

## *Small Group Discussion*

# Safety Standards of University Rockets

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**Moderator: Ass. Prof. Dr. Yutaka Wada (Chiba Institute of Technology, Japan)**

**Presenter: Daichi Manabe (University of Tsukuba, Japan)**

**< Discussion Members >**

**With Group9 Members**

## < Purpose >

To date, many universities worldwide actively conduct their small rocket launches based on the individual safety standards or regulations established by the own clubs or the organizations they belong to. The main purpose of the safety standards is to secure the safety of launch members and personnel of the third party, but shall not ties down the students by the strict rules to spoil their motivation for innovative ideas. In our group, each member introduces own activity of small rocket launch experiments at each country, and share with common sense each other about the safety of launching. Our group propose important contents in the safety standards and revise it. Moreover, we find launch experiment cooperative relationship at each country.

The agenda of discussion is as follows:

- |   |                 |
|---|-----------------|
| 1. Introduction of rocket experiment in each country 1        | (11:35 - 12:00) |
| 2. Introduction of rocket experiment in each country 2        | (13:00 - 14:45) |
| 3. Discussion on the safety standards for further enhancement | (14:45 - 15:30) |
| 4. Wrap up conclusion   | (15:30 - 15:50) |

**Today,**

**We have discussed with group 9 members because of shortage of discussion member .**

**Outline:**

- **Share information about safety standards of rocket launching by amateur in America and Japan**
- **What is the safety standards for?**

## <USA>

- **Request for space**
  - **The ratio of height: diameter of ground is 1:1**
  - **No need for simulation below 40k N/sec**
  - **Blanket approvals for multi rocket launches for approved rocket clubs**
- **Restriction on flights above 40k N/sec**
  - **Each flight requires full dispersion simulation**
  - **Each flight requires preapproval by FAA**

## <Japan>

### **Request for space**

- **Japanese land is small**
- **Need for flied simulation**

### **Restriction on height**

- **10km high at most**

## **Common Understanding:**

**Safety standards of university rocket is for prevention on serious accident and injury.**

**The safety standards must be set by:**

- **Location**
- **Situation of nation**

**< References > Documents are provided for the discussion members**

- 1. NASA - University Student Launch Initiative 2009-2010 (USA)**
- 2. FAA - Rules for Rockets 2007 (USA)**
- 3. National Association of Rocketry - High Power Rocket Safety Code 2012 (USA)**
- 4. Planete Science\_CNES - Book of Spaceifications Single Stage Experimental Rockets (France)**
- 5. UNISEC – Safety Standard for Rocket Development Ver. 6 (Japan)**
- 6. Noshiro Event – Safety Standards (Japan)**
- 7. JAXA - Safety Plane for Small Winged Rocket for Evaluating Flight Environment Adaptive/ Optimal Guidance and Control System (Japan)**

## Discussion Issues

- 1. What kind of experiment are there?**
- 2. What kind of problem are there? (When an experiment cannot be conducted, what kind of the reason are there?)**
- 3. What is the purpose of “Safety”?**
- 4. What kinds of information are necessary to discuss “Safety”?**

- Discussion result (introduction of some rocket launch experiments and its safety) will be presented by students.
- Home work: Group 5 will issue **the draft of full “Safety No home work!!”** by the end of May.



## Safety Code of UNISEC Global (1/6)

**Draft**

1. Definition of Safety
2. Design of Rocket
  - 2.1 Major Dimensions
  - 2.2 Flight Profile
  - 2.3 Aerodynamic Characteristics and Stability Margine
  - 2.4 Propulsion System
  - 2.5 Structure
  - 2.6 Avionics and Power Supply
  - 2.7 Actuation System
  - 2.8 Recovery System

**At last year, the safety code contents were decided**

## Safety Code of UNISEC Global (2/6)

**Draft**

### **3. Ground Support Equipment**

#### **3.1 Launcher**

#### **3.2 Propellant/ Oxidizer Supply and Ignition System**

#### **3.2 Telemetry System**

#### **3.3 Emergency Uplink System**

### **4. Flight Operation**

#### **4.1 Pre-Flight Preparation**

#### **4.2 Flight Operation and Check Manuals**

#### **4.3 Post-work**

## Safety Code of UNISEC Global (3/6)

**Draft**

### 5. Analysis

#### 5.1 Parts List and Mass Characteristics

#### 5.2 Ground Impact Points Analysis

(1) Effect of Wind

(2) Launch Elevation

#### 5.3 Loads Calculation

(1) Aerodynamic Load

(2) Thrust Load

(3) Parachute Deployment Load

(4) Touch Down Load

## Safety Code of UNISEC Global (4/6)

**Draft**

- 5.4 Strength of Structure
  - (1) Wing
  - (2) Body
  - (3) Fins
  - (4) Parachute Lizer

- 6. Test
  - 6.1 Structure Test
  - 6.2 Sub-system Operation Test
  - 6.3 Electrical System Test
  - 6.4 Total Functional Test

## Safety Code of UNISEC Global (5/6)

**Draft**

### **7. Hazard Analysis**

**7.1 Safety Distance of Propulsion System**

**7.2 FTA (Fault Tree Analysis)**

**7.3 FMEA (Failure Mode and Effect Analysis)**

### **8. Design Review and Approval of Flight**

**8.1 Design Review**

**8.2 Pre-flight Review**

**8.3 Organizations to Contact for Flight**

**8.4 Approval of Flight**

## Safety Code of UNISEC Global (6/6)

**Draft**

### 9. Project Management

- 9.1 Team Organization and Supervisors
- 9.2 Development and Flight Test Schedule
- 9.3 WBS (Work Break Down Structure)
- 9.4 Parts List
- 9.5 Budget Management

**A target table of contents will be corrected to further sufficient contents by discussion in order to share information and problem each other in this group.**