

Roscommon Equipment Center Program

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FIRE CONTROL USE OF ALL TERRAIN VEHICLES



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Northeast Forest Fire Supervisors

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INTRODUCTION

Many fire agencies have been using, or are interested in using, All Terrain Vehicles (ATV) at the fire line. Common questions that have prompted the request for this report are:

1. How stable are these vehicles?
2. What is the proper way to load the vehicles?
3. Is the operator adequately protected against injury from brush or limbs intruding on the operating area?
4. Is it practical to trailer loads into remote areas with these vehicles? If so, what is a good trailer?

5. What is a recommended trailer for transporting the vehicles to the fire site?
6. Is it practical to develop a trailer to haul the vehicle to the fire site and use the same trailer behind the ATV at the fire site?

Many other questions have been asked. This paper is intended to help guide purchasers and users of ATV's for fire control. In order to provide timely basic information to these readers, the project scope was narrowed to include items of interest that did not require extensive testing. The work was hampered by slow (or in some cases, no) response for technical information from ATV manufacturers.

ATV DEFINITION

A number of changes have occurred in the ATV business in the last two years. Much of this was the result of the high accident rates and ensuing legal action taken by the United States Department of Justice against the ATV manufacturers. On April 28, 1988, Judge Gerhardt Gesell approved the final Consent Decree in the case of the United States vs. American Honda Motor Company, et. al., Civil #87-3525 (D.D.C.). This was an agreement between the then four major distributors of ATV's and the government to take action to enhance ATV safety. The decree resulted in:

- The "Stop Sale" of all new 3-wheeled ATV's
- A public awareness campaign to educate operators about safe use
- A training program available at time of sale provided by the dealers
- Development of a voluntary standard for manufacturing the vehicles.

The Consumer Product Safety Commission (CPSC) was the government group charged to monitor compliance of the manufacturers' actions with the Consent Decree. Legal action

resulted in the four major Japanese manufacturers jointly creating the Specialty Vehicle Institute of America (SVIA). An objective of SVIA was to develop a program to meet the actions required by the Consent Decree. SVIA has become the industry's focal group for developing ATV standards required by the court.

The basic vehicle standards (ANSI/SVIA 1-1990) were approved by the American National Standards Institute. In model year 1990 the manufacturers began producing vehicles that meet the proposed standard. This has helped greatly in defining the scope of this project. The majority of this project will pertain only to vehicles defined as an ATV, according to the proposed ANSI standard (see Figure 1).

Utility models (Category U) will be the vehicles that are of primary interest to fire control agencies. Because of Intra-agency multiple use, general use models (Category G) might also have some application.

Sport and youth ATV's (Categories S and Y) will not be considered in this report. The reader should not interpret discussions in this report to apply to S or Y Category ATV's.

Definition: All Terrain Vehicle (ANSI/SVIA 1-1990)

Any motorized off-highway vehicle 50 inches (1270 mm) or less in overall width, with an unladen dry weight of 600 pounds (275 kg) or less, designed to travel on four low pressure tires, having a seat designed to be straddled by the operator and handlebars for steering control, and intended for use by a single operator and no passenger. Width and weight shall be exclusive of accessories and optional equipment. ATV's are subdivided into four categories as follows:

Category G (General Use Model) ATV: An ATV intended for general recreational and utility use.

Category S (Sport Model) ATV: An ATV intended for recreational use by experienced operators only.

Category U (Utility Model) ATV: An ATV intended primarily for utility use.

Category Y (Youth Model) ATV: An ATV intended for recreational off-road use under adult supervision by operators under age 16. Youth model ATV's can further be categorized as follows:

- Category Y-6 ATV: A category Y-6 ATV is a youth model ATV which is intended for use by children age 6 and older.
- Category Y-12 ATV: A category Y-12 is a youth model ATV which is intended for use by children age 12 and older.

Figure 1 – ATV Definition

POSSIBLE FIRE CONTROL USES

The Missouri Department of Conservation has been using ATV's in some districts for several years. In 1989, they surveyed 18 districts regarding uses of these vehicles in fire control. While not scientific in nature, the responses shed light on some possible uses for the machines. Of the 18 districts, six had experience using ATV's on fire control; 12 did not. Of those districts that have used ATV's, all indicated that there could be some role for the machines in fire control. Two districts felt there was not use. Possible fire control uses and the opinions of such use by Missouri fire control personnel follow.

Patrol or Scouting: Reconnaissance at the fire was most often cited as a plausible use. Little or no modification of the vehicle is needed for this activity, nor is extra equipment. Five out of six fire control ATV users responded that this was a valid task. Nine of twelve responders who had not used ATV's expected this to be a possible use.

Water Pumping/Tank Unit: Those who had used the ATV's at fires, wanted water tank units. These could be mounted on cargo racks or trailer. Mop-up was the use most often cited. Only six out of 12 non-ATV users said water tanks were desirable.

Trailer Loads: Trailers have the potential to increase the cargo capacity of an ATV. Limitations will be discussed later. Seven of 18 Missouri districts had interest in trailering. Some desired a dual purpose trailer – ability to haul the ATV to the fire and then be used behind the ATV.

Leaf Blowing: Leaf blowing is a technique used in many areas of Missouri and Appalachian states. Agencies that use backpack leaf blowers might be interested in adding this capacity to an ATV. Missouri has made some attempt at a trailer leaf blower, but not without sacrificing some maneuverability and stability. In all, ten of 18 districts thought

leaf blowing was a desirable task to try with an ATV.

Carrying Tools and Supplies: Similar to some of the above categories, hand tools, pumps, hose, and food are potential items to be hauled into remote sites.

SAFE USE

Almost all sections of this report present information concerning safe use of ATV's. This section concentrates on the safety topics.

Training: Managers often have concerns about the safety of ATV's. One of the most significant effects of the ATV Consent Decree was the establishment of training programs. There is "hands-on" training available at more than 500 sites throughout the United States. The Consent Decree requires ATV distributors to offer this training program to all interested persons. Those who have purchased new ATV's may take the course free of charge. Agencies can use the ATV Safety Institute¹ (ASI) to provide training or train instructors to teach their personnel.

Besides mandating training programs, the Consent Decree resulted in training support materials, such as manuals and guides, to help instruction. Further information on these programs and materials can be found by calling ASI at 800-447-4700.

Protective Clothing: The type of riding conditions that exist in fire control situations demands that the rider wear protective clothing. The following is a list of protective gear needed to reduce the chance of injury because of spills or contact by brush and limbs:

- Motorcycle helmet
- Eye protection
- Boots
- Gloves
- Long pants
- Long sleeved shirt or jacket

Helmets should meet Department of Transportation, American National Standards Institute (ANSI-90.1) or Snell Memorial

¹ ASI produces safety programs and material and is also a part of SVIA.

Foundation standards. Further information can be obtained by contacting ANSI at 800-447-4700.

Brush Protection: Maneuverability is one of the ATV's greatest assets. The rider can manage these vehicles through tight terrain in the forest. This also means that the rider and machine must be able to withstand the potential of some abuse from rocks, stumps, and limbs. Some of this protection will be afforded to the driver by his personal protective gear. Another concern that has been reported has been the entrance of limbs and spears coming up from the footrest area into the operator area. This would most likely occur with ATV models that have foot pegs. The addition of running boards might help prevent this problem. You may need to consider underbody protection for the ATV. If so, this should be done in a manner that allows adequate cooling of the engine and access for maintenance of the vehicle.

Stability: The ANSI/SVIA 1-1990 standard addresses pitch stability. Pitch stability is defined as the resistance of the vehicle to overturn rearward. Model year 1990 ATV's meet this standard. Lateral stability (the resistance to sideways roll over) is another major concern. The CPSC and SVIA have had difficulty in agreeing on criteria to define and test for lateral stability. It will be some time before a lateral stability standard will be in place. In the interim, ATV manufacturers agreed that any new model ATV introduced must have at least as much static lateral stability as that of any models currently produced.

The weight of ATV's is relatively small. The weight of the operator is a significant addition to the total mass of the system. Likewise, additions of small water tanks or other cargo adds significant mass to the system. Because of this, analysis of the vehicle's stability must consider all of these parts. Weight shifts of the

operator can be used to help stabilize the vehicle or can hinder it. Operators and managers must understand these facts. Proper

loading and proper driving techniques are important.

ATV STANDARDS

As was mentioned earlier, ANSI/SVIA Standard 1-1990 was approved in February, 1990. These detail certain requirements the manufacturers must meet. Beginning with the 1990 model year, all ATV's that were produced by the manufacturers met these standards. Standards include the following requirements that might be important to fire control agencies:

1. Equipment configuration including brakes, operator controls, tire, mechanical suspension, and owners manuals.

2. Performance of service and parking brakes.
3. Pitch Stability. As mentioned previously, no final agreement was reached on criteria for lateral stability. Work is continuing on reaching agreement concerning lateral stability standards.

Also the SVIA is working with the Society of Automotive Engineers (SAE) on lighting and fuel retention standards.

SPECIFICATIONS

ATV Manufacturers

Presently five companies are manufacturing or distributing ATV's that meet the ANSI standards definition. These are:

- American Honda Motor Company, Inc., 100 West Allondra Boulevard, Gardena, CA 90247
- American Suzuki Motor Corporation, P.O. Box 1100, Brey, CA 92621
- Kawasaki Motor Corporation USA, P.O. Box 25252, Santa Ana, CA 92799-5252
- Polaris Industries, Ltd., Route 1, Box 35A, Roseau, MN 56751
- Yamaha Motor Corporation USA, 6555 Katella Avenue, Cypress, CA 90630

Each of these companies has a number of dealers throughout the country where current information on their product line may be obtained. Kawasaki and Polaris did not respond to technical inquiries by REC.

Strongly Recommended Features

This and the next section list options and features that should be considered when building specifications for ATV purchases. You may not be able to find an ATV model that contains all the features you prefer. In other words, to get a machine with a highly desirable feature, you may not be able to get some other desirable features.

For fire control use, the following features should be specified:

Reverse: A reverse gear adds convenience and off-road maneuverability for utility ATV's. A transmission with reverse is highly desirable. If pulling a trailer, it will be a necessity. The following section will discuss other transmission options.

All-Wheel Drive: In mud and soft ground a rear wheel drive ATV will have trouble pushing the front tires. An ATV purchased for fire control should have all-wheel drive to prevent this problem.

Other Features to Consider

Other considerations that may be important to ATV purchase specifications are listed in this section. We have not fully evaluated the merits or shortcomings of these characteristics. The variety of intended ATV use and yearly changes in the model lines of these machines makes full analysis difficult. Each agency must do some research and decide which, if any, of these characteristics is necessary to include their specifications.

Braking: The ANSI/SVIA standards require brakes for all four wheels. The manufacturer can choose to have the front and rear brakes operate independently, together by single control, or both. If the agency has a preference, it should be stated in the specification. Variations in handling and driving technique will occur for differing brake system configurations. Agency-wide standardization would be desirable.

Throttle Control: Two types of throttle are used on these types of vehicles – twist grip or thumb lever. If a strong preference or need is identified for one type over the other, make sure to include this in the specification. Agencies building fleets of ATV's to be used by different operators should consider standardizing on one type of throttle. This will simplify training and promote safety.

Transmission: Three types of transmissions exist: hand operated clutch, automatic clutches, and fully automatic transmissions. Select the type best suited for your use. Agencies again

should look at standardizing the type transmission to facilitate training and interchangeability of operators.

Power Take Off (PTO): At this writing, one manufacturer offers a model with a Power-Take-Off (PTO). This is the Yamaha model YFP350 (Terrapro). Using the vehicle's engine to drive a pump would save the weight of an auxiliary motor. This would make the use of an ATV for a water pumping unit more viable. *The purchaser should make sure that a water pump exists which matches the PTO and provides the necessary performance.* The manufacturer or dealer could provide help. The ANSI standards require that the manufacturer provide an automatic means to stop the PTO or engine of an ATV when the operator leaves the normal seated position. This is similar to garden-type tractors.

Shaft vs. Chain Drive: State the preference if it is important. We had no data to preclude the use of either type.

Electric vs. Kick vs. Pull Starter: Most models now have electric start with a recoil backup.

Air vs. Water Cooling: Some of the larger engine utility models are liquid cooled. Long term engine reliability and engine heating problems at the fireline are beyond the scope of this report.

LOAD CAPACITY

The ATV manufacturers discuss the load capacity of their machines in the operator manual. The manual will define the maximum load determined by the manufacturer for the vehicle. Typically, the utility type ATV's have a front rack and a rear rack to carry loads. Front rack capacities generally vary from about 30 to 75 pounds; rear racks normally vary in capacity from 100 to 175 pounds.

Handling

The operating weight of an ATV, with the operator and maximum loading of the racks, could be as much as 1,050 pounds. Rack loads will raise the center of gravity. As weight increases, the operator will become a smaller part of the total mass of the system. This will make it more difficult for the operator to use his body weight to help control the vehicle. Load balance is also important. Putting a heavy load on the rear rack, when not adding load to the

front, will reduce pitch stability of the vehicle. Pitch stability, in this case, is the tendency of the vehicle to rotate around the rear axle and come over backwards. When driving with heavy ATV loads, consider the following:

- Speeds should be 15 mph maximum on level ground in clear areas.
- Reduce speed to 10 mph maximum as conditions get more rugged.
- Avoid side slopes and steep grades (down or up).
- Loads will raise the center of gravity, causing more instability. Also, the operator's weight shift will have less affect in controlling the vehicle.
- Secure loads to avoid unexpected weight shifts that could cause roll-over or impact injury.

Read the section on trailer handling (Page 9) for a more detailed explanation about the affects of weight on stopping and handling.

Water Pumping Systems

Many users have asked about the feasibility of carrying a small supply of water on an ATV into remote fire areas. Considering the load capacities of the larger ATV's, 20 gallons would appear to be the largest capacity possible. For many ATV's, a capacity of 10 gallons would be maximum. Weight of water is just less than 8.5 pounds per gallon. The use of a light weight, plastic tank would allow for maximum water loads on a rear rack. A light weight, 2 cycle, engine driven auxiliary pump could be mounted on a front rack to balance the load. The addition of any other cargo would require reduction in the water load.

RECOMMENDATIONS FOR TWO WHEEL UTILITY TRAILERS FOR ATV'S

This report places a large emphasis on the issue of using trailers behind ATV's. Fire agencies have a demand for this information and ATV manufacturers have not offered much guidance in this area.

Each ATV model has differences in weight, center of gravity, wheelbase and other characteristics which may result in differences in trailer needs. Because of this and because model changes occur frequently, the following section discusses general needs to consider when specifying or building trailers to be used behind ATV's. Most ATV's of the size class considered in this report are of similar dimension and weight. Differences in models may make an ideal trailer for one ATV a poor candidate for another.

Trailer Specifications

The following discussion helps define an ideal trailer for towing behind an ATV.

Width: Should be no wider than the width of the ATV at any point.

Tongue Length: Should be long enough to allow clearance between front of box and rear tire when making a full turn while traveling forward. Trailer specifications should state a minimum tongue length. Figure 2 shows the minimum tongue length (Dimension B) required for various trailer base lengths. For most ATV's, a 40-inch trailer base will result in approximately equal spacing of all axles.

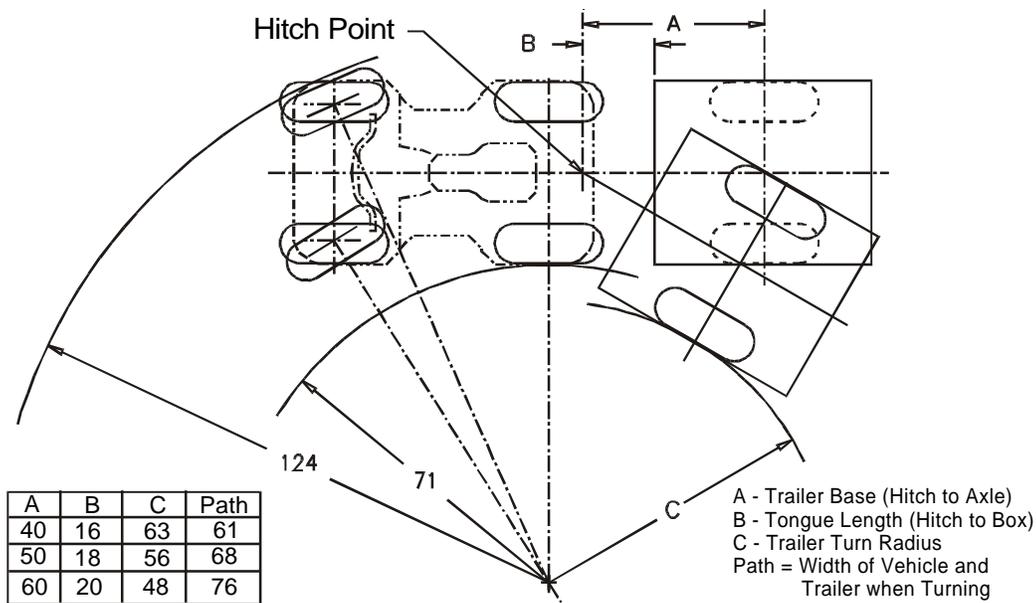


Figure 2 – The affects of trailer design on the path for a typical ATV.

Trailer Base: The minimum recommended length is approximately 40 inches. The trailer base will affect handling in two ways.

- The inside turning radius decreases with a longer trailer base. This in turn increases the path of the vehicle. The path is the width of the vehicle when cornering (see Figure 2).
- The longer the trailer base, the easier it is to back up with the trailer.

Thus, you must compromise between turning radius and backing up performance. The trailer base dimensions should reflect the type of duty intended for the trailer. If a narrow path is critical, the trailer base must be short.

Hitch Height: The optimum hitch height will be when the trailer box is level when it is attached to the ATV. Use a ball type hitch. This will allow substantial unrestricted oscillation of the trailer. Minimum load rating of the hitch should be 1,000 pounds. The latch mechanism should be “quick release” type with secondary catch or pin to hold it in the latched position.

Box Length: The optimum box length of the trailer depends upon the trailer base and the minimum tongue length for that trailer base. However, the box should be symmetrical lengthwise about the center of the axle.

Trailer Tire Track: This should be as close to the track of the vehicle as possible, but the outside width at the tires should not exceed the width of the ATV.

Box Height: The maximum height should not be above the height of the ATV’s rear fenders. However, at this height the box will cover the ATV’s rear lights. Commercially available trailers of this size generally do not have lighting available. If night use is expected, a stop and tail light or red reflectors should be added to the rear of the trailer. This is not a legal requirement but may be a safety concern. Another option is to limit the trailer height to that which would allow the lights to be seen over the trailer.

Tires: The trailer’s tires should be a flotation type with a tread pattern that helps prevent side slip (for limited cross slope travel) and mud build-up. Minimum tire size should be 16x6.50x8 and maximum tire size should be no larger than the towing vehicle’s tires. Most ATV type tires fit this description.

The perfect trailer for the ATV probably does not exist. These recommendations will help select or construct a trailer. If you are writing specifications for bidding, include the items shown in Figure 3 and Table 1.

Table 1 – Recommended ATV Trailer Dimensions for Specifications (see text on Page 6 and Figure 3)

Trailer base (A)	Overhead tire clearance (1" minimum)
Tongue length (B)	Inside tire clearance (1" minimum)
Box length (D)	Tire track (track of ATV is optimum)
Axle to rear of box (D/2)	Trailer height
Trailer width (width of ATV maximum)	Hitch height w/box level

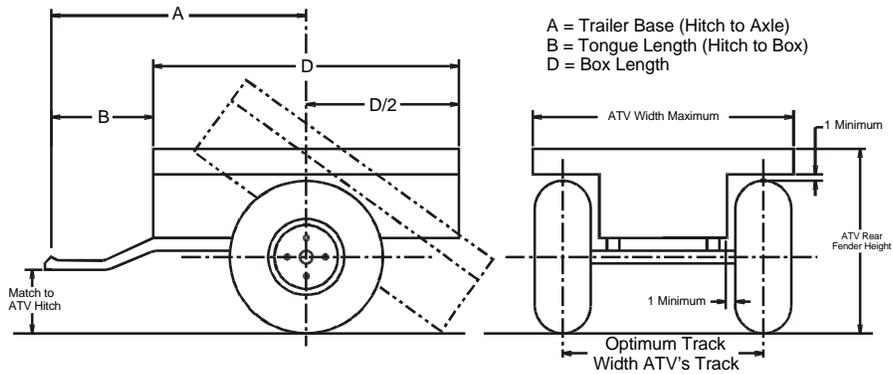


Figure 3 – Important ATV trailer dimensions for purchase specifications.

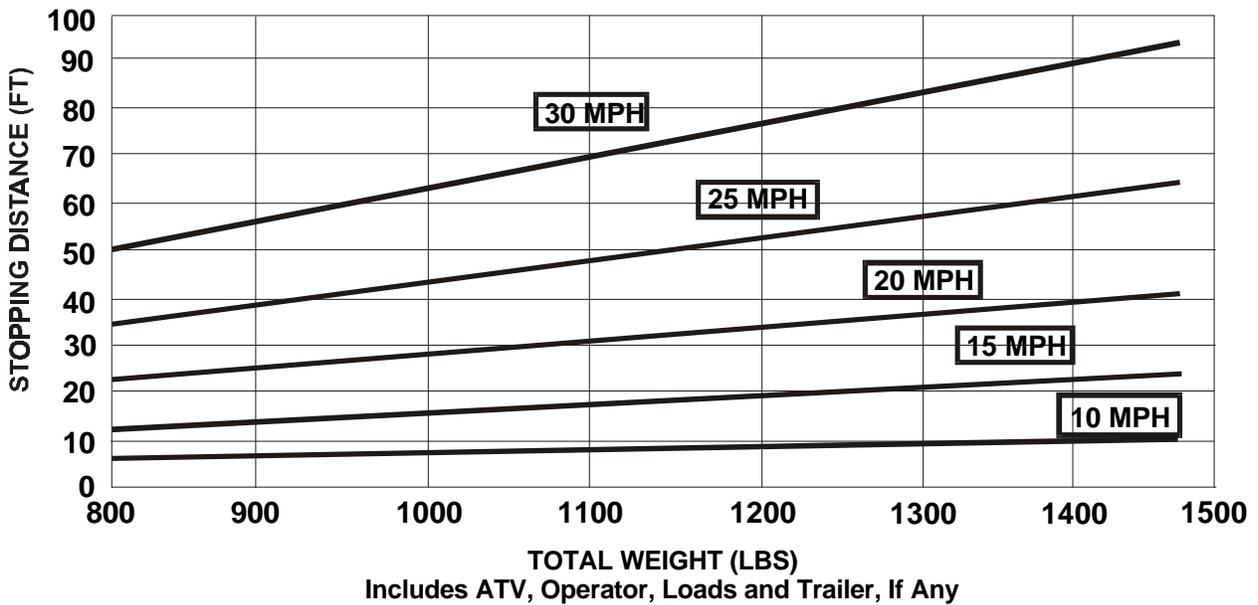


Figure 4 – Theoretical stopping distances at various weights for ATV's and their loads. Assumes deceleration of 0.6g – the required minimum by ANSI standards and no tire skid.

Handling Characteristics

Braking: The ANSI/SVIA standards require an ATV to brake with a deceleration of 0.6g or more, after a prescribed burnishing procedure. Braking will vary for each model and will depend on the owner's maintenance procedure. However, this 0.6g standard can give some insight into expected stopping distances of ATV's in general.

Figure 4 shows the stopping distance for various weights of ATV's. The weight is that of the total system, including ATV, operator, cargo, and trailer, if any. This is based on the 0.6g standard stopping deceleration and a weight of 800 pounds. This approximates the maximum weight of a large ATV and operator. The stopping distance increases by 12.5 percent for every 100 pounds added to the system. This information clearly shows that, with heavy loads, seemingly moderate speeds of 20 to 25 mph would result in unacceptable stopping distances in the woods.

As with all vehicles, the extra weight will affect braking. However, with an ATV the load can be a very large part of the system mass.

Adding a 175 pound trailer increases the stopping distance by 22 percent when operating at 20 mph. Each 50 pounds of payload in the trailer adds another 6 percent to the original stopping distance. A trailer plus 500 pounds of payload increases the stopping distance an additional 150 percent. These stopping distance factors remain constant, independent of vehicle speed.

Because the trailer has no brakes, braking while cornering or traveling downhill will be quite different than the same operation with the ATV alone. Two points of information for braking are:

- Use both front and rear brakes to maximize braking effort. Apply the rear brake first, then the front.
- During braking, do not lock brakes so that the tires skid. When the tires are not rolling (especially the front tires), steering and handling control are lost.

Acceleration: As with braking, any added payload will affect acceleration. This should not be a problem if the trailer is properly loaded and the load is secure.

Cornering: Under most circumstances a vehicle equipped with a ball type hitch or equivalent, and a properly loaded trailer, should not be adversely affected by cornering except for reducing the inside turning radius. However, the placement and securing of the load is critical. This is covered next.

Loading Trailers

Load stopping distance increases so rapidly with increased weight that we recommend limiting the gross combination weight (GCW) to 1,200 pounds. The GCW includes the weight of the ATV, operator, trailer, and payload. When loaded to this GCW, stopping distances will increase approximately 1-1/2 times. At very low speeds (less than 10 mph) the GCW may be manageable up to 1,400 pounds.

The Gross Trailer Weight (GTW) is the weight of the trailer plus its load. The manufacturer's maximum recommended GTW for these ATV's is often as much as 850 pounds. This may vary depending on the model. We believe this is excessive for rough terrain and the type of use expected in fire control work.

Loads should be positioned slightly ahead of the trailer axle with heaviest items located low in the trailer box. General guidelines for loading are:

- Balance front to rear with center of gravity slightly ahead of axle. Maximum tongue weight for most models is 30-35 pounds. For normal operations it should be 15-25 pounds. *Never operate with a negative tongue weight.*
- Balance load side to side. Attempt to load so that each tire of the trailer carries equal load.
- The load should not extend above the maximum box height of the trailer bed. Keep the center of gravity low.
- Secure loads from shifting during operation. due to the nature of the ATV and the terrain

to be traversed, it will be necessary to check the load often for security.

Operating ATV's with Trailers

Normally, the weight of an ATV is relatively small for a vehicle and the operator becomes a significant amount of the mass of the system. However, a trailer and its load can easily double the mass. The operator becomes less significant and will not be able to shift his weight as effectively to control the vehicle. Because fire control tasks will occur off-road, often in tight conditions, using a trailer demands these adjustments by the operator.

- The maximum speed should not exceed 10 mph with a loaded trailer.
- The operator should travel over level or near-level terrain only.

Keeping the speed low will help both the operator and machine. Trailering loads increases the stress on the machine, including brakes and structural components. Low speed operation can significantly reduce repair costs and down time. It will also help reduce operator fatigue. Most of all, reducing speed will prevent the potential of accidents and roll over.

Dual Purpose Trailer

Several agencies have said that it would be desirable to tow ATV's to a fire site by trailer, then use that trailer to tow loads behind the ATV. We will refer to this as a dual purpose trailer. Can this be designed? Probably, but not

without violating a recommendation contained in the previous section.

For stability on the highway, the trailer should have a relatively wide stance. However, a wide stance will increase the path of the ATV/trailer in the woods. Likewise, it would be preferable to have a longer tongue for the trailer on the highway. Again, this will widen the path during cornering when behind the ATV. Adjustable axles and tongues could be managed, but with added cost and weight. Because of the limited load capacity of an ATV, the trailer weight should be minimized. Figure 5 illustrates the stability vs. width dilemma posed by dual purpose use.

Tires may also be an issue with a dual purpose trailer. If the ATV is to be used in less than level terrain, highway-type trailer tires may be inadvisable. Low pressure ATV-type tires are not suitable for the trailer during highway use.

In short, dual purpose trailers will sacrifice some performance in either off-road and/or highway use. They will likely be wider than the ideal ATV trailer, but would offer the convenience of easy transportation to the fire site. This may be an alternative for an agency if:

1. There is a need for extra load capacity the trailer could provide.
2. The trailer will operate in level, open terrain.

Consult state and local codes to make sure the trailer has proper lighting and safety items for highway use.

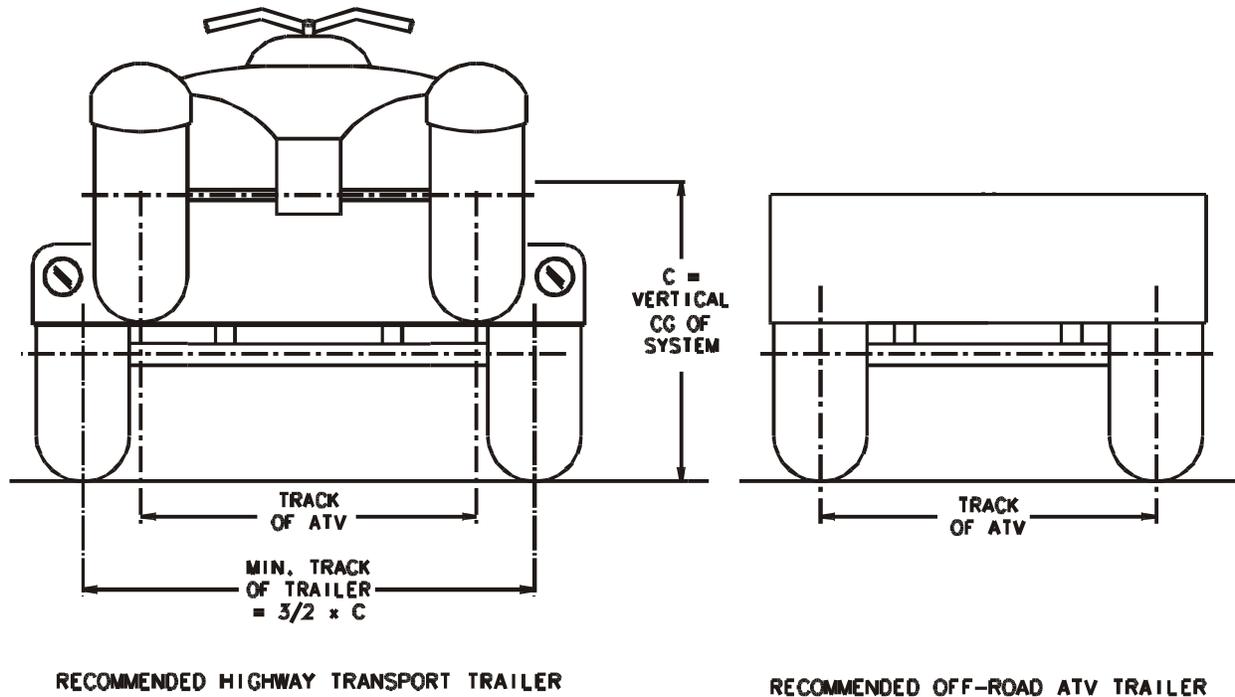


Figure 5 – The track width of an ATV towing highway trailers should be at least 3/2 times the center of gravity of the ATV/Trailer system (C). This limits the possibilities for dual purpose trailers.

ATV-LIKE UTILITY VEHICLES

There are several vehicles that REC has looked at that have similarities to an ATV, but do not meet the ATV definition. These vehicles have load carrying characteristics that may better suit them for fire control tasks compared to standard ATV's.

Polaris Big Boss 4x6®: The Polaris Big Boss 4x6 is a 6-wheel vehicle with four driving wheels. The front is similar to Polaris' 2-wheel drive utility ATV with a cargo box located over the four rear driving wheels. Polaris rates the cargo box at 650 pounds capacity.

John Deere AMT 600® and AMT 620®: John Deere sells two vehicles that look similar in concept to Polaris' Big Box 4x6. These are the AMT 600 and AMT 620. The AMT 600 has a single front wheel and four rear driving wheels and is equipped with a rear cargo box. The

AMT 620 is a later version of the AMT 600, which has a bench seat for two passengers and six wheels. The cargo capacity for the box is 400 pounds for rough surface use. The Forest Fire Experiment Station evaluated the AMT 600 in 1987. A major drawback was the inability to position protective guards or shields to prevent injury to the operator by intrusion of brush and limbs. There was some questions as to whether the AMT 600's frame would withstand a rugged off-road use over a period of time.

The design of the AMT 620 may help rectify some of the operator protection problems. In any event, those who wish to have a cargo box at the expense of some maneuverability may wish to investigate these models.

Yamaha YFU1 (Prohauler®): By definition (Figure 1) the Yamaha YFU1 is an ATV. This

means it must meet ANSI/SVIA 1-90 standards when they take effect. Unlike the other models in this section, it meets the ATV definition because it is a 4-wheel one occupant vehicle that weighs less than 600 pounds. We have mentioned it in this section because its purpose

compares more closely to the ATV-like vehicles. It has longer wheelbase than a standard ATV. A large rear rack is placed on the stretched framework. Yamaha rates the payload capacity at 463 pounds.

CONCLUSIONS

Many changes have lessened the safety shortcomings of earlier ATV's. The 3-wheel vehicles noted for their instability are no longer sold. The initial design standards are in place although several standards, particularly those concerning lateral stability, remain to be developed. Operator training, provided by the manufacturer, is available. when used with proper personal protective equipment, ATV operation is, on the whole, safer than a few years ago.

Except for scouting, ATV fire control tasks will require carrying or towing loads. Some of the uses, such as water pumping, will require relatively heavy loads. Management and operators must understand the limits of these

vehicles. Consult the owner's manual to find the vehicle's load limit. We encourage the user to re-read the section on Load Capacity and Trailers. Carrying loads on these vehicles is reasonable if the terrain is not rugged and speed is kept below 10 mph. The braking chart in Figure 3 helps emphasize this point. By keeping speed low and avoiding terrain that causes stability handicaps, these vehicles can be used for a variety of fire tasks.

Manufacturers are showing more interest in utility type ATV's. New models are being introduced rapidly. These higher load capacity, generally lower speed models, make the most sense for fire control.