ELEMENTS OF CONTROL IN ALLIANCE FORCE DEVELOPMENT

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ABSTRACT

This paper introduces an aggregate view of factors and policies that can influence the development of military forces in two international alliances which see each other as potential adversaries. The growth of forces observed in the NATO and Warsaw Pact alliances is taken as a reference mode. A conceptual System Dynamics Model is described which can accommodate a number of different perspectives on this issue.

1. INTRODUCTION

Press Reports in recent years have referred to the growth in military capability achieved by both the NATO and Warsaw Pact alliances since their inception. The subject is particularly topical today with each side promising further increases in its forces in the near term. It might be argued that there appears to be no control in what the media calls "the arms race" and that one is witnessing a state of "runaway inflation", or positive feedback somewhere in the force buildup system. However, given the proclaimed alliance policies and the real-world constraints that bound them it is more rational to assume that this system is goal seeking although it may be difficult for each side to be specific about its respective goal.

This paper discusses how differing viewpoints of the force development behaviour witnessed in the two alliances can be illustrated by means of a conceptual system dynamics model.

Where signs are shown in the diagrams the sign convention (1) is: if the variable at an arrow head changes in the same direction as the variable at the tail of the arrow, a positive sign is shown, while if it changes in the opposite direction a negative sign is shown.

The model in Fig. 1 is described first and is expanded into Fig. 2 and 3 during the discussion. The two symmetrical circular loops in Fig. 1 will be referred to as the "force design loops" and the presence of one negative sign in each loop indicates its assumed goal seeking nature. The following text will bring out how the competition between the two goal seeking loops over the value of a common variable ("actual force ratio") can lead to continuous growth in each side's "force strength".

2. INITIAL MODEL DESCRIPTION

The words "force strength" appearing at the top of the loops imply the inclusion of everything that contributes to an alliance's military capability. The concept of a "force ratio" is meaningful to most people in considerations of both deterrence and war-fighting capability. Detailed understandings of "force ratio" certainly differ, however, and reliable quantification is elusive. For the purposes of this discussion the practical difficulties of identifying precisely what is meant by the term "force ratio" can be left aside – acceptance of the concept is enough.

On this basis it can be postulated that each alliance has its own perception of the force ratio and has policies which drive towards the achievement of a "desired force ratio". For NATO and the Warsaw Pact countries the "desired force ratio" is shown at the bottom of the diagram as a separate input to the respective force design loop. (There is, incidentally no significance in defining force ratio as WP force strength divided by NATO force strength. Taking the reciprocal as the definition would merely change the places in the force design loops at which the negative signs appear).

The "force ratio" perceived by each side is determined after a delay following the "actual force ratio". The words "perceived" and "delay" here imply the military intelligence communities at work, their associated time requirements, predictive capabilities, and probable measurement errors. All arguments regarding perceptions of the opponent's intentions are subsumed in this activity.

In each side's "force requirements generator", a comparison of the perceived with the desired force ratio, combined with a knowledge of the current force strength, leads to changes in the "rate of investment in forces". The term "investment" is intended to cover all resources of finance and manpower. The delay between the "force requirements generator" and the "rate of investment in forces" accounts for the alliance planning process and decision time.

The "other political, economic and technical factors" which influence the "rate of investment in forces" are shown for simplicity initially as exogenous inputs to each alliance's force design loop. Finally, the delay between "rate of investment in forces" and "NATO (or WP) force strength" represents the research, development and production cycle times, force training times, etc.

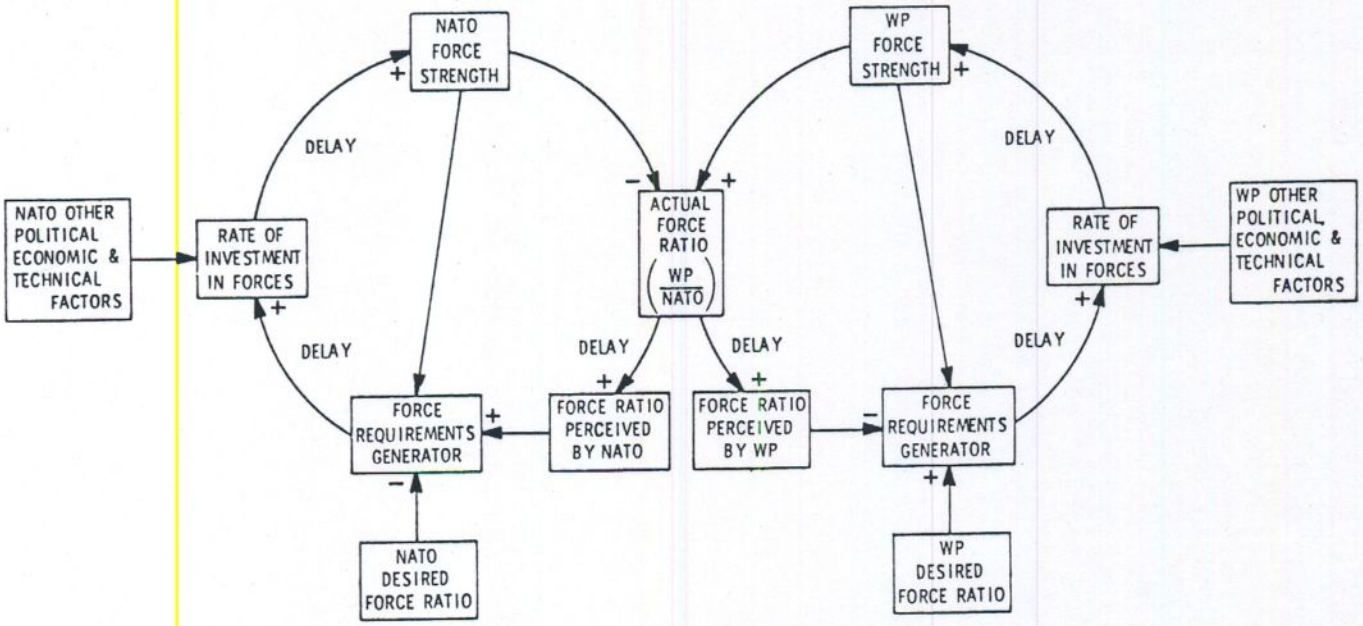

Figure 1. NATO and WP Force Development – Initial Model

3 DISCUSSION AND MODEL EXTENSION

The basis for this model is the assumption that each alliance views the other as a potential adversary. This may be a simplified view but it is hard to see how it can seriously be disputed in today's world. The first point to recognise is that the model's symmetry provides an unbiassed starting point for the discussion of certain policy issues. The asymmetry in force capability claimed by each side, whether it is real or the result of differences in viewpoint, can be accommodated by arguing differences in content and emphasis (i.e. considering different values) for the factors shown in the diagram.

Two observations of a more general nature can be made. Firstly, if the force design loops rather than the exogenous political, economic and technical factors are dominant in determining force strength, then in the long term, the alliance with the more responsive loop is going to be able to pull the actual force ratio closer to its own desired force ratio. In other words one can demonstrate the advantages accrued by the alliance that can modify or reduce one or more of the three delays identified in its force design loop. On the other hand, if the rate of investment in forces is totally dominated by the other factors then efforts to modify two of the delays (those due to the intelligence efforts and the alliance planning efforts) are futile.

In all probability both the perceived threat and the other factors play a role but in the West one has the uneasy feeling that NATO responds less to the threat signals than it should and pays more attention to the "other factors". This leads to the second observation which concerns the relative dominance of the feedback loops and exogenous inputs between the alliances.

It is tempting to suggest that on the Warsaw Pact side the force design loop which strives to meet the desired WP force ratio dominates the other political and economic factors in determining investment in WP forces. It was suggested above that the reverse seems to be true for NATO. The Warsaw Pact might therefore benefit more from reducing the delays in its force design loop than NATO would following corresponding action. Each side can seek to alter the relative importance of the force design loop and of the other factors. The Warsaw Pact could aim to degrade the Western economies by influencing the flow of oil. NATO could use economic measures to shift the dominance in WP force development from the design loop to the other factors. Such activities run the risk that they might lead to military intervention and it is here that the weakness of such a simple model becomes apparent.

Figures 2 and 3 introduce successive modifications of the initial model designed to permit expression of these and further concerns discussed below.

Referring to figure 2, each side's awareness of its own current rate of investment in forces combined with information gained (after a delay) of the other side's expenditures, can serve to stabilise the force design loops. Stabilising in this context means avoiding large oscillations in the force ratio and does not mean stopping the force enhancement on either side from continuing. The analogy is with "velocity" or "rate" feedback in Control Theory in which advance notice of a trend, given proper emphasis to avoid over reaction by the system, can be instrumental in securing a more controlled system response.

From the standpoint of military deterrence strategists on each side who perceive aggressive intentions in the other, world peace may ultimately be best served by neither side ever being thought to have achieved its desired force ratio. The smaller that the fluctuations in force ratio are allowed

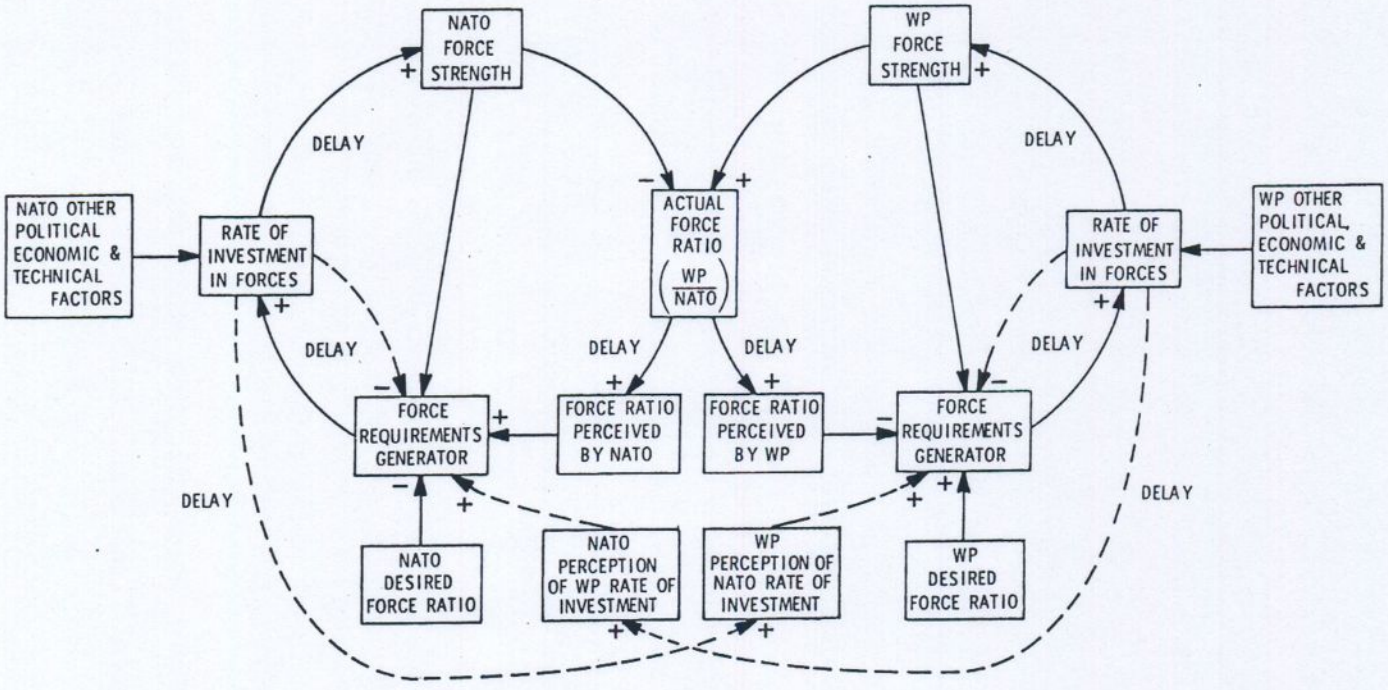

Figure 2. Stabilising the Force Design Loops

to be, then the smaller would seem to be the risk of precipitate military action encouraged by one side's perception of a temporary overriding advantage. The stabilising loops shown in figure 2 help to keep the force ratio between bounds while force improvement programmes continue.

It is interesting to note that the model shown in figure 2, which encapsulates a large part of the arms race argument, could also illustrate the course of a controlled reduction in forces by both sides in the event of disarmament. The model could accommodate a downward spiral in force strength while preserving the force ratio within acceptable limits. The impetus for such a change in direction would however, have to come from outside the force design loops. Arms control agreements constraining weapons development and acquisition such as the one reached between the US and USSR in the area of Anti-Ballistic Missiles can be effective in limiting the rate of investment in forces. Arms control verification procedures become particularly important in this regard as they affect the timeliness and accuracy of each side's perceptions of both the force ratio itself and the future trends. Each side has a strong requirement for controlling the dissemination of information on its forces for reasons of military security. This requirement, which follows naturally from perceptions of aggressive intentions, acts to inhibit each side's efforts to track the other's force developments and hence degrades the efforts to stabilise the force ratio. The open publicity given to many defence expenditures and decisions in the NATO arena contrasts sharply with the more covert nature of these activities in the WP countries. WP planners may therefore have an advantage over their NATO counterparts with regard to monitoring trends in the force ratio and formulating appropriate responses. The "Spy Satellites" in use by each side can be viewed as useful verification tools for arms control negotiators and also as a means for stabilising the force ratio by preventing significant changes in forces and trends from going unnoticed. Negotiations between NATO and the WP such as those conducted under the the umbrella of MBFR (Mutual and Balanced Force Reductions) offer a possible route for initiating a downward movement in force strength but have not so far met with success. It is in the outer loops of figure 3 that effective arms control mechanisms are sought and are potentially to be found. (In figure 3 the stabilising loops introduced in figure 2 should be understood as remaining in the model and are only omitted from the diagram for the sake of clarity in the discussion which follows).

There will be other common variables between the alliances, such as raw material resources, that will lead to further competition between them. Political and economic circumstances (or "threats") as well as the military threat all play a role in force development. The delays shown in the new outer loop of figure 3 between one alliance's "other factors" and the other alliance's perception of those factors accounts for the time it takes to analyse these variables. Perceptions (or misperceptions!) of the state of one side's factors can then influence, after a further delay, policy making and developments in the other side's political, economic and technical spheres of activity.

The "desired force ratios" will probably change over time in response to changes that occur in the political, economic and technical factors pertaining to each side (hence the new links shown with dashed lines in Fig. 3). Moreover, the deliberate use of bluff or deception to alter one side's perceptions of the overall threat may well be as effective as a variation in force strength in striving to achieve one's own desired force ratio.

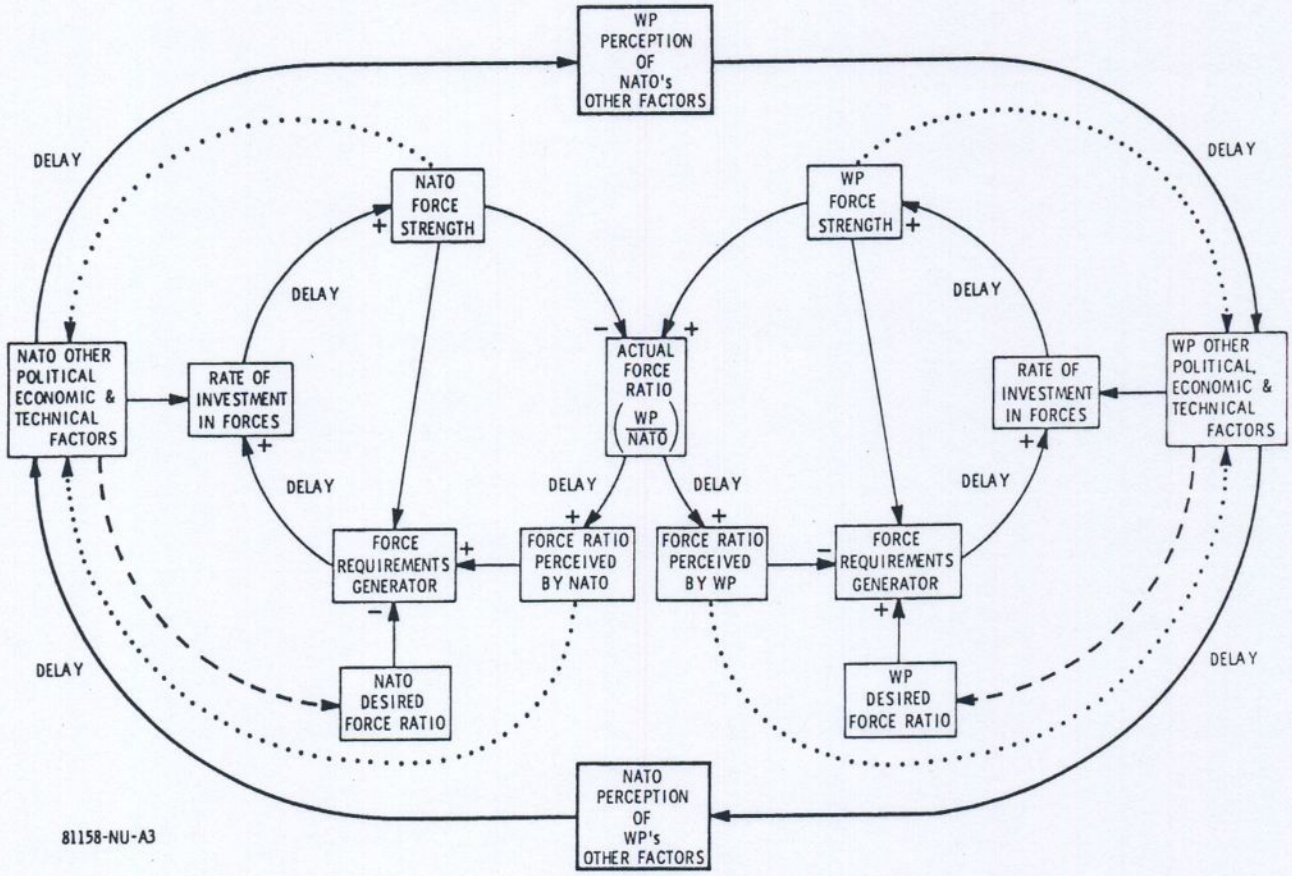

Figure 3. NATO and WP Force Development – Extended Model

By the additions of these extra links, the mechanism by which each side tries to shift the dominance in the other's force development from or to the "force design loop" is conceptually included in the model.

Changes in perceptions of the overall threat can be brought about not only by overt variations in force strength but also by means of the many avenues open to nations for diversionary tactics. Such tactics might extend from simple physical deceptions, through subtle propaganda, to a few well chosen words spoken by political leaders at the right time.

Given the risk of military intervention referred to earlier, each alliance's freedom of action in political and economic spheres is influenced by what it perceives the military threat to be. The dotted links in Figure 3 are added to reflect this interdependence.

Examination of the literature on strategic issues reveals differing schools of thought on the reasons for (or even the existence of) "the arms race". There are those who point to pressures arising from the momentum of the "military/industrial complex" within each alliance as the dominant factor driving force development. Their argument puts the emphasis on the 'rate of investment in forces – force strength – other factors' loops rather than on those loops which include perceptions of force ratio.

The concept of "force strength" itself merits expansion into at least three of its well publicised components – strategic nuclear, tactical nuclear and conventional force strength (the "triad"). Discussions on "the arms race" tend to relate to one or more of these elements at a time. The IISS report on the Military Balance[2] confirms a growth in capability in conventional and tactical nuclear forces in both alliances. However, papers by Wohlstetter[3] question the commonly held view that there is an arms race (in the sense of a real growth in capability) in the area of strategic nuclear weapons. His assessment of the facts would suggest that the dominant factors responsible for the development and acquisition of these weapons lie in technical, political and economic fields rather than in more direct military capability comparisons between the alliances. In terms of Figure 3 Wohlstetter's arguments translate into an emphasis on the outer loops as determinants of policy in this area. A model expanded further to accommodate the three components of the triad might provide a medium for describing the presumed interaction between conventional, tactical nuclear and strategic nuclear weapons holdings as contributors to deterrence. An approach using influence diagrams might complement and enhance an appreciation of the subtleties which pervade the literature on the analysis of deterrence issues.

CONCLUDING REMARKS

A conceptual System Dynamics model has been used to

support a qualitative discussion on alliance force development. At this stage the utility of the model shown in Figure 3 lies in its potential for focusing discussion and for demonstrating the common ground and the interdependencies between what are often considered to be quite different schools of thought. It might, for example, be reasonable to argue with the aid of Figure 3 that each school of thought on the arms race has been right for part of the time. Within the loop structure can be found the basis for a number of differing points of view. An analysis of the historical background could show that the dominance in this area of policy making shifts from one loop to another following changes in alliance circumstances.

The degree to which the aggregate variables identified in the diagrams are open to interpretation needs to be recognised. Bearing this in mind it may prove to be more challenging to try to find a rational viewpoint on the arms race question which *cannot* be accommodated within the framework of this conceptual model. The System Dynamics approach appears to offer potential as a means for broadening the understanding of the course of alliance force development.

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