FREE Sample Lesson Plan - (see the next page)

From the book: ***Teaching Science Through Model Rocketry***
Written By Tony Wayne
Apoge Components P/N: 01022 (www.ApogeeRockets.com/teaching_science.asp)

This is one of our largest and most resourceful education books. It gives teachers like you the ideas you need to teach science with the excitement of rocket power. It's rocket fuel for your classroom, and you'll be the "favorite" teacher in your school.

This expanded 400 page how-to guidebook turbo-charges your science class with high-intensity demonstrations, activities, and research projects. This e-book (on CD-Rom) contains:

- Detailed lesson plans using a "how-to" approach to achieve the 11 daily objectives of the core curriculum.
- 24 simple "magic trick-like" demonstrations to show Newton's Three Laws of Motion.
- QuickTime™ videos and FLASH™ animations. These can be projected onto a big screen to show students how rockets work (in live-action).
- Building Tips - What things kids do to screw up rockets - and how to avoid them.
- How to build two different types of water rocket launchers.
- Three visual demonstrations you can perform to show the concepts of Center-of-Pressure and Center-of-Gravity; plus two different activities for the students to perform.
- How to use the cardboard-cutout method to estimate a rocket's Center-of-Pressure.
- Charts to show how rocket engines work, what "Thrust Curves" show us, and which is the correct ejection delay you should select when purchasing engines.
- How to measure a rocket's altitude and liftoff velocity.
- 21 Rocketry labs you can perform to expand the length and completeness of your curriculum.
- How to assemble and fly gliders that are boosted into the air with rocket engines.
- 12 Overhead transparencies you can use in your classroom.
- 18 Simple demonstrations to show the principles of flight. For example: how to show lift and drag forces, static and dynamic pressure, gyroscopic movement, and the properties of air.
- A list of 34 basic supplies you'll need to build the rockets, as well as 23 items you'll need to launch your rockets.
- Three award certificates you can give out to your students.
- 17 mini-posters you can display in your classroom.
- Five different launch controller plans you can build in under an hour.
- A construction jig you can make that will help your students to build their rockets quicker and with greater accuracy.
- A special tool you can make to map out the launch site, which also can be used to find where the rocket landed.
- Resource list of 22 suppliers and useful books that can help you with your rocketry program.
- Simple Rocket design program for the TI-82, TI-83, and TI-83+ calculator.
- How to use Apogee Components' RockSim design software in your rocketry unit to increase safety and help speed up the unit if you're pressed for time.

This science book is written by a teacher for teachers. It is a culmination of over 1000 hours of classroom instruction including the hands-on experience of launching over 3000 rockets! The book is set up so that you can teach anything from a 5 hour rocketry unit to more than a month of science classes. It can be used in grades 6 and up.

Media: This book comes on a CD-ROM that works on both Windows and Macintosh computers. Contains a collection of files that can be read with Adobe Acrobat Reader. The videos can be viewed with an internet browser like Netscape and Internet Explorer, or with a stand alone program like QuickTime.

The Effect of Body Tube Caliber on Apogee

PROCEDURE

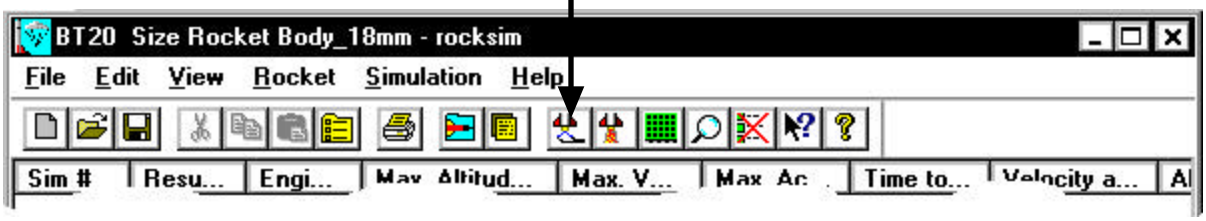
The rockets to be used in this lab have already been constructed. They are in a folder called "Body Caliber." "Body Caliber" is in the folder called "Experiments."

▼-Experiments (folder)
|
▼-Body Caliber (folder)
|
BT_20 Size Rocket Body_18mm
BT_50 Size Rocket Body_24mm
BT_60 Size Rocket Body
BT_70 Size Rocket Body

The data table lists the file to open and the data to collect. After opening a file:

- Select an motor. Pick any motor from the database unless your teacher directs you to use a specific motor. When you need to choose a time delay for an ejection charge, use the middle time delay from the choices they provide. Make sure you use the same motor for each rocket.

Click here to choose an engine.



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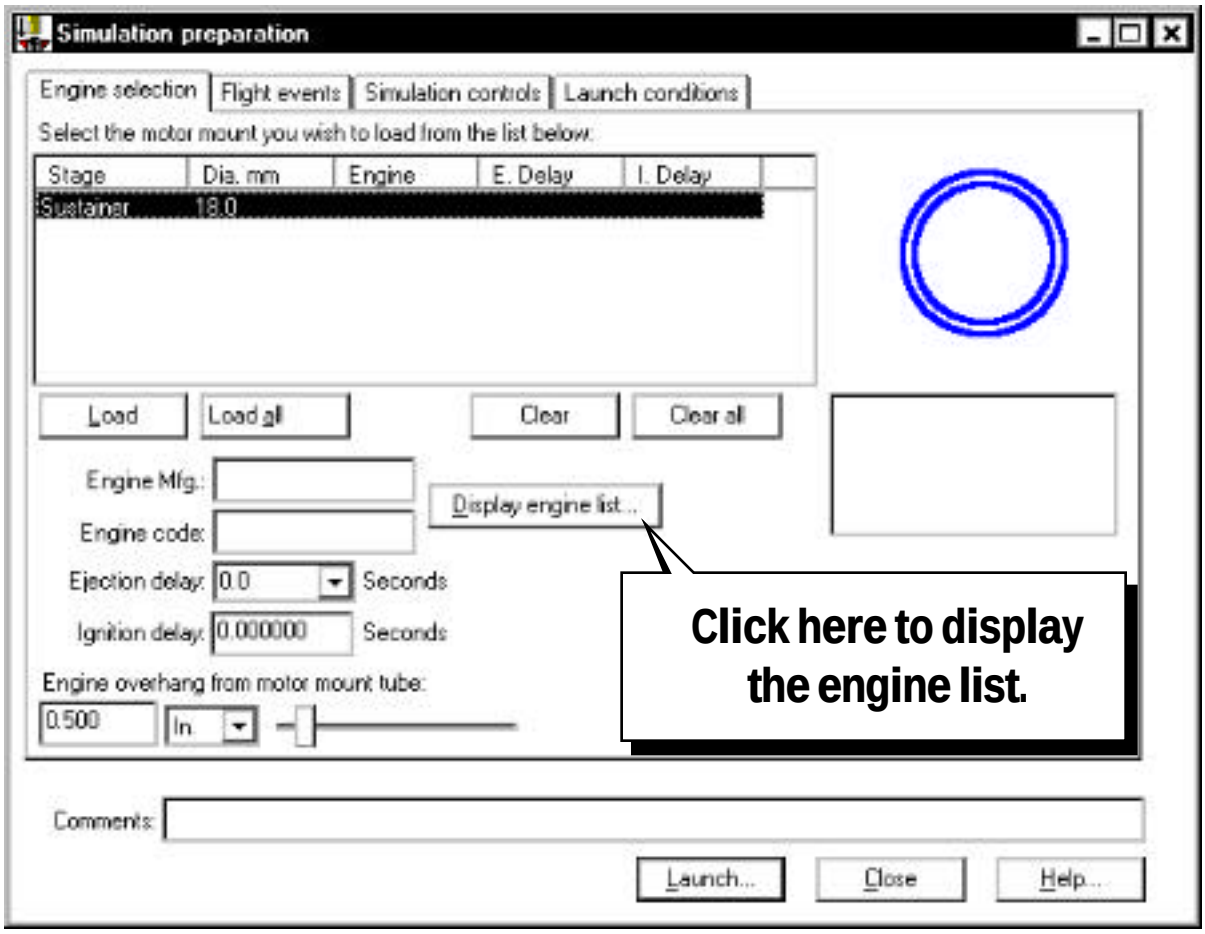
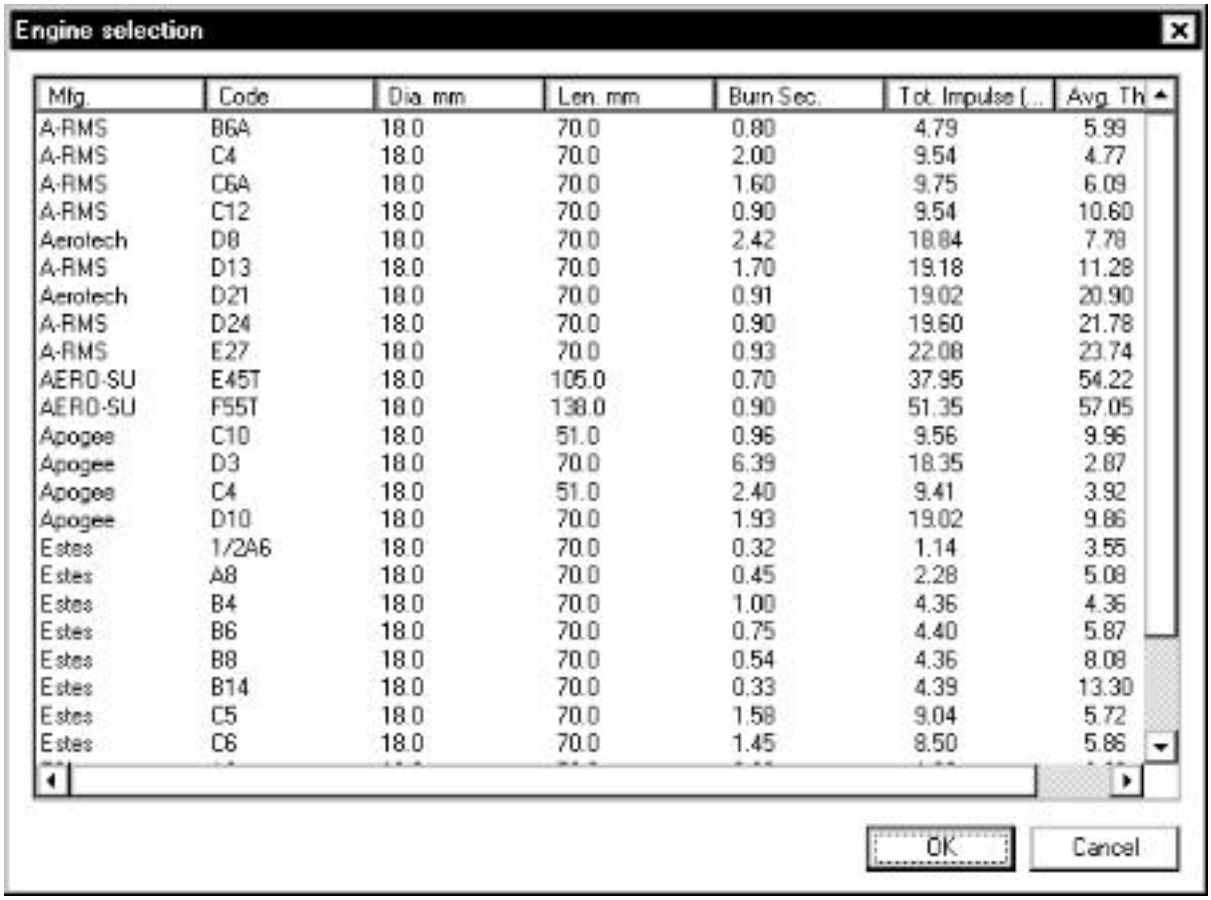


The Effect of Body Tube Caliber on Apogee

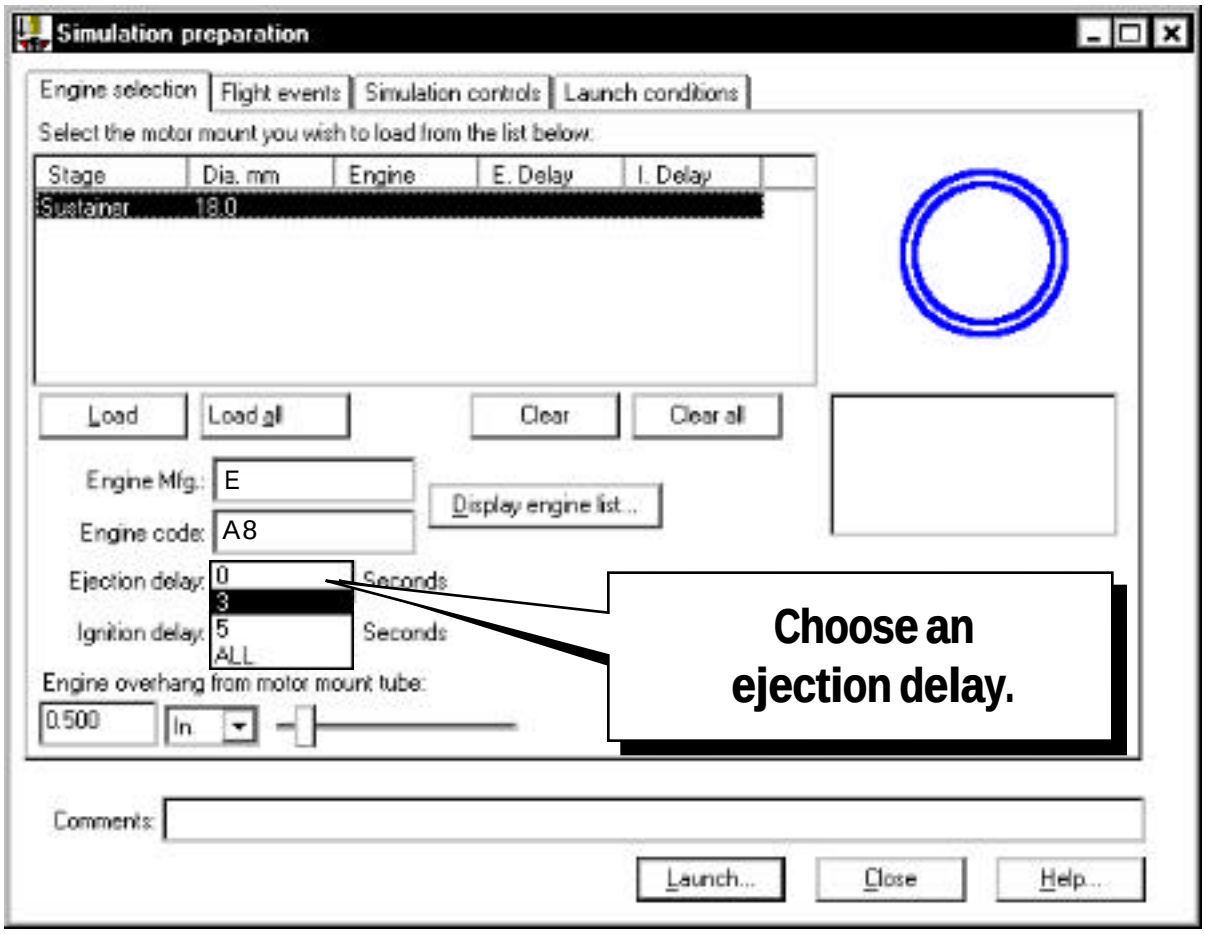
- Select an engine from the presented list. You may select any engine. Make sure the same engine is selected for each rocket.



Mfg.	Code	Dia. mm	Len. mm	Burn Sec.	Tot. Impulse (...	Avg. Th
A-RMS	B6A	18.0	70.0	0.80	4.79	5.99
A-RMS	C4	18.0	70.0	2.00	9.54	4.77
A-RMS	C6A	18.0	70.0	1.60	9.75	6.09
A-RMS	C12	18.0	70.0	0.90	9.54	10.60
Aerotech	D8	18.0	70.0	2.42	18.84	7.78
A-RMS	D13	18.0	70.0	1.70	19.18	11.28
Aerotech	D21	18.0	70.0	0.91	19.02	20.90
A-RMS	D24	18.0	70.0	0.90	19.60	21.78
A-RMS	E27	18.0	70.0	0.93	22.08	23.74
AERO-SU	E45T	18.0	105.0	0.70	37.95	54.22
AERO-SU	F55T	18.0	138.0	0.90	51.35	57.05
Apogee	C10	18.0	51.0	0.96	9.56	9.96
Apogee	D3	18.0	70.0	6.39	18.35	2.87
Apogee	C4	18.0	51.0	2.40	9.41	3.92
Apogee	D10	18.0	70.0	1.93	19.02	9.86
Estes	1/2A6	18.0	70.0	0.32	1.14	3.55
Estes	A8	18.0	70.0	0.45	2.28	5.08
Estes	B4	18.0	70.0	1.00	4.36	4.36
Estes	B6	18.0	70.0	0.75	4.40	5.87
Estes	B8	18.0	70.0	0.54	4.36	8.08
Estes	B14	18.0	70.0	0.33	4.39	13.30
Estes	C5	18.0	70.0	1.58	9.04	5.72
Estes	C6	18.0	70.0	1.45	8.50	5.86

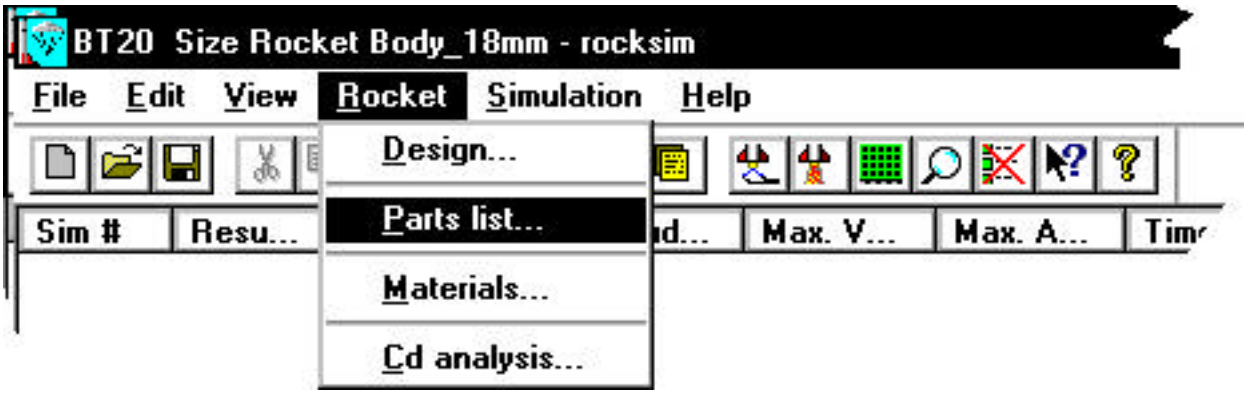
The Effect of Body Tube Caliber on Apogee

- Select and ejection delay



At this point write down the engine choice in the data table

- The body tube caliber can be found on the parts list page.



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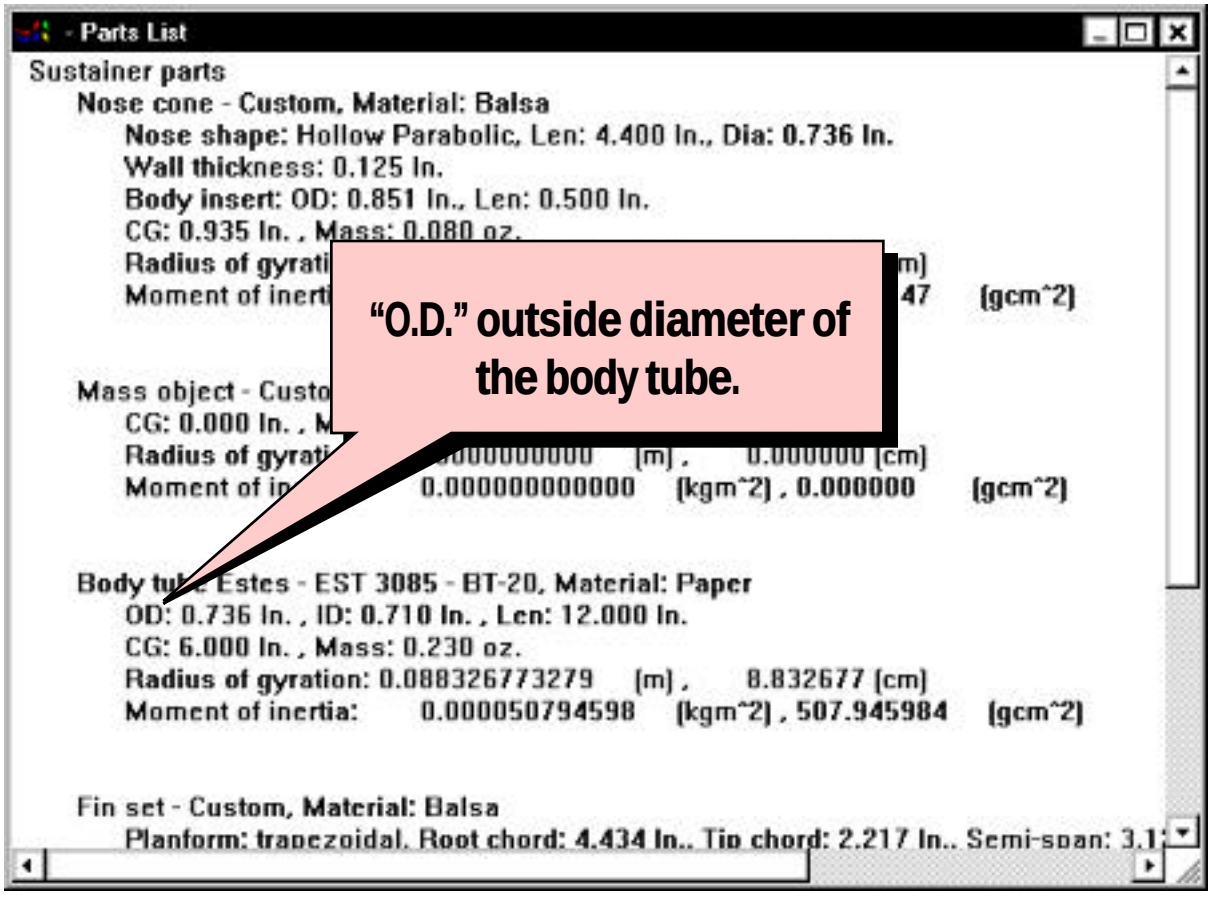

Write down the body tube caliber on the data table.

- After running a simulation the "Apogee Height" and "Velocity at Deployment" can be found on the software's data chart.

- Write down the "Apogee's Height" and "Velocity at Deployment" in the data table.

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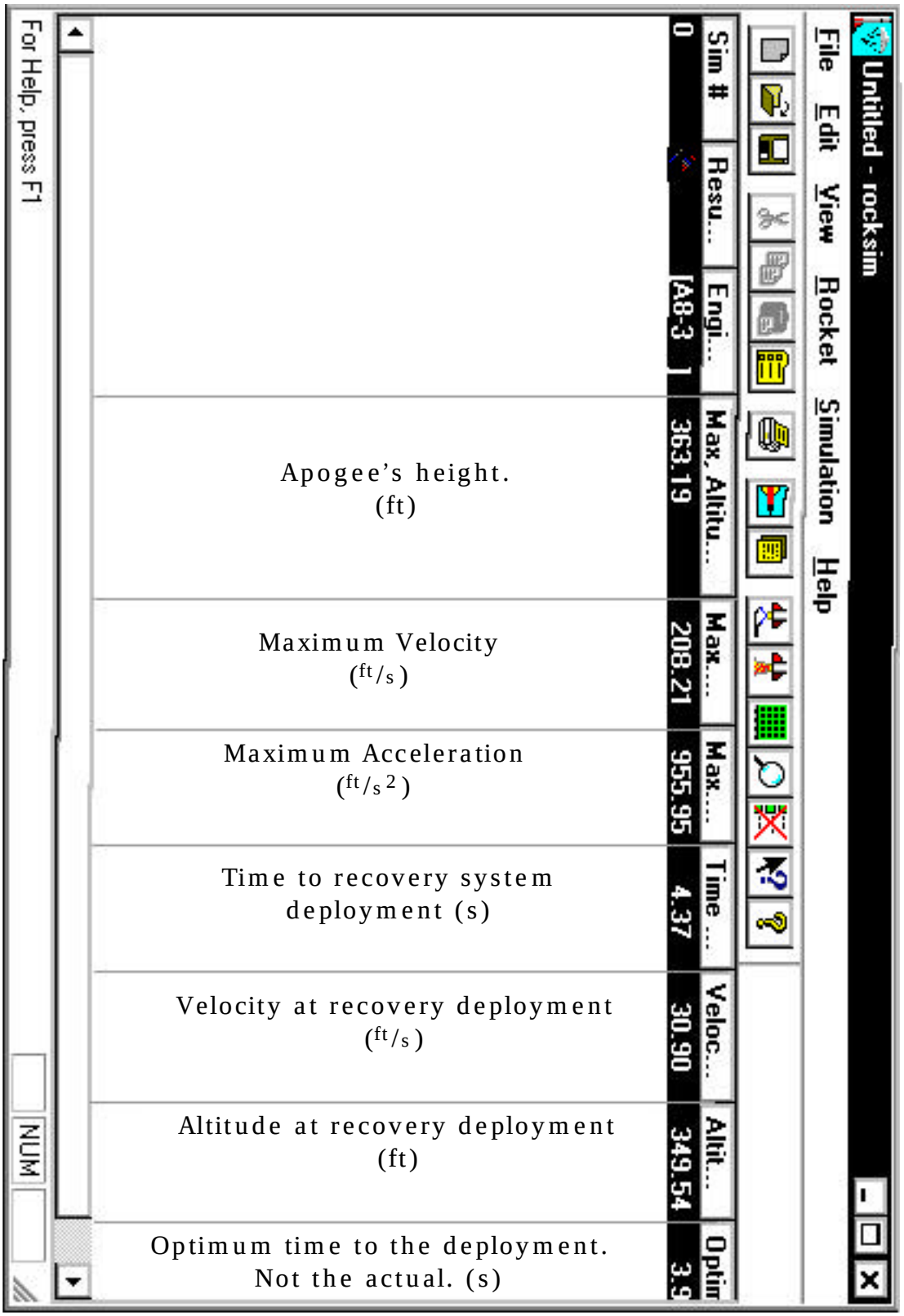

Apogee's height.
(ft)

Maximum Velocity
($^{ft}/_{s}$)

Maximum Acceleration
($^{ft}/_{s^2}$)

Time to recovery system deployment (s)

Velocity at recovery deployment
($^{ft}/_{s}$)

Altitude at recovery deployment
(ft)

Optimum time to the deployment. Not the actual. (s)

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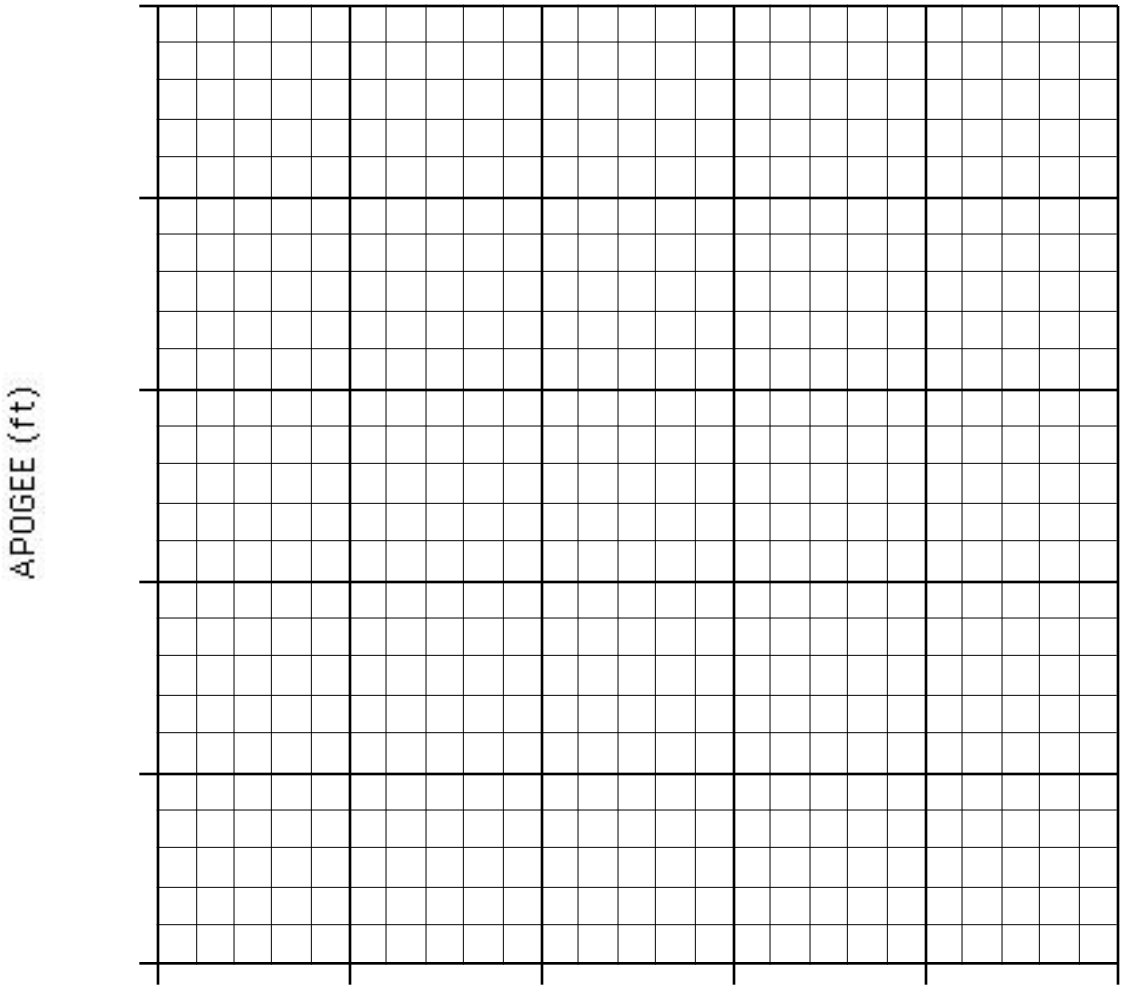
DATA TABLE

File Name	Engine	Body Tube Caliber (in)	Apogee Height ft	Velocity at deployment ft/s
BT20 Size Rocket Body_18mm				
BT50 Size Rocket Body_24mm				
BT60 Size Rocket Body				
BT70 Size Rocket Body				

On the lines below, make a graph of body tube caliber vs apogee.



Which body tube caliber is best suited for **THIS** rocket and why? (Look as flight simulation data for supporting data.)