

MODELING AND ANALYSIS OF A PROTOTYPE OF MULTIPLE LAUNCH ROCKET SYSTEM USING MATLAB SIMULINK

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Abstract: This paper presented the control modeling and analysis of the prototype of Multiple Launch Rocket System (MLRS) using Matlab Simulink. The mathematical model was determined using physical law and theoretical foundation of the turning mechanism control system and the elevating mechanism control system. Then, the model was identified in Matlab Simulink and analyzed in open-loop frequency characteristic analysis, closed-loop frequency characteristic analysis, step response characteristic analysis, and sinusoidal response analysis. The simulation results showed a good stability performance for both open-loop control and closed-loop control systems. We observed the fast response of tracking and controlling with the overshoot less than 3% and the steady-state error less than 0.2 Mil.

Index terms: Modeling, Multiple Launch Rocket System, Matlab Simulink.

I. INTRODUCTION

This paper presented the development and analysis of control modeling for elevating and turning of Multiple Launch Rocket System (MLRS). In order to design the controller for any dynamical system, a suitable dynamical model of the system is formulated and the parameters are accurately identified [1-4]. Required model parameters were obtained with various methods. Some parameters were obtained from handbooks and manufacturer specifications. Some parameters are obtained through experiments. There are other parameters obtained through the computer simulation. Since there have no MLRS control parameters available, this paper thus proposes the modeling and analysis of the system using Matlab Simulink [6-10]. The model was identified using Matlab Simulink and analyzed in open-loop frequency characteristic analysis, closed-loop frequency characteristic analysis, step response characteristic analysis, and sinusoidal response analysis. This paper was organized in the following manner: Section 2 Prototype of multiple launch rocket system; Section 3 The Modeling Theory of the Hydraulic Elevating Mechanism Control System; Section 4 The modeling theory of hydraulic turning Mechanism Control System; Section 5 Simulation model using Matlab Simulink; Section 6 Simulation Results and discussion; final section the conclusion.

II. PROTOTYPE OF MULTIPLE LAUNCH ROCKET SYSTEM

The plant used in this research is the prototype of multiple launch rocket system as shown

in Figure.1. The multiple launch rocket system consists of seven major parts as following: (i) The chassis wheel-type cross-country vehicle with high maneuverability, use to carry all of upper part, lower part, and canisters; (ii) The packing box for storing rocket, called canisters use to bear and lock the rocket projectiles; (iii) The elevating mechanism composed of canister and cradle, connected to turning plate through the trunnion; (iv) The turning mechanism composed of elevating mechanism and turning plate; (v) The hydraulic system is mainly used for implement, operate, aiming, support both manual and automatic modes; (vi) The electric system is mainly used to implement power supply and distribute electrical power via power distribution unit to device and all of electrical instruments; (vii) The fire control computer mainly use to control all of the launching process both automation and manual modes.

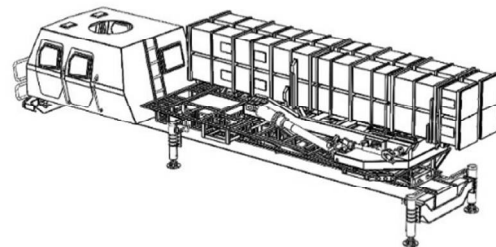


Figure 1: Prototype of Multiple Launch Rocket System