# FH JOANNEUM

# GRAZ

Model Based Design

---

# Mechanical System Rocket & Electrical System

**Training Unit 03**

---

*Autor*
David B. Heer
Jakob
Graz, October 31, 2018

*Lecturer*
Alfred Steinhuber

# Contents

# Part I
# Flight of a Model Rocket

## 1   Introduction

**[TODO - Grundlagen]**

1. **Acceleration with constant force**] 0.15 seconds with 16N

2. **Parabelflight** Until the parachute ist open at a velocity of $-20^m/_s$

3. **Parachute flight** Constant velocity of $-20^m/_s$

$$v\left(t\right) \qquad = v_0 + a * t \tag{1}$$
$$s\left(t\right) = s_0 + v_0 * t + 0.5 * a * t^2 \tag{2}$$
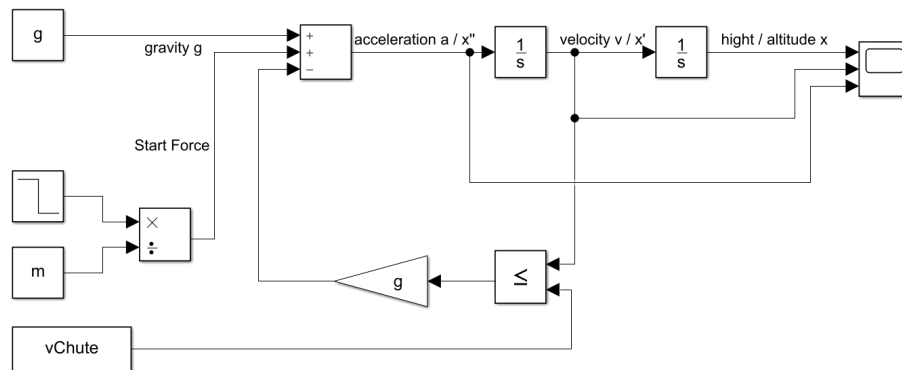
## 2   Model



***Figure 1:** Overview of the simulink model.*
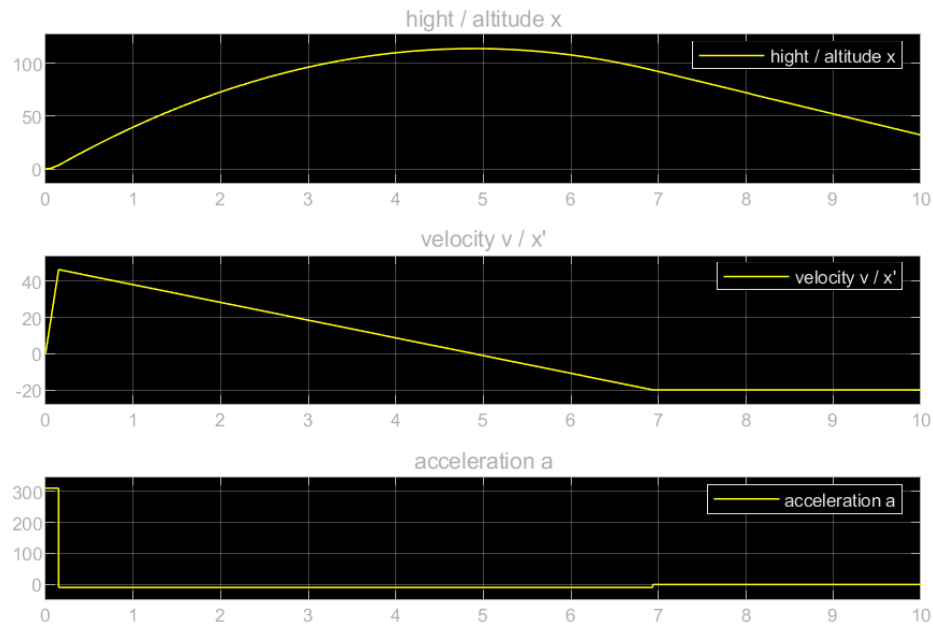
# 3 Simulation



***Figure 2:*** *Scope from the Simulation.*

```matlab
clear all; clc; close all;

%%
% g inverted
m=0.05; g=-9.81; tEngine=0.15; Force=16; vChute=-20; Dt=0.01;
clear t v h
n=1;
t(n)=0; v(n)=0; h(n)=0; t(2)=0;

%%
% Segment 1
a1=(Force-m*g)/m;
while (t(n) < tEngine) &&  (n < 50000)
n=n+1;
t(n)=t(n-1)+Dt;
v(n) =a1 *t (n) ;
h(n) =0.5*a1*t(n)^2;
end;
v1=v(n); h1=h(n); t1=t(n);

% Segment 2
```

```
22              while v(n)>=vChute && n<50000
23              n=n+1;
24              t(n)=t(n-1)+Dt;
25              v(n)=v1-g*(t(n)-t1);
26              h(n) =h1+v1 * (t(n)-t1 )-0.5*g* (t (n)-t1)^2;
27              end
28              v2=v(n); h2=h(n); t2=t(n);
29
30              % Segment 3
31              while h(n)>0 && n<50000
32              n=n+1;
33              t(n)=t(n-1)+Dt;
34              v(n)=vChute;
35              h (n) =h2+vChute* (t(n)-t2) ;
36              end
37
38              %%
39              subplot(1,2,1)
40              plot(t,h,t2,h2, 'ro', t1, h1, 'r+')
41              xlabel('Time [s]');
42              ylabel('Hight [m]');
43              subplot(1,2,2)
44              plot(t,v,t2,v2, 'ro', t1, v1, 'r+')
45              xlabel('Time [s]');
46              ylabel('Velocity [m]');
```

# Part II
# Electrical System

[TODO - input jakobs code]

# References

# List of Figures

# List of Tables