Incorporation of Model-Based Systems Engineering into the Vee Model to Aid in Reducing the Time Required for the Design Cycle of a Military Tank

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Background/ Objectives:

Department Of Defence in U.S. is moving towards the usage of Model-Based Systems Engineering (MBSE) to improve the engineering processes and reduce the design life cycle of the system of interest especially when the complexity of defense systems and the difficulty to sustain these systems in a document-intensive engineering process are increasing.
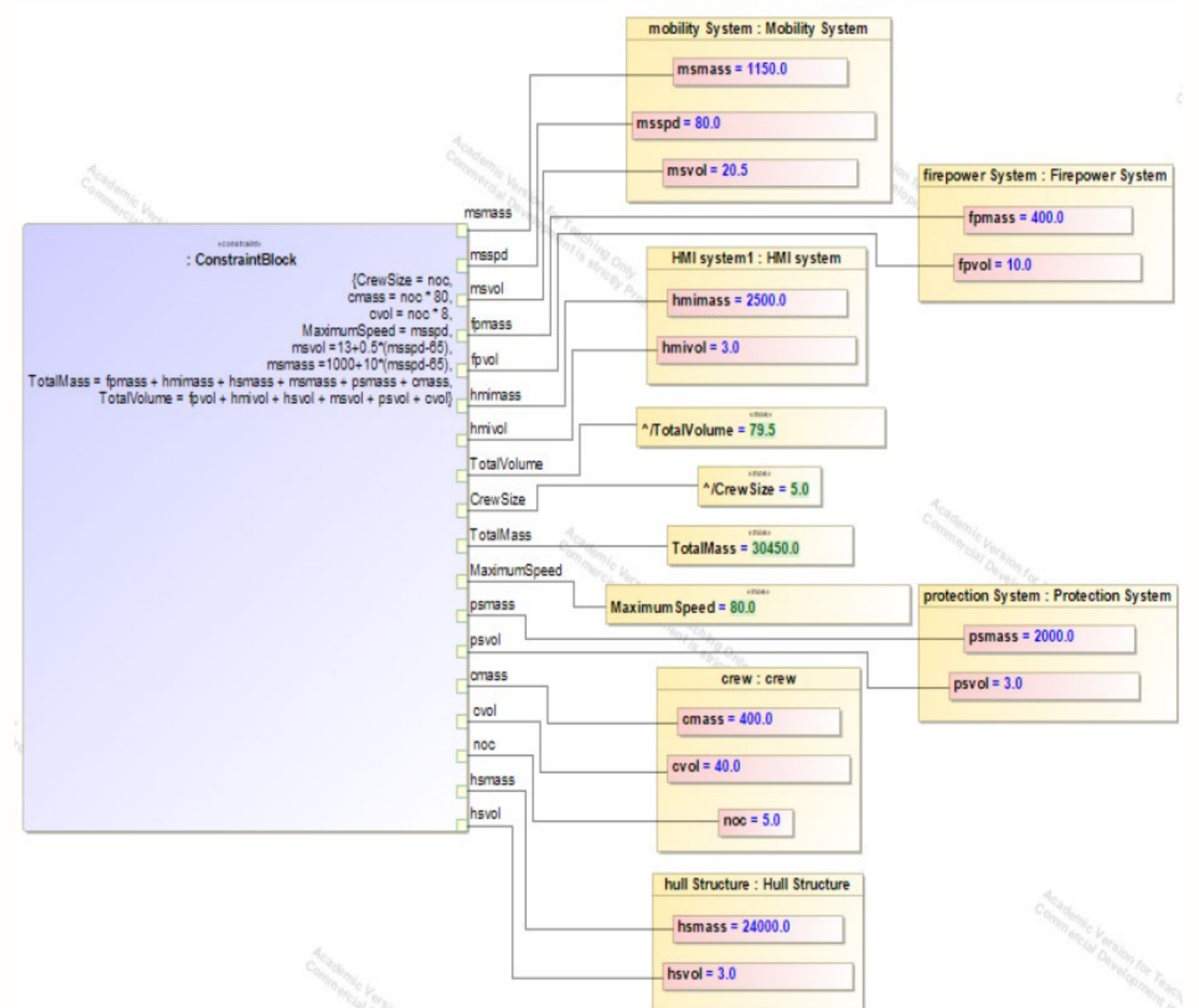
Methodology:

Dassault Systems CAMEO Magic System of Systems Architect (MSOSA), a MBSE tool, is explored with a military tank as an application to analyze the advantages and disadvantages of MBSE. MSOSA MagicGrid methodology is implemented within the framework of the Vee model which is often used in SE processes. The requirements, system context, activity diagram, internal block diagram, solution domain, traceability matrix and parametric diagram are modeled with a tank that comprises of these subsystems: 1) Hull, 2) Engine, 3) Weapon, 4) Armor, 5) Track, 6) Turret, 7) Human Machine Interface.

Results:

MSOSA shows that MBSE can provide functionality and utility that is not realised in DBSE in these four aspects: 1) Information Views, 2) Traceability, 3) Discrepancies Identification and 4) Continuity and Redundancies Reduction.

The MBSE tool is also useful in performing a trade-off analysis and identifying the remaining feasible solutions when there is a requirement change or 'requirement creep', with the help of a parametric diagram shown at the right and an instance table shown at the bottom of the parametric diagram.

Recommendations:

MBSE has a more effective engineering process, which helps to reduce the design life cycle of the system of interest. It can help match up the pace of technology advancement and increase in complexity.

Future Work:

The model can be further enhanced to better represent a military tank and taking into account more subsystems.

Verification Status: ☐ Pass ☐ Fail

#	Name	TotalMass : mass[kilogram]	CrewSize : Real	MaximumSpeed velocity[kilometr per hour]	TotalVolume : volume[cubic metre]	HMI system1.hmima : mass[kilogram]	fi Syst mas
1	tank1	30380	6	65	80	2500	400
2	tank2	30480	6	65	80	2600	400
3	tank3	30580	6	65	80	2700	400
4	tank4	30430	6	65	85	2500	450
5	tank5	30530	6	65	85	2600	450
6	tank6	30630	6	65	85	2700	450
7	tank7	31380	6	65	80.5	2500	400