# T PREFECTURE # 138

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#### SEPTEMBER 2014 Vol. 04 No. 05 PUBLISHED EXCLUSIVELY FOR THE MEMBERS OF TRIPOLI GERLACH AND ANYONE ELSE INTERESTED

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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** Member Eric Cayemberg readies his large scale V2 at LDRS 33 in Wisconsin. Eric was one of the few launching a really large rocket. It was his home field and didn't had a problem but the size and condition hampered others from enjoying the first LDRS in Central US.

PHOTO BY GERALD MUEX Jr

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## THE EDITOR

Well here's another 24 page issue. As stated we will run 20 pages unless we get stuff that warrants the addition of 4 more pages.

With this issue we are a month out from BALLS and HAMSTER DANCE. Our annual Member's Meeting is also coming up at the end of September.

We have plenty of business on this year's agenda. Primarily that of selecting a new Executive Committee. It's been discussed by some members that we rotate Prefects each year. Our membership has so many Prefects of other Prefectures that we have no shortage of "qualified" people.

Consider stepping forward and nominate yourself - or someone you know - but probably more like yourself. We could use new people in all three positions: Prefect, Secretary and Treasurer.

Gary Rosenfield has served as Prefect for the last year. He will gladly tell anyone how easy it is. - and he wouldn't be lying!

Here's your chance. Do some considering and at the meeting step up to bat. Everyone else is counting on you cause they sure don't want to do it!!

#### DISCLAIMER

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## TRIPOLI GERLACH UPDATE MEETING VENUE CHANGE

Our Annual Member's Meeting and Spaghetti Dinner with Meatballs has undergone a major change. We will not be meeting in Bruno's WayBack room as in the past. For financial reasons we have acquired the Gerlach Community Center.



Jeannie Leininger, with the Black Rock Bistro, in cahoots with Skippy, will be presenting us with a Banquet Dinner of Brisket, Pulled Pork and Crack Bacon. In addition she is making Potato Salad, Cole Slaw, Baked Beans and Strawberry Short Cake. Sodas, Ice Tea and Water will be available. Anything other you'll have to bring your own.

Festivities will begin around 7pm with members gathering. Dues for 2015 will be collected and raffle tickets sold.



The Buffet will open at 7:30. We will conduct our business during the dinner. Of most importance is the election of out Executive Committee. Candidates will be presented and voted upon for 2015.

Our HAMSTER DANCE 4 results will be announced and our Alpha Hamster will be officially announced and awarded a Trophy for 2014.

A special discussion regarding 2015 launches at Black

Rock will be held; Hamster Dance, BALLS and others..

Vern Knowles will give a brief presentation on his TelemetryPro Tracking System. All questions will be answered and members will be made more aware of all the features the system has to offer, besides a pretty voice.

Several of our members have purchased KATE Transmitters. The goal has been reached for the Prefecture to acquire a Telemetry<sup>tm</sup>Pro Receiver to be used by members having Transmitter units. Even so we are holding a raffle to continue raising funds for the Prefecture.

## PREFECTURE RAFFLE

DYNACOM SCORPION KIT DT Research Rocketry

AEROTECH DMS K535W Gary Rosenfield

ROUSE-TECH 75/5120 Motor Case Tom Rouse

TRIPOLI GERLACH APPAREL GRAPHIX & STUFF

ASSORTED HP MOTORS Rich Hagensick

> BOTTLE O WINE Deb Koloms

This year's Member's Meeting should be filled with information, business and activities so don't miss out. All paid 2014 members will be issued a Dinner Ticket to get into the Buffet and Meeting. See Tom.

## HAMSTER DANCE IV

HAMSTER DANCE IV is set to go. The waiver to 15,000 AGL is in hand. All we need is your Registration Forms and the dumb dollars for the BLM - and don't forget a T-Shirt!

#### www.hamsterdancelaunch.com

There is still time to Register for BALLS. It is important spectators as well as flyers register. Visit their website:

#### www.balls23.com



LDRS 33 was held for the first, and probably last time, in wonderful Wisconsin. As the above photo shows the launch site was NOT your hoped for LDRS site. Trees and swamp, even ponds peppered the launch and recovery areas. Many Tripoli flyers traveled hundreds of miles only to attend a social event and meet distant friends.

Tie this with the fact that nearly hundreds of NAR members made up the majority of flyers, and attendees, made this LDRS a giant NAR launch. You never saw so many little rockets at an LDRS - ever!

#### THE GOOD SIDE

Luckily all was not lost. The clubs sponsoring LDRS without a doubt were outstanding in all other areas of the event. Keep in mind this was an East Coast Launch and there is very little in the way of wide open launch sites to work with, Tripoli Wisconsin worked with what they had and did a really good job in covering all the other bases.

First off the Range was run efficiently with people who knew what they were doing. The RSOs, LCOs and Pad Techs were always there for you. An outstanding PA system covered the entire area and no one was not informed of the activities going on.

Rev Brad of WILSON FX supplied the Launch Systems which worked flawlessly through out the entire event. Even the far cells had excellent operations. For the number of pads in the near and mid launch areas everything went on as planned.

The BoD and Member's meeting was not held in the Host Hotel as usual, but in a neighboring building proving very adequate.

The Banquet itself was nicely decorated celebrating Tripoli's 50 birthday and the food was great, being brought out once the members were seated. Absolutely no complaints in this area. Thank you to all who planned and executed a difficult event.

The Spectators filled the Line of Death Area for a more better view of the festivities.

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To the left Eric Cayemberg readies our V2 cover rocket. Above, Jerry McKinlay traveled all the way from Las Vegas to successfully fly his M powered PEGASUS.

Most big flyers never launched due to the site's tree and brush covered surroundings however, all in all, LDRS 33 was a success.

Next year LDRS moves back to Potter, NY and we all look forward to it once again. - Rain stay away!





# **BLACK ROCK ROCK HUNTING**

Unless you are an ardent Rock Hound and know what you're looking at Rock Hunting in the Black Rock area can be maybe frustrating. So much rock and so little knowledge! Little do you realize what your walking on is interesting, its just that the rocks are so small and insignificant you don't take the time to look.

All under foot is Agate, Cinnabar, Epidote, Gypsum, Malachite, Obsidian, Quartz, Topaz, Rhyolite, Tiger Eye, Opal and Petrified Wood. Nobody wants the little pebbles, they want the big stuff. Unless you really know what you're looking for finding the "big stuff" probably ain't gonna happen.

Most of us are Rock Monkeys, that is as we walk along if a pretty or shiny stone catches our fancy we pick it up and take it with us. Our knowledge of what is about us is very lacking and we just pass by the good stuff or just don't know what to look for that is actually worth keeping.

The Black Rock desert is one of the best places to go Rock Hunting. Volumes can be written about what is available, what to look for - and where to look.

#### GRANITE

The most common rock is Granite. The surrounding

mountains are built of it. It's everywhere you turn. This rock consists mainly of quartz and feldspar, with stuff like Mica or Hornblem. Granite containing black particles of Hornblende have the salt & pepper look. Granites can be pink to gray in color, depending on their chemistry and mineralogy.



Granite is one of the basic rocks in a rock collectors collection.

#### QUARTZ

The second easiest rock to find is Quartz, this white crap is everywhere! It ranges from a near opaque white, through a rosey white to a clear transparent crystal. There are so many variations it will seem like you're

#### constantly picking up different types all day.



Quartz can be found in pure crystal form if you look hard enough - and dig some.



One thing that will spark your interest is where ever you find Rose Quartz you stand a chance finding Gold. But don't get too excited to soon as finding stones and pebble don't count - you need to find a vein!

#### **OBSIDIAN**

The Black Rock area is all volcanic in origin and probably the thrid easiest rock to find is Obsidian. This is basically volcanic glass. Obsidian is an easily recognizable igneous rock. It is a glassy-textured, extrusive igneous rock. Obsidian is a natural glass - it lacks crystals

Obsidian is moderately hard, has conchoidal fracture (smooth & curved fracture surface), and has exceedingly sharp edges. Freshly-broken obsidian has the sharpest edges of any material known, natural or man-made (as seen under scanning electron microscope).



#### **GYPSUM**

The thrrd easiest rock found throughout the Black Rock area is Gypsum. The town of Empire was founded on it.

Gypsum comes as clear crystals that display one perfect cleavage (selenite), as blocks of featureless white rock (alabaster), Most common around Black Rock is a combination of both type not clear yet not as transparent as Quartz.

Rare find is the "Desert Rose", a ball shaped Gypsum having bladed pettles.



#### AGATE

Agate is very abundant around Black Rock. Just about all small pebble rocks found off the lake bed are Granite, Quartz and Agate



Agates are semi-precious gemstones that are a variegated form of chalcedony (pronounced kal-sed'nee), which is silicon dioxide in the form of microscopic fibrous quartz crystals. Agates naturally develop when an empty pocket inside a host rock fills in molecule-by-molecule, layer-by-layer as these microcrystals self organize to form concentric bands or other patterns. The colors and arrangement of the microcrystals are influenced by changes in pressure, temperature, and mineral content that occur during the formation process. Unlike other gemstones, each agate is unique. Even slabs cut from the same specimen will vary in color and design.



#### **PETRIFIED WOOD**

The Black Rock area has several Petrified Forests, from the federally protected areas, private property to just plain free range areas. Seemingly unrelated samples can be found all over the place. Due to the

high silica content of the land; most petrified wood found here is white.

> Petrified Canyon in the Calico Mountains is a source for petrified wood deposits. Just paying attention as you trek will provide rewards

Most loose Petrified Wood is weathered to a dull white finish. "Fresh" samples have an almost pearlish opaline look. Most large pieces will contain Agate centers.



#### **OPAL**

Opal rocks seem to be the ultimate specimens looked for at Black Rock - only bested by Silver & Gold. With the Rainbow Opal mine no longer in official operation it still offers great opportunities for opal hunting.



#### Opal in a Rock Matrix

Opal is a hydrated amorphous form of silica meaning it does not have a crystal structure; its water content may range from 3% to 21% by weight, but is usually between 6% and 10%. Without water Opal dries up. Because of its amorphous character it is classed as a mineraloid, unlike the other crystalline forms of silica which are classed as minerals. It may occur in the fissures of almost any kind of rock, being most commonly found with limonite, sandstone, rhyolite, and basalt. All common in the Black Rock area.

Precious opal ranges from clear through white, gray, red, orange, yellow, green, blue, magenta, rose, pink, slate, olive, brown, and black. Of these hues, the reds against black are the most rare, whereas white and greens are the most common.

Common opal, called "potch" by miners, does not show the display of color exhibited in precious Fire Opal.



# **RULES FOR ROCK HUNTERS**

To protect mineral deposits and ensure long-term opportunities for collection within the NCA and its Wilderness Areas, the following regulations apply:

Only hand tools may be used to dig for minerals and fossils. Using motorized equipment for collection purposes is prohibited.

All rock and mineral collection is limited to 25 pounds plus one piece per person per day, with a maximum collection of 250 pounds per year.

Common invertebrate fossils such as plants, mollusks and trilobites may be collected for personal use in reasonable quantities, but may not be sold or bartered.

Petrified wood may not be traded or sold without a permit issued by BLM.

Vertebrate fossils such as dinosaurs, mammals, fishes,

and reptiles, and uncommon invertebrate fossils may be not collected. Only trained researchers, under a BLM permit, may extract these resources. These items are placed with museums or other public institutions after study.

Hanging Rock Petrified Forest and Charles Lund Petrified Forest are closed to rock hounds.

No new mining claims are allowed in the NCA or wilderness areas, but a few claims that predate Congressional designation remain valid.

All minerals found on an existing mining claim belong to the claim holder and permission must be obtained to rock hound there. Records of claims can be viewed at BLM offices or County Recorder Offices.

Using motorized equipment for collection purposes is prohibited. Doesn't mean your vehicle.

#### What You May Find

Sandstone, limestone and granite formations all occur in the Black Rock-High Rock Country. Minerals and gemstones of interest you may find (in alphabetical order) include:

Agate • Arsenopyrite • Azurite • Barite • Cinnabar • Epidote • FireOpal • Geodes • Gypsum • Magnetite Malachite • Marcasite • Miargyrite • Obsidian • Petrified Wood • Stibnite • Topaz • Rhyolite • Tourmaline

**BLACK ROCK EXPLORERS SOCIETY** 

SOC

At least once a year, usually in September, members of Tripoli Gerlach come to Black Rock to launch rockets. Several members arrive a week early and take advantage of what Black Rock has to offer other than the world's greatest non professional rocket launching site.

Several have formed the Black Rock Explorers Society and have created a WebSite to share their adventures.

Starting about ten years ago a small group arriving early for the launch spent time riding the gravel roads to see what they could see. Each year they ventured further and further until today there is almost no place they haven't trekked to. The group is open to anyone who wants to join in the fun. Experience has taught them a lot about the Black Rock area, not only what it has to offer but how to survive it safely.

If you're interested in joining them visit their WebSite and get a better idea of what they do. Anyone interested is free to join the treks.

There are no fees involved, just follow the rules and be willing to share your photos. If taking your own vehicle it must be a 4WD with good tires and service.

Check their WebSite for complete information and contact information.



**SEPTEMBER 2014** 

# KITCHEN AID LUBE JOB

### Content & Photos by BARRY HARMON www,artisanbreadbaking.com Artisan Bread Baking

Bake great bread in your kitchen

The Kitchen Aid stand mixer is the most popular large home mixer in the United States. It is actually used by more Research Rocketry people than any others, not counting the smaller Hobarts used when you really get serious! (Actually Hobart makes Kitchen Aid) It is a fine piece of equipment, big and powerful, and easy to use. Like most equipment and tools, it requires a bit of care to ensure that it works properly and for a long time. Like most equipment, it frequently doesn't get even this borderline level of maintenance.

You should replace the grease in the gear heads of your Kitchen Aid every year or so. It's a one hour job, gets a little messy and, when it's finished, yields a lot of satisfaction. This photo shoot is a step-by-step record of how to do it. This is one way of doing it; you may find better ways to accomplish the same ends, or you may decide to skip a step or two.

Since you are going to be taking the machine apart, you should take a look at all of the mechanical parts and get an idea of the general layout. Here is an internet link to the KITCHEN AID PARTS SELECT WebSite located at: **www.partselect.com**. Once there enter your Kitchen Aid Model# (usually found on the chrome band around the head or under the base) and you should be presented documentation.

This is NOT a hard job, it does seem very involved, but you should be able to handle it otherwise what are you doing with rockets?!

#### There are five things that are critical in this operation:

Place a baggie around the plug and secure it with a rubber band. This is called Lock Out Tag Out.

Be sure not to stress the wires connecting the lower and upper parts of the mixer.

Be very careful not to damage the gasket that seals the upper gear head.

Don't mushroom the two small pins that secure the inner gear and the outer gear head.

**DO NOT** remove the two dime-sized black screw covers on the sides of the mixer body. These hold the brushes for the motor. You can break your mixer if you take these covers off and remove the inner workings.

Other than that, it's very simple.



#### You will need these tools and supplies:

- A small Phillips screwdriver, #0 is good, #1 works.
- A medium Phillips screwdriver, #1 or #2.
- A medium blade screwdriver.
- A small utility knife such as the breakaway blade knives sold in hardware stores.
- A supply of popsicle sticks or other scoopers.
- A tub of grease. Any grease will do; I use wheel bearing grease from NAPA or Sears. \$4 a pound.
- A spray can of brake cleaner or other heavy duty, true, degreaser. If you have access to a parts cleaning cabinet, great.
- A supply of paper towels or rags.
- One or two small bristle or other type brushes. You can use soldering brushes, available at a hardware store for about 50 cents each. Old toothbrushes work well, too.
- A small dish or bowl to hold the parts you remove from the mixer.

First step. Login to the KITCHEN AID PARTS SELECT WebSite and find your mixer documents. Look at the diagram for the gear head and planetary. That's what you 'll be working with, so you might just as well print it out so you'll know what's what and what's where. Also remember models will vary for model to model, year to year but in all cases following the steps outlined will accomplish the job for all.

#### Here's How To Do It



Here's a shot of the mixer and all the tools you'll use. An old toothbrush is useful as well, but I didn't have one. You should have a can of brush cleaner to clean small parts with. Be sure to have the windows open wide or, better yet, work outside.



Here's the back of the mixer. You'll be removing the two small screws so you can remove the chrome strip..



Here's the mixer with the chrome strip and back cover removed. The small screws go into the box.



It is a good practice to put the plug in a baggie and tied it up. Do this to prevent someone from accidentally plugging in the mixer and turning it on during the work. This sounds farfetched, but stranger things have happened.



Here's the back cover. You have to remove this to get to the ends of the chrome strip.



Take a blade screwdriver and place it at the top of the metal ring. Then tap it gently. Move the screwdriver around the ring and repeat. You may have to do this for a minute or two, but eventually the ring will fall off. You'll be rewarded with reminders of just about everything you've made in the mixer since the last cleaning.



Here's the ring, as promised.



Removing the screws.



Take the small Phillips screwdriver and gently tap the pin out of the planetary housing.



Gently lay the mixer on its side. See those four screws? They have to come out. That black disc just above the black knob is the brush cover. Don't mess with that. Or with the one on the other side.



Now for the planetary housing, also called the snout. This has to come off.



Gently separate the planetary housing from the body of the mixer. You may need a bit of round-and-round, but it will come off.mixer since the last cleaning.



Here's the interior of the planetary housing. This is the old grease. It's very sticky and doesn't smell all that good.



Here's the inside of the planetary housing. Use the blade screwdriver to remove the five screws around the gear.



Another shot of the grease. If you think this is bad, wait'll you see what's inside the main housing!



Gently work the case apart. When you get it apart, be very careful not to stress the three wires at the back of the mixer. Be very gentle on the gasket that's in there as well.



This is the main drive gearing. There is a lot of old grease here and it's very tough and sticky. Don't worry, we have the means to remove all of it. The gear on the left is the fail-safe gear. It will fail if the mixer gets stuck.



A shot inside the housing. The large gear on the left drives the accessories. The small worm-gear on the right is the main drive gear. The hole between the two gears is where the main planetary drive shaft fits. Clean it out and put a good shot of grease in the hole when you put the mixer back together.



Scoop and scrape out the old grease. You may need a small utility knife to get some of it out.



The planetary responds nicely to cleaning.



Tower out and quite a mess.



Checking the old grease for metal shavings. I didn't find any, so there isn't anything very bad in there.



Outside, starting to clean the gearing. We go outside because we will be working with some things that we must work with in the fresh air. See that gear tower and the two screws? There are three of them, one of them hidden on the other side. Remove them and remove the gear tower.



As you examine the tower, notice the small pin through the shiny part of the gear. Use the small screwdriver gently to drive the pin out, then take it apart. You may have to soak it a bit in cleaner. Note the position of the gear relative to the housing. It will fit only one way when you put it back together. When you get it all apart, this is what you'll have.



Gear tower clean and back together. A good sign; it means the job's past the half-way point.



Cleaning the ring gear.



Cleaning the main housing. The gearing, on the left, looks pretty good.



Here's the clean ring gear.



Back inside. Put grease on all gears and on the shafts.



Position the gasket and assemble the body.



Replace the two sets of screws: the 5 in the gear area and the 4 in the body.



Grease all over the ring gear.



Position the planetary housing and gently install the pin. You may have to fiddle around with the pin and the shaft to get them to line up.

earch Rocke



Replace the chrome strip and the back cover and we're done. Here it is, cleaned up and back in service.

**NOW AVAILABLE:** The Tripoli Gerlach Hat. One size fits all Cotton Twill with an adjustable velcro band. Sand color with Brown trim. Fully embroidered logo on front panel.

#### You need one of these!



TEE SHIRTS • SWEAT SHIRTS • LICENSE PLATES • MUGS • THERMOS • DECALS Help Support Our Prefecture With A Purchase Of Our Top Quality Branded Merchandise Visit Our Website And Click MERCHANDISE - Thank You

# DRILLING & TAPPING HOLES

Many aspects of High Power & Research Rocketry require drilling a hole and placing threads for attachment purposes. Drilling the holes are easy; creating the threads are just as easy if you have the right tools and know how.

A tap cuts a thread on the inside surface of a hole, creating a female surface which functions like a nut. The three taps in the image to the right illustrate the basic types commonly used by most machinists. They are generally referred to as hand taps, since they are, by design, intended to be manually operated

**TAPER TAP**: The small tap illustrated at the top of the image is similar to a plug tap but has a more pronounced taper to the cutting edges. This feature gives the taper tap a very gradual cutting action that is less aggressive than that of the plug tap. The number of tapered threads typically ranges from 8 to 10. A taper tap is most often used when the material to be tapped is difficult to work (e.g., alloy steel) or the tap is of a very small diameter and thus prone to breakage.

**INTERMEDIATE TAP**: Sometimes called a second tap or plug tap. The tap illustrated in the middle of the image has tapered cutting edges, which assist in aligning and starting the tap into an untapped hole. The number of tapered threads typically ranges from 3 to 5. Plug taps are the most commonly used type of tap. In the US they are commonly known as plug taps, whereas in Australia and Britain they are commonly known as second taps.

**BOTTOMING TAP**: or plug tap. The tap illustrated in the bottom of the image has a continuous cutting edge with almost no taper — between 1 and 1.5 threads of taper is typical. This feature enables a bottoming tap to cut threads to the bottom of a blind hole. A bottoming tap is usually used to cut threads in a hole that has already been partially threaded using one of the more tapered types of tap; the tapered end ("tap chamfer") of a bottoming tap is too short to successfully start into an unthreaded hole. In the US they are commonly known as bottoming taps, but in Australia and Britain they are also known as plug taps.

#### BEGINNING

When making holes it is most important to use a SHARP drill bit. It is unbelievable the difference that a sharp bit will make. Drill bits are fairly cheap, especially the smaller sizes that we use most of the time, so if you are having trouble drilling a hole in something, the first thing you want to do is, make sure that you are using a bit with a



good cutting edge. If you are not sure, go buy a new one. Next, is to use some type of cutting fluid. Some cutting fluids are made specifically for certain metals, so make sure you are using the proper fluid for the type of metal you are drilling. Near the end is an easy explanation of lubricating fluids.

Before you attempt to start drilling a new hole, ALWAYS center punch the material you are drilling to keep the drill bit from walking around all over the place when you are trying to get it started. If you can't get a good indentation in the material with a center punch, then the metal is probably too hard to drill and you will only screw something up if you keep trying. More than likely you'll break the tap.

Once you have drilled your hole to be tapped, chamfer the rim where the tap will be inserted. This will help steady the tapping process and help keep the tool straight and aligned and will also aid in the tap cutting into the material to start.

Again the taps we work with are called hand taps and will fit into Tap Holders. These are specifically designed to hold and manipulate the tap as you work it manually. The photo shows a TEE Handle holder and two Vice Type holders for small and larger taps.



One other thing: Its is a lot easier to run a tap straight with

a tap wrench than a adjustable wrench. When you break off a tap because you insisted on using an adjustable wrench or a pair of vise grips, remember you were told!

Threading holes requires 3 things to do it right.

FIRST The right size drill bit (sharp of course) SECOND The right tap set (3-taps), also taps must be sharp. Taps can wear out and get dull edged. THIRD Proper cutting fluid.

Check the charts at the end of this article to find the right size drill bit to use with the tap size you are working with.

If you are tapping into a thin piece of metal, 1/8" or even 1/4" the Taper Tap (the one with the most taper) Start the threads about a turn and a half, add some cutting fluid, then run the tap in a couple more turns. then you want to back the tap back out about half to a full turn, this breaks the chip. run the tap in a couple of turns then back it off again. do this until you have reached bottom or have gotten the desired length of thread. don't forget to add fluid as you go.

For material thicker than 1/4" it is best to follow the steps as outlined:

**1** Mark the location for the threaded hole with the tape measure and scribe. With the center punch and hammer, center mark the hole location.

**2** Refer to the drill and tap chart to determine the correct size of the drill bit required for the tap. If the hole is larger than  $\frac{1}{2}$  an inch, you will need to drill a pilot hole before you can drill the final hole size. Do not use a pilot hole that is larger than 40 percent of the diameter of the final hole size. A larger pilot hole will cause the final drill bit to bind and break, resulting in a poor final hole quality or injury to the person drilling the hole.

The proper diameter for the hole to be drilled is called the Tap Drill Size.

**3** Insert the drill bit into the drill. Apply cutting fluid to the center mark that you placed on the metal and onto the drill bit. Drill the hole through the metal, using steady pressure. Apply additional cutting fluid as necessary to keep the drill bit cool. If you are drilling into stainless steel, pump the trigger to keep the drill bit moving slow. Increased drilling speeds will result in your drill bit heating up and losing its cutting edge. With stainless steel, slower is always better.

4 Clean the shavings from around the drilled area with a

clean rag. Insert the proper tap into the tee handle. It is NOT advisable to use a drill to run the tap through the hole as even slight pressure other than straight down will break the fragile carbide tap.

**5** Liberally coat the tap with cutting and tapping fluid. With the tap aligned straight with the hole, turn the tee handle clockwise to start tapping the hole.

6 Eliminate tap binding by turning the tee handle backwards 1/4 of a turn after each revolution of the tee handle. The 1/4 turn back will remove filing build-up from the front edge of the tap. Apply tapping fluid to the tap before continuing the tap into the hole.

7 Reverse the tap to remove it from the threaded hole. Attach the flapper wheel to the grinder and remove the burr from the hole. Test the threads with the correct size bolt to ensure that the bolt threads correctly.

#### PLASTICS

When working with plastic turn the tap handle slowly clockwise 1/4 turn. Then turn it counterclockwise--this is to remove plastic shavings. Turn the tap another clockwise 1/4 turn before turning it counterclockwise again. Continue in this fashion until the entire hole has been threaded. Finally, remove the tap by turning it counterclockwise and wipe away any plastic shavings from around the hole entrance.

#### **LUBRICANTS**

The use of a suitable lubricant is essential with most tapping and reaming operations. There are many good lubricants available on the market today. Recommended lubricants for some common materials are as follows:

Carbon Steel Petroleum-based or synthetic cutting oil.

*Alloy steel* Petroleum-based cutting oil mixed with a small amount (approximately 10%) of kerosene or mineral spirits. This mixture is also suitable for use with stainless steel.

*Cast iron* No lubricant. An air blast should be used to clear chips.

*Aluminum* Kerosene or mineral spirits mixed with a small amount (15–25%) of petroleum-based cutting oil. WD-40 and 3-In-One Oil are acceptable substitutes in some cases.

Brass Kerosene or mineral spirits.

**Bronze** Kerosene or mineral spirits mixed with a small amount (10–15%) of petroleum-based cutting oil.

## STANDARD DRILL & TAP SIZES

Tap & Clearance Drill		l Sizes		Тар	Drill		Clearance Drill				
Screw Size	Major Diameter	ajor Threads Minor Aluminum, Brass, & Steel, Stai neter Per Inch Diameter Plastics & Iron		read for tainless, ron	for less, Close Fit		Free Fit				
				Drill Size	Dec. Eq.	Drill Size	Dec. Eq.	Drill Size	Dec. Eq.	Drill Size	Dec. Eq.
0	.0600	80	.0447	3/64	.0469	55	.0520	52	.0635	50	.0700
1.0	.0730	64	.0538	53	.0595	1/16	.0625	48	.0760	46	.0810
		72	.0560	53	.0595	52	.0635				
2 .	.0860	56	.0641	50	.0700	49	.0/30	43	.0890	41	.0960
		64	.0668	50	.0700	48	.0760	37	.1040	35	.1100
3	.0990	48	.0/34	4/	.0785	44	.0860				
		30	.0771	40	.0820	43	.0890	32	.1160	30	.1285
4	.1120	48	0864	43	.0070	40	.0900				
		40	.0004	38	1015	7/64	1094				
5	.125	44	.0971	37	.1040	35	.1100	30	.1285	29	.1360
	1,140	32	.0997	36	.1065	32	.1160		10000	1000	0.000
6	.138	40	.1073	33	.1130	31	.1200	27	.1440	25	.1495
23	1202028	32	.1257	29	.1360	27	.1440	V.See h	L CARENA -	1.353.5	0.02512
8	.1640	36	.1299	29	.1360	26	.1470	18	.1695	16	.1770
-	1000	24	.1389	25	.1495	20	.1610		.1960	7	.2010
10	.1900	32	.1517	21	.1590	18	.1695	9			
		24	.1649	16	.1770	12	.1890		.2210	1	.2280
12	.2160	28	.1722	14	.1820	10	.1935	2			
0.6677	D MANROSAGE P	32	.1777	13	.1850	9	.1960	- 28	N) 4034633868 ()		
		20	.1887	7	.2010	7/32	.2188	F	.2570	н	.2660
1/4	.2500	28	.2062	3	.2130	1	.2280				
	1 1	32	.2117	7/32	.2188	1	.2280				
L Records of	Constant of	18	.2443	F	.2570	J	.2770	Ρ	.3230	Q	.3320
5/16	5/16 .3125	24	.2614	1	.2720	9/32	.2812				
		32	.2742	9/32	.2812	L	.2900				
12/17/27		16	.2983	5/16	.3125	Q	.3320	w	.3860	x	.3970
3/8	.3750	24	.3239	Q	.3320	S	.3480				
		32	.3367	11/32	.3438	T	.3580				
7.44		14	.3499	0	.3680	25/64	.3906	29/64	.4531	15/32	.4687
7/16	.4375	20	.3/62	25/64	.3906	13/3Z	.4062				
		28	. 3937	1	.4040	20/64	.4130				
4/2	5000	13	.4030	20/64	.4219	29/04	.4001	33/64	.5156	17/32	.5312
172	1.5000	20	.4307	15/32	.4551	15/32	.4000	33/04			
		17	4603	31/64	4844	33/64	5156				
9/16 5625	5625	18	4943	33/64	5156	17/32	5312	37/64	.5781	19/32	.5938
		74	.5114	33/64	.5156	17/32	.5312				
		11	.5135	17/32	.5312	9/16	.5625				
5/8	.6250	18	.5568	37/64	.5781	19/32	.5938	41/64	.6406	21/32	.6562
200	1. 1926.5	24	.5739	37/64	.5781	19/32	.5938				
11/16	.6875	24	.6364	41/64	.6406	21/32	.6562	45/64	.7031	23/32	.6562
3/4 .7500		10	.6273	21/32	.6562	11/16	.6875	49/64	.7656	25/32	.7812
	.7500	16	.6733	11/16	.6875	45/64	.7031				
		20	.6887	45/64	.7031	23/32	.7188				
13/16	.8125	20	.7512	49/64	.7656	25/32	.7812	53/64	.8281	27/32	.8438
7/8	.8750	9	.7387	49/64	.7656	51/64	.7969	57/64	.8906	29/32	.9062
		14	.7874	13/16	.8125	53/64	.8281				
		20	.8137	53/64	.8281	27/32	.8438				
15/16	.9375	20	.8762	57/64	.8906	29/32	.9062	61/64	.9531	31/32	.9688
	6723400	8	.8466	7/8	.8750	59/64	.9219	RESPONDEN	CONTRACTOR -	22	2011-0-00
1	1.000	12	.8978	15/16	.9375	61/64	.9531	1-1/64	1.0156	1-1/32	1.0313
		20	.9387	61/64	.9531	31/32	.9688				

## METRIC DRILL & TAP SIZES

Metric Tap &			Тар	Drill		Clearance Drill				
Cloaran	co Drill	75% Thr	ead for	50% Thr	read for					
Clearan	ce Dim	Aluminur	n, Brass,	Steel, St	tainless,	Clos	e Fit	Stand	ard Fit	
Siz	es	& Pla	astics	81	ron					
Screw Size	Thread	Drill Size	Closest	Drill Size	Closest	Drill Size	Closest	Drill Size	Closest	
(mm)	Pitch (mm)	(mm)	American	(mm)	American	(mm)	American	(mm)	American	
141 E	0.35	4.45	54	1.25	Dritt	1.60	Dritt	1 45	Dritt	
M1.5	0.35	1.15	55	1.25	54	1.00	1710	1.05	50	
M 1.8	0.35	1.45	53	1.55	1/16	1.90	49	2.00	5/64	
	0.45	1.55	1/16	1.70	51	1174		2.00	5101	
M 2	0.40	1.60	52	1.75	50	2.10	45	2.20	44	
M 2.2	0.45	1.75	50	1.90	48	2.30	3/32	2.40	41	
M 2.5	0.45	2.05	46	2.20	44	2.65	37	2.75	7/64	
4.2	0.60	2.40	41	2.60	37	2.15	1/0	2.20	20	
W 2	0.50	2.50	39	2.70	36	5.15	1/0	5.50	50	
M 3.5	0.60	2.90	32	3.10	31	3.70	27	3.85	24	
M 4	0.75	3.25	30	3.50	28	4.20	19	4.40	17	
246.2	0.70	3.30	30	3.50	28	1		300570		
M 4.5	0.75	3.75	25	4.00	22	4.75	13	5.00	9	
	1.00	4.00	21	4.40	11/64	5.25	141	5.50	7/22	
мэ	0.90	4.10	20	4.40	1/	5.25	c	5.50	5.50 7/32	
M 5 5	0.00	4.20	14	4.00	10	5.80	1	6.10	R	
M 3.3	1.00	5.00	8	5.40	4	5.00	1	0.10	D	
M 6	0.75	5.25	4	5.50	7/32	6.30	E	6.60	G	
and the second second	1.00	6.00	В	6,40	E	7.40 1 7.70				
M 7	0.75	6.25	D	6.50	F	7.40	L.	7.70	N	
	1.25	6.80	Н	7.20	J	0.40	0	0.00		
MO	1.00	7.00	J	7.40	L	0.40	Q	0.00	2	
MQ	1.25	7.80	N	8.20	Р	9.50	3/8	9.90	25/64	
mis	1.00	8.00	0	8.40	21/64		410		20101	
	1.50	8.50	R	9.00	T	10.50 Z 11.0				
M 10	1.25	8.80	11/32	9.20	23/64		11.00	7/16		
	1.00	9.00	T	9.40	U	11.70	20164	10.10	45.000	
M 11	1.50	9.50	3/8	10.00	X	11.60	29/64	12.10	15/32	
H 12	1.70	10.30	13/32	11.00	2//04	12.60	1/2	13 20	22/64	
M 12	1.30	10.50	27/64	11.00	7/16	12.00	172	13.20	33704	
	2.00	12.10	15/32	12.70	1/2	-				
M 14	1.50	12.50	1/2	13.00	33/64	14.75	37/64	15.50	39/64	
96212/22	1.25	12.80	1/2	13.20	33/64	5 (50%)E3			0.550.556	
M 15	1.50	13.50	17/32	14.00	35/64	15.75	5/8	16.50	21/32	
11.16	2.00	14.00	35/64	14.75	37/64	44.75	21/22	17.50	44/46	
W 10	1.50	14.50	37/64	15.00	19/32	10.75	21/32	17.50	11/10	
M 17	1.50	15.50	39/64	16.00	5/8	18.00	45/64	18.50	47/64	
M 18	2.50	15.50	39/64	16.50	41/64	19.00	3/4	20.00	25/32	
	2.00	16.00	5/8	16.75	21/32					
12.20	1.50	16.50	21/32	17.00	43/64		00.100	04.00	F. (7)	
M 19	2.50	16.50	21/32	17.50	11/16	20.00	25/32	21.00	53/64	
H 20	2.50	17.50	11/10	18.50	L3/32 A7/64	21.00	52/64	22.00	55/64	
M 20	1.50	19.50	47/64	10,00	2/4	21,00	53/64	22.00	55/64	
	1.00	10.00	47704	19.00	3/4					

# DIES ON THE OTHER HAND

Tap and dies are metal threading tools. Taps make internal threads inside a hole and dies make external threads on a round rod. They are often used for rethreading (cleaning up existing threads).

In a Tap and Dies Set the dies are the circular items with "teeth" on the inside.

Dies are used in the same manner as taps except they are used on a round rod instead of in a drilled hole. The die size you select should be the same size as the rod. IE If you want a 3/8" rod, you would use a 3/8" die.

In a Tap and Die Set you will find a Die Wrench which holds the particular Dies you wish to use. Do not use channel locks or other tools to work the Die.



Choose the correct Die. When using a tap and die set, there are corresponding sets of taps and dies in the kit. You should use a tap to re-cut the threads of a hole when you need to use a die, and vice versa. This is because, for example, if you only cut threads on the screw with your die and then try to stick the screw in the hole with the old threads, it probably won't fit well.

#### **CUTTING THREADS ON A METAL ROD**

• 1 Clamp the steel rod into the bench vice securely. Use the metal file to create a beveled surface along the edge of the rounded part of the rod. Secure the object you are working on in a vise and tighten it (see Resources). If the object slips while you are cutting new threads, it will mess up the threads, and you will have to secure the object and start over.



• 2 Measure the gauge of the threads on the hexagon nut using the thread gauge. Depending on the type of nut you are using the threads may either be course or fine and metric or standard. Record the size of the threads by looking at the marking on the side of the gauge.

• 3 Select the correct die from the die set that correlates with your gauge reading from Step 2. Secure the die into the die wrench by tightening the set screws on both sides of the wrench until the die is firmly seated.

• 4 Apply cutting fluid to the steel rod. Position the die wrench perpendicular to the steel rod.

• 5 Work the tap and/or die by twisting slowly. Turn the die wrench clockwise until you feel resistance, then turn it counterclockwise to free it up a little. Turn it clockwise once more until you feel resistance again, and turn it counterclockwise to free it up. You'll probably feel resistance every twist or two, so go slowly and be patient. A good rule is for every turn of the wrench back it off onehalf turn. Continue to turn the die wrench until the required length of steel rod is threaded.

• 6 Clean the threads with the shop towel to remove any metal shavings and excess cutting fluid.

• 7 Tighten the hexagon nut onto the new threads of the steel rod. Run the nut the full length of the threads and reverse it back off.

We always recommend using a quality cutting fluid. This will extend the life of the tools and improves the quality of the threads.



A couple of years ago when we would arrive at Gerlach for our Black Rock launches we were met by thousands of green pipes stacked up and being loaded from trains onto trucks to be hauled north. These were for the Ruby Gas Line they were building from Wyoming to Oregon. Gerlach was the staging station for the section directly north through the Vya area.







Most of us never gave a second thought to them other than they were headed up to a major construction site with gigantic machines plowing open trenches throught the desert landscape. In reality most of the pipeline was built like this, through wilderness, desolation and mud. Never thought of it this way huh?





# SOVIET ENGINEERING with versatility in mind

	BLUEPRINT	
Entrance > Exit <		
	<ul> <li>Things yo</li> </ul>	ou need to buy