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Department of
Agriculture

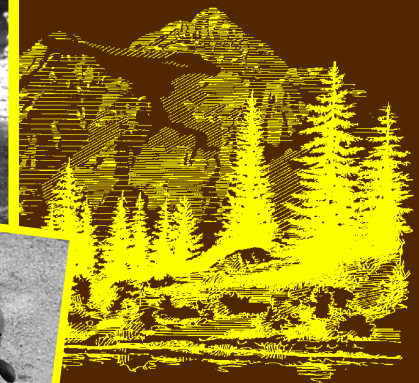
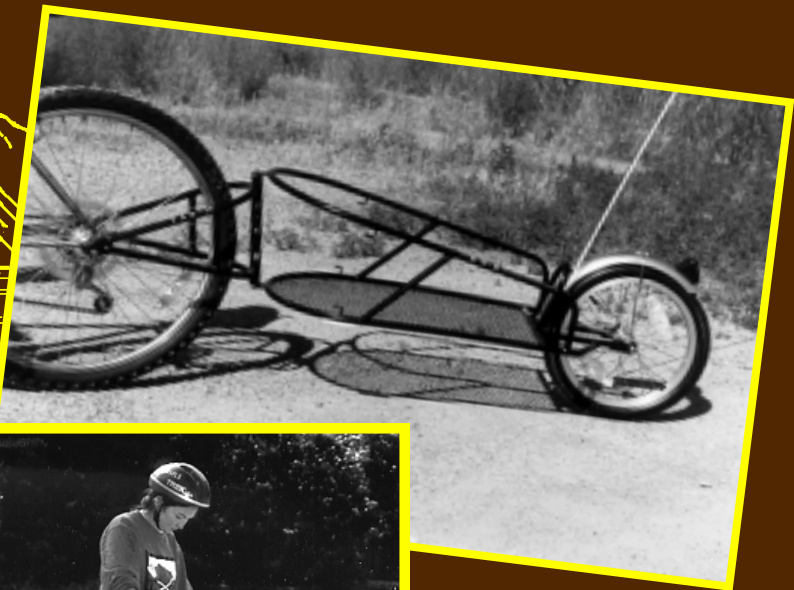
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Development
Program

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Mountain Bike Accessories for Trail Work



Brian Vachowski, *Project Leader*

7E72A47—Accessories for Transporting
Trail Maintenance Tools

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John Morris, Burley Design Cooperative

Sylvia Russell, Recreational Equipment, Inc.

Keith Wolferman, Missoula Aerial Fire Depot

MTDC Staff: **Bob Beckley, Windy Hayden, Bob Hensler, Gary Hoshide, Bert Lindler, and Sara Lustgraaf.**

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Introduction

Mountain bikes. You find them on nonwilderness trails everywhere. Continual improvements in bicycle suspensions, brakes, structural materials, and other key components allow mountain bikers to travel faster, farther, and with greater ease and dependability than ever before.

It should come as no surprise that mountain bike enthusiasts who also maintain trails have seen the benefits of using mountain bikes for trail work. This case study shows how the Seward Ranger District on the Chugach National Forest uses mountain bikes. In addition, it describes how the Missoula Technology and Development Center (MTDC) worked with the District trail crew to develop a bicycle-mounted chain saw carrier and evaluate several single-wheeled bicycle cargo trailers.



The Situation at Seward

Set in the beautiful and mountainous Kenai Peninsula south of Anchorage, Alaska, the Seward Ranger District has a short summer season, high visitation, and a shrinking trail maintenance budget.

In her project proposal to MTDC, District Trails Coordinator Irene Lindquist (Figure 1) provided some details about the trail program:

“The Seward Ranger District has a spruce bark beetle infestation which

has been spreading for the past several years. Each year, more dead trees are falling across the trails. Removing 2,000 trees with diameters averaging 15 to 24 inches is beginning to be the norm.

We are not located in a wilderness and the preferred method for trail employees to remove fallen trees is with a chain saw, adding to the weight of standard camping equipment. Heavy backpack loads combined with continuous mounting and unmounting of the pack and walking several miles cutting trees is physically and mentally exhausting.

We have been experimenting with mountain bike travel for early season tree removal

and have noted an incredible savings of time by 50% over backpacking. We have found mountain bike travel to be fast and easier on the body and mind than hiking with the gear and equipment in the proper situation. For the trails and circumstances where mountain bike travel is appropriate, we believe a good system with specially designed equipment is worth investigating.

Currently we mount a chain saw in a scabbard on the rear rack. Our front rack holds a set of panniers. A second traveler on mountain bike usually has panniers on front and back for the gas/oil and ax. We are trying new and more advanced designs of mountain bikes for the 1995 season. We have not come up with any new designs for carrying a chain

saw, gas/oil, and ax. We would like to design a bike and accessories capable of holding a chain saw (size similar to a Stihl 036 with a 20-inch bar) and 1.5 gallons gas, 2 quarts oil, wedges, ax, safety and first aid equipment, and personal gear for the day.”

At MTDC’s suggestion, the Seward trail crew also agreed to evaluate single-wheeled cargo trailers.



Figure 1—Irene Lindquist and Stephen Hmurciak (right) were principal evaluators for this project.

Benefits of Bicycles

We don't want to turn trail maintenance into another Extreme Sport. Picture it. Barely-in-control cyclists careening down mountain trails, chain saws in tow, grinning fiendishly as hikers scatter like terrified sheep at their approach.

To the contrary, we want to show you how members of one trail crew found that using mountain bikes for logging out some pretty tough trails allowed them to double their production without taking extraordinary risks.

The Seward trail crew has used mountain bikes since about 1989, but has increased the use of bikes markedly during the past 4 years. Currently, the District fields three, two-person bike teams to log out trails at the beginning of the summer season.

Irene Lindquist reports: *“Our number one savings utilizing mountain bike travel has been time. Running a close second is a lack of wear and tear on the employees' backs, knees, and feet.*

The savings of time not only benefits the Forest Service by allowing time saved to be used on bridge and tread maintenance,

it allows the recreating public to experience a less frustrating hike, bike, or horseback ride on our trails.”

Mountain bikes improve dramatically every year. In 1997, the District had six bikes:

- Two Novara Arribas without shocks, purchased in 1990
- Two Trek 970's with front shocks, purchased in 1994
- Two Specialized Rock Hoppers with front shocks, purchased in 1995.

Front shocks are a prerequisite for any new bicycles purchased.

The Seward District's mountain bikes are used hard and require constant maintenance and repair. Brake pads, in particular, need to be replaced weekly, or even more often when bike trailers are used. The District expects to spend about \$150 in parts for each bike per year, not counting the labor to install the parts.

The Seward trail crew is experienced. Crews use loaded mountain bikes on single-track trails considered moderate to difficult for ordinary mountain biking. Their use as described in this report represents difficult conditions and heavy wear. The scabbard and trailers described in this report make more sense and would be safer on easier trails.

On the Seward Ranger District, mountain bikes work best for logging out trails early in the summer. A two-person crew typically can log out 8 miles (12.8 km) in a 12-hour day. Crews have logged out as much as 11 miles (17.6 km) of trail in a single day. This is about twice as much trail as a hiking crew can log out in a day. Being able to return to the trailhead fairly quickly often eliminates the need for camping out. That means crews don't have to carry camping gear and food in addition to their equipment.

Mountain bikes have also proven invaluable for trail contract inspection. Irene Lindquist rode 20 miles (32 km) to check a contractor, then rode out, all in a single day. Hiking 40 miles (64 km) would have taken her 3 days.

Not for Everyone

Riding a mountain bicycle on any trail takes considerable skill. The rider needs to be in good physical condition. Controlling a heavily loaded bike on rough mountain trails requires much more—exceptional skill, endurance, strength, and experience. Make sure your crew has plenty of experience riding mountain bikes before loading one up with a chain saw or attaching a trailer.

Look at your own situation carefully before committing to a bike-mounted trail crew. This is not an easy decision. The easier the trail, the more mountain bikes make sense. Mountain bikes and other mechanical devices are not permitted in designated wilderness.

In Appendix A, we've enclosed two job hazard analyses prepared by the Seward Ranger District, one for using the mountain bikes and the other for using mountain bike trailers. Tailor your analyses to the local conditions and hazards—you might have cactus to contend with instead of bears.

Panniers

Irene Lindquist also wanted MTDC to investigate panniers that would hold 10 to 15 pounds of equipment: “We have tried several good-quality panniers and have had problems with the attachment system keeping the panniers on the bike racks. Because we are riding on trails which are not always smooth and have lots of bumps, our panniers have bounced free from the racks, and have blown seams.”

MTDC chose not to evaluate panniers because so many good ones are available. Basically, you get what you pay for with panniers. Generally, the most expensive bags are the strongest. Pay particular attention to the weight of the fabric, quality of stitching, and reinforcement. PVC-coated fabrics look especially strong and weather resistant. Bags with some sort of lock-

ing clip or clasp instead of open clips prevent the panniers from bouncing off the racks.

Quality retail and catalog suppliers carry a good selection of panniers that should meet your needs.

Chain Saw Carrier

Missoula smokejumper Keith Wolf-erman designed and fabricated the simple, yet effective chain saw carrier that MTDC sent to Alaska for testing (Figure 2). He built it to fit a Stihl 036 with 20-inch (508-mm) bar, a fairly large saw. If you decide you want some of these, build them to fit the saws you will be carrying. We do not recommend carrying saws larger than the one we tested. The smaller the saw, the easier it will be to transport.

The rack is simple. Three layers of $\frac{1}{2}$ -inch (12.7-mm), closed-cell foam were glued together with spray adhesive and topped by a $\frac{1}{16}$ -inch (1.6-mm) sheet of aluminum. The rack fits snugly on top of the bike rack as a cushion for the saw's power head (Figure 3).

The side scabbard was fabricated from two pieces of inexpensive, high-density $\frac{1}{8}$ -inch (3.2-mm) polyethylene plastic, with a $\frac{3}{8}$ -inch (9.5-mm) spacer between the pieces. The Seward trail crew found that the saw teeth chewed through the soft polyethylene, and they recommended that the inside of the top of the scabbard be lined with $\frac{1}{16}$ -inch (1.6-mm) aluminum, folded back over the top of the scabbard. Perhaps the teeth could be shielded from direct contact with the polyethylene by a tight-fitting rubber or plastic guard that could be slipped over the teeth before the bar was placed in the scabbard. We don't have all the details yet on the best fix for this problem.

We selected the heavy-duty Blackburn Expedition EX-1+ rear cargo rack as a mount for the chain saw scabbard. We also tried the heavy-duty Burley Moose Rack, available from that

company's dealers on special order. Both worked equally well. The Seward trail crew also used the carrier with the less expensive Blackburn Mountaineering rack. It worked fine, too.

We designed our prototype to be permanently mounted to the rack (Figure 4). This was a mistake, because the trail crew sometimes needed to remove the chain saw carrier without taking the rack off. All the fasteners on the cargo rack had been treated with Loctite to keep them from loosening. Future versions of the chain saw carrier need to feature bendable hook attachments rather

than solid loop attachments to hold both the power head cushion and side scabbard to the cargo rack.

So long as the saw was nearly all that was being carried, it could be carried safely, despite its high center of gravity and its weight on the back of the bike (Figure 5).

The bike's front shocks limit the ability to carry offsetting weight up front. Front cargo racks and shocks are not compatible. A second bike is needed to transport safety gear like chain saw chaps, first aid kit, gas, oil, personal protective equipment, saw kit, radio, bike tool kit, ax, water filter, personal gear, water, and food. Each bike carries at least 30 pounds (13.5 kg). Needless to say, use the smallest saw that will meet your needs.

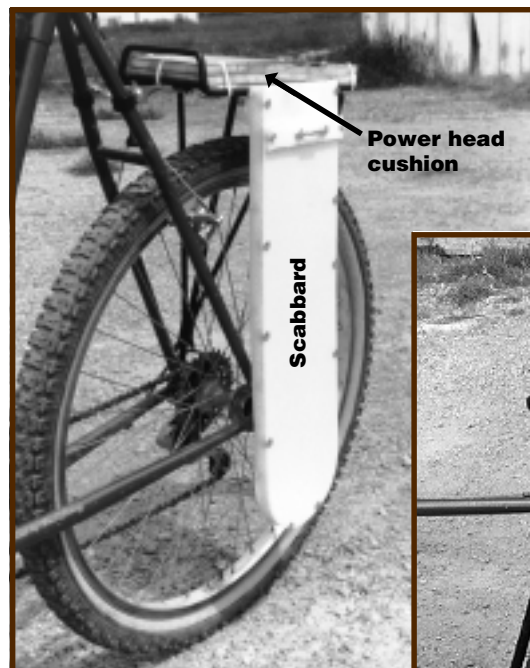


Figure 2—MTDC's prototype chain saw carrier consists of a power head cushion and side scabbard.



Figure 3—The power head cushion topped with sheet aluminum needs to be high enough so that the saw dogs clear the side scabbard. The height will vary with different brands of saws.

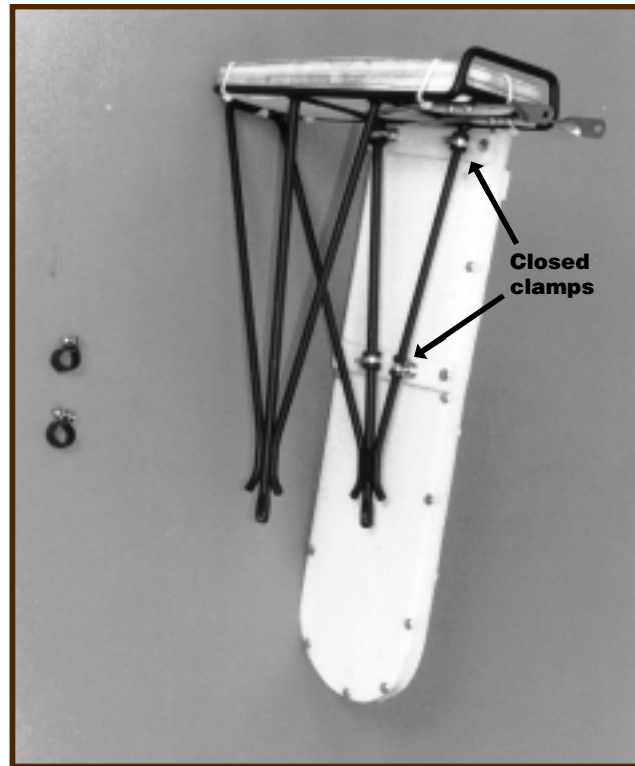


Figure 4—We should have used clips rather than the closed clamps shown so the chain saw carrier could be removed easily.



Figure 5—Two bikes, one for the saw and one for gear, are needed to outfit a crew. Handlebar bags on the front help to balance weight in the rear.

Trailers

Bicycle racks will only carry so much gear. We decided to evaluate single-wheeled cargo trailers as an alternative. Several double-wheeled trailers on the market might be suitable for old roadbeds and wide trails. We limited our evaluation to single-wheeled trailers because we were dealing with single-track trails on the Seward Ranger District.

Three single-wheeled trailers—the B.O.B. Yak, the B.O.B. Coz, and the Wheelie Pac Dog—are commercially available. Two others were prototypes that used a Burley Design Cooperative hitch system that mounts to this company's sturdy Moose Rack cargo carrier.

Some characteristics were common to all of the trailers. When trailers were loaded with 30 to 70 pounds (13.5 to 31.5 kg), all trailers and rack combinations hurt bicycle performance. The bikes were light in the front end, even though handlebar packs were sometimes used to help offset rear weight. When cyclists hit a root while climbing, the front tire often lifted or did a "wheelie." Steering was somewhat shaky most of the time. The extra weight pushed the bike down hills, testing brakes to their limits. Extra brake pads are essential. Poor tracking around curves limits the safe usage of the trailers on narrow, winding trails. Only expert riders should use trailers on steeper, single-track trails.

The Seward trail crew evaluators suggested that trailer brakes, not offered on any of the trailers, would be an improvement.

B.O.B. Yak Trailer

The B.O.B. Yak trailer (Figure 6) seems to be the most prevalent single-wheeled trailer being used by trail crews. Its features include an optional 5700-cubic-inch (94-L) Cordura cargo bag, chrome-moly steel frame, and 16-inch (406-mm) wheel. The bag will carry 70 pounds (31.5 kg). Its cargo space is 25 inches long, 16 inches wide, and 18 inches high (640 by 400 by 450 mm). Total weight (including the bag) is about 14 pounds (6.3 kg).

The B.O.B. Yak attaches to the hub of the rear wheel by means of a special quick-release skewer. With the special quick release left in place, the trailer can be attached or detached in seconds. The Seward trail crew found this to be the most stable connection to the bike with heavy loads. This trailer also rode the lowest to the ground. It carried handtools, chain saw, and day gear very well. Because its pivoting radius is limited, the B.O.B. Yak was the most difficult trailer to turn in tight spots.

The B.O.B. Yak has been in production for about 4 years. We have heard reports of welds breaking that attach the metal screen to the frame, and also two reports of the vertical pivot rod bending or breaking (Figure 7). The manufacturer has since beefed up the diameter of the pivot rod and nuts, and suggests that tightening the pivot rod nuts properly and sealing them with Loctite would eliminate this problem.

The International Mountain Bicycling Association (IMBA) has a 1994 memorandum of understanding with the USDA Forest Service to work cooperatively on mountain bicycling programs of mutual interest at national, regional, and local levels. Kurt Loheit, who is associated with IMBA, has designed a handtool holder that fits the B.O.B. Yak trailer (Figure 8). Kurt has shared his carrier plans with us. They are included in Appendix B.

The suggested 1998 retail price for the B.O.B. Yak is \$229, or \$259 with the fitted Yak Sak cargo bag.

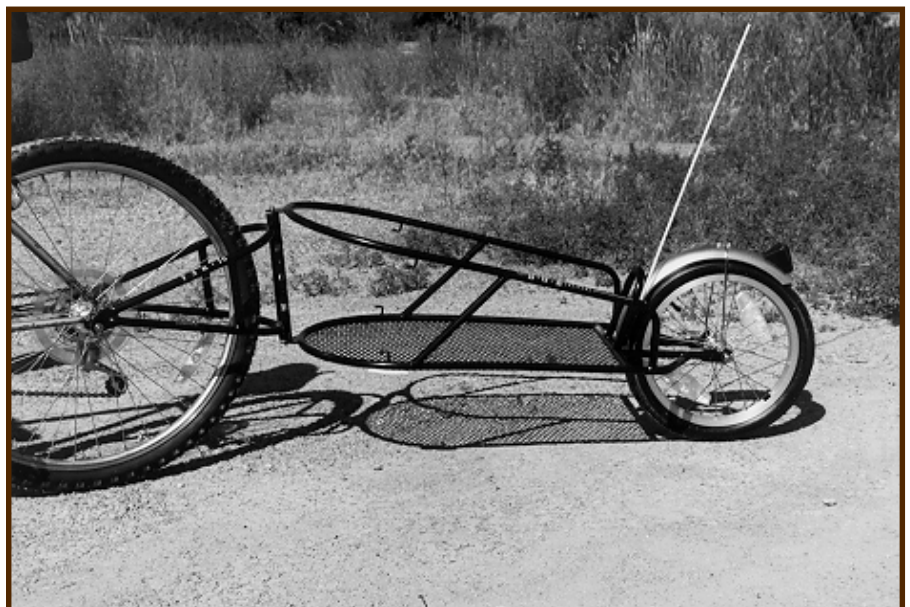


Figure 6—The B.O.B. trailer rides close to the ground and can be used with an optional cargo bag.



Figure 7—The pivot rod (under his thumb) bent on this B.O.B. Yak. On new models, the manufacturer is using a larger diameter rod and the pivot rod nut is sealed with Loctite to keep it from loosening.

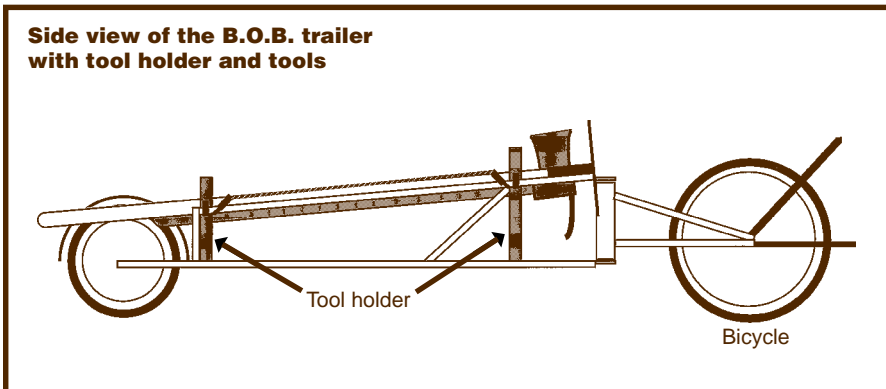


Figure 8—Kurt Loheit's tool holder for the B.O.B. Yak trailer is made of $\frac{5}{8}$ -inch (16-mm) polyethylene. See Appendix B for construction plans.

B.O.B. Coz Trailer

New for 1998 is the B.O.B. Coz (short for *Coz* mopolitan) cargo trailer. This single-wheeled trailer attaches to the bike in a manner similar to that used by the B.O.B. Yak, and features a 15.5-gallon (58.9-L) Rubbermaid lockable plastic box. Rubbermaid's larger

25.5-gallon (96.9-L) container will also fit the frame. The trailer weighs 20 pounds (9 kg)—more than the B.O.B. Yak—but is rated to carry only 50 pounds (22.5 kg), compared to 70 pounds (32 kg) for the Yak. It was not available when we were doing our testing. The suggested retail price for the B.O.B. Coz is \$199.95.

Whee Pac Dog Trailer

The Whee Pac Dog trailer (Figure 9) is manufactured and distributed by Innovation Sports, Inc. It weighs about 12 pounds (5.4 kg) with the cargo bag included. It is 6 feet, 4 inches (1.9 m) long, and can carry up to 60 pounds (27 kg).

The Whee Pac Dog carries loads in a cargo bag suspended from its aluminum frame. The trailer attaches to the seatpost (Figure 10). This attachment, in the opinion of our evaluators, was the least stable setup for heavy loads.

Seward trail crew evaluators liked the Pac Dog's light weight and the ease with which gear could be loaded in the back without the need for extra strapping and bungee cords. It carried day gear, handtools, and chain saw very well.

Because it is so long, the Whee Pac Dog tracks wide around curves. On narrow trails, the trailer tends to go off the trail on curves, carrying the bike and rider with it. Riders need to dismount before going around sharp corners, or should not use the trailer on such trails. The trailer probably was not designed for use on narrow, curvy trails.

The suggested 1998 retail price for the Whee Pac Dog is \$259, including the cargo bag.

Burley Design Cooperative's Prototype

We liked the sturdy looks of Burley Design Cooperative's unique hitch and pivot system and the Moose Rack, so we decided to have MTDC's shop build a prototype trailer featuring them.

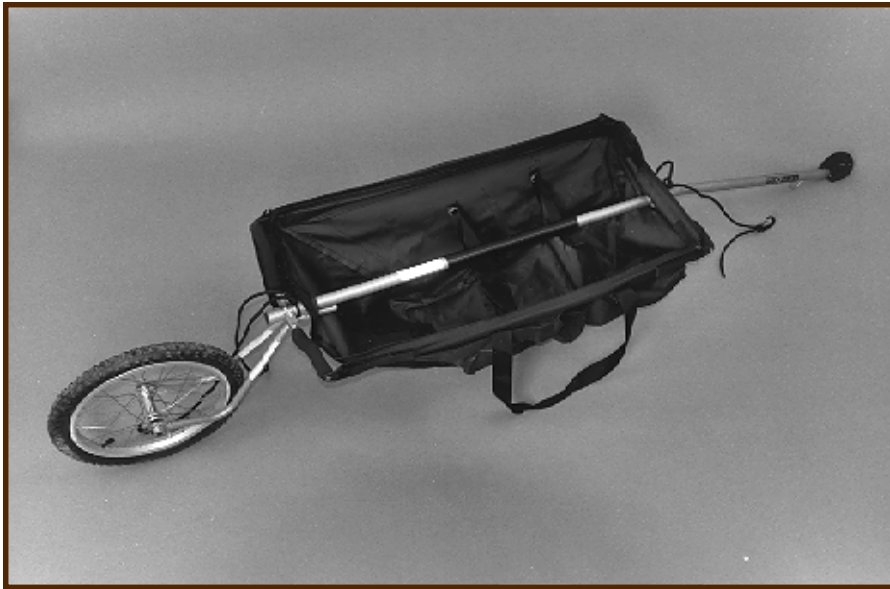


Figure 9—The Wheelee Pac Dog weighed less than the other trailers. The adjustable compartments in the bag provided versatility, and the outside side pockets were convenient.



Figure 10—The Wheelee Pac Dog is long and tracks wide around curves, a disadvantage.

Burley also shipped one of its own prototypes directly to the Seward Ranger District for testing.

Like a fifth-wheel trailer, the Burley hitch and pivot system attaches to the bike by clamping to the top of the Moose Rack, a TIG-welded chrome-moly steel rack that also accepts panniers (Figure 11). This hitch proved to be very sturdy, locking solidly to the rack. Play in the hitch's internal pivoting mechanisms on both prototypes allowed the loaded trailers to wobble slightly from side-to-side, even though the hitches were tightly fastened. The Burley product development manager said there should be no play in the hitch if it was adjusted properly. At the time of this discussion, we no longer had the hitches to see if adjusting them would have made a difference.

Burley's prototype was heavier than most of the other trailers, about 16 pounds (7.2 kg). Because it is a proprietary design and not yet in production, we are not showing a photo of it.

The prototype held up well in the Seward trail crew's evaluation. If Burley continues to develop it, the trailer should offer another good choice for a single-wheeled trailer.

The trailer designed by MTDC was not satisfactory (Figures 12 and 13). We started out with the Burley Hitch and Moose Rack, and a stripped down version of Burley's Piccolo trailercycle, a heavy-duty, chrome-moly unit intended as a trailercycle for a child to ride tandem behind Mom or Dad. So far so good. We went wrong by loading on heavy steel side supports, two fabric ATV bags for cargo, and ATV gun racks to carry a shovel and Pulaski. We even installed brakes, responding to suggestions that they would be useful. When all was said



and done, our trailer weighed nearly 40 pounds (18 kg)—more than twice as much as the others. Although we managed to drag it along some of the easier trails around Missoula, the Seward trail crew (politely) said it was too heavy for them to even contemplate using it.

Figure 11—Burley's hitch and pivot system and Moose Rack are used in their Piccolo trailercycle. The cables are for a brake on the MTDC prototype trailer.



Figure 12—Clueless in Missoula. We put too much emphasis on sturdiness and not enough on reducing weight. You'll need a locomotive to pull this 40-pound beast.



Figure 13—We used steel and accessories designed for ATV's, but neglected to consider the importance of using lightweight materials.

Product Sources and Organizations

Here are the sources for the products that were used in our evaluation. Other mountain bike trailers and racks are available and may be equally suitable. The listing below does not constitute an official endorsement by the USDA Forest Service.

Blackburn Racks

Blackburn Designs
Route 136 East
Rantoul, IL 61866
Ph: 800-456-2355

B.O.B. Yak and Coz Trailers

B.O.B.
3641 Sacramento Drive #3
San Luis Obispo, CA 93401
Ph: (805) 541-2554 or 800-893-2447
E-mail: bobinc@callamer.com
Web site: <http://www.callamer.com/bobinc>

Burley Piccolo and Moose Rack

Burley Design Cooperative
4020 Stewart Road
Eugene, OR 97402
Ph: (541) 687-1644 or 800-311-5294
Fax: (541) 687-0436
E-mail: burley@burley.com

Wheelee Pac Dog

Innovation Sports, Inc.
7 Chrysler
Irvine, CA 92618
Ph: 800-222-4284
E-mail: sales1@isports.com

International Mountain Bicycling Association (IMBA)

IMBA
P.O. Box 7578
Boulder, CO 80306
Ph: (303) 545-9011
E-mail: imba@aol.com
Web site: <http://www.imba.com>

About the Author

Brian Vachowski has been a Project Leader specializing in recreation, trails, and wilderness projects at MTDC since 1993. He received a bachelor of science degree in forestry from the University of Massachusetts

in 1974, and a master of science degree in outdoor recreation from Utah State University in 1976. Brian has worked for the Nez Perce, Bighorn, Winema, and Routt National Forests in recreation, wilderness, lands,

planning, rural community assistance, special uses, fire, and timber positions. Before coming to MTDC he was an assistant staff officer for wilderness and recreation on the Nez Perce National Forest.

Appendix A—Job Hazard Analyses for Riding Mountain Bicycles and for Trailers

USDA - Forest Service	1. Identify Job or Project to be Analyzed	2. Location	3. Unit
	MOUNTAIN BIKE RIDING	Seward Ranger District	(Chugach NF)
JOB HAZARD ANALYSIS	4. Name of Analyst Stephen Hmurciak	5. Job Title of Analyst Trail Crew Leader	6. Date Prepared 8/92
	7. Hazards	8. Actions to Eliminate Hazards (Specify safe work procedures and personal protective equipment)	
Mechanical Failure		Before each ride check tire pressure & tightness of wheels, adjust brakes & bounce to listen for rattles. Keep a thorough monthly & yearly maintenance schedule.	
Vibrations causing circulation problems		Wear padded or gel gloves; use a gel seat cover; use a bike with front suspension when riding on trails; don't grip handlebars extremely tightly.	
Falls		Wear helmet and gloves; ride slowly & carefully observe the trail ahead; tie up loose pant legs; walk bike when trail becomes too rough or obscured by brush or grass.	
Endos (head first over the handlebars)		Always wear helmet; apply pressure evenly to front & rear brakes; don't attempt to jump over abrupt obstacles like waterbars and open drains; ride slowly and observantly.	
Surprise encounters with other trail users		Ride slowly; ring bell when approaching a blind corner; slow way down or get off and walk when passing hikers or other cyclists; get off to downhill side for horses.	
Bears and wildlife encounters		Watch for wildlife crossing trail; carry pepper spray mounted on handlebars or bike frame; ring bell in high risk bear areas and on blind corners.	
Serious Injuries		Carry a radio and first aid kit; sign out at office or let someone know where you are going.	
Hypothermia		Wear less clothing when riding uphill and more when riding downhill; wear raingear and wind protection when needed.	
Dehydration		Carry lots of water and drink frequently.	
Sore rear end, clothing getting caught in chain, too much sweating.		Wear padded bike pants, don't use pants with loose pant legs, wear synthetic clothing for riding mtn. bikes.	
Head and Face Injuries		Wear helmet and goggles or shatterproof sunglasses; watch for overhanging branches and brush; avoid going over the handlebars head first.	
Hazards of carrying loads		Make sure paniers are secure and not in way of wheels or feet; loads on racks should be lashed tightly and not stick out the sides; cover all sharp tool edges; don't wear backpack while riding; keep weight balanced.	
9. Approved By		10. Title	11. Date

USDA -Forest Service	1. Identify Job or Project to be Analyzed	2. Location	3. Unit
JOB HAZARD ANALYSIS	Trailer with a Mountain Bike	Various Trails on SRD	Seward Ranger District
	4. Name of Analyst	5. Job Title of Analyst	6. Date Prepared
	Irene B. Lindquist	Forest Technician	7/9/97
	7. Hazards	8. Actions to Eliminate Hazards	
		(Specify safe work procedures and personal protective equipment)	
	Falls From bike due to pulling a trailer which makes travel on a bike more unstable. Falls due to the trailer not tracking behind the bike on corners	Wear protective helmet, walk the bike when it's difficult to steer. Walk the bike and trailer around tight corners. Carry first aid kit.	
	Loss of braking ability due to loaded trailer pushing the mountain bike, especially down hills.	Don't load the trailer too heavy if you are traveling a trail w/many hills. Check brake pads before you go & take extra brake pads with you to replace worn pads.	
	Physical exertion leading to loss of fluids, fatigue, and heat exhaustion. Mountain bike riding on the trails is a physically demanding activity in itself, add the weight of a trailer and you have an even more physically demanding task.	Since mountain biking and pulling a trailer on the trails is a physically demanding activity, be sure only people who are in excellent physical condition who have good coordination ride the bikes with trailers. Drink lots of fluids before, during, and after your trip, and replace lost electrolytes with drinks such as Gatoraide Sports Drinks. Carry a water filter.	
	Breakdowns of trailer and or bike.	Carry items to help you repair a breakdown. See list of suggested mtn. bike parts in the Trails Dept. Also carry a few items to help in repair of trailer hitch, such as pins, wire, etc.	
	People unfamiliar with bikes and trailers.	Review hazard analysis on mountain bike riding with an experienced trail rider. Experience trailering with light (20 lbs) loads. Keep trailer load under 40 lbs Only trailer on well maintained Mountain Bike trails.	

Appendix B—Kurt Loheit's Tool Holder (Fits B.O.B. Yak Trailer)

List of materials for the tool holder:

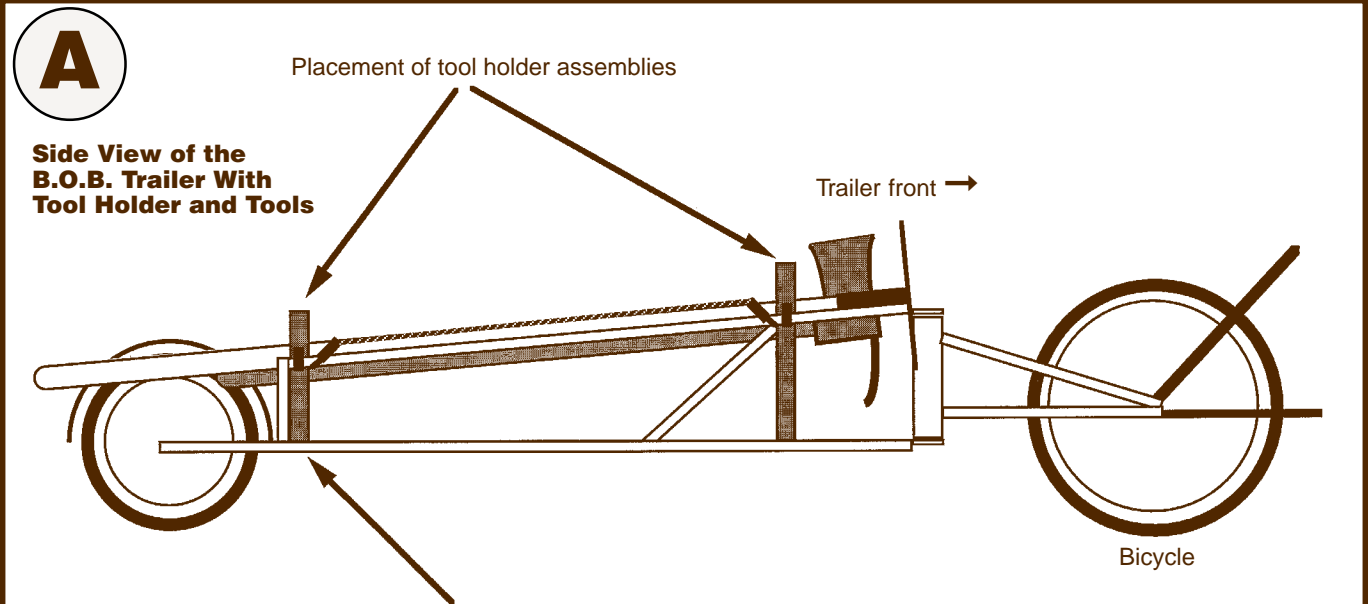
- 1 each — $13\frac{7}{8} \times 5\frac{3}{4} \times \frac{5}{8}$ -inch polyethylene sheet or equivalent
- 1 each — $15\frac{3}{4} \times 6 \times \frac{5}{8}$ -inch polyethylene sheet or equivalent
- 2 each — $9\frac{1}{2} \times \frac{3}{4} \times \frac{3}{4}$ -inch C-channel aluminum
- 2 each — $13\frac{1}{4} \times \frac{3}{4} \times \frac{3}{4}$ -inch C-channel aluminum
- 4 each — $1\frac{1}{2} \times \frac{1}{2}$ -inch steel angle brackets
- 12 each — No. 8 $\times \frac{5}{8}$ -inch self-tapping screws
- 16 each — No. 8 $\times \frac{3}{8}$ -inch bolts
- 16 each — No. 8 large-diameter washers
- 16 each — No. 8 nylon lock nuts
- 4 each — Cable clamps, $\frac{5}{8}$ -inch diameter (metal preferred)

List of tools:

- $1\frac{1}{8}$ -inch-diameter hole saw
- $1\frac{1}{2}$ -inch-diameter hole saw
- Hacksaw
- Screwdriver
- Wrench
- Hand drill with No. 8 clearance drill, and No. 8 tap drill bits

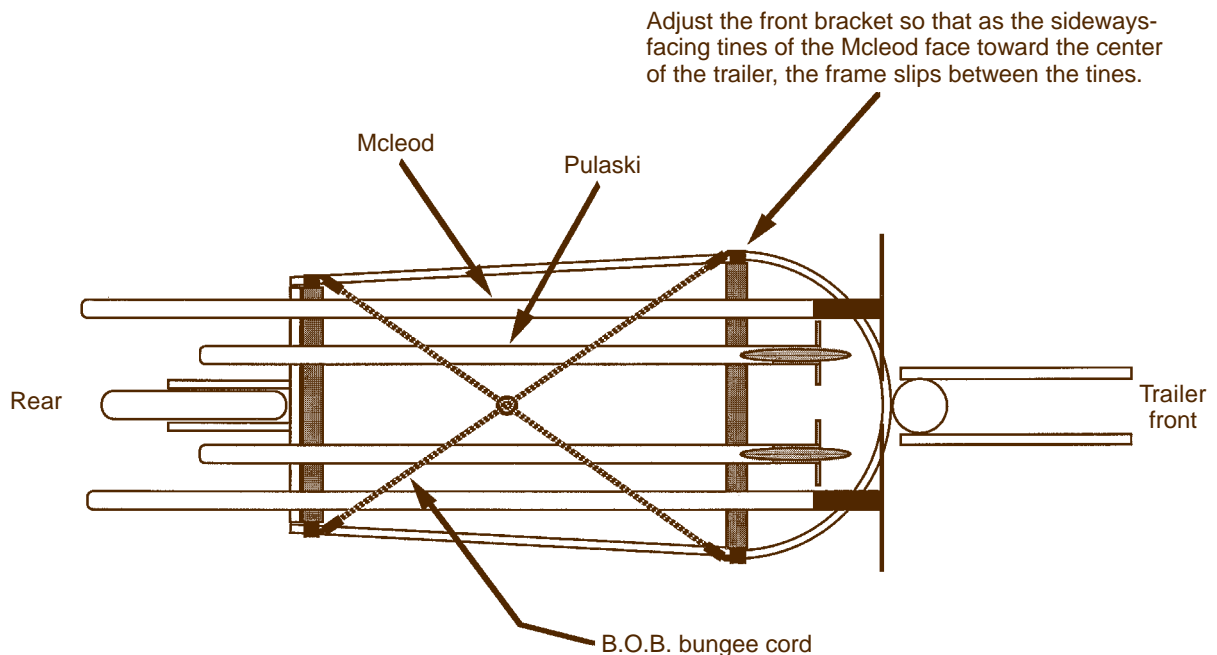
Assembly:

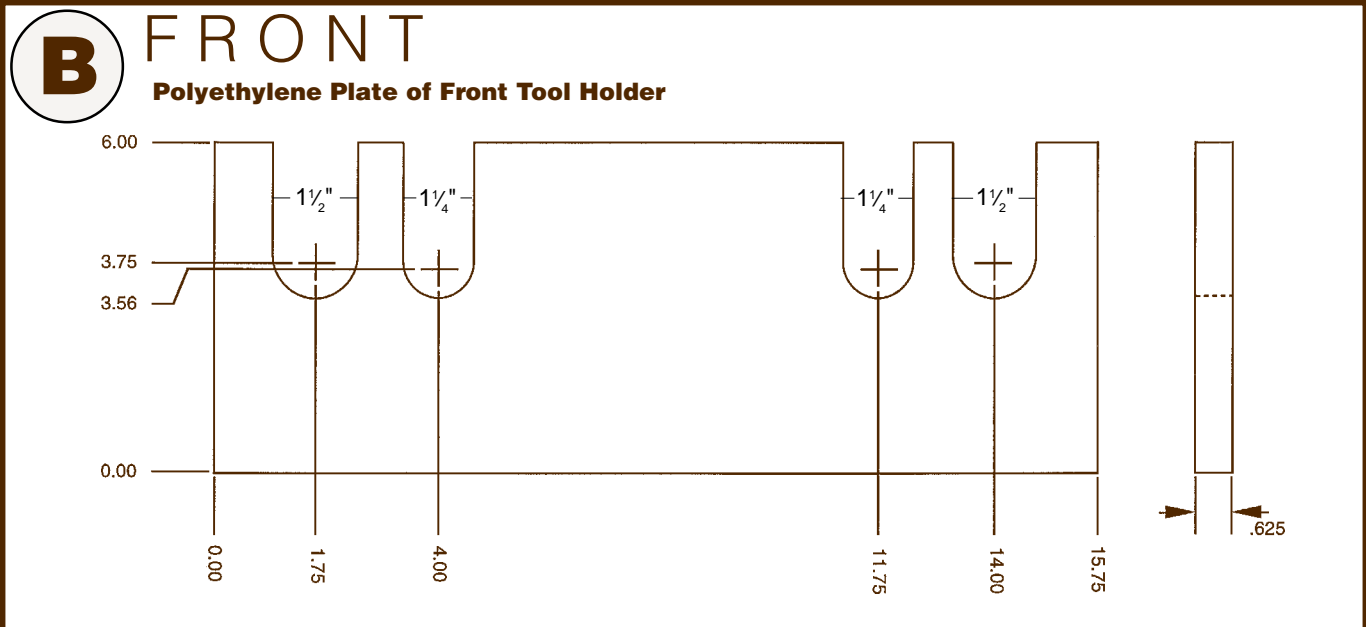
- Side and elevation drawings of the trailer and assembled tool holder are shown in Drawing A.
- Start by fabricating the tool holder plates (Drawings B and C). The widths may vary from trailer to trailer, so all parts should be fitted before the final assembly.
- Cut the aluminum C-channel into the specified lengths.
- Attach the C-channel to the plates using the self-tapping screws.
- Drill the clearance holes for the screws going into the C-channel that will hold the angle brackets to the tool plates. Use the No. 8 tap drill and drill only $\frac{1}{8}$ - to $\frac{1}{4}$ -inch deep.
- Attach the angle brackets to the C-channel using the No. 8 bolts and lock nuts.
- Once the tool holders are assembled, fit them onto the trailer. Place a McLeod in the holders to adjust the front holder so that the McLeod tines straddle the trailer frame. (The rear holder sits all the way to the back of the trailer.)
- Now mark the C-channel for the location of the cable clamps.
- Attach the clamps around the trailer frame and screw them into the tool holder.
- Attach the angle brackets to the trailer, inserting the No. 8 bolts through the brackets and the mesh bottom of the trailer. Use the large-diameter washers with lock nuts.
- Now the tools can be placed in their slots and secured with the 4-point bungee supplied with the trailer.



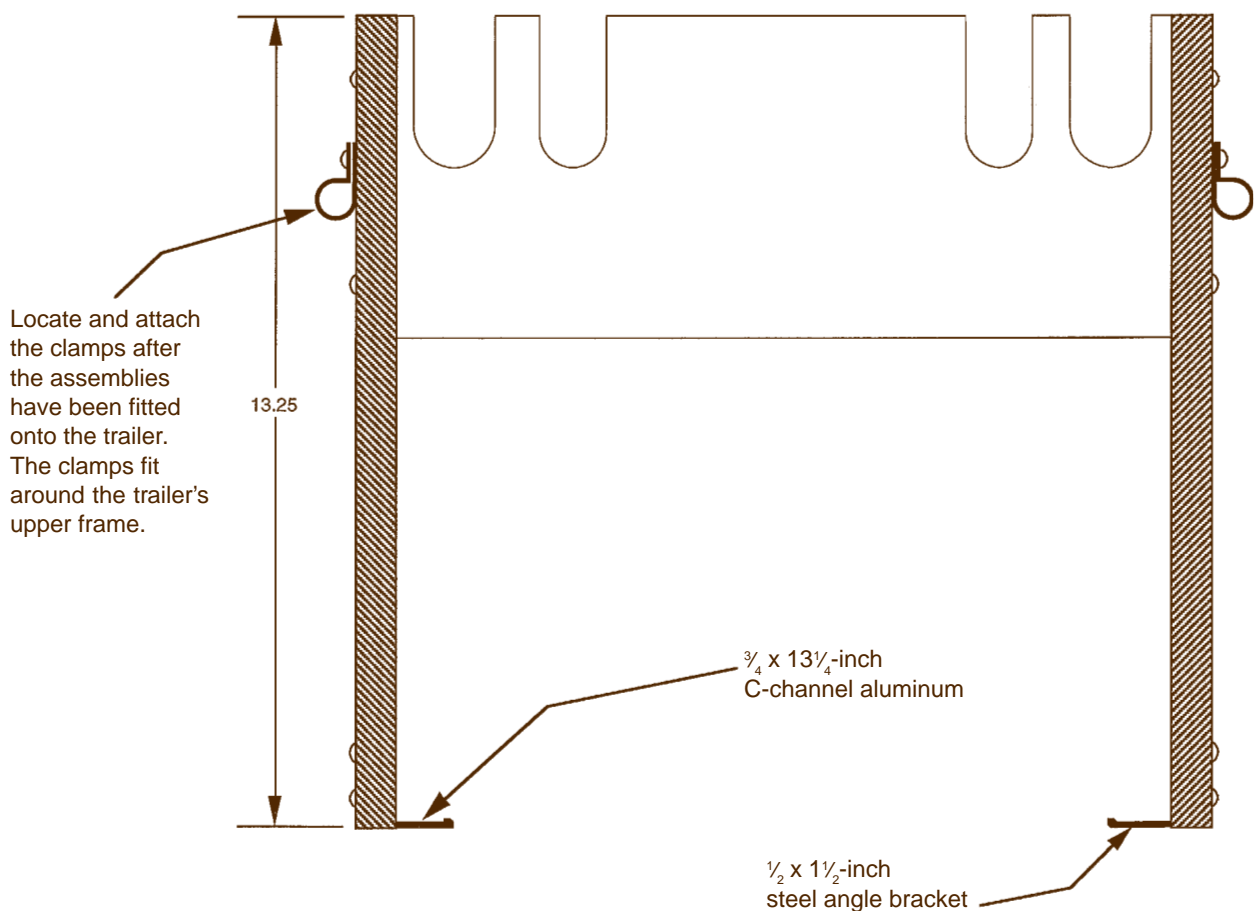
Use 8-32 x 1/2-inch hardware to attach the tool holders. Place the large washers on the wire-mesh bottom of the trailer to prevent the nuts from pulling through. Secure it with the lock nuts.

Top View of the B.O.B. Trailer With Tool Holder and Tools



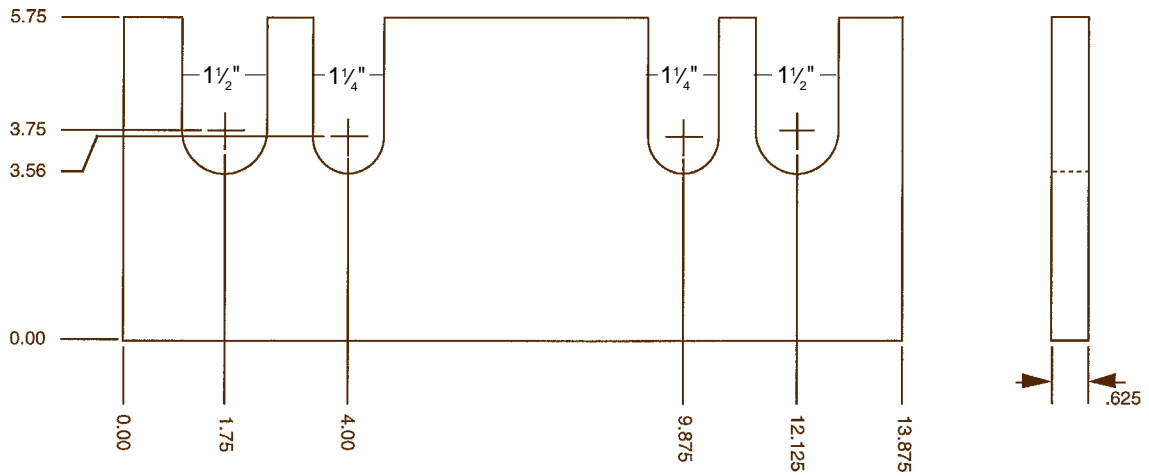


Assembled Front Tool Holder

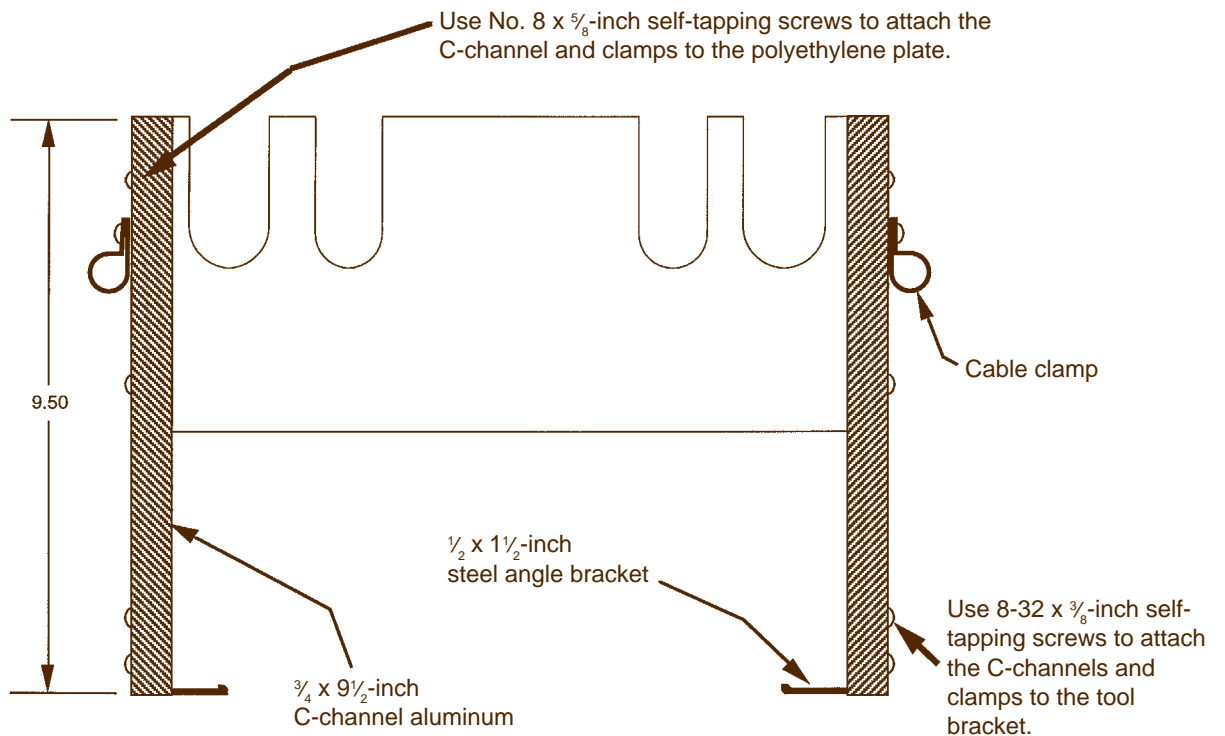


C REAR

Polyethylene Plate of Rear Tool Holder



Assembled Rear Tool Holder



Library Card

Vachowski, Brian. 1998. Tech. Rep. 9823-2812-MTDC. Missoula, MT: U.S. Department of Agriculture, Forest Service, Missoula Technology and Development Center. 21 electronic p.

Describes how trail crews using mountain bikes have doubled production while logging out deadfall from trails on the Seward Ranger District. Shows a design for a bicycle-mounted chain saw carrier, and evaluates several single-wheeled bicycle trailers. Construction plans for a trailer tool holder and product sources are included.

Keywords: bicycle trailers, mountain bicycles, trail equipment, trail maintenance.

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