

TRIPOLI GERLACH

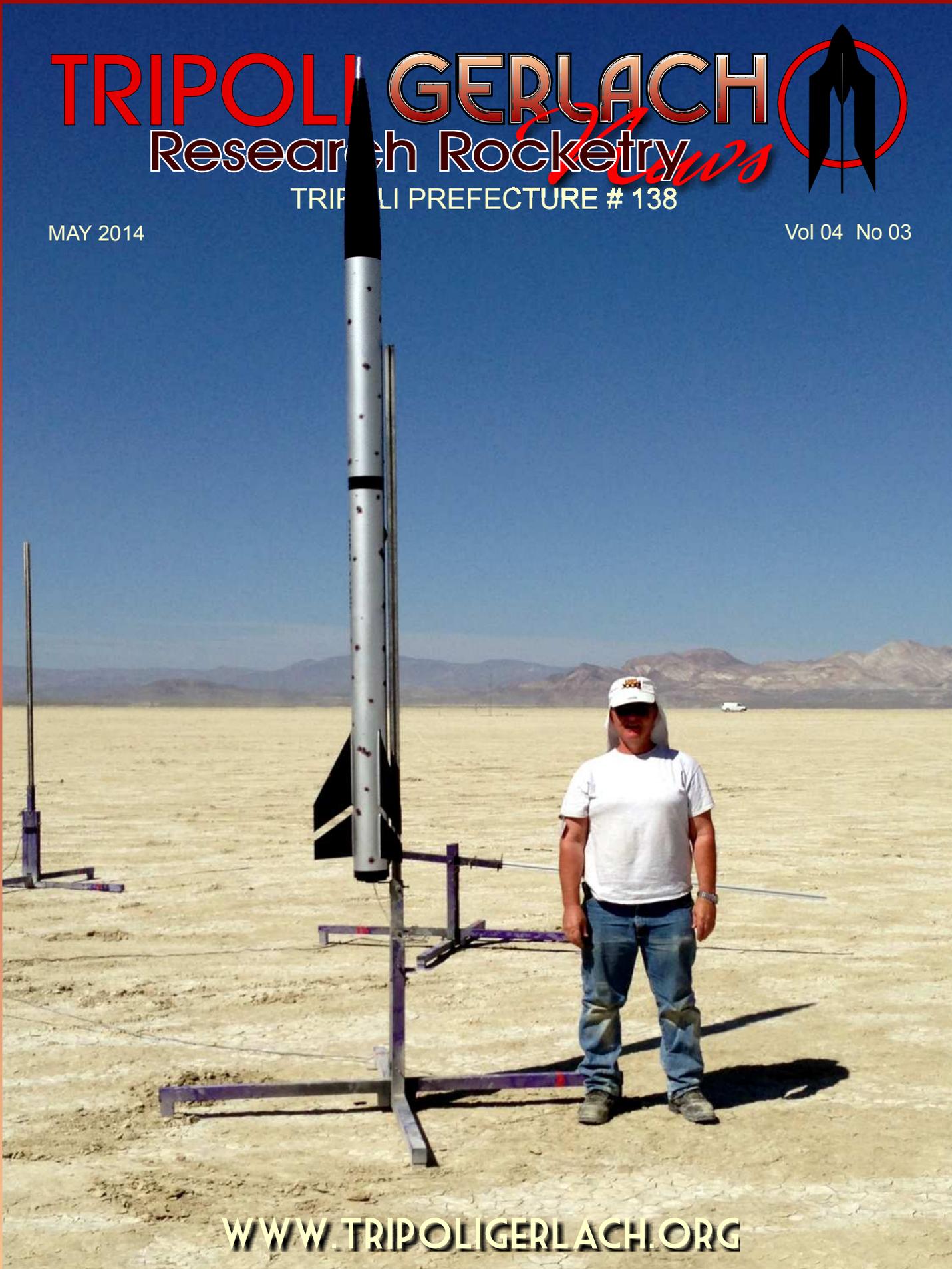
Research Rocketry



TRIPOLI PREFECTURE # 138

MAY 2014

Vol 04 No 03



WWW.TRIPOLIGERLACH.ORG



MAY 2014

Vol. 04 No. 03

**PUBLISHED EXCLUSIVELY FOR
THE MEMBERS OF TRIPOLI GERLACH
AND ANYONE ELSE INTERESTED**

All Content Copyright ©2014 by TRIPOLI GERLACH
Tripoli Gerlach was founded as a National Prefecture under the Tripoli Rocketry Association, Inc. Devoted to Research Rocketry and the Black Rock Desert area of Nevada, we welcome all National Tripoli Members, no matter their location or Certification Level.

Our Executive Officers are;

Gary Rosenfield (022)
Prefect
Cedar City, UT
garoq@scinterent.net

Tom Blazanin (003)
Secretary
Valencia, PA
shadow@pghmail.com

Dave Rose (7126)
Treasurer
N. Huntingdon, PA
drose191@comcast.net

If you have anything to contribute in the way of information, articles, photos or whatever, please send them to Tripoli Gerlach Headquarters. Visit our WebSite on-line at:

WWW.TRIPOLIGERLACH.ORG

ON THE COVER Tripoli Gerlach member Bill Gack of Industry, Pennsylvania accomplished his Tripoli Level 3 at BALLS 22. He'll be back this year with a full fledged research project somewhat proving once you fly at Black Rock you can never go back to a grass field!

MAGAZINE STAFF

EDITOR & LAYOUT:

Tom Blazanin

CONTRIBUTING STAFF:

Chris Pearson

Greg Deputy

OFFICE:

Tripoli Gerlach

748 Galloway Drive

Valencia, PA 16059

THE EDITOR

This issue of TRIPOLI GERLACH NEWS is only 20 pages yet it is filled with some very interesting stuff.

We have the missing Manual for BurnSim written by Chris Pearson and approved by Greg Deputy. While not a step by step hold your hand through the whole operation it does explain what BurnSim is all about.

We have an informative, and eye opening, article for those people interested in buying a metal lathe. Despite what a lot of people might tell you about various brands; the truth is there. We also offer a brief article on tooling which no one considers when thinking about purchasing a metal lathe.

As always our coverage of the Black Rock area presents information on the various Hot Springs the area has to offer. The three places covered (there are more) are the easiest to get to. You can enjoy the Launch and still have time to trek to these places and enjoy some relaxation.

Next issue will post July 1st, the month of LDRS, and we'll offer a ton of LDRS history you've never heard of. How the name LDRS actually came to be. What High Power Rocketry was like back then - even what Research Rocketry was like. Look for it and see you at LDRS, HAMSTER DANCE and BALLS.

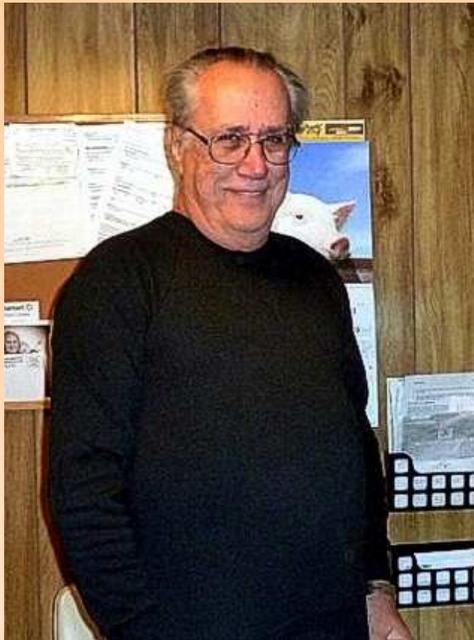
DISCLAIMER

Tripoli Gerlach does NOT promote nor certify any activities presented here as safe nor appropriate to all readers of this Publication. Information is for educational purposes only. Tripoli Gerlach, its members & officers, the authors of articles presented and the Tripoli Rocketry Association, Inc. are not responsible for reader's activities, conduct or participation in the use and pursuit of any content presented.

TOM BLAZANIN

EDITORIAL

Five years after Tripoli was formed as a rocket club in Pittsburgh (1964); David Bowie came out with a song of a doomed or destined Astronaut named Major Tom (1969). Those of us into rocketry took it as an emblem of our hobby, as a song of our time. Then in 1980, actually still before Tripoli caught on as a National Rocketry Organization, Elto John came out with his "Rocketman" song – and the irk began.



today the only people who want to be called ROCKETMAN are those who search for attention.

Today so many of our national members are getting into Research Rocketry. This is serious stuff and those pursuing it take the title of ROCKETMAN belittling and annoying. It is sad the world does not see things as these people do. It is even sadder that there still exists people who seek the name.

Everyone was a rocketman but as the years progressed it became a nuisance. Anyone who found out that you were into rockets declared you a ROCKETMAN. At first a personal title it became a yoke that was soon hard to carry. While their ROCKETMAN declarations were meant to be friendly it soon evolved into sarcasm, at least in the minds of those people getting really serious into High Power rocketry.

I've met a lot of people into all levels of rocketry. It holds true to say the higher or deeper you get into the hobby the more you find people who really wince at the reference of them as a ROCKETMAN.

It seemed the only rocket people who liked the title of Rocketman were those new to the hobby. Much like Howard Walowitz (Big Bang Theory) searching for a ROCKETMAN Astronaut name for his first space mission. These people even promote the name, much as did Walowitz. (He ended up with the name "Fruit Loops" appropriately). The story proves the fact that

It is odd that today there are full grown men who still strive to obtain the title ROCKETMAN. Take a look around you at the launches, or even meetings, and you can spot the Rocketmen. These will be the ones who hit the hobby big time. Strive to advance as fast as they can then fade as fast as they raised

The real ROCKETMAN can be found untitled providing inspiration to others with years of experience and dedication to the hobby at Research Launches.

Please fill out this form completely. It is necessary to supply us with your TRA number and certification level. Membership runs from January to December. Renewal will be January 1st,

MEMBERSHIP APPLICATION

NAME _____ TRA# _____
 ADDRESS _____ CERT LEVEL _____
 CITY _____ STATE _____ ZIP _____ EXP DATE _____
 E-MAIL _____ @ _____
 PHONE (____) _____ - _____ CAN WE PUBLISH (YES) (NO) _____
 HOME PREFECTURE _____
 PERSONAL WEBSITE _____

As a member I will abide by all rules set forth by the Prefecture as well as those set forth by the National Organization. I pledge to pursue a commitment to the Prefecture's designated Launches & Activities and support the Prefecture to the best of my ability.



TRIPOLI GERLACH
Research Rocketry
TRIPOLI PREFECTURE #138

www.tripoligerlach.org

**YEARLY DUES
ARE \$20.00**

Make Check for \$20 Payable to:

DAVE ROSE
13385 Lincoln Way
N. Huntingdon, PA 15642

If at all possible please E-Mail your photo to be posted to:

justtom@rimworld.com

SIGNATURE

DATE

BLACK ROCK HOT SPRINGS



There are many many hot springs in the Black Rock area. In the past, these springs were vital to the survival of early emigrants crossing the Black Rock Desert. The water was first cooled, and then consumed by both livestock and people. Today, visitors experience these hot springs as interesting natural formations that are best viewed from a safe distance since only one can be swam in.

Hazards at Hot Springs

Despite the inviting appearance, some hot springs are hot enough to kill. Some of the hazards are :

- 1st 2nd and 3rd degree burns causing disfigurement or death.
- Loss of consciousness from chemical fumes.
- Cuts from sharp rocks or broken glass
- Bacterial irritations. such as swimmer's itch
- Bacterial diseases. such as meningitis

Scalding is the leading hazard. In Nevada. many of the hot springs are hotter than 150° Fahrenheit. Some hot springs are hotter at 180° F The average temperature for home hot tubs in 104° F Skin is scalded within three seconds in 140° F water

Stay Out and Stay Alive!!!

All hot springs on public lands are considered dangerous. It is impossible to tell how hot a spring is by looking at it In fact. on hot days when no mist rises the water can appear cool. Never assume the temperature of a hot spring is suitable for soaking. It is perilous to stand too close the edge of a hot spring because the banks are typically slippery and steep.

Look for posted hazard signs or fences. If present heed them. They are there to warn visitors about the danger of scalding water or other hazards. Never remove posted hazard signs, it could result in serious injury or death to other persons or their pets. And, most definitely, No camping within 300 feet of any water source.

There are three Hot Springs having easy access from the Black Rock Playa:

BLACK ROCK HOT SPRING

Black Rock Springs(shown above) is about a tenth of a mile northwest of Black Rock Point. This spring is extremely hot. and all precautions should be taken when approaching the spring There are two overlapping pools at Black Rock Springs The smaller. deeper pool reaches unknown depths and should not be entered due to extreme temperatures. The larger. more shallow pool also has very hot temperatures. This spring flows into a

marshy area where temperatures drop considerably. An old sheep herder's wagon lies south of the springs.



Please be considerate of this piece of history and do not climb on it. A beautiful view of the Black Rock playa can be seen expanding south of the spring. This spring can be reached by following the western arm of the playa. Follow the main dirt road north, and it will lead you to the springs. The road to the spring is only accessible in dry conditions. Do not attempt to drive on wet playa conditions or you will get stuck. It can be days before someone comes by so be prepared with sustainable supplies just in case.

DIRECTIONS TO BLACK ROCK HOT SPRING

From the usual launch site on the playa head in a straight line almost 45° to the West of Black Rock Point. You will come to the first Playa Road which heads toward Black Rock Point. Follow that road and you will approach an area with scrub brushes. Stay on the road, the scrub brush area can be wet, and you will see two pole markers on each side of the road. Head straight between the two poles and follow the dirt road to the Hot Spring that will be on your left. When you see the wagon on the right you are there.

DOUBLE HOT SPRINGS

Double Hot Springs is the prettiest, ugliest and most dangerous. It has a fence around it for a reason and should not be entered. In the past it has scalded, with fatal results, humans and pets. It is a beautiful spring with incredibly clear waters.

Use extreme caution around this double pool hot spring whose pools are approximately 180 degrees. For some distance, the water in the streams carrying runoff from the springs is almost as hot. In addition the banks of the springs are very steep and slippery. If you fall into the springs, you cannot get out in time to avoid serious injury. People have died after falling into the springs. Do not dip your hand or put your foot into the springs to

test the temperature. Be extremely careful when walking on the paths around the springs.



The “main’ pool of Double Hot is crystal clear and contains undescrivable colors. The twin pool next to it is dark and black. It is said someone dumped something in it and it lost its colors. It is said to be bottomless. The odd thing is the dark pool empties into the clear pool - go figger!



About 50 yards downstream is a soaking tub which lies on private property. Do not abuse it.



Keep your dog on a leash and your children close by around Double Hot Springs. Dogs will jump into the springs and almost always die when they do. Dogs have scalded their tongues by drinking from the streams and have burned their feet when crossing the streams.

DIRECTIONS TO DOUBLE HOT SPRINGS

Double Hot can be reached by first finding Black Rock Hot Spring. Continuing north past Black Rock Hot Spring there will be a sign at an intersection to the east of the springs that points towards Hardin City. Turn west at this intersection to get to Double Hot Springs. The road is definitely "off road" so don't try it with a car. An SUV or pickup will make it with no problem.

Another way is get back out on the playa and turn right (west) and go to the next Playa road. Turn right again and follow the dirt road to Double Hot.

TREGO HOT SPRING

Trego Hot Springs is a natural spring located on the east side of the playa. When the railroad tracks were being built, water was struck and a ditch was created. It quickly filled with water creating the current spring conditions.

Trego the only hot spring that you can swim in, but use extreme caution before entering any hot spring, especially where the water comes out of the ground. The water tends to be hot enough to burn you really bad. Being in a ditch the water has time to cool down as long as you stay away from the source. You also get a very good view of the lake bed from this location. Since you're at the mid point of the lake and you're up on the eastern shore.



DIRECTIONS TO TREGO HOT SPRING

It can be accessed off of Jungo Road/Trego Road when heading east toward the town of Sulphur. It is on the north side of the road. It can also be located by driving across the playa. It is located off of the twelve mile access road off of Highway 34. north of Gerlach. From there, head east across the playa, staying on the dirt road. Once across the playa there will be two railroad track crossings. The railroad crossings are unmarked, and everyone should stop and proceed with caution when crossing the railroad tracks. You can't miss it.

These are but three Hot Springs one can easily visit when attending events at Black Rock. Many more exist if you have time to explore. At all time remember Hot Springs are DANGEROUS, even Trego if you get too close to the source!

EVEN THOUGH THERE IS LOTS OF WATER - TAKE WATER

DATA ACQUISITION Made easy

NASSA TC LOGGER-USB

Flight Thrust Curves
Propellant Characterization

Members of NASSA, Nevada AeroSpace Science Associates, have developed a solid Data Acquisition System for testing propellants and flight motors. Collect Thrust and Chamber Pressures with easy to use software.

Complete Systems just about virtually ready to go.

Basic units starting at \$300



www.tclogger.com

NEW TO BURNSIM? OLD USER AND STILL CONFUSED?

THIS WILL HELP

Back in the early days of HPR, many people, including myself, experimented with making our own motors, mainly because there were virtually no composite motors available at the time! Propellant formulas were then a closely guarded secret. Today, many common formulas are available free on the Web, and many other like-minded Research rocketeers are usually willing to share their formulas. Commercial classes in propellant mixing and motor construction are routinely held and available to anyone. And many Prefectures have propellant making seminars that are open to members interested in making their own motors.

For those high-power rocketeers who want to enter the realm of Research (or EX) rocketry, BurnSim is a valuable tool which allows the enthusiast to design and test various motor designs and propellant formulas before he mixes and casts propellant for the first time. This can save a great deal of time, chemicals and expensive hardware as motor burns can be simulated without having to mix and burn propellant in an actual motor.

Unfortunately, there is no instructional manual for BurnSim. Help is available by pressing F1, but it is very limited. You have to know what you're looking at to understand everything that BurnSim is telling you. While it is good to have someone around that is experienced in using it, many times this is not an option.

While many of the terms used in BurnSim are self-explanatory (i.e., grain diameter and length), many are not. The following is a list of definitions and some suggestions of values and figures that could be valuable for those using BurnSim for the first time.

Making Everything Easier!™

BURNSIM

FOR
DUMMIES

Learn to:

- Understand the screen layout
- Recognize big words
- Make it all work

THE MISSING MANUAL

Chris Pearson
Greg Deputy

WWW.BURNSIM.COM



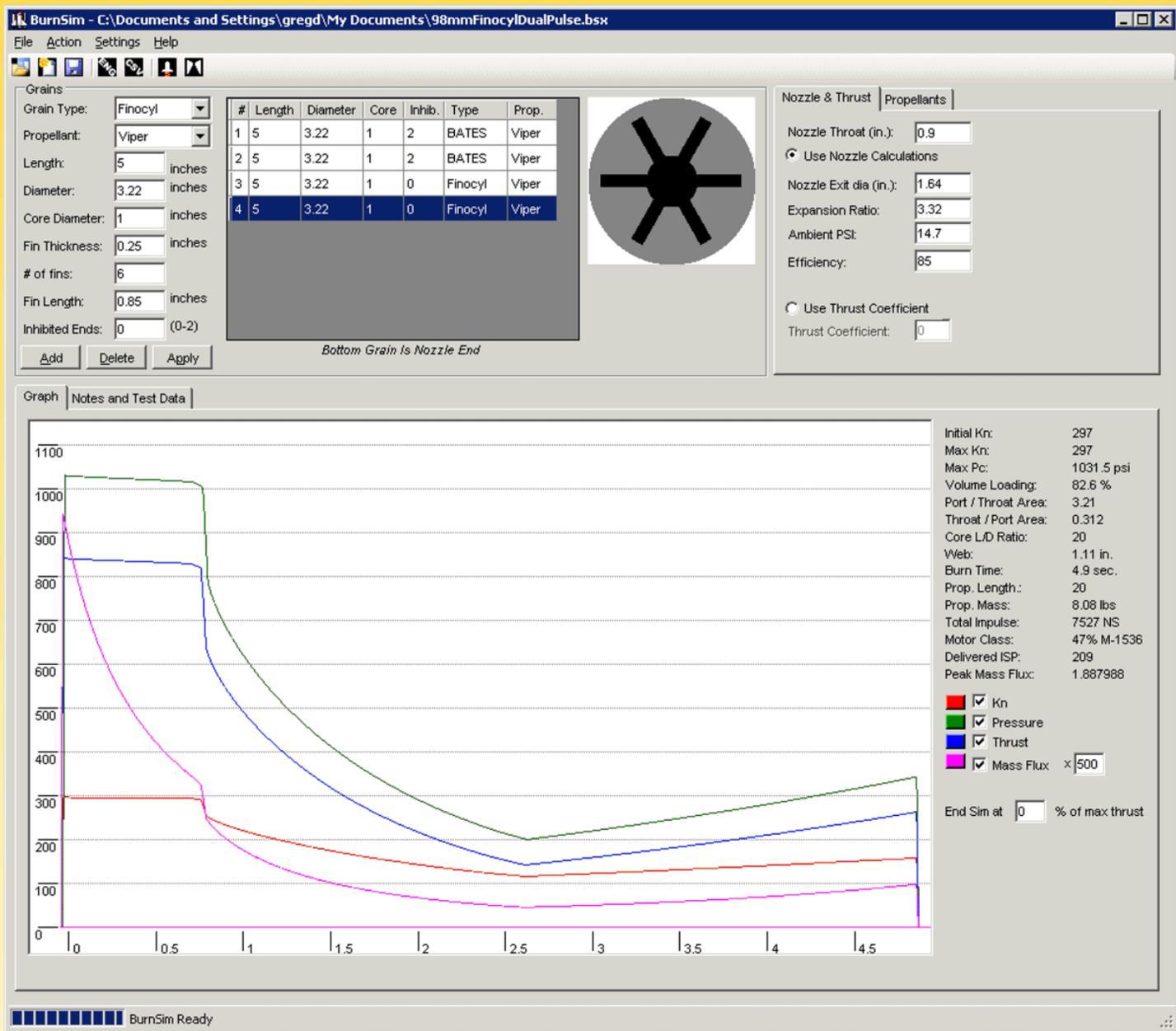
Nozzle and Thrust

Nozzle Throat Dia. – The diameter of the narrowest part of the nozzle throat in inches.

Nozzle Exit Dia. – The final diameter of the diverging section of the nozzle in inches.

Expansion Ratio – The ratio of the nozzle exit area divided by the nozzle throat area. BurnSim will calculate this automatically from the Throat and Exit diameters.

Ambient PSI – If you launch at sea level this value is 14.7 psi. If you launch from higher altitudes or air-start a motor, you will have to convert the altitude pressure to psi.



BURNSIM Screen Capture for Reference Use

Efficiency – Usually set to 95%, assuming that you are using valid c^* numbers for your propellant. Smaller motors will tend to have a lower efficiency, larger motors a higher one.

Thrust Coefficient – The amount a motors thrust is augmented by nozzle effects. Values usually range from 1.2 to 1.4. 1.25 is the value normally used.[1]

Propellants Standard Properties

C^* - The Characteristic Velocity, also called c-star or simply c^* , is a figure of thermochemical merit for a particular propellant and may be considered to be indicative of the combustion efficiency. [2]

Char. ISP – Characteristic Specific Impulse (I_{sp}^*) is the expected propellant performance in seconds not including nozzle contribution. This is not the same as Delivered ISP.[3]

BR Coef (a) – The Burn Rate Coefficient (a) is a propellant characterization value and is defined as the “rate constant.” The value of a depends of particle size of the oxidizer and solid fuel and generally indicates how temperature affects the burn rate.[4]

BR Exp (n) – The Burn Rate Exponent (n) is a propellant characterization value, represents the “molecularity” and describes the burn rate of the propellant at a given chamber pressure.[4]

Density – The measured propellant weight in pounds per cubic inch (lb/in³).

S. Heat Ratio – Specific Heat Ratio refers to the ratio of the heat capacity of propellant burning at constant pressure (CP) to heat capacity at constant volume (CV) of the propellants exhaust products. [5] Usually set at a value of 1.25.

Mol. Mass – Molecular Mass refers to the mass of a molecule. It is calculated as the sum of the mass of each constituent atom multiplied by the number of atoms of that element in the molecular formula. This value is optional in BurnSim, not required for normal simulations.

Graph

Initial Kn – The propellant surface burn area divided by the throat area at motor start up. [6]

Max. Kn – The propellant surface burn area divided by the throat area at its maximum, often at burn out.

Max. Pc – Maximum combustion chamber pressure experienced during motor burn. [7]

Volume Loading – Total percentage of motor volume that is propellant.

Port/Throat Area – Ratio of the bottom grain port area to the nozzle throat area. [8]

Throat/Port Area – Ratio of the nozzle throat area to the bottom grain port area.

Core L/D Ratio – Ratio of the length of the propellant core divided by the core diameter.

Web – The thickest depth of the propellant that the flame front will burn through. In a Bates grain motor that is the distance from the outside edge of the propellant grain to the outside of the core. It varies for other core geometries.

Burn Time – Actual operating time of the motor in seconds.

Propellant Length – Total length of the propellant grain(s) in inches.

Propellant Mass – Total mass of the motor propellant in pounds.

Total Impulse – The time integral of the thrust over the operating duration of the motor. Units are those of force multiplied by time, typically pound-seconds (lb-s) or Newton-seconds (N-s).

Motor Class – The commercial motor class letter designation and the average thrust in N-s. Also shown is what percentage (%) of that letter class the motor actually is.

Delivered ISP – The actual Total Impulse divided by the propellant weight or mass.

Peak Mass Flux – The peak propellant weight flow rate in pounds per square inch of core area. This is currently calculated at the bottom of the last grain only. It is a measurement of the mass of exhaust products moving through a given area and can be used to measure the onset of erosive burning.[9]

End Sim at % of max thrust – Not necessary to specify for normal operation. Many professional motor manufacturers set this value at 10%.

Notes:

[1.] Thrust Coefficient - This is an override value, to be used if the user wants to specify a thrust coefficient, rather than have BurnSim use the nozzle dimensions to calculate it. BurnSim calculates the value which changes as chamber pressure changes, so is usually more accurate than specifying a static value.

[2.] It is recommended that you use the value for c^* as calculated by ProPep or other software. Values gathered experimentally can vary widely.

[3.] The Specific Impulse that a propellant is capable of producing (either theoretical or delivered) is the key "yardstick" of performance potential. In its basic form, Specific Impulse can be considered to relate the thrust produced by a unit mass (e.g. 1 lb or kg) of propellant over a burning time of one second.

Characteristic Specific Impulse (I_{sp}^*) is the expected propellant performance in seconds not including nozzle contribution.

Theoretical I_{sp} is the ideal specific impulse delivered with a perfect nozzle. With a real world nozzle and motor the delivered specific impulse is typically 85-95% of the theoretical specific impulse.

The delivered Specific Impulse (I_{sp}) of the propellant is

simply the Total Impulse divided by the propellant weight or mass. Thus, the units for Specific Impulse are pound-seconds per pound (lb-sec./lb), or simply "seconds." In small motors the delivered Isp is often smaller than calculated or theoretical.

$I_{sp} = c^*/\text{acceleration of gravity (G)}$. If you have a good c^* value for a propellant, you also have the I_{sp}^* .

Also, BurnSim converts that on the fly. If you put in a c^* value, I_{sp}^* is updated, and vice versa.

[4.] The Burn Rate Coefficient, like the Exponent is a value that must be determined experimentally through either ballistic motor tests or strand burn rate tests.

A low value for n (0.2-0.4) is desirable. Low n values means that the propellants burn rate will be less sensitive to pressure change.

The values of a and n cannot be predicted except approximately. These are empirical quantities: a and n can change from one propellant batch to another.

Burn rate catalysts may increase either a or n , or both, depending on the type of catalyst. Metals generally increase both a and n .

[5.] Specific Heat Ratio - can be calculated using ProPep or other software.

[6.] Initial K_n is the area ratio of the burning propellant surface/area of nozzle throat. This is not minimum K_n , but initial K_n , that is, when the motor propellant first ignites. Chamber pressure is directly related to K_n , but because of the burn rate exponent this relationship is not linear.

[7.] Max P_c – Try to keep the maximum chamber pressure between 500-1000 psi. Higher pressures might damage your hardware. Open the nozzle throat to lower pressure. Binder rich smoky or sparky propellants need higher chamber pressures to operate efficiently. Reduce nozzle throat to increase chamber pressure. If chamber pressure gets too low, the propellant will not sustain combustion and will either extinguish or “chuff.”

[8.] Port/Throat Area – If this number drops below 2.0 you will get a yellow warning indicator. If it drops below 1.0 you will **get** a red danger indicator. Enlarging the core on the nozzle-end grain is a good way to solve this problem. Except for extreme L/D ratio motors, no part of the core should be less than the diameter of the nozzle throat.

[9.] Erosive burning (or “erosivity”) is the process where the high temperature gasses flowing at a high velocity inside the motor over the burning surface of the core speed up the burn rate of the propellant. See the Mass Flux/Erosivity Chart top of the next page

BurnSim
Solid Propellant Internal Ballistics Simulation
EX Rocket Motor Design Software

BurnSim is a solid rocket steady-state ballistic simulation software package for the Windows platform

BurnSim 3.0 Personal License **\$39.00**
DOWNLOAD IT TODAY AT:
www.burnsim.com

TRIPOLI GERLACH
Research Rocketry

MERCHANDISE

TEE SHIRTS
SWEAT SHIRTS
LICENSE PLATES
MUGS
THERMOS
DECALS

Help support our Prefecture with a purchase of our top quality branded merchandise. **ALL** money from sales goes directly to Tripoli Gerlach. Visit our WebSite and click **MERCHANDISE**.

- Thank You

WWW.TRIPOLIGERLACH.ORG

Mass Flux/Erosivity Chart.

NON-EROSIVE		MAXIMUM RECOMMENDED EROSIVITY	
Max Pressure	Core Mass Flux	Max Pressure	Core Mass Flux
Pc = 400 psia	≤ 1.00 lb/sec-in ²	Pc = 400 psia	≤ 2.00 lb/sec-in ²
Pc = 500 psia	≤ 1.20 lb/sec-in ²	Pc = 500 psia	≤ 2.25 lb/sec-in ²
Pc = 600 psia	≤ 1.38 lb/sec-in ²	Pc = 600 psia	≤ 2.50 lb/sec-in ²
Pc = 700 psia	≤ 1.57 lb/sec-in ²	Pc = 700 psia	≤ 2.75 lb/sec-in ²
Pc = 800 psia	≤ 1.75 lb/sec-in ²	Pc = 800 psia	≤ 3.00 lb/sec-in ²
Pc = 900 psia	≤ 1.79 lb/sec-in ²	Pc = 900 psia	≤ 3.25 lb/sec-in ²
Pc = 1000 psia	≤ 1.83 lb/sec-in ²	Pc = 1000 psia	≤ 3.50 lb/sec-in ²
Pc = 1100 psia	≤ 1.87 lb/sec-in ²	Pc = 1100 psia	≤ 3.75 lb/sec-in ²
Pc = 1200 psia	≤ 1.91 lb/sec-in ²	Pc = 1200 psia	≤ 4.00 lb/sec-in ²
Pc = 1300 psia	≤ 1.95 lb/sec-in ²	Pc = 1300 psia	≤ 4.25 lb/sec-in ²
Pc = 1400 psia	≤ 2.00 lb/sec-in ²	Pc = 1400 psia	≤ 4.50 lb/sec-in ²

AHPRA *Presents*

BALLS 23

BLACK ROCK, NEVADA
SEPTEMBER 19, 20 & 21, 2014

World Class Research Rocketry



www.balls23.com

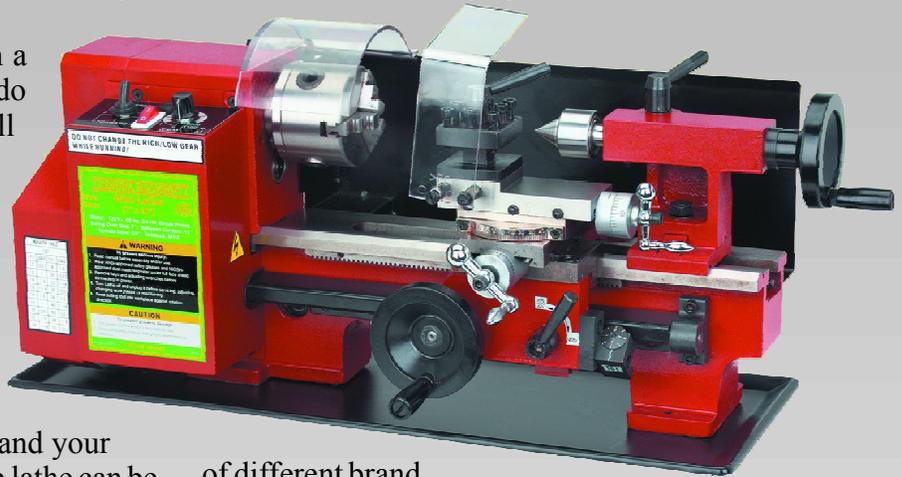
SO YOU WANT TO BUY A LATHE

There comes a time in your rocketry activities when you arrive at the point where you seriously consider buying a metal lathe. This can be a premature point or a very actual point. Being versed on a wood lathe making nose cones & centering rings out of wood, collects virtually no experience in what a metal lathe brings into your life. The fact that they both spin material for shaping ends there. This article covers the very basics of things to consider and know before investing... or even after purchasing... a metal lathe. It is not all encompassing - and doesn't cover Tooling - but there are some things you should understand.

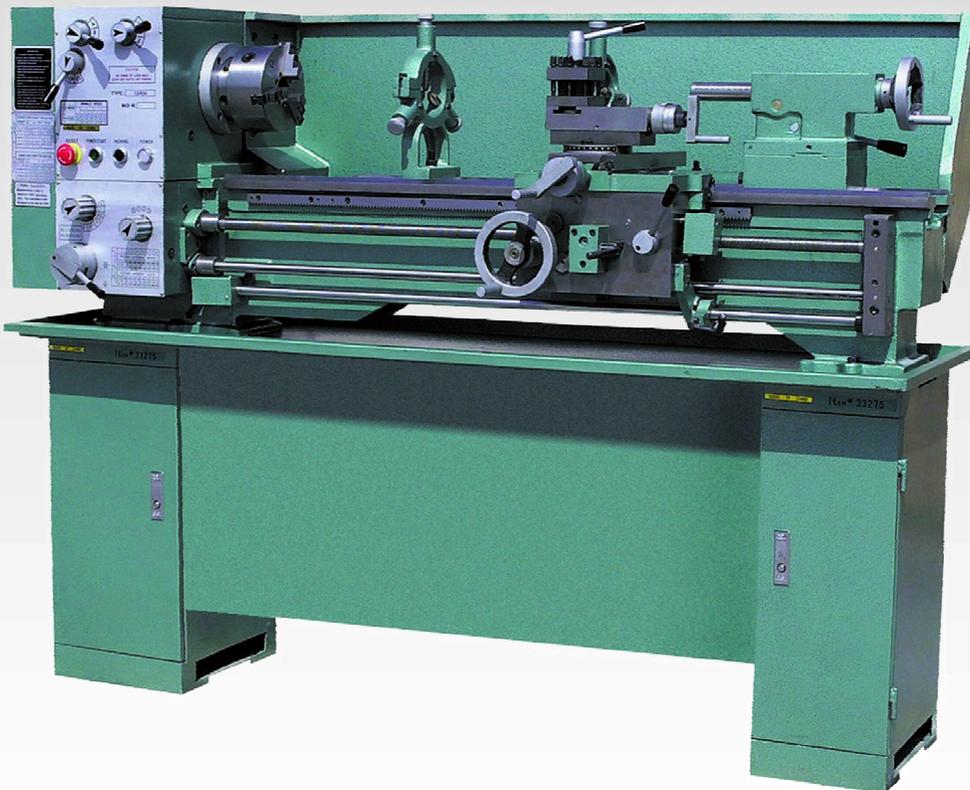
The first thing to know about investing in a Metal Lathe is the cost of tools needed to do just about anything on a Metal Lathe will out-cost the price of the Lathe itself. That said, and it is a very important statement, let's begin.

Metal Lathes come in various sizes from small bench top personal lathes for hobby applications to full size "commercial" machines. The size of your Lathe will have to fit the size of your available area, and your dreamed use. Also keep in mind a bench top lathe can be handled by you, or you and a friend, while a "commercial" machine will require special handling equipment to move and position.

The next thing to know is 90% of all Metal Lathes are made in China. Probably the most popular Bench Top Lathe is the well known 9x20 that is sold under a bunch



of different brand names and different sellers, from the respected Grizzly tools to Harbor Freight. Unfortunately unless you happen onto an old American or European machine (getting harder to find all the time!) you will be stuck with a Chinese import of very poor quality such as that popular 9x20.



Some larger Chinese imports are actually decent lathes but there seems to be a definite decrease in quality in anything less than the 12x36 machines and the smaller ones are more suited to softer materials like plastics and aluminum. DON'T fall for a "Brand Name" expecting better quality because most Chinese machines are the same regardless who sells them and a better "Brand" will not mean better quality.

An example is that 9x20, The older Jet brand sold for over \$1200 while the SAME EXACT machine at Harbor Freight is usually less than \$700 and the only difference is the color! The newer Jet looks somewhat different than the others but it is cosmetic and a trick to make

you think it is different. Grizzly, Enco and a couple of others have this lathe priced somewhere between Harbor Freight and Jet.

That 9x20 Bench Top is of course only one example but it is by far the most popular. If you have room for a bigger lathe it is strongly recommend to look at at least a 12x36 because there is not that much price difference and the smaller hobby lathes are very limited in usefulness.

Again what do you intend to use it for and about how big did you have in mind?

It is strongly suggested to avoiding the 3-in-1 multi-purpose machines because each function is so compromised in the attempt to be able to do everything that it really does nothing very well.

An interesting note is that for a while the Harbor Freight 14x40 lathe had the manual/parts book for the much more costly "Brand name" Birmingham YCL1440 lathe! The only difference between it and the Harbor Freight lathe is the color scheme. The point is these lathes vary widely in price depending on who you buy from but they do not seem to vary in quality.

Harbor Freight shop machinery is not the same as the hand tools they sell in the stores. It is imported from the same factories as the Enco, Birmingham, etc and they are the same as long as they are the same basic models.

Last consideration: Harbor Freight has little or no after sale service and since pricing has gotten closer to other suppliers it would be wise to consider a dealer such as Grizzly or Enco who does offer after sales assistance.

BUYING USED

Consideration should be given to obtaining a used Lathe. These are readily available on E-Bay or Craig's List. Problem buying used is you stand a good chance you're buying someone else's problem.

Used machines are exactly that - used. Gears can be worn out or the built in precision could have been compromised through abuse and lack of regular maintenance. This is not to say you can't find a great deal buying used but keep in mind you're probably still buying a Chinese machine.

BASIC ACCESSORIES

The following accessories should come with most lathes. Some come with additional accessories

however, these are the basics you should expect. Anything more and you're ahead

- Chuck key for the 3-jaw chuck
- Outside jaws for the 3-jaw chuck
- Change gears: 30, 35, 40 (2), 45, 50, 55, 57, 60 and 65 teeth
- Hex wrenches: 3, 4, 5, and 6 mm
- Open end wrenches: 8 x 10 mm and 14 x 17 mm

As you can see not much is offered. You'll quickly find yourself purchasing needed accessories and the count is on.

The machine you buy will come standard with a three jaw chuck for holding the work piece. This usually has Inside Jaws which holds the work piece on the inside and has three steps for sizing.



Above is a standard three jaw chuck and chuck key. You'll notice the jaws on the chuck will grip the inside of a tube like a motor tube. The three jaws on the right are outside jaws. They hold an object secure by gripping the outside surface. Removing the original jaws and replacing them with the outside jaws permits holding the work on the outside. These do not come with a standard chuck and must be purchased separately.



On the left a Three Jaw Chuck with Inside Jaws; on the right a Four Jaw Chuck with Outside Jaws

Because of the gearing Inside Jaws can not be reversed for outside use. You'll see why once you own a Lathe.

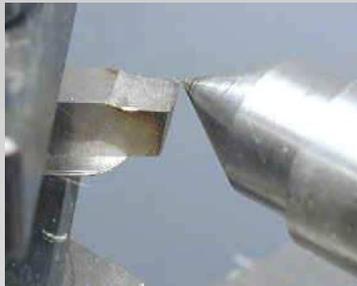
The previous photos also show a Four Jaw Chuck. A Six Jaw Chuck is not that uncommon either. They all serve a purpose but starting out with a Three Jaw is sufficient.

QUICK CHANGE TOOL POST

Next you want to address a tool post. This is the device that holds the cutting tool. Almost all Lathes come with a Tool Holder. It is simple and basic and every time you change cutting tool you must readjust and compensate for height.

Some of the tool posts that home shop machinists call quick-change tool posts don't have the "quick-change" feature at all, but simply provide an easy height adjustment.

A cutting tool must be centered with the centerline of the object being turned. This can become very tedious. The photo shows a cutting tool aligned with the tail stock center for accuracy



The advantage of a Quick Change Tool Post is several Tool Holders can hold several different tools all pre-adjusted to the proper height. When needed a simple lever turn releases the old tool, drop in the new tool and there is no need to realign everything. Without a quick-change tool post, you have to shim tools that are too low, and simply can't use tools that are too high.



THE TAIL STOCK

The Tail Stock on a metal lathe is also a tool holder. Most commonly used with a Dead Center to hold an object being turned. It can also hold a Drill Chuck for drilling operations and it can hold what is called a Bull Nose used to center large diameter tubes.

All of these tools have one thing in common, they require a mounting shaft called a Morris Taper that slides in and is held secure by the Tail Stock. Most common are MT-2 for Bench Tops and MT-3 for larger.



CLEANING

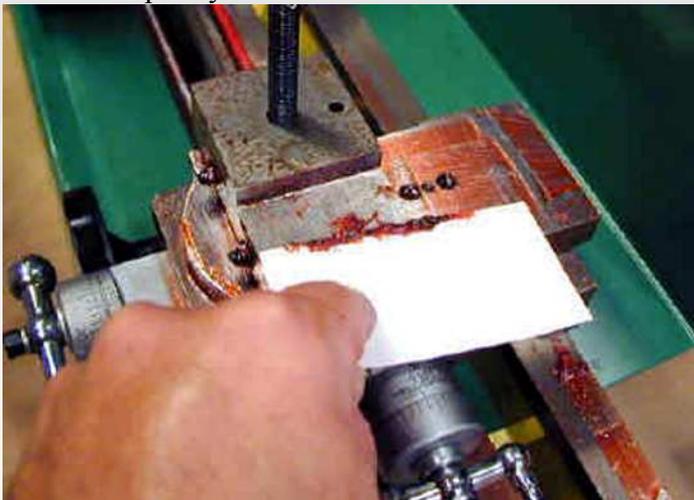
Your lathe will arrive coated with grease to protect it from corrosion during shipment. ALL Lathes will have a greasy wax coating on all bare metal surfaces. In the "old days" a sort of Cosmoline was used. Today most small Lathes are coated with a thick red crap that is very heavy and sticky. One of the biggest problems with cheaper priced lathes, and even larger ones, is not removing this stuff.

The biggest problem with people buying a Harbor Freight machine - actually with all machines - is not taking the time to THOROUGHLY disassemble and clean all of this protection out. Left uncleaned and with time & heat from running this crap gets hard and can clog gears and threads creating lose of precision and actual operation.

Could it be Harbor Freight is cheaper because they don't remove the massive amount of protective grease as possibly other higher priced companies do?

A good and proper cleaning will involve a lot of disassembly to get at all locations that are coated. Use Kerosene, mineral spirits or WD-40 - available in 1 gallon cans at Home Depot and similar stores. You'll need a few 2" and 3" cheap throw-away brushes available in any hardware paint department. Have plenty of newspaper or cardboard to go under the lathe during cleanup process You'll also need a disposable plastic pail for cleaning parts in the kerosene.

The photo shows what to expect. An old credit card comes in handy for scraping excess crud and as you can see there is plenty.



A good cleaning will turn the most budget wise machine into a very acceptable investment. And be prepared for regular maintenance.

SAFETY

Considering getting a Metal Lathe, get in the habit right from the start of rigorously following good safety practices. Here are some tips:

- To start: Never leave the Chuck Key in the Chuck
- Always wear eye protection - preferably industrial quality safety glasses with side-shields. The lathe can throw off sharp, hot metal chips at considerable speed as well as spin off spirals of metal that can be quite hazardous. Don't take chances with your eyes.
- Wear short sleeve shirts, if possible, or shirts with snugly fitting cuffs if long sleeve. Loose sleeves can catch on rotating work and quickly pull your hand or arm into harm's way.
- Never leave the Chuck Key in the Chuck
- Wear shoes - preferably leather work shoes - to protect your feet from sharp metal chips on the shop floor and from tools and chunks of metal that may get dropped.
- Remove wrist watches, necklaces, chains and other jewelry. It's a good idea even to remove your wedding ring since it can catch on rotating work and severely damage your ring finger and hand.
- Never leave the Chuck Key in the Chuck
- Tie back long hair so it can't get caught in the rotating work. Think about what happens to your face if your hair gets entangled.
- Always double check to make sure your work is securely clamped in the chuck or between centers before starting the lathe. Start the lathe at low speed and increase the speed gradually.
- Never leave the Chuck Key in the Chuck
- Keep your fingers clear of the rotating work and cutting tools. This sounds obvious, but you'll be often tempted to break away metal spirals as they form at the cutting tool.
- Avoid reaching over the spinning chuck. For filing operations, hold the tang end of the file in your left hand so that your hand and arm are not above the spinning chuck.
- Never leave the Chuck Key in the Chuck
- Never use a file with a bare tang - the tang could be forced back into your wrist or palm. Inexpensive wooden handles are readily available for common file sizes.
- Make sure you have an up-to-date tetanus shot. Booster shots are good for up to ten years. Working with metal on a regular basis, it is likely that you will get many small cuts and occasionally a deep cut or puncture that could put you at risk for a tetanus infection.
- Get in the habit of removing the Chuck Key immediately after use. Some users recommend never removing your hand from the chuck key when it is in the chuck. The chuck key can be a lethal projectile if the lathe is started with the chuck key in the chuck.

TURNING TOOLS

TURNING TOOLS

Turning is the simplest operation on a metal lathe. It is reducing the outside diameter of a work piece. It's probably the first thing you will do with a lathe.

There are two basic types of turning tools: high-speed steel tool bits, and carbide turning tools.

Carbide turning tools come in two flavors. There are tool bits with brazed-on carbide tips, and indexable carbide turning tools. The image shows a set of indexable cutting tools.



Indexable carbide turning tools consist of a shank of hardened steel with a small triangle of sintered carbide (called an insert) attached to the end. The carbide insert is factory sharpened with three cutting edges, one at each point of the triangle. When one point becomes dull, you rotate the next point into the cutting position. When all are dull you replace the insert. These turning tools are called indexable because you can change the insert without affecting the position of the cutting edge relative to the work piece.

Tool bits with brazed-on carbide tips are relatively economical, but once the carbide tip is worn out, the entire tool bit is discarded.



High-speed steel tool bits, as shown above, start as rectangles of high-speed steel that you sharpen with a bench grinder. A 5/16" high-speed steel tool bit starts as a piece of high-speed steel that is 5/16" square and 2-1/2" long. Before you can use it to cut metal, you use a bench grinder to shape and sharpen the end. There are several standard shapes for tool bits, which depend on the intended use.

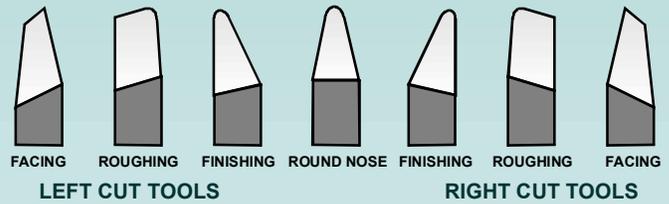
Once experience is gathered you'll find yourself grinding your own tool bits out of High Speed Steel to fit your needs.

Facing tools are ground to provide clearance with a center.

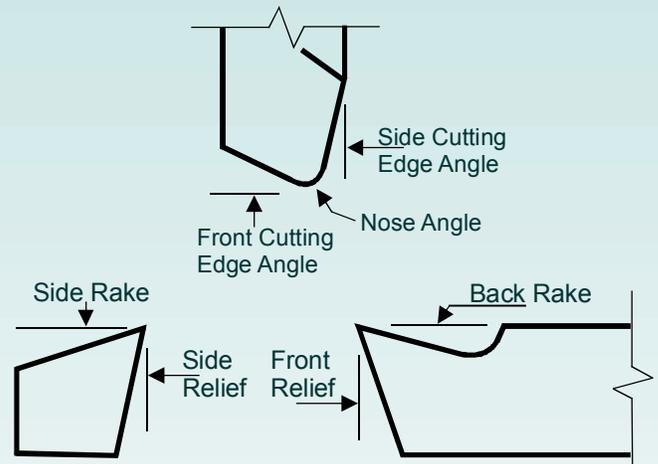
Roughing tools have a small side relief angle to leave more material to support the cutting edge during deep cuts.

Finishing tools have a more rounded nose to provide a finer finish.

Round nose tools are for lighter turning. They have no back or side rake to permit cutting in either direction. Left hand cutting tools are designed to cut best when traveling from left to right.



RAKE & RELIEF ANGLES FOR HIGH SPEED TOOL BITS



MATERIAL	Side Relief	Front Relief	Side Rake	Back Rake
Aluminum	12	8	15	35
Brass	10	8	5 to -4	0
Bronze	10	8	5 to -4	0
Cast Iron	10	8	12	0
Copper	12	10	20	16
Machine Steel	10 to 12	8	12 to 18	8 to 15
Tool Steel	10	8	12	8
Stainless Steel	12	8	15 to 20	8

PNUEMATIC TAIL STOCK

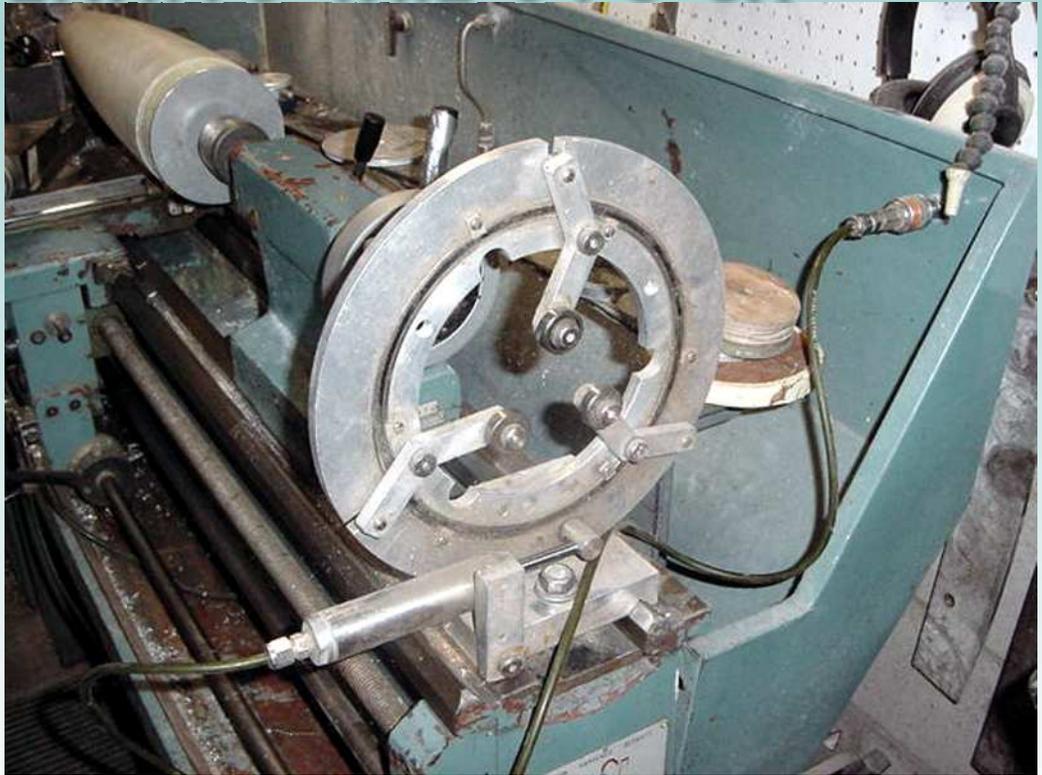
Eric Haberman, formerly of DYNACOM and an expert Tool Maker, needed a tail stock for his metal lathe to handle quick centering of various diameter fiberglass tubes when he was making DYNACOM Rocket Kits.

He designed and fabricated an air driven adjustable tail stock on his metal lath. A tube chucked up in the head jaws extended through the center of the ring assembly. When air pressure is applied the three arms are equally expanded centering the tail end of the tube to be worked on.

The unit consists of an inner and outer ring. The inner ring is actually stationary, mounted to the bed ways. The outer ring rides on bearings and is moved by the small air piston attached.

Three arms holding small ball bearing wheels pivots as the outer ring is moved when air is applied to the piston.. This centers the captured tube with three points of equal pressure.

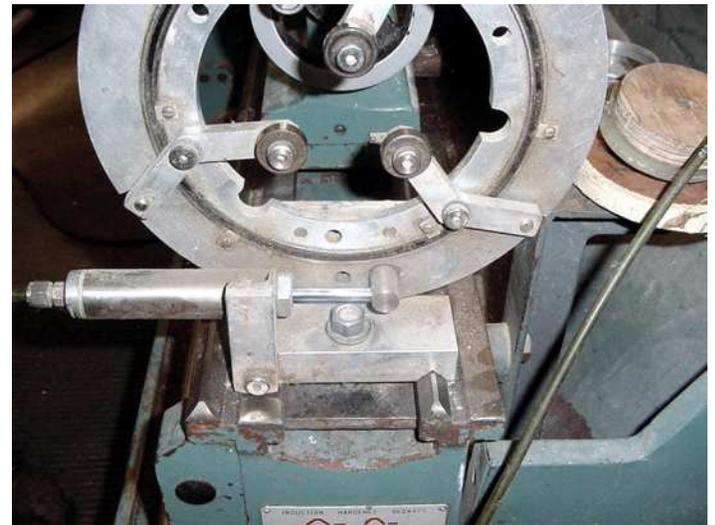
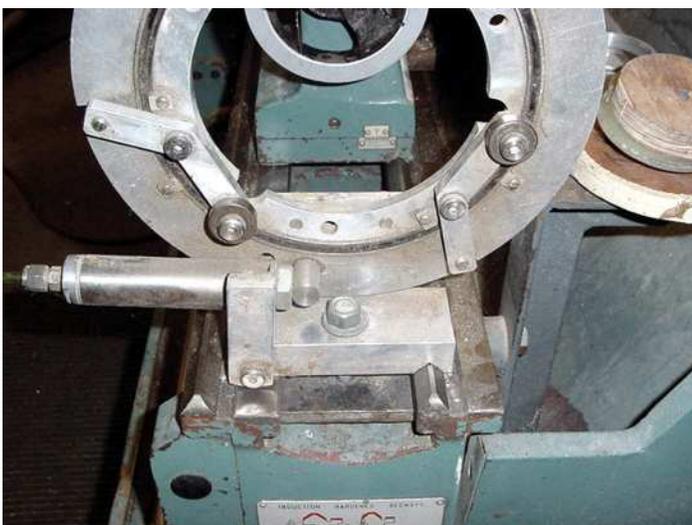
The small air piston extends a push rod which spins the outer ring and causes the wheeled arms to grasp the



tubing. This virtually eliminates any scarring of tubing, both fiberglass and metal, and permits longer lengths on a shorter lathe.

The center ring hole is the same diameter as the head stock with the jaw teeth. There are limitations to the size diameter of the work piece depending the size of the lathe.

The black hose is attached to an air chuck mounted on the back of the lathe.



To the left shows the normally open Pnuematic Tail Stock. On the right shows the air piston extended shifting the outer ring and pivoting the centering arms to hold the material being machined.

RUST SOLUTION

Everyone living in damp humid areas like the East Coast and the great Northwest knows rust. What's terrible is when you have good equipment placed in damp humid environments. Without constant cleaning & service - even with constant cleaning & service, rust begins to spread its brown skin on all exposed surfaces making you want to scream.

PMS PRODUCTS has a solution for you. It's actually two solutions. The first is a great product called RUST FREE™ for removing rust from metal surfaces.

For light rust on steel or cast iron, spray RUST FREE™ on a rag and wipe the surface. Do not spray directly on surface, as it may cause spotting.

For heavy rust apply RUST FREE™ thoroughly wetting surface, allow to penetrate for 30 seconds, then scrub with Scotch-Brite pad before wiping off.

RUST FREE™ is a Phosphoric Acid based solution that kills rust. USE GLOVES. It virtually removes all signs of light rust and on heavy rust turns it black. This means it is DEAD!



The before & after photos left & right were cleaned using just a shop cloth as recommended



Even with really hard crusted rust spray on RUST FREE™, let it sit a minute and use of a wire wheel brush on a drill before it dries. Wipe it down with a shop cloth and you'll be amazed. The surface will shine clean. Extreme rust will turn black, this is good!



The second solution is BOESHIELD T-9®. T-9® was developed and licensed by The Boeing Company to fill their need for a superior lubricant/protectant, probably in the Northwest region. (Rain you know!)

The formulation, based on a unique combination of solvents and waxes, is designed to penetrate metal pores and dissolve minor corrosion, then leave a resilient waxy coating that lasts for many months. Continued use of T-9® will really have pieces and parts moving super smooth and clean.

A light coat can be sprayed on then wiped down with a shop cloth. For storage or long term heavier protection and lubrication just spray and let sit.

T-9® has proven to be a tough, long lasting waterproof lubricant. It will lubricate metal lathe ways as well as tool holders and crossfeeds.

T-9® is great for table saws, drill presses, and anything with bare exposed metal subject to rust.

And, while Boeshield claims not to be picked up by wood we'd advise not to use it in cases where overspray will fall on wood projects. It has wax in it



Visit their WebSite at:

WWW.BOESHIELD.COM

More Hamsters, More Rules, More Fun!



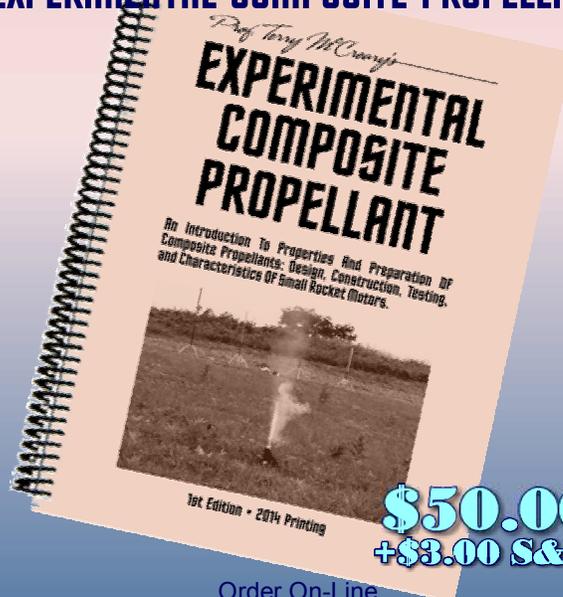
**IT STARTED AS A JOKE
AND STILL IS!**

**SEPTEMBER 18th, 2014
BLACK ROCK, NEVADA**

REGISTER AT

www.hamsterdancelaunch.com

Prof. Terry McCraney
EXPERIMENTAL COMPOSITE PROPELLANT



Order On-Line

www.compositepropellantbook.com

If you are in search of information on the design and fabrication of Rocket Motors, this is the book. Whether you're new to Research Rocketry or Experienced this book is a must in your library. Order today, in stock, quick delivery.

No orders outside the U.S. • Allow 7 to 10 Days For Delivery

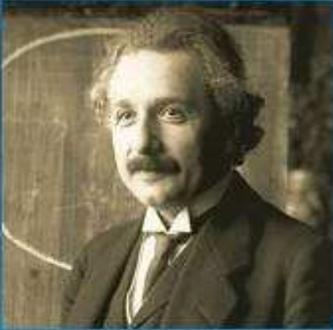
SCAM WARNING

I usually don't pay attention to Scam notices but after I personally got hit I want to warn everyone who finds themselves at Lowe's, Home Depot, Costco, or even Wal-Mart. This one caught me totally by surprise. Over the last months I have become a victim of a clever scam while out shopping. Simply going out to get supplies has turned out to be quite traumatic. Don't be naive enough to think it couldn't happen to you.



Here's how the scam works; Two nice looking, college-age girls will come over to your car or truck as you are packing your material into your vehicle. They both start wiping your windshield with a rag and Windex, with their unmentionables almost falling out of their skimpy T-shirts. (It's impossible not to look). When you thank them and offer them a tip, they say 'No' but instead ask for a ride to McDonald's.

“A person who never made a mistake never tried anything new.”



—Albert Einstein

THIS MESSAGE IS DESIGNED TO PROVE HOW OUR MINDS CAN DO AMAZING THINGS!
IMPROVE YOUR THINGS!
IN THE BEGINNING IT WAS HARD BUT NOW, ON THIS LINE YOUR MIND IS READING AUTOMATICALLY WITHOUT EVEN THINKING ABOUT IT, EVEN WITH THE DASHES THROWN IN - BE PROUD!

You agree and they climb into the vehicle. On the way, they start undressing.

Then one of them starts crawling all over you, while the other one steals your wallet.

I had my wallet stolen May 4th, 9th, 10th, twice on the 15th, then on the 17th, 20th, 24th, and the 29th and again on June 1st, 4th, 8th, twice on the 15th & 16th, and very likely again this upcoming weekend.

Spread the word and tell your friends to be careful and vigilant. What a horrible way to take advantage of us older men.

Wal-Mart has wallets on sale for \$2.99 each. I found even cheaper ones for \$.99 at the Dollar Store and bought them out in three of their stores.

Also, you never get to eat at McDonald's. I've already lost 11 pounds just running back and forth from Lowe's, to Home Depot, to Wal-Mart.

So please, notify this to all the older men that you know and warn them to be on the lookout for this scam. (The best times are just before lunch and around 4:30 in the afternoon.)



NERDY GIRLS
She's Way Out Of Your League.
And She's Smart Enough To Know It.