Model rockets, A-C

Model rockets D-E

Mid Power, F-G

Small High Power, H-I

2inch High Power, I-J

3inch High Power, I-J

4inch High Power, J-K

6inch High Power, K-L

7.5inch High Power

Large rockets
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 30mm, drag = 0.65, density = 1180 g/m³, weight = 0.111kg
Results: time to apogee: 8.3s, expected altitude: 442m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 30mm, drag = 0.65, density = 1180 g/m³, weight = 0.122kg
Results: time to apogee: 9.4s, expected altitude: 450m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 30mm, drag = 0.65, density = 1180 g/m³, weight = 0.127kg
Results: time to apogee: 8.9s, expected altitude: 429m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 30mm, drag = 0.65, density = 1180 g/m³, weight = 0.113kg
Results: time to apogee: 8.6s, expected altitude: 469m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 30mm, drag = 0.65, density = 1180 g/m³, weight = 0.105kg
Results: time to apogee: 8.3s, expected altitude: 477m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 30mm, drag = 0.65, density = 1180 g/m³, weight = 0.124kg
Results: time to apogee: 8.6s, expected altitude: 459m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 30mm, drag = 0.65, density = 1180 g/m³, weight = 0.142kg
Results: time to apogee: 10.6s, expected altitude: 725m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 30mm, drag = 0.65, density = 1180 g/m³, weight = 0.139kg
Results: time to apogee: 10.7s, expected altitude: 764m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 30mm, drag = 0.65, density = 1180 g/m³, weight = 0.184kg
Results: time to apogee: 10.5s, expected altitude: 686m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 30mm, drag = 0.65, density = 1180 g/m³, weight = 0.187kg
Results: time to apogee: 11.4s, expected altitude: 754m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 30mm, drag = 0.65, density = 1180 g/m³, weight = 0.123kg
Results: time to apogee: 9.7s, expected altitude: 777m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 30mm, drag = 0.65, density = 1180 g/m³, weight = 0.135kg
Results: time to apogee: 10.0s, expected altitude: 785m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 30mm, drag = 0.65, density = 1180 g/m³, weight = 0.130kg
Results: time to apogee: 10.7s, expected altitude: 843m

Data source: Aerotech E15W

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1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 30mm, drag = 0.65, density = 1180 g/m³, weight = 0.137kg
Results: time to apogee: 10.5s, expected altitude: 816m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 30mm, drag = 0.65, density = 1180 g/m³, weight = 0.147kg
Results: time to apogee: 11.1s, expected altitude: 887m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.559kg

Results: time to apogee: 7.4s, expected altitude: 255m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m$^3$, weight = 0.512kg
Results: time to apogee: 8.0s, expected altitude: 286m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.530kg
Results: time to apogee: 8.2s, expected altitude: 297m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.510kg
Results: time to apogee: 8.1s, expected altitude: 323m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.559kg
Results: time to apogee: 8.0s, expected altitude: 288m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.534kg
Results: time to apogee: 8.5s, expected altitude: 331m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m^3, weight = 0.514kg
Results: time to apogee: 9.0s, expected altitude: 373m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.526kg
Results: time to apogee: 8.6s, expected altitude: 373m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.535kg
Results: time to apogee: 8.8s, expected altitude: 381m
### 1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.

### 2. Move along horizontal to left border of density scale.

### 3. Move up slanted line to vertical line matching density at launch site.

### 4. From intersection point move horizontally to vertical line matching rocket mass.

### 5. Read off expected time to apogee from red curves, altitude from green curves.

#### Sample:
- Diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.525kg

#### Results:
- Time to apogee: 9.3s, expected altitude: 413m

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**Launch Site Altitude [m ASL]**

**F-G**

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**Aerotech F20W**

- \( I_{\text{tot}} = 60.6 \text{ Ns} \)
- \( F_{\text{avg}} = 22.6 \text{ N} \)
- \( I_{\text{burn}} = 2.68 \text{ s} \)
- \( d = 29 \text{ mm} \)

Data Source: Aerotech

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1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.551kg
Results: time to apogee: 9.5s, expected altitude: 409m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.584kg
Results: time to apogee: 9.7s, expected altitude: 393m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.540kg
Results: time to apogee: 9.6s, expected altitude: 485m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: 
- diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.547kg

Results: 
- time to apogee: 10.1s, expected altitude: 496m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.571kg
Results: time to apogee: 9.8s, expected altitude: 498m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.586kg
Results: time to apogee: 9.8s, expected altitude: 526m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.576kg.
Results: time to apogee: 10.3s, expected altitude: 537m.
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.587kg
Results: time to apogee: 10.3s, expected altitude: 561m
Launch site altitude [m ASL]

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Aerotech

G142

I_{tot} = 84.6 Ns
F_{avg} = 93.9 N
I_{burn} = 0.90 s
d = 29 mm

Data source: Aerotech

1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.548kg

Results: time to apogee: 10.3s, expected altitude: 621m

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Data source: Aerotech

1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.548kg

Results: time to apogee: 10.3s, expected altitude: 621m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.576kg
Results: time to apogee: 11.1s, expected altitude: 626m

Data source: Aerotech

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1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.602kg
Results: time to apogee: 11.0s, expected altitude: 654m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.609kg
Results: time to apogee: 11.9s, expected altitude: 701m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.573kg

Results: time to apogee: 11.6s, expected altitude: 731m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.551kg
Results: time to apogee: 11.9s, expected altitude: 766m

Data source: Aerotech
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1780 g/m³, weight = 0.57kg
Results: time to apogee: 11.4s, expected altitude: 750m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.574kg

Results: time to apogee: 11.8s, expected altitude: 787m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.597kg
Results: time to apogee: 11.5s, expected altitude: 774m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.641kg
Results: time to apogee: 11.7s, expected altitude: 752m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.575kg
Results: time to apogee: 11.7s, expected altitude: 811m

Data source: Aerotech

<table>
<thead>
<tr>
<th>Diameter [mm]</th>
<th>Density [g/m³]</th>
<th>Takeoff Weight [kg]</th>
<th>Empty Weight [kg]</th>
<th>Time to Apogee [s]</th>
<th>Expected Altitude [m]</th>
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</thead>
<tbody>
<tr>
<td>29</td>
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<td>0.575</td>
<td>0.3</td>
<td>11.7</td>
<td>811</td>
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1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.640kg
Results: time to apogee: 11.8s, expected altitude: 768m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.640kg
Results: time to apogee: 11.2s, expected altitude: 770m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.594kg
Results: time to apogee: 11.9s, expected altitude: 839m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.601kg
Results: time to apogee: 12.2s, expected altitude: 865m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.578kg
Results: time to apogee: 12.5s, expected altitude: 980m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.651kg
Results: time to apogee: 12.8s, expected altitude: 947m

data source: Aerotech G69N
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 45mm, drag = 0.65, density = 1180 g/m³, weight = 0.678kg
Results: time to apogee: 13.7s, expected altitude: 1127m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.202kg
Results: time to apogee: 10.6s, expected altitude: 589m

data source: Aerotech
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.215kg
Results: time to apogee: 11.1s, expected altitude: 600m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.204kg
Results: time to apogee: 11.2s, expected altitude: 644m

H-I 4s 5s 6s 7s 8s 9s 10s 11s 12s 13s 14s 15s 16s 17s 18s 19s 20s
200m 300m 400m 500m 600m 700m 800m 900m 1000m
empty weight [kg]
takeoff weight [kg]

Data source: Aerotech
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m^3, weight = 1.188kg
Results: time to apogee: 11.6s, expected altitude: 638m

Data source: Aerotech H55W
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.308kg
Results: time to apogee: 11.8s, expected altitude: 540m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.282kg

Results: time to apogee: 12.0s, expected altitude: 712m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.264kg

Results: time to apogee: 12.5s, expected altitude: 822m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.293kg
Results: time to apogee: 12.8s, expected altitude: 786m

empty weight [kg]
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.249kg
Results: time to apogee: 12.8s, expected altitude: 908m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.313kg
Results: time to apogee: 13.0s, expected altitude: 899m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.246kg
Results: time to apogee: 12.9s, expected altitude: 931m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.252kg
Results: time to apogee: 12.8s, expected altitude: 950m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.279kg
Results: time to apogee: 13.1s, expected altitude: 932m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.256kg
Results: time to apogee: 13.4s, expected altitude: 1014m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.385kg
Results: time to apogee: 15.5s, expected altitude: 1202m

Data source: Aerotech
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.362kg
Results: time to apogee: 15.2s, expected altitude: 1374m

Data source: Aerotech

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1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.363kg
Results: time to apogee: 15.2s, expected altitude: 1398m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.375kg
Results: time to apogee: 15.5s, expected altitude: 1410m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.331kg
Results: time to apogee: 14.9s, expected altitude: 1413m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.358kg
Results: time to apogee: 15.7s, expected altitude: 1459m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.385kg
Results: time to apogee: 16.1s, expected altitude: 1477m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.365kg
Results: time to apogee: 15.9s, expected altitude: 1560m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m$^3$, weight = 1.486kg
Results: time to apogee: 16.5s, expected altitude: 1622m.
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 1.506kg
Results: time to apogee: 17.4s, expected altitude: 1651m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 2.863kg.
Results: time to apogee: 10.9s, expected altitude: 559m.
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 2.875kg
Results: time to apogee: 11.0s, expected altitude: 548m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 2.858kg
Results: time to apogee: 11.3s, expected altitude: 577m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample:  diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 2.885kg
Results:  time to apogee: 11.5s, expected altitude: 567m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 2.865kg
Results: time to apogee: 11.9s, expected altitude: 664m

Data source: Aerotech
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 2.986kg
Results: time to apogee: 12.4s, expected altitude: 692m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 3.006kg
Results: time to apogee: 12.7s, expected altitude: 634m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 2.941kg
Results: time to apogee: 13.4s, expected altitude: 854m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 2.998kg
Results: time to apogee: 13.4s, expected altitude: 848m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 2.976kg
Results: time to apogee: 13.7s, expected altitude: 856m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 2.922kg
Results: time to apogee: 13.4s, expected altitude: 933m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 3.082 kg

Results: time to apogee: 14.1 s, expected altitude: 883 m

### Table: Empty Weight [kg]

<table>
<thead>
<tr>
<th>Diameter [mm]</th>
<th>Density [g/m³]</th>
<th>Takeoff Weight [kg]</th>
</tr>
</thead>
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### Quick Find Diameter [mm]

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<tr>
<th>Empty Weight [kg]</th>
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</thead>
<tbody>
<tr>
<td>2.00</td>
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<td>5.00</td>
</tr>
<tr>
<td>6.00</td>
</tr>
</tbody>
</table>

Data source: Aerotech
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 3.081kg
Results: time to apogee: 13.9s, expected altitude: 933m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 3.027kg
Results: time to apogee: 15.6s, expected altitude: 1223m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 3.068kg.
Results: time to apogee: 15.9s, expected altitude: 1248m.
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 3.062kg
Results: time to apogee: 16.0s, expected altitude: 1291m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m$^3$, weight = 3.178kg.

Results: time to apogee: 16.2s, expected altitude: 1289m.

Data source: Aerotech
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m$^3$, weight = 3.276kg

Results: time to apogee: 18.5s, expected altitude: 1297m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 3.117kg
Results: time to apogee: 17.7s, expected altitude: 1654m
J350W.5

1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 3.165kg
Results: time to apogee: 17.9s, expected altitude: 1684m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 3.159kg
Results: time to apogee: 18.0s, expected altitude: 1685m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 50mm, drag = 0.65, density = 1180 g/m³, weight = 3.165 kg

Results: time to apogee: 18.3 s, expected altitude: 1729 m

Data source: Aerotech
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.363kg
Results: time to apogee: 8.9s, expected altitude: 374m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.375kg
Results: time to apogee: 9.0s, expected altitude: 365m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm; drag = 0.65; density = 1180 g/m³; weight = 3.385kg
Results: time to apogee: 9.5s, expected altitude: 376m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.365kg
Results: time to apogee: 9.7s, expected altitude: 441m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.580kg
Results: time to apogee: 10.0s, expected altitude: 384m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.486kg.

Results: time to apogee: 10.1s, expected altitude: 458m.
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.506kg
Results: time to apogee: 10.5s, expected altitude: 416m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.527kg
Results: time to apogee: 10.5s, expected altitude: 488m

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<th>Takeoff weight [kg]</th>
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Data source: Aerotech
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.520kg
Results: time to apogee: 10.3s, expected altitude: 542m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.580kg
Results: time to apogee: 11.0s, expected altitude: 453m

Aerotech I115W

I₄₅₅ = 408.8 Ns
F_avg = 116.3 N
I_burn = 3.51 s
d = 54 mm

Density [g/m³]
Takeoff weight [kg]
Empty weight [kg]
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.441 kg
Results: time to apogee: 10.9s, expected altitude: 562m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.520kg
Results: time to apogee: 10.8s, expected altitude: 529m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.498kg
Results: time to apogee: 10.9s, expected altitude: 560m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.476kg
Results: time to apogee: 11.1s, expected altitude: 563m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.422kg
Results: time to apogee: 10.8s, expected altitude: 614m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.582kg
Results: time to apogee: 11.6s, expected altitude: 580m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.581 kg
Results: time to apogee: 11.3s, expected altitude: 615m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.527kg
Results: time to apogee: 12.4s, expected altitude: 792m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.568kg
Results: time to apogee: 12.7s, expected altitude: 806m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.562kg
Results: time to apogee: 12.8s, expected altitude: 831m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.678kg
Results: time to apogee: 13.0s, expected altitude: 836m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.617 kg
Results: time to apogee: 13.9s, expected altitude: 1050 m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.665kg.
Results: time to apogee: 14.1s, expected altitude: 1068m.
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.659kg
Results: time to apogee: 14.2s, expected altitude: 1067m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.665kg
Results: time to apogee: 14.4s, expected altitude: 1094m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.834kg
Results: time to apogee: 15.9s, expected altitude: 934m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m$^3$, weight = 3.920kg
Results: time to apogee: 15.2s, expected altitude: 1112m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.654kg
Results: time to apogee: 14.9s, expected altitude: 1221m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.863kg
Results: time to apogee: 15.6s, expected altitude: 1224m.
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.833kg
Results: time to apogee: 15.6s, expected altitude: 1290m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.914kg
Results: time to apogee: 15.5s, expected altitude: 1366m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.883kg
Results: time to apogee: 16.3s, expected altitude: 1342m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 4.797kg.
Results: time to apogee: 15.4s, expected altitude: 1004m.
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.841kg
Results: time to apogee: 16.6s, expected altitude: 1361m.
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 76mm, drag = 0.65, density = 1180 \text{g/m}^3, weight = 4.497\text{kg}

Results: time to apogee: 15.9s, expected altitude: 1230m.
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 3.880kg
Results: time to apogee: 16.5s, expected altitude: 1609m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 4.126kg
Results: time to apogee: 19.1s, expected altitude: 1567m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 76mm, drag = 0.65, density = 1180 g/m³, weight = 4.111kg
Results: time to apogee: 18.1s, expected altitude: 2114m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 5.665kg
Results: time to apogee: 10.4s, expected altitude: 517m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 5.659kg
Results: time to apogee: 10.5s, expected altitude: 512m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient,
2. Move along horizontal to left border of density scale,
3. Move up slanted line to vertical line matching density at launch site,
4. From intersection point move horizontally to vertical line matching rocket mass,
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 5.665kg
Results: time to apogee: 10.6s, expected altitude: 528m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 5.920kg
Results: time to apogee: 11.3s, expected altitude: 523m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 5.654kg
Results: time to apogee: 11.2s, expected altitude: 610m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 5.863kg
Results: time to apogee: 11.7s, expected altitude: 598m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 5.833kg
Results: time to apogee: 11.7s, expected altitude: 651m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m$^3$, weight = 5.914kg
Results: time to apogee: 11.8s, expected altitude: 707m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m$^3$, weight = 5.883kg
Results: time to apogee: 12.4s, expected altitude: 665m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 6.797kg
Results: time to apogee: 11.6s, expected altitude: 491m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 5.841kg
Results: time to apogee: 12.6s, expected altitude: 669m
Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 5.834kg
Results: time to apogee: 11.9s, expected altitude: 762m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 6.497kg
Results: time to apogee: 12.0s, expected altitude: 628m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 5.880kg
Results: time to apogee: 12.8s, expected altitude: 868m

Data source: Aerotech
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 6.126kg
Results: time to apogee: 14.8s, expected altitude: 748m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 5.886kg
Results: time to apogee: 13.8s, expected altitude: 999m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102 mm, drag = 0.65, density = 1180 g/m³, weight = 5.912 kg
Results: time to apogee: 14.7 s, expected altitude: 1059 m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 6.100kg
Results: time to apogee: 14.6s, expected altitude: 1105m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 6.574kg
Results: time to apogee: 14.8s, expected altitude: 1011m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m$^3$, weight = 6.199kg

Results: time to apogee: 15.2s, expected altitude: 1103m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102 mm, drag = 0.65, density = 1180 g/m³, weight = 6.134 kg
Results: time to apogee: 14.6 s, expected altitude: 1168 m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 6.111kg
Results: time to apogee: 14.5s, expected altitude: 1229m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 6.740kg
Results: time to apogee: 15.3s, expected altitude: 1150m

Launch site altitude [m ASL]
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 6.741kg
Results: time to apogee: 14.7s, expected altitude: 1212m

Data source: Aerotech

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1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 6.434kg
Results: time to apogee: 17.5s, expected altitude: 1293m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102 mm, drag = 0.65, density = 1180 g/m³, weight = 6.647 kg
Results: time to apogee: 16.5 s, expected altitude: 1444 m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102 mm, drag = 0.65, density = 1180 g/m³, weight = 6.506 kg
Results: time to apogee: 16.4 s, expected altitude: 1493 m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 6.426kg
Results: time to apogee: 16.3s, expected altitude: 1531m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 6.515kg
Results: time to apogee: 17.1s, expected altitude: 1557m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 7.220 kg
Results: time to apogee: 17.4s, expected altitude: 1562m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 102mm, drag = 0.65, density = 1180 g/m³, weight = 6.543kg.

Results: time to apogee: 17.5s, expected altitude: 1733m.
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: 
diameter = 152mm, drag = 0.65, density = 1180 g/m³, weight = 11.741kg
Results: 
time to apogee: 10.0s, expected altitude: 492m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 152mm, drag = 0.65, density = 1180 g/m³, weight = 11.647kg
Results: time to apogee: 11.4s, expected altitude: 567m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 152mm; drag = 0.65; density = 1180 g/m³; weight = 11.506kg
Results: time to apogee: 11.4s, expected altitude: 603m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 152mm; drag = 0.65; density = 1180 g/m³; weight = 11.426kg

Results: time to apogee: 11.4s, expected altitude: 640m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 152mm, drag = 0.65, density = 1180 g/m³, weight = 11.515kg
Results: time to apogee: 12.0s, expected altitude: 620m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 152mm, drag = 0.65, density = 1180 g/m³, weight = 12.220kg
Results: time to apogee: 12.2s, expected altitude: 640m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 152mm, drag = 0.65, density = 1180 g/m³, weight = 11.543kg
Results: time to apogee: 12.6s, expected altitude: 735m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 152mm, drag = 0.65, density = 1180 g/m³, weight = 12.061kg
Results: time to apogee: 13.7s, expected altitude: 985m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 152mm, drag = 0.65, density = 1180 g/m³, weight = 12.100kg
Results: time to apogee: 15.9s, expected altitude: 855m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 152mm, drag = 0.65, density = 1180 g/m³, weight = 12.223kg
Results: time to apogee: 14.0s, expected altitude: 983m

Data source: Aerotech
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 152mm, drag = 0.65, density = 1180 g/m³, weight = 12.035kg
Results: time to apogee: 14.6s, expected altitude: 1060m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 152mm, drag = 0.65, density = 1180 g/m³, weight = 13.035kg
Results: time to apogee: 14.8s, expected altitude: 999m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 152mm, drag = 0.65, density = 1180 g/m³, weight = 12.934kg
Results: time to apogee: 14.6s, expected altitude: 1016m
Aerotech
K650T

Launch site altitude [m ASL]

Diameter [mm]

Density [g/m³]

Itot = 2387.8 Ns
Favg = 581.3 N
Iburn = 4.11 s
d = 98 mm

Data source:
Aerotech

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1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 152mm, drag = 0.65, density = 1180 g/m³, weight = 12.935kg
Results: time to apogee: 15.1s, expected altitude: 1011m

empty weight [kg]

takeoff weight [kg]
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 152mm, drag = 0.65, density = 1180 g/m³, weight = 12.714kg
Results: time to apogee: 15.5s, expected altitude: 1090m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 152mm, drag = 0.65, density = 1180 g/m³, weight = 12.128kg
Results: time to apogee: 14.9s, expected altitude: 1192m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 152mm, drag = 0.65, density = 1180 g/m³, weight = 13.106kg
Results: time to apogee: 16.3s, expected altitude: 1019m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 152mm, drag = 0.65, density = 1180 g/m³, weight = 12.989kg
Results: time to apogee: 14.3s, expected altitude: 1126m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 152mm, drag = 0.65, density = 1180 g/m³, weight = 12.211kg
Results: time to apogee: 17.8s, expected altitude: 1112m
**Aerotech L339N**

<table>
<thead>
<tr>
<th>Diameter [mm]</th>
<th>Takeoff Weight [kg]</th>
<th>Empty Weight [kg]</th>
<th>Density [g/m³]</th>
<th>Drag Coefficient</th>
<th>Launch Site Altitude [m ASL]</th>
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</table>

Data source: Aerotech

1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: Diameter = 152mm, drag = 0.65, density = 1180 g/m³, weight = 13.149kg

Results: Time to apogee: 18.3s, expected altitude: 1136m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 152mm, drag = 0.65, density = 1180 g/m³, weight = 14.990kg.
Results: time to apogee: 18.7s, expected altitude: 1942m.
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 190mm, drag = 0.65, density = 1180 g/m³, weight = 23.674kg.
Results: time to apogee: 13.3s, expected altitude: 763m.

Data source: Aerotech L1150R
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 190mm, drag = 0.65, density = 1180 g/m³, weight = 23.673kg
Results: time to apogee: 14.0s, expected altitude: 812m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample:
- diameter = 190mm, drag = 0.65, density = 1180 g/m³, weight = 23.876kg
Results:
- time to apogee: 14.2s, expected altitude: 921m
### Sample: Diameter = 190mm, Drag = 0.65, Density = 1180 g/m³, Weight = 24.884kg

### Results:
- Time to Apogee: 15.5s
- Expected Altitude: 1089m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 190mm, drag = 0.65, density = 1180 g/m³, weight = 24.562kg
Results: time to apogee: 15.6s, expected altitude: 1137m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 190mm, drag = 0.65, density = 1180 g/m³, weight = 24.658kg
Results: time to apogee: 16.5s, expected altitude: 1232m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 190mm; drag = 0.65; density = 1180 g/m$^3$; weight = 24.659kg
Results: time to apogee: 16.4s, expected altitude: 1271m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move up along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. Move up horizontal to right border of mass scale
5. From intersection point move horizontally to vertical line matching rocket mass
6. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 190mm, drag = 0.65, density = 1180 g/m³, weight = 25.026 kg

Results: time to apogee = 17.2s, expected altitude = 1980m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 190mm, drag = 0.65, density = 1180 g/m³, weight = 24.751kg
Results: time to apogee: 15.9s, expected altitude: 1318m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 190mm, drag = 0.65, density = 1180 g/m³, weight = 24.896 kg
Results: time to apogee: 16.7s, expected altitude: 1324 m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 190mm, drag = 0.65, density = 1180 g/m³, weight = 24.906kg
Results: time to apogee: 16.5s, expected altitude: 1390m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 190mm, drag = 0.65, density = 1180 g/m³, weight = 24.637kg
Results: time to apogee: 17.1s, expected altitude: 1423m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 190mm, drag = 0.65, density = 1180 g/m³, weight = 25.715kg
Results: time to apogee: 17.1s, expected altitude: 1432m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 190mm, drag = 0.65, density = 1180 g/m³, weight = 25.125kg
Results: time to apogee: 19.8s, expected altitude: 1533m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 190mm, drag = 0.65, density = 1180 g/m³, weight = 26.833kg
Results: time to apogee: 19.9s, expected altitude: 1670m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 190mm, drag = 0.65, density = 1180 g/m³, weight = 25.645kg
Results: time to apogee: 19.2s, expected altitude: 1784m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 190mm, drag = 0.65, density = 1180 g/m³, weight = 27.004kg
Results: time to apogee: 19.3s, expected altitude: 1844m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 190 mm, drag = 0.65, density = 1180 g/m³, weight = 27.173 kg
Results: time to apogee: 18.6 s, expected altitude: 1919 m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 190mm, drag = 0.65, density = 1180 g/m\(^3\), weight = 26.871kg
Results: time to apogee: 19.9s, expected altitude: 1978m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 190mm, drag = 0.65, density = 1180 g/m³, weight = 26.931kg
Results: time to apogee: 21.0s, expected altitude: 2012m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 190mm, drag = 0.65, density = 1180 g/m³, weight = 28.776kg
Results: time to apogee: 25.3s, expected altitude: 2429m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 190mm; drag = 0.65; density = 1180 g/m³; weight = 32.777kg
Results: time to apogee: 29.6s, expected altitude: 3861m

Data source: Aerotech
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 400mm, drag = 0.65, density = 1180 g/m³, weight = 47.004kg
Results: time to apogee: 12.1s, expected altitude: 577m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 400mm, drag = 0.65, density = 1180 g/m³, weight = 46.483kg
Results: time to apogee: 12.0s, expected altitude: 675m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale.
3. Move up slanted line to vertical line matching density at launch site.
4. From intersection point move horizontally to vertical line matching rocket mass.
5. Read off expected time to apogee from red curves, altitude from green curves.

Sample: diameter = 400mm, drag = 0.65, density = 1180 g/m³, weight = 47.030kg
Results: time to apogee: 12.1s, expected altitude: 673m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 400mm, drag = 0.65, density = 1180 g/m³, weight = 49.162kg
Results: time to apogee: 13.0s, expected altitude: 711m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 400mm, drag = 0.65, density = 1180 g/m³, weight = 49.099kg
Results: time to apogee: 13.7s, expected altitude: 819m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 400mm, drag = 0.65, density = 1180 g/m$^3$, weight = 48.064kg
Results: time to apogee: 13.4s, expected altitude: 871m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 400mm, drag = 0.65, density = 1180 g/m³, weight = 48.845kg
Results: time to apogee: 15.0s, expected altitude: 936m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 400mm, drag = 0.65, density = 1180 g/m³, weight = 52.283kg
Results: time to apogee: 16.3s, expected altitude: 1224m
1. From rocket diameter scale move down along slanted line to vertical line matching drag coefficient.
2. Move along horizontal to left border of density scale
3. Move up slanted line to vertical line matching density at launch site
4. From intersection point move horizontally to vertical line matching rocket mass
5. Read off expected time to apogee from red curves, altitude from green curves

Sample: diameter = 400mm, drag = 0.65, density = 1180 g/m³, weight = 54.784kg
Results: time to apogee: 16.6s, expected altitude: 1686m

Data source: Aerotech

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