25th International Congress on Modelling and Simulation, Darwin, NT, Australia, 9 to 14 July 2023
mssanz.org.au/modsim2023

Modelling the impacts of non-kinetic factors on combat effectiveness: The role of deception

K. Hock [a], S.-E. Staby [b], M.S. Gary [c], L. Kosowski [a], D. Blumson [a], H.T. Cao [a], S. Elsawah [b], N. Kempt [a] and M.K. Richmond [a]

[a] Defence Science and Technology Group, Edinburgh, South Australia
[b] School of Engineering, University of New South Wales Canberra, Australia
[c] School of Management and Governance, University of New South Wales Sydney, Australia
Email: karlo.hock@defence.gov.au

Abstract: The changing nature of future land warfare has applied an increasing focus on an interplay between kinetic and non-kinetic effects, as well as soft and hard factors, on combat effectiveness. Potential impacts of new and emerging technologies on the soft factors is critical to simulate the complexity of future battlefields, yet also challenging to characterise and quantify. Models that are capable of jointly representing a broad spectrum of factors can help with insights into technological impacts that translate directly into land combat outcomes. To achieve this aim, the scope of such models needs to strike a balance between highly detailed technical simulations and highly abstracted attrition models in order to examine the interaction between crucial factors at the heart of the modern land warfare.

Here we show the outputs of a model that represents the effect of soft factors like situational awareness, deception, and electromagnetic spectrum actions, as well as the decision-making that stems from these factors, on outputs such as kinetic engagement outcomes. We first provide an overview of implementation of these factors in a wider model architecture based on system dynamics that includes kinetic combat and attrition. We then focus on the model components that specifically deal with the force's perception of battlefield. A key concept here is that of deception, represented in the model at various stages of decision-making. Force's actions not only deny the opponent the ability to acquire information about the battlefield, but also degrade opposing force's ability process information about dynamic battlefield situations. In addition to interfering with the sensing, force's action also hinder the ability of the opponent to act advantageously on the information by increasing the proportion of incorrect information that is available to the opponent through deception. This then diminishes the opponent's ability to implement decisions that would enhance its combat capabilities, notably degrading its ability to inflict casualties. The level of deception can be assessed from the discrepancy between the decisions that the opponent ends up making to guide the performance of its forces and the optimal level of decision-making that it would be making in the absence of force's active effort to deceive it. Ultimately, high levels of negative perception stemming from detrimental decisions could also promote decision paralysis, further affecting the opponent's ability to exert effective command and control over its forces. Such effects could be enhanced with the use of novel technologies that could exacerbate these negative feedbacks at various stages of the decision-making process.

Overall, the model captures a range of soft effects and translates their impacts into operational success in the field, and as such provides an inclusive framework to explore the effects of future technologies on combat effectiveness. The presence of feedback loops in the model structure also makes it possible to simulate runaway processes that may arise from subtle changes in parameters, and this feature of the model then allows for examination of potential tipping points in warfare that could be introduced by future technologies. Inclusion of soft factor impacts extends the scope beyond attritional warfare and also helps to align the modelling approach with doctrinal postulates that focus on breaking opponent's will to fight, and therefore achieve success in modern combat that is not primarily focused on material and physical losses.

Keywords: *Modern combat, military deception, operational decision-making, military utility assessment*