possible to categorize such thresholds and to employ them during weapon system advocacy and design.

SYSTEMS MANAGEMENT--PART OF THE PROBLEM??

Whether or not we can specifically identify and quantify the effects of the Force Divisor, we must recognize that there may be yet other factors which contribute qualitatively to its overall impact. In particular, we should recognize that one contributor to our problems may be that we are, quite simply, taking high-tech weapon developments too much for granted. In somewhat of a "007 Syndrome" we, in advocating and developing high tech weapons, may be significantly overreaching technological realities by (perhaps subliminally) believing and espousing something akin to "if James Bond can do it, we should do it". If we are indeed embracing the 007 Syndrome--and the author believes we are--we may be failing to appreciate the reality that high tech weapon endeavors are, in and of themselves, unique and can be but marginally engineered and managed as are other, often less demanding, technological endeavors. As a result, and to the detriment and demise of many of our weapon system developments, we may find that we've been 'overmanaged and underengineered'.

Specifically, we as a nation may be failing to fully appreciate the reality that today's high-tech weapon developments are probably the most dynamic technological endeavors ever undertaken by mankind; the technologies which emerge and ultimately integrate (or disintegrate) on opposite sides of modern battlefields make it so. Not even the Space Program--because the geometries, drags, gravitational influences, etc., are reasonably well known and predictable--faces a domain which is dynamic as that faced by the high-tech weapon on the unpredictable, 'fog of war' battlefield; nothing, but nothing, remains stagnant in this environment wherein unpredictable change is the rule rather than the exception. The technologies which we engineer into our designs, as well as the managerial talents we employ, must therefore be capable of being 'aimed at moving (technological) targets', so to speak. The dynamics of this situation would thus seem to mandate a premium in regard to the capacities of the individuals we employ therein; unknowingly, and unfortunately, it doesn't.

This failure stems from the reality that, in respect to high-tech weapons developments, many of the participants employed 'in the loop', from those writing the initial requirements documents (i.e., the 'users') to those drafting the final system designs (i.e., the 'technologists'), while they may be experts in their respective endeavors, are usually only partially, at best, qualified for the total task at hand. Stated differently, very few participants in the loop are, of themselves, capable of efficiently conceiving and/or realistically matching technological and operational capacities and needs with those of the modern battlefields. The focus here is on efficiently blending technology into the operational domain--those weapons which fall short usually do so because they fail to attain this optimal technological blend.

In the ideal situation, we would employ in our development programs individuals who were simultaneously conversant and proficient in both the technological and operational domains. By being so, they would best understand what could and couldn't and--importantly--what should and shouldn't realistically be sought in our future weapon system designs. As such, they would be able to better determine realistic needs and better resist the siren's song attendant with high-tech exhuberance.

Failing this ideal, but rare, situation we would in its stead have a perfect communications system which would enable those who were technologically competent to totally and completely communicate with those competent in respect to battlefield realities, and vice-versa. Through such a communications system optimized armaments would be specified and developed, with technological content being optimally tailored to meet real needs and deficiencies. We have, in practice, attempted for decades to institute such a system in our weapons developments but, because of reasons discussed below, we've fallen short. These attempts have been known by several titles, the most prominent being 'Weapon Systems Management'.

In reality, neither the ideal situation mentioned previously nor its Weapon Systems Management surrogate mentioned above have consistently met the needs of the modern, technological world. The

former, ideal, situation but rarely occurs because of the fact that very few users have sufficient technological acumen with which to accurately match operational deficiencies with technological realities. Similarly, only a small percentage of developers have adequate operational experience with which to aim their technologies. True, the users themselves may have been highly trained and experienced in the use of high-tech equipments, and, true, the technological developers may have focused exclusively upon high tech weapons endeavors throughout their careers, but this doesn't suffice; each still brings only a nominal portion of any total solution to the table.

Furthermore, the Weapon Systems Management approach which was, in essence, designed to efficiently bring the two sides together and to enable them to effectively communicate, fails to do so by a wide margin. A key reason behind this failure is that there has, unknowingly, developed between the technologist and the user a growing chasm--a chasm which greatly inhibits effective communications.

This chasm has largely gone unnoticed because, previously, it was small or nonexistent; such was the case because both sides had reasonable and adequate insight into the other's domain. Things, quite simply, were simpler--an Air Corps Lieutenant could, and did, have the capacity to successfully manage and oversee the integration of one of the high-tech weapon systems of the day; the B-17 bomber.

The fast, dynamic pace of modern technology, both in the laboratory and on the battlefield, has today largely, but yet unknowingly, dimmed this insight. Such is so because neither the technologist nor the user-- unless each is properly educated in both domains--can adequately perceive the content and changes in the other's arena. Correspondingly, a chasm continues to grow wherein the user's perceptions of his high tech needs significantly differ from the realities of what the technologist can deliver and, equally devastating, the technologist develops, and often promises, technologies which, although effective and robust in the laboratory, when introduced to the battlefields become stumbling blocks to effective combat. Unfortunately, few individuals recognize the truth of this reality; perhaps the age of the video wargame, wherein technology perfectly blends with the battlefield, has exacerbated this problem and contributes to the chasm's silent growth. The 007 Syndrome undoubtedly also contributes.

Because of this chasm, the two sides often fail to effectively
communicate with one another (although they normally believe they do)
and thus, the 'bringing together' aspect of weapon developments, however
well managed, often fails to work except in the simplist of situations.
Few situations, however, are simple and, because we've relied upon the
unquestioned assumption that the two sides could effectively communicate,
and thus generate a summation to the whole, our current Weapon Systems
Management approach is unknowingly contributing to our failures
of today.

NARROWING THE GAP

If a communications chasm does preclude effective weapon designs,
the solution thereto is self-evident; we must better educate both sides
in regard to the other's domain such that effective communication is a
direct product of, rather than a haphazard result of, their associations.
In order to reduce this Force Divisor's impact, it is appropriate that we
directly expose both sides to the other's domain. Technologists, for
example, should spend significant time "in the field" with the users they
support; they should sail, fly, and drive everything which their creative
talents touch, and do so in the rain, fog, sunshine, and snow. The servic·s
would likely resist such intrusions but, given the benefits which this
type of exposure would likely accrue in terms of the technological focus it
would provide, its benefit would likely be priceless.

Unfortunately, in respect to the user, mere 'field trips' won't
cure his technological deficit; nor likely would the 'standardized'
technologial training programs typically found within the services.
Instead, that which is required, so as to provide the user with an
appropriate degree of technological acumen, is a bona fide technological
education; the potential, otherwise, for a 'little knowledge becoming
dangerous thing' is--as it is too often demonstrated today--all too
real.

Although it would likely be perceived to be expensive in terms of
opportunity costs, the user communities would be well-served to require
that a significant portion of their members have technical (college)

educations. Stated clearly, so as to reduce the number of false starts in our high-tech programs, we need more tank commanders, ship captains, helicopter pilots, etc. with engineering, or like, degrees. If done, this would better enable those members, and their respective communities as a whole, to more realistically specify achievable technological requirements. This in turn would enable the technological developer to better focus his energies rather than attempting to meet overaggregated and technologically unrealistic 'wish lists' as is all too often the current case. The Force Divisor's potential would undoubtedly be reduced.

In concert with the foregoing recommendation, it is useful to recall that both the Army and the Navy, in reacting to technological deficits more than a century ago, effectively solved the problem by creating engineering colleges through which they processed their officers. These colleges—West Point and Annapolis—specialized exclusively in producing engineering graduates. Today, we've added a third major academy, the Air Force Academy but, for all of the three, the emphasis upon engineering has significantly declined and, instead, nonengineering degrees often dominate. When viewed in respect to the grievous impacts of a technological Force Divisor, one must question the wisdom of continuing such a practice and question whether or not the academies' emphasis should once again focus on technology. After all, engineering needs today exceed those of a century past.

UNIVERSALITY OF MANAGEMENT--A DIVISOR??

This paper will conclude with a brief comment in regard to the widely accepted management-school precept of the Universality of Management and on how it likely serves as a Force Divising ingredient.

Under this precept, the manager who has demonstrated managerial acumen in one endeavor is thus deemed qualified to effectively manage in virtually any other endeavor. It makes little difference as to what the next endeavor is—the manager under this precept could readily move from the management of a, say, used car lot to the presidency of an aerospace firm in one leap—managerial acumen is managerial acumen!

This precept has had a far reaching, negative impact in respect to weapon system developments and has been another major contributor to our many failures. Such is so because of the sheer technological dynamics inherent in the weapon system's technical domain wherein it but marginally suffices to have less-than-technical managers directly in the technological loop. True, good and effective management, of all credentials, is needed throughout the weapon systems development process--in accounting, contracting, procurements, etc.--but in the technological realm itself, the emphasis must remain on managers who are technologically competent and who possess technical acumen.

Herein the Universality of Management theory falls short because, sooner or later, and regardless of the multitudinous technical staffs which may exist, the manager in the technological domain must, standing on his own credentials, ultimately make technological decisions. This, obviously, requires some measure of technological acumen--an acumen which doesn't accrue through the precept of the Universality of Management. Therefore, in respect to technological management, even the best of the Ivy League's management schools fall short, and, once again, the Force Divisor raises its head. The term 'Podiacide' has been defined as shooting one's self terminally in the foot--the unquestioned adoption of the Universality of Management within the high-tech weapons domain may indeed be a good (or bad) example of such.

CONCLUSION

In summary, the Force Divisor is alive and well, and its negative attributes are embedded throughout our high-tech weapons community. How this evolved is through a number of wide and sundry means, but this evolution is of but moderate importance today. Rather, that which is of critical importance is that we eliminate the vestiges of the Force Divisor before they generate an impact which extends far beyond terms of efficiency and cost and, instead, jeopardize the lives of our servicemen. Given the reality of budget constraints, few endeavors could be more important today.

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