Triage of Triads

You pays your money,
and you takes your choice.

Caption to cartoon
John Leech
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Pay your money and take your choice is poor advice for U.S. participants in the table stakes game called "Nuclear Strategy." Preferred procedure is to pick a winning combination *before* opening the national purse.

The United States, committed to a second-strike strategy, requires a retaliatory force that could accomplish assigned missions after absorbing a large-scale attack. In addition, the force should afford flexibility, and forestall technological surprise.

Projected Soviet capabilities, however, suggest that U.S. deterrent powers predicated on the present triad may be perishable. The Soviets already have more than four times as many intercontinental ballistic missile (ICBM) *warheads* as Strategic Air Command (SAC) has *missile silos,* which are static targets. Most of Moscow's weapons are in the megaton range and their power and precision are steadily being improved. Emerging hard target capabilities consequently make the security of U.S. fixed-site ICBMs an increasingly serious source of concern, since they are undefended.

B-52 bombers, along with supporting tankers, depend in part on dispersion to ensure pre-launch survival, but runway and parking restrictions limit the choice of airstrips. Soviet submarine launched ballistic missiles (SLBMs) mounting Independently Targetable Reentry Vehicles (MIRVs), which numbered 192 tubes in January 1981, could cover dispersal sites and saturate escape routes much more effectively than single-shot missiles, if they chose to shoot from short range. Moreover, intelligence analysts indicate that Soviet air and civil defenses could deny many crucial targets to U.S. manned penetrators (especially B-52 Bombers) during this decade.

Straight-line projections of those trends to the mid-1980s, could cause U.S. deterrence to depend mainly on a monad of SLBMs, whose survivability could be significantly degraded by Soviet anti-submarine warfare (ASW) or antiballistic missile (ABM) breakthroughs that are not expected immediately, but which are not impossible either. A structured approach to posture improvement thus is worth reviewing.

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Planning Imperatives

Any U.S. assessments must stress fundamental differences between functional classes. Bombers accomplish strategic nuclear missions in ways completely different from intercontinental ballistic missiles, which duplicate few strengths and weaknesses of their submarine-launched counterparts, and so on. Improved products within each class perform missions better than predecessors, but in much the same way. Piston-powered aircraft and jets, for example, both fly from point A to point B. It is fruitless, therefore, to argue about relative merits of B-1 bombers and MX missiles before the need for *any* bomber or ICBM has been established.

Exclusive reliance on systems with similar characteristics, however strong, would reduce U.S. security, not strengthen it. Pre-launch survival prospects of air-launched cruise missiles and air-launched ballistic missiles (ALBMs) are similar to those of manned bombers. SLBMs and submarine launched cruise missiles (SLCMs) would be endangered by a Soviet ASW breakthrough. An effective Soviet ABM shield would drastically reduce the deterrent properties of *any* ballistic missile. Diversification thus is in demand, but only within loosely defined limits. No rule, for example, states that land-, sea-, or air-launched systems all must be represented. Two of the three triad legs could be aloft, ashore, or afloat if the resultant combination satisfied U.S. security requirements more completely than any other amalgam.

Which weapon systems would best satisfy U.S. force requirements depends on survivability, performance, and total program costs of the complete package. High-priced manpower and scarce energy supplies should be taken into account. No solution would seem acceptable if it risked instability or an all-out arms race.

Optional Alterations of the Triad

Seven new systems compete with the three triad components now deployed, giving U.S. strategists a total of ten to choose from. ICBMs, SLBMs, and manned penetrating bombers need no further introduction. Air- and submarine-launched cruise missiles (ALCMs, SLCMs), together with semi-mobile ICBMs (SM ICBMs), are under active consideration at this time. Freely mobile ICBMS (FM ICBMs), air-launched ballistic missiles (ALBMs), ballistic missiles fired from surface ships (SSBMs), and Hydra are waiting in the wings. Shallow Underwater Missiles (SUM) on coastal submarines, sometimes called the Shallow Undersea Mobile Force, differ in detail from deep water SLBMs, as shall be discussed below. Airmobile missiles on aircraft that land before the missiles launch are lumped with ALBMs.

One hundred twenty triads are mathematically possible, with 10 systems to choose from. Almost 90 percent exhibit distinctly undesirable traits:

— Twenty-nine sets overstress "airbreathing" systems.
— Thirty-five contain nothing but ballistic missiles.
— Nine put too many eggs in the land-based basket.
— Six rely too much on submarine-launched missiles.
— Nineteen change the current triad completely.
— Nine include "sitting duck" ICBMs in silos.

The remaining 13 possibilities are somewhat more attractive. All mingle two classes of ballistic missile with a single "air-breather." Eight incorporate one airmobile component, with others aloft or afloat. All depend on mobility and/or deception to preserve pre-launch survival prospects.

Every one of these 13 options, however, involves tough tradeoffs:

— Four sets embrace semi-mobile ICBMs, which attract the attention of Soviet marksmen to known aiming points in the Continental United States (CONUS).
— Four more with freely mobile ICBMs also present targets on the American land mass.
— Four of those eight possibilities abandon SLBMs, the most survivable system presently deployed.
— The final five, which feature two dissimilar sea-launched systems, lack complete diversity, because they dispense with any land-based model.

U.S. decisionmakers therefore must compare relative merits of various combinations to ascertain the most suitable mix. Calculations invariably involve subjective values. Every option is plagued with some shortcomings, but sensible compromise is not impossible.

SLBMs As the Constant Component

All options selected for serious study should preserve SLBMs, which are vulnerable in port, but survivable on station. That stable system discourages enemy proclivities to preempt. If armed conflict should develop, despite our deterrent, SLBMs would draw few nuclear fires on the United States. U.S. responses, triggered at times of our choice, would presently be unsuppressible. Counterforce target coverage could be expanded by installing warheads with improved accuracies and yields, if U.S. decision-makers desired.

Those strengths will remain unshaken until enemy ASW forces acquire high confidence that they can locate most U.S. strategic submarines at sea and sink

them simultaneously before they launch their missiles, or until Soviet ABMs can stop U.S. warheads enroute.

Alternatives to Fixed-Site ICBMs

The deterrent value of U.S. fixed-site ICBMs declines at a rate that relates directly to the deployment of Soviet counterparts with credible hard target capabilities. That process cannot be impeded effectively for long by improving any second-strike system installed in silos.

Silo hardness already is approaching its practical limitation. Even new bases in bedrock, prepared at prodigious cost, could be destroyed by big enough blasts. Expanding the force would be fruitless, for the Soviets could add warheads much faster than we could build silos and fill them with missiles, and this at a fraction of the cost. Replacing Minuteman missiles with MX would merely provide Soviet marksmen with more lucrative targets. Launch-on-warning policies (sometimes called launch-under-confirmed-attack) could strengthen deterrence by increasing uncertainty in the Soviet camp, but could be prudently implemented only if the Kremlin promised to leave the U.S. alert apparatus intact. Otherwise, the President, lacking proper input, might opt for a response completely out of proportion to the provocation, with ruinous results.

The long-term utility of fixed-site systems might be extended by early deployment of ballistic missile defense, but the SALT I ABM Treaty allows just 100 launchers, and suitable technology is still immature. Such a small force would leave eight of our nine ICBM fields uncovered. Many political and economic impediments oppose rescinding that pact, even if Moscow refused to renegotiate.

Pressures to supplement or partly supplant our silo-based force are thus powerful. Five options perhaps should take top priority. Each replaces a single constituent — the fixed-site ICBM — in the current U.S. triad:

Option One	*Option Two*	*Option Three*	*Option Four*	*Option Five*
SM ICBM	FM ICBM	SSBM	Hydra	SUM
SLBM	SLBM	SLBM	SLBM	SLBM
Bomber	Bomber	Bomber	Bomber	Bomber

Option 1: Substitute Semi-Mobile ICBMs

Semi-mobile ICBM systems (SM ICBMs) constitute large-scale "shell games." Each MX transport, according to some current concepts, could move randomly among 23 reinforced structures along a linear route or closed loop

"racetrack" 15 to 20 miles long, then dash to a new destination at the last moment. Other basing modes might include covered trenches, hardened open trenches, pinwheels, and multiple vertical structures, to cite a few examples

SM ICBMs, however, compromise between hardness and mobility. Maneuverability is strictly limited and associated shelters are less protective than silos. The system is more survivable than its fixed-site forerunner *only* if true target locations remain secret *and* the number of shelters exceed the Soviet stock of weapons with lethality sufficient to destroy them. SM ICBMs could therefore be smothered by a first strike, unless some sort of SALT ceiling controls both the quantity of large Soviet launchers and the legal load of independently targetable warheads per missile. Failing that, U.S. semi-mobile missile deployments would have to be expanded far beyond present contemplation, be defended, or both. In any event, the proliferation of known aiming points on American soil could invite saturation attacks of much greater magnitude than the Soviets would now need to swamp our 1,054 silos if deterrence failed for any reason. Critics also complain about construction costs and completion times, plus societal and environmental implications.

Option 2: Substitute Freely Mobile ICBMs

Freely mobile ICBM systems (FM ICBMs) mounted on trucks, trains, tracked vehicles, ground effects machines, river barges, and even lake-based submarines are essentially separate from semi-mobile models in one important military respect: they eliminate a known number of precisely located targets for enemy marksmen to hit. Backers believe that even a very large Soviet force would lack ample means to cripple the freely mobile land-launched leg of our triad with a full-scale assault, unless equipped with supersensitive surveillance devices and "smart" weapons that lock onto moving objects. Acquisition costs for the FM ICBMs are low when compared with semi-mobile models (although operating costs are higher).

FM ICBMs, however, are saddled with shortfalls of their own. Barrages of enemy MIRVs might blanket suspected hiding places in the United States. Protection against sabotage would pose special problems for missiles in the open, either stopped or in transit. Political opposition to nuclear weapons roaming public roads and rail lines is particularly strong. Arms controllers already lament inabilities to verify how many mobile launchers are deployed.

Option 3: Substitute Surface Ship Ballistic Missiles

Some strategists prefer to remove as many targets as possible from the American land mass. One school therefore suggests that surface ship ballistic missiles (SSBMs) would make better replacements for fixed-site ICBMs than

any semi-mobile or freely mobile land-based model, although SALT II as presently prescribed prohibits this option.

The concept calls for transport ship hulls to be modified as special purpose launch platforms. Tests with Polaris SLBMs proved practical in the early 1960s. Such vessels could fool satellite sensors, but not preclude visual verification. Prelaunch survival would depend primarily on mingling missile carriers with legitimate merchantmen on crowded shipping lanes. It would be easier to pick up the trail of surface ships than submarines when they leave port, and easier to track them thereafter, but crisscrossing paths and decoys still would make it difficult to differentiate false leads from true targets. Even if all could be detected at any given time, the Soviets would nevertheless be taxed to attack the total SSBM fleet simultaneously, with two other legs of our triad. U.S. National Command Authorities could maintain radio contact with SSBMs and transmit emergency orders more surely than with submerged submarines.

Option 4: Substitute Hydra

Hydra is the most revolutionary sea-launched missile system. Submarines (including SUM) and/or surface ships in any combination desired could mount ballistic missiles internally or externally, either in canisters or modified to waterproof and improve bare missile buoyancy. Crews would then release those packets to float free in times of crises, far from the carriers and each other. Firings could be triggered on call from remote positions at sea or ashore. All components could be recovered if threats were to recede and requirements to launch disappear, according to the concept, which Navy personnel tested in part in the early 1960s.

Hydra missiles theoretically could be affixed to all sorts of carriers with collateral functions (some ships, for example, might also transport cargo). Serious conflicts between main and secondary missions, however, would likely occur. Special purpose platforms, purchased at increased cost, would be more appropriate.

Releasing weapons in response to strategic warning would violate present nuclear safety regulations. Further, such an act might prompt Soviet strikes rather than reducing tension. Hostile surveillance ships might find and confiscate or destroy free-floating U.S. missiles, unless steps were taken to prevent detection.

Such problems seem solvable, but some champions of the Hydra system prefer tighter control. Their alternative concept calls for spontaneous launch to start as soon as missiles hit the water. Hydra in such case would lose its unique prelaunch survival properties. Costs, however, would still be less and carrying capacities greater than for submarines and surface ships designed to launch missiles from batteries on board.

Option 5: Substitute SUM

A fifth option considers Shallow Underwater Missiles (SUM) on small coastal submarines as possible replacements for fixed-site ICBMs.

The original intent was to operate SUM from submerged positions on the U.S. continental shelf, where submarines might even remain motionless on the bottom for prolonged periods. Communication links would be simple. Soviet seekers would find it difficult to separate true signals from background clutter close to U.S. shores.

That concept, however, proved impractical, since SUM vessels apparently would be vulnerable to the Van Dorn effect. A single Soviet nuclear weapon detonated in deep water near our continental shelf would sweep the shallows for 100-200 miles with waves perhaps exceeding 100 feet in height. Even a few such blasts would be ruinous. SUM, confronted with those conditions, would need to move to deeper patrol stations and that would reduce many of its advantages. Bottom-sitting, for example, is not possible on steep continental slopes or at sites submerged much more than 1,000 feet. The fact that SUM remains within range of shore-based ASW support is not directly important. The U.S. Navy exerts no control over international waters in peacetime, and thus would be in poor position to protect SUM prior to a Soviet first strike. At best, Soviet ASW concentrations near the United States would ring alarm bells and allow our retaliatory forces to improve their routine readiness posture.

SUM and deep water SLBMs consequently compete for primacy within a single functional class, just as one of many basing modes would best serve mobile ICBMs. The integrity of our triad would remain intact if one sub-launched ballistic missile system replaced the other, but switching missiles in silos for SUM, while sticking with Trident, would create a strategic nuclear dyad instead of strengthening a three-legged structure.

Alternatives to the Bomber

Bombers are advertised as the most flexible of all strategic delivery systems. They can satisfy requirements across the conflict spectrum, from shows of force to nuclear combat. They can function as manned penetrators carrying diversified payloads, or as standoff missile carriers. Heavy bombers also have the hypothetical ability to engage a series of widely-separated targets; to locate, track and destroy moving objects; and to crack the hardest known structures. Crews can assess post-strike damage and enemy activities (such as the rapid reloading of missile launch facilities), then take action on their own or recommend responses to responsible headquarters. On examination, however, at least two of those claims seem extravagant.

Time-sensitive hard targets, for instance, are mainly immune to attacks by the fastest bombers, whose reflexes simply are too slow to engage enemy alert

forces. The competence of aircraft to strike several successive targets with bombs is also dubious — survival prospects could drop sharply when intruders proceed from one heavily defended objective to another, despite "black box" assistance and defense suppression support from other triad components.

Converting sophisticated strategic aircraft for tactical roles in regional combat, however brief, does *not* bolster nuclear deterrence. On the contrary, committing them to secondary missions can detract from this aim. As a result of B-52 drawdowns during operations in Southeast Asia, the size of the SAC alert force slumped by 15 percent. Capabilities of a smaller force would be degraded even further, and combat losses like those SAC suffered over the Red River Delta in December 1972 could prove unsupportable. (The original B-1 buy was to be just 244 aircraft). In short, the heavy bomber seems less attractive *tactically* than advocates assert, and is rather rigid *strategically,* being better suited for "assured destruction" purposes than for countersilo options.

Beyond that, the deterrent value of U.S. strategic nuclear bombers continues to decline at a rate inversely proportionate to the age of our B-52s, which already are older than most of their crews. Modernization, however, faces no insurmountable impediments. Replacing B-52s with B-1s or some advanced system that incorporates "Stealth" technology would reduce the danger to U.S. bombers. Pre-launch survivability would improve because alert aircraft not only could "scramble" more quickly, but could disperse to many strips with short runways. (Tankers, however, will be denied that advantage until superior substitutes for KC-135s deploy in strength). Faster speeds and better "black box" support should also make it possible to breach Soviet air defenses that could defeat B-52s.

A key question, therefore, follows: Would it be cost-effective to refurbish Strategic Air Command's bomber force to foster better capabilities within its rather restricted scope, or would some other airbreathing system be more satisfactory?

There is no way to accommodate SLCMs or ALBMs without accepting structural defects, such as excessive reliance on submarine-launched systems, total reliance on ballistic missiles, or adopting a quadrad at extra expense.

Four options therefore seem to take top priority, if decisions are made to switch. They are the same as Options One through Four already discussed, but change two legs of the triad instead of one by substituting air-launched cruise missiles for manned bombers:

Option One	*Option Two*	*Option Three*	*Option Four*
SM ICBM	FM ICBM	SSBM	Hydra
SLBM	SLBM	SLBM	SLBM
ALCM	ALCM	ALCM	ALCM

Pre-launch survival problems for ALCM carriers are similar to those of strategic bombers. They could be launched on warning in the same way, under positive control, subject to recall if required. Wide-bodied transports are less responsive than high-performance aircraft, because they need more time to taxi and take off. Converting vertical/short take-off and landing (V/STOL) aircraft to carry ALCMs would alleviate that problem, but V/STOL lift capabilities are limited.

Once aloft, security would improve temporarily. Opponents, however, almost certainly would hope to destroy U.S. carriers *before* the crews could launch any missiles. Otherwise, anti-aircraft units would have to hit a horde of separate projectiles, instead of one compact target. Barrage attacks against flight corridors over U.S. soil could be expected.

Cruise missiles are less adaptable than manned aircraft. Range restrictions are set in concrete, since in-flight refueling is impossible (although auxiliary tanks can be mounted in some cases). Once a current generation missile has been fired, it can neither be recalled nor recovered.

After separating from delivery vehicles, cruise missiles depend heavily on compact radar cross-sections, low infrared signatures, and terrain-hugging capabilities to assist in breaching defenses. They currently lack active penetration aids and elaborate electronic countermeasure (ECM) packets, are unable to take evasive action, and cannot cope with contingencies. Supersonic speeds would help, but U.S. systems now in development are subsonic. The present ALCMs' low, slow approaches, however, encourage accuracies that as yet are unattainable by ballistic missiles. An internal guidance system, periodically updated enroute, can reduce errors to a few feet. If the missiles are fitted with warheads of sufficient yield, they can crush very hard structures, but most time-sensitive and mobile targets could avoid destruction.

Aside from the launch platforms, ALCMs come at "cut-rate" prices, compared with other systems. Their greatest strength, therefore, might be realized by deploying sufficient numbers to overload opposing defenses. Electing to deploy ALCMs instead of manned penetrating bombers, however, would swap a proven system for new technology that still contains "bugs."

Tentative Findings

There is no way of authoritatively evaluating the advantages and disadvantages of new systems — Minuteman versus MX, Trident versus Poseidon, or B-52s versus B-1s — without analyzing combinations in the context of specific system characteristics, hard cost data, authoritative threat estimations, target distribution by number and type, and arms control goals. Third party threats, civil defense, air defense, ABM, and ASW all should be considered. A few tentative findings nevertheless emerge.

Any forthcoming U.S. force posture not accompanied by convincing justification should be viewed with caution if it plans to:

- expand or contract the U.S. triad by adding or subtracting systems;
- expand existing force levels;
- contain two or more land-, air-, or submarine-launched systems;
- contain two or more airbreathing systems;
- exclude airbreathing systems;
- retain fixed-site ICBMs;
- include undefended semi-mobile ICBMs, unless SALT limits Soviet warheads sufficiently;
- replace all three components in our present triad.

Decisionmakers also would do well to balance benefits against liabilities before approving any option that retains part of a present system after the rest is replaced (such as a mix of manned penetrating bombers with ALCMs or fixed-site with mobile ICBMs).