Sensitivity Analysis and Numerical Simulation of Rocket Detent Catch Fatigue Life

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ABSTRACT

This paper presents a prediction of fatigue life sensitivity of Rocket detent catch used on rocket launcher tube for proper design and specify maintenance cycle. Detent catch is subjected to large stress and strain in a short duration time in the operation. The basic fatigue model was developed to predict fatigue compare to the numerical analysis. Many geometric parameters of detent catch were considered to evaluate sensitivity of fatigue life via pareto chart.The result showed compromising value between analytic and simulation. The arm width of detent catch has the most effect to failure cycle while the other features have some significant effect.

Keyword: fatigue, sensitivity, detent, numerical, pareto.

1. Introduction

Detent catch is a component on rocket launched tube (Fig.1) to sustain the rocket thrust at specific value before launching. This component initiates the accuracy and stability on rocket trajectory as required. The detent catch consists of two main arms made from high strength steel to resist the load generated. When the rocket start moving, it will impact the arm of detent catch through the guide knob and causing elastic deformation of the arm in bending mode. While the arms are bending, the rocket will pass through them and after that the arm returns to their original shape. This interaction generates large displacement and large strain phenomena on the arm, causing them to break at some operating point known as fatigue life. To prevent breaking, the maintenance cycle should be considered. Thus the purpose of this study aim to estimate the sensitivity of detent catch geometric shape influence on fatigue life to provide designer of launcher with design guideline tool for proper design and specify maintenance cycle.