Choose Your Weapon:
Deploying U.S. Forces to the Taiwan Strait

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Noah J. Richmond
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In 1996, China bracketed Taiwan with live missile fire. The US Executive had to act so as to (1) maintain short term security, and (2) ensure long term stability. This study outlines a decision process for selecting an optimal force deployment with the objective of meeting these goals. A framework for making the decision is formulated: Feasible alternatives are identified, a two dimensional metric for their utility is developed, simulations that would improve the decision by reducing uncertainty are identified, and a preliminary costing out of the choices is presented. The limitations of choosing between options that cannot be perfectly ordered is briefly discussed, and preliminary recommendations are made.

Confronted with China's bracketing of Taiwan by means of missile fire, the Clinton Administration decided in March 1996 to deploy the aircraft carriers *Independence* and *Nimitz*. The choice of military response successfully quelled further Chinese showings of force, and maintained strategic stability. Several alternatives were available; however, and it is not immediately clear which was optimal. This study reconsiders the choice of deployment given the information available in 1996, and demonstrates the utility of decision analysis in choosing between the alternatives. In addition, it is shown that tactical operational analysis may be applied to inform a strategic decision model.

Background of Conflict and Ensuing Decision

In protest of the Republic of China (ROC)'s democratic elections and pursuit of international clout, the People's Republic of China (PRC) conducted several military exercises in late 1995 and early 1996. In 1996, live missile fire was conducted near the ports of Keelung (North) and Kaohsiung (South West), prompting a rerouting of sea and air traffic, as well as moderate adjustment to the Taiwanese stock exchange. The United States congress reacted in unilateral, but non-binding, support of the ROC. A non-binding resolution calling for the defense of Taiwan in case of missile fire, blockade, or other attack was passed. The Clinton Administration was faced with the immediate need to act so as to maintain present *and* future security in the Strait.

The scenario thus involves four players: (1) The ROC, (2) The PRC, (3) The U.S. Congress, and (4) The U.S. Executive. The decision is analyzed from the perspective of the U.S. Executive, who is assumed to have two objectives:

- Ensure Short Term (tactical) Security in the Strait.
- Provide for long term (strategic) Stability in the Strait.

These two objectives are taken to amount to effecting two guarantees:

- Guarantee Taiwan conditional short term security.
- Guarantee China long term unification (i.e. maintain one China policy and strategic ambiguity).

By taking into account the intentions and capabilities of each of the players, it is possible to choose a deployment to maximize the likelihood of meeting the stated security objectives. We next develop the decision process.

Decision Process

The following framework is used to develop the deployment decision:

(1) Identify strategically acceptable alternatives.
(2) Identify tactically acceptable alternatives.
(3) Order the effectiveness of alternatives that are both strategically and tactically acceptable.
(4) Cost out the acceptable alternatives.
(5) Select the preferred effectiveness/cost combination amongst the acceptable alternatives.

It should be noted that some of these steps are more easily accomplished than others. As will be noted, it is not possible to order all alternatives from a strictly mathematical point of view. However, a partial ordering of effectiveness on two dimensions is possible and of use to the decision maker.

Identify Strategically Acceptable Alternatives

Strategically acceptable alternatives are defined to be those that (1) Maintain the U.S. strategy of ambiguity and one-China policy, (2) Reduce pressure on China to escalate the use of military means for unification, (3) Do not embolden Taiwan, and (4) Appease the U.S. Congress' demands for action. A striking violation of any of these objectives would likely undermine security in the strait. For example, failing to appease the Congress would likely lead to a binding security commitment to Taiwan, thereby polarizing security relations in the Strait and more generally between the U.S. and China. Likewise, sufficiently emboldening Taiwan could lead to a declaration of statehood by the ROC and massive retaliation by the PRC. The executive should therefore restrict his choice of deployment to those that do not

violate these points in the extreme. Moreover, alternatives that satisfy more points more fully are preferred to those that satisfy fewer points to a lower extent.

We apply this method two six possible deployments: (1) None, (2) one Carrier Battle Group (CBG), (3) two CBGs, (4) Theater Missile Defense (TMD)[1], (5) Convoy, (6) Anti-missile interdiction.[2] Each is evaluated against four critical measures:

- US Commitment: The degree to which the action signifies U.S. commitment to Taiwanese Security, and thereby undermines strategic ambiguity. Negative numbers indicate a lack of commitment, while positive numbers indicate a presence of commitment. Ideally, the U.S. would like to present perfect ambiguity, or a zero rating.
- Pressure on China to Escalate: The degree to which the action will encourage or compel China to escalate the conflict either through retaliation or opportunism. Action that appears to directly indicate support for autonomy or confront the Chinese military is likely to pressure China to act forcefully. Lower numbers indicate less pressure, higher numbers indicate more pressure.
- Embolden Taiwan: The extent to which the stated action is likely to encourage Taiwan to act imprudently, i.e. declare statehood or otherwise fragrantly pursue greater international clout. Actions indicating unambiguous support may be misperceived by the ROC as a blank check security guarantee. Negative numbers indicate policies likely to discourage confidence in U.S. security guarantees, while positive numbers indicate policies likely to be interpreted as allowing for greater freedom of action. This measure is of course highly correlated with US Commitment.
- Appease Congress: The context of this decision includes a Congress that nearly unilaterally supports a guarantee of Taiwan's short term security. Failure to act so as to satisfy the Congress' non-binding resolution could lead to a binding resolution that undermines strategic ambiguity and US-China relations. Negative numbers indicate actions that are unlikely to enjoy support by Congress, while positive numbers indicate actions likely to enjoy support by Congress.

needs to be eliminated as unfeasible. see below. we would need to deploy this quickly (within one week)

The above measures are subjective, and therefore the ratings applied are deliberately ~~corse~~ coarse—a five point scale from (-2) to +2 is utilized. In some cases a range of number is included, or it is noted that the rating cannot be declared with even this degree of confidence ("unclear"). Some categories can be ranked however, and usefully so. The scoring of the alternatives is listed below. We restrict the feasible set of selections as those which do not fail to meet any of the above points in the extreme. For example, actions that will almost surely compel China to resort to further armed conflict are eliminated.

	Commit (No -2, 2)	P Escalate (No 2)	Embolden Taiwan (No 2)	Appease Congress (No -2)	Strategically Sound?	
None	(-2)	unclear	(-2)	(-2)	No	
1 CBG	0	(-1) or 0 or 1	0	(-1)	High	Preferred
2 CBG	1	0 or 1	1	0 or 1	High	Preferred
TMD	1 or 2	1 or 2	1 or 2	1 or 2	Low	
Convoy	1 or 2	1 or 2	1 or 2	1 or 2	Low	
Counter	2	2	2	unclear	No	

should be eliminated. as not feasible.

An attack on Chinese forces prior to an actual attack on Taiwan could start a war. See ~~note~~ comments.

This synopsis allows us to eliminate inaction and anti-missile counterattack. The former is likely to compromise strategic ambivalence, and fail to appease congress. The latter also fails strategic ambiguity in the extreme, and unnecessarily emboldens Taiwan. The remaining choices are feasible, though CBG deployments are preferred to TMD and Convoys because the latter border the "danger zone" of over-commitment, provocation of China, and emboldening of Taiwan. Thus we have a partial ranking on the strategic dimension. The second dimension of tactical utility is next considered.

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[1] The US could, for example deploy PAC-3 to Taiwan as was PAC-2 to Israel and Saudi Arabia during the Gulf War. It should be noted that sub-decisions include sending the system to be staffed by the foreign nation (as with Israel) or providing manned systems (as with Saudi Arabia).

[2] Anti-missile interdiction would comprise attacks on missile launchers in Chinese territory used to stage the attacks on Taiwan.

we will not station troops on Taiwanese soil - this violates One-China policy since the soil is theoretically China. Since Taiwanese went currently trained on US systems, they wouldn't be ready to receive them in the crisis time frame

Identify Tactically Acceptable Alternatives

We next turn to the short term, tactical aspect of this problem. The deployment must address the threats that China will muster. Evaluating the remaining US deployment options requires essentially two steps: (1) Determining to the extent possible China's intentions and capabilities, (2) Determining the ability of US deployments to *change* these threat levels. There is a critical subtlety in this second point: A US deployment is useful primarily if there is a threat that is both likely to occur, and against which the proposed defense will usefully reduce the damage incurred. Implicitly, defenses raised against vacuous attack have low ability to *change* the effectiveness of these threats, and are themselves of low utility.

Four principal types of attack are considered:

(1) Missile Blockade: Firing missiles into the waters adjacent Taiwan's ports
(2) Missile Strike: Firing Missiles directly on Taiwan (cities, ports, etc).
(3) Submarine Blockade: Using the PLA's submarine forces to wage attrition warfare on Taiwan's shipping dependent economy
(4) Invasion: Conducting a large scale land based assault

The following threat levels (expected damage) and likelihood (probability of the PLA undertaking given action) are assessed.[3]

	Missile Blockade	Missile Strike	Submarine Blockade	Invasion
Present Threat Level	Unclear; OR helpful	High	Unclear; OR helpful	Low
Likelihood	High	unclear	unclear	Low

It is clear from this assessment that a major source of uncertainty is within the likelihood and effectiveness of the military options of the PLA. Likewise, the effect of US deployments in reducing these threats is similarly uncertain:

	Effect on Threat Level				
	Missile Blockade	**Missile Strike**	**Submarine Blockade**	**Invasion**	**Tactical Benefit**
1 CBG	–	–	(-1)	(-2)	unclear
2 CBG	–	–	(-1)	(-2)	unclear
TMD	Unclear; OR helpful	Unclear; OR helpful	–	–	unclear
Convoy	Unclear; OR helpful	–	Unclear; OR helpful	–	unclear

In the above chart, negative numbers indicate reductions in the threat level—more *negative* indicates greater security for Taiwan. A dash "—" indicates little or no effect. In spite of the high degree of uncertainty, a few points are clear if we restrict our attention to strategically feasible choices and rule out the highly unlikely possibility of PLA invasion:

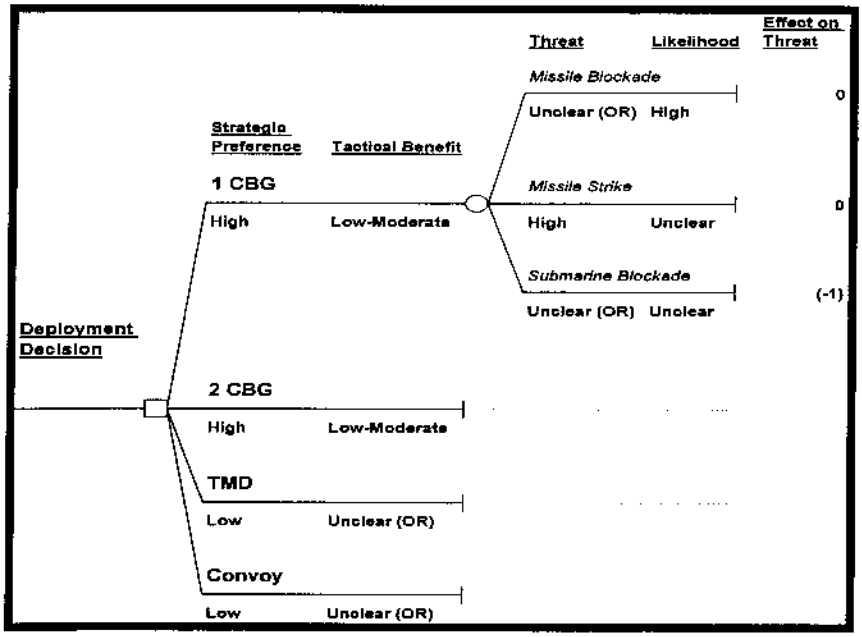
- Unless a submarine blockade is expected, the CBG options will effect a minimal change in the tactical balance of power for the given set of possible PLA actions. This fact results from the relative inability of carriers to challenge ballistic missile attacks without resorting to direct interdiciton. Thus on the dimension of tactical utility, the CBG options will rank low.
- If missile blockades and strikes are deemed unlikely or ineffective, or TMD defense are deemed ineffectual, then the TMD option will be judged to have low tactical utility. This option would then be inferior to CBG deployments which enjoy high strategic utility.
- If Missile Blockades and Submarine Blockades are judged unlikely, or Convoy operations deemed ineffectual, then the Convoy option will be judged to have low tactical utility. This option would then also be inferior to CBG deployments.

We therefore see that determining the threat levels of Missile and Submarine operations as well as the proposed defenses form the crux of the decision.

[3] The designation "Unclear, OR helpful" indicates that an operational analysis of this type of warfare is likely to be useful in determining these entries, but that they are otherwise unkown.

Order the Effectiveness of Alternatives:

As noted, uncertainty prevents a full determination of the utility of the decisions involved. This uncertainty can, however, be reduced. Ultimately, we would like to rank each decision on two coordinates: strategic and tactical utility. We first synopsize the Executive decision makers choices in a decision tree. This perspective provides a more natural way of assimilating the information presented. For the purpose of succinctness only the 1 CBG option is fully drawn; the same sub-tree enumerating the given threats would be attached to each deployment option when making a final analysis:[4]



As noted in the assessment of tactical utility, the TMD and Convoy options have uncertain tactical utility. If they turn out to have low strategic utility, then the decision is done—the CBG alternatives are superior. If the TMD and Convoy options have high tactical utility then the set of choices cannot be properly ordered from a purely mathematical standpoint, and a more difficult weighing of options will be necessary.

Operational analysis via modeling and simulation could be useful in reducing these critical uncertainties. The development of two models is recommended:

(1) A model analyzing the threat posed by anti-ship or strategic missile attack. A consideration of the accuracy of China's missiles, size of their inventory, and lethal radius when applied against merchant ships would, for example, allow the development of a distribution on the level of damage posed by this threat against shipping.

The lethality of a missile with a lethal radius of R_{hit} and given CEP is governed by the equation:

$$P_{hit} = 1 - .5^{\left(\frac{R_{hit}}{CEP}\right)^2}$$

R_{hit} is the range at which an impacting munitions will hit, or otherwise substantially damage the target.
CEP is the Circle of Equal Probability of the attacking missiles.
P_{hit} is the probability that the missile destroys or substantially damages the target.

[4] It should be noted that the likelihood of each contingency may depend upon the choice of US deployment. The tree is appropriately shaped because the US first deploys, and then China may select among her own military options.

Thus A DF-15 with a CEP of 300 meters and lethal radius of 15 meters has a probability of hitting a merchant vessel of only 0.17% assuming perfect target acquisition. This back-of-the-envelope calculation indicates that a large scale model could be telling. Missile defenses and convoying should also be considered.

(2) A model analyzing the threat posed by submarines against merchant vessels. China has over 60 sea worthy submarines, and Taiwan is dependent upon shipping to sustain its economy. Based on the density of the submarines in the waters surrounding Taiwan, their armaments, and the density of shipping, it is possible to determine the total attrition they could enforce, and the *rate* at which they could enforce it. The damage accrued would have to be sufficiently *extensive* and *rapid* to substantially effect Taiwan's economy. The effectiveness of convoys in mitigating this threat could then be considered.

Cost of Acceptable Alternatives

The cost of the US Executive's choices can be measured in terms of dollars and lives. The US military should be able to determine dollar costs with moderate to high certainty. Rough estimates on loss of life are also possible. The following preliminary estimates are given:

	$US Cost	Life US Cost
None	Low	Low
1 CBG	Med	Low
2 CBG	Med	Low
TMD	Med	Very Low
Convoy	High	Uncertain (possibly high)
Counter	High	High

Again, a two dimensional formulation of cost precludes a full ordering. However, the general US insistence on lowering casualties at the cost of greater dollar expense may allow a subjective ordering satisfactory to the decision maker.

Select the Preferred Two Dimensional Effectiveness/cost combination

The optimal effectiveness/cost alternative cannot be known with high certainty prior to developing the models proposed in the section *Order the Effectiveness of Alternatives*. However, preliminary results indicate that the Executive can restrict his choice to the following four options:

(1) Deploy one Carrier Battle Group (1 CBG)
(2) Deploy two Carrier Battle Groups (2 CBG)
(3) Deploy Theater Missile Defenses (TMD)
(4) Deploy Convoys to protect shipping (Convoy)

Along the dimension of strategic utility, the choices 1 CBG and 2 CBG are preferred. Along the dimension of tactical utility, 1 CBG and 2 CBG have low utility, while the utility of TMD and Convoy options are uncertain. If the threat posed by China's missiles or submarines is deemed vacuous, or TMD or Convoy operations deemed to be ineffective defenses, then these alternatives may be eliminated. This preference is further supported by the relative insensitivity of cost across the 1 CBG, 2 CBG, and TMD options. Simulation and modeling may provide useful information for determining this critical information. Once complete, choosing an alternative with an agreeable mix of cost and utility can be made—though there may not be one solution optimal in all dimensions.