

## Chapter V

### CONCLUSIONS

#### 5.1 Conclusions and Discussion

The basic idea and the concept of a short-range rocket system have been described in Chapter 1. Many factors have been considered in this rocket system to achieve successful in firing. For an experimentation is concerned, all equipment such as the Rate Gyro, Accelerometer and High-speed Movie Camer, etc. are difficult to obtain in the country because these are very expensive instruments. It requires enormous amount of budgets. However, several experiments on rocket firing have been carried out since February 1974. The parameters of a short-range rocket has been described in Chapter 4. And the progressive experimentation of the Fin-stabilized Short-range Rocket System can be concluded as follows.

In November 1974, three different positions of the launcher were set up.

1. The launcher-angle was adjusted as 90 degrees. The rocket was fired and climbed up above 3,000 feet as expected.

2. The launcher-angle was adjusted as 60 degrees.

The observing range of the rocket firing was exceed 3 kilometers.

3. The launcher-angle was decreased to be 18 degrees. The observing range of the rocket firing was reduced and stopped in a distance about 2 kilometers.

In December 1974, four different positions of the launcher were set up. In this experiment, the time delay after ignition was about 0.03 second and the velocity was about Mach 0.9 to Mach 1.1.

The following results have been obtained.

1. When the launcher-angle was set up to 90 degrees, the rocket climbed up more than 3,000 feet.

2. When the launcher-angle was reduced to 60 degrees, the range of the rocket firing was observed to be greater than 2 kilometers.

3. When the launcher-angle was adjusted as 45 degrees, the range of the rocket firing was observed to be further than 3 kilometers.

4. When the launcher-angle was reduced to 18 degrees, the range of the rocket was observed to be less than 3 kilometers but greater than 2 kilometers.

In March 1975, two well designed rockets were fired in order to identify the dynamical parameters by using the launcher-angle fixed at 45 degrees. The aerodynamic drag coefficient was evaluated from both experiments and the value was close

to each others.

## 5.2 Some Suggestions for Further Study

For further system analysis, it may be recommended to study the rocket as a closed-loop system. It is necessary to control the rocket to hit any particular target with high accuracy and also increases the capability of the weapon system. This is an interesting research topic. An air-to-ground rocket may be considered and developed to reach the stage of applications. The mathematical model of a rocket system may be derived subject to several parameters in a modern day.

Another interesting research may be an optimal control in rocket system subject to thrust programming, designing for the best burning time to optimize the rocket motion.