## Researching and Buying An HDT

# Thanks to Gregg Shields for allowing me to use some of the following information from his slides!

#### Why An HDT in the First Place?

- 1. Cost
- 2. Safety
- 3. Maintenance
- 4. Convenience/Inconvenience

#### **Decisions**

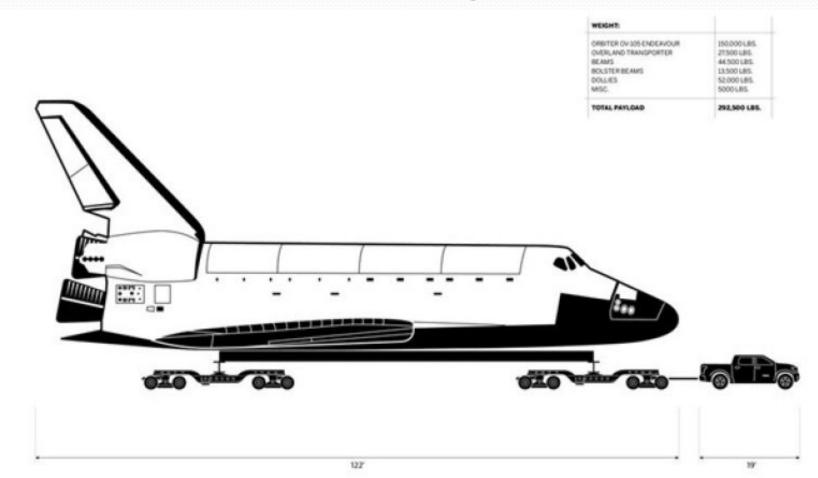
- Trailer should decide the truck. You don't need an HDT for a 10,000 lb trailer.
- Think of future needs. Fulltiming?, Bigger Trailer?
- Think of type of camping you plan on doing and locations.
- If in muddy or excessively sandy places may want to look for HDT with a locking rear axle.
- Length will be an issue in some places.

	Pickup LGT	Super Pickup 450 / 550	MDT New	HDT Used	HDT New
Horse Power	500?	500?	< 400	465+	465+
Torque	750?	800?	860	1650-1850	1650-1850
Fuel					
Economy					
Towing	< 7	< 7	7 - 10	7 - 10	7 - 10+
Fuel Range	300	300	800	1500-2000	1500-2000
Trailer GVW	18,000	18,000	35,000	35,000	35,000
Pin Weight	< 4000	< 4000	7,000 - 10,000	7,000 - 10,000	7,000 - 10,000
Resale 10 yr	\$0	\$0	\$50,000	\$50,000	\$90,000
Price	~\$70,000	~\$80,000	~\$130,000	\$30- \$80,000	~\$165,000

#### Don't Believe The Hype!



### Is this what you want on a 6% downhill grade?



Realize some HDT's can be bought for mid to high \$teens but are going to need some investment of time, knowledge, and money to make into a hauler.

### You can buy something like this and make it a hauler with skill.



You can easily have a decent, reliable HDT hauler for under \$50,000 if you are diligent in your search, patient, and ready to move.

#### Safety (lets assume trailer 18000 lbs.)

	Pickup LDT	Super Pickup 450 / 550	MDT New	HDT Used	HDT New
SAFETY					
Braking					
Emergency					
Visibility					
Mountain					

#### Drivability

	Pickup LDT	Super Pickup 450 / 550	MDT New	HDT Used	HDT New
DRIVABILITY					
Seats					
Ride					
Noise					
Passengers					
Height					
Length					

#### Intangibles

	Pickup LDT	Super Pickup 450 / 550	MDT New	HDT Used	HDT New
INTANGIBLES					
Longevity					
Daily Driver					
Storage					
End of Trip Relaxed					

#### Flexibility

	Pickup LDT	Super Pickup 450 / 550	MDT New	HDT Used	HDT New
<u>Flexibility</u>					
Mini Motorhome					
Smart Car					
Motorcycle					
Refrigerator					
Portapottie					
Microwave					
Coffee / Crock Pot					

#### So What Do You Look For?









# Volvo, Peterbilt, Kenworth, Freightliner, International? Long Nose, Short Nose, Condo, mid roof?

Comes down to what you like and want. Realize they all have different benefits, and different detriments. i.e. turning radius, noise, ease of service etc.

#### What to Choose

- Volvos have traditionally been the truck of choice for quietness, turning radius, etc. but again is choice.
- Kenworth, Freightliner, Peterbilt make some pretty fine trucks. All have their perks.
- Recently have been some trouble with the International Navistar/Maxxforce Engine with emissions equipment but you may be able to pick up one that is repaired for cheap.

#### What Engine and Transmission

- Detroit vs. Volvo vs. Cummins vs. Navistar?
- Transmissions: Standard 10 speed, 13 speed, 18 speed vs. iShift vs. Ultrashift (Ultrashift Plus), Freedomline, Autoshift. Again it comes down to personal choice
- Automatic transmissions are easier for persons with little to no experience in HDTs to transition into.
- Realize some older automatics still are known as "3 pedals" because a manual clutch is used to start and stop the transmission.

#### **Volvo Choices**









#### **Freightliner Choices**







#### **Kenworth Choices**







#### **Peterbilt Choices**







#### International, Western Star





#### Cabovers (COE)







#### Maintenance

- Average dealer shop cost ~\$125-135/hr labor.
- Local shop rate \$75-120/hr.
- Dealer vs. local is choice. Get referrals, look at reviews, talk to them and see services offered.
- You want a mechanic not just a "technician who throws parts at the problem"
- See who owner/operators use for their service. Fleets often have their own maintenance so OTR truckers may not be the best resource.
- Parts are usually fairly readily available even at auto parts stores such as NAPA or CarQuest.
- Most truck stops have mechanics available 24/7/365.
   Dealers likewise.

#### Convenience

Kenworth Interior



Truck itself can be used to camp in if desired. Note: New trucks can be ordered with rear seat fold downs.





Most of us have an inverter, small microwave, fridge, and bunk. This adds some cost but usually less than \$1000.

#### So How Do We Locate an HDT

- Dealers
- Escapees For Sale Section
- Truckpaper
- Racing Junk
- Friends
- Craigslist
- Want Ads

#### **Before Purchase**

- Research what will work for you. Old vs. older vs. new.
- Don't shy away from mileage if you know maintenance.
   500,000 miles is not necessarily bad.
- What brand and style do you want?
- What is your budget? Remember a used OTR tractor will require inspection, dyno, probably some work, a bed if you are going to carry vehicle, new hitch, maybe tires so include that in budget. All the above can add anywhere from \$5,000 to \$35,000 depending on your wants. At minimum have \$5000 backup for repairs on used truck.
- Realize a \$15,000 HDT may or may not be a bargain.

- Check with your state or domicile requirements for registering an HDT.
   Preferable is as a Motorhome but is not allowed in all states.
- We have great resource within the HDT forum in that its members have registered or researched just about every state in the Union and are willing to help.
- So be sure an HDT is right <u>before</u> purchase.
- Finally get a qualified inspection, dyno (good indication of engine status), negotiate price and have funds ready to go.

- Good deals come around rarely so be ready to go when they are available. Have all the above lined up.
- Great deals are even more rare and will last only a short period because you're not the only one looking.
- Know the licensing requirement in your state or domicile. (Escapees HDT Forum Resource Guide is a great source.)
- Talk to folks here about their experiences.

#### Summary

- So what is a realistic budget for a used hauler? \$25,000-\$60,000. Emergency fund \$5000 minimum.
- Bed and hitch: \$4,500-\$30,000 depending on type.
- \$4,500: Wood, aluminum, or steel simple bed that you provide most of labor. Air ride/air cell hitch: \$2500-4500.
- Seriously consider HDT that has already been converted because most of those owners/sellers have worked most of the bugs out and for the most part will be honest with

- Budget for New Truck: >\$125,000
- Other seminars will cover New Truck purchase sources and things to think about.
- Remember ongoing costs of maintenance (avg \$500-2000 depending), insurance (\$1000-2000 truck and trailer), fuel, campsites, roadside assistance etc.
- Not necessarily a rich man's hobby, but is not a broke man's toy.

## The Heavy Haulers Resource Guide & HDT Rally Site @rvnetwork.com. HDT Forum...

## One final thought

- How do I learn to drive this behemoth?
- Friends with trucking experience?
- Driving Schools. Realize they are geared toward over the road truckers and CDLs but not bad resource.
   Cost usually several thousand \$\$.
- Maybe one of the instructors will give "private lessons" on fee for service basis. Do you know O/O who might also?
- Practice: Don't make your first trip across the Rockies with a 20,000 lb trailer.
- Check your ego at the door. Ignorance can kill you and others.

## Questions or discussion?

#### **Break**

## Inspection and Beds

## Inspection (what to look for in a used truck)

- Mileage: these are 1 million mile trucks so hundreds of thousands of miles on a used truck is common.
- Maintenance: Are there records available? Was the majority done at one place? If so, using VIN, dealer should have copy of all work. Fleets may give you records. Was scheduled maintenance done?
- DOT inspections. Brakes, suspension, lights, tires, etc.
- Tire dates: OTR trucks often have recap drive tires which are okay if dates are good. Dates should be stamped on the tire when recapped. Steer tires cannot be recaps. Look for dates preferable <5 years or negotiate into offer.

- Oil change intervals, when were fluids last changed, fluid leaks?
- Brakes: Condition of cans, slack adjusters, lines, when were shoes changed, are liners showing cracks?
- Air bags: Cracking, major air leaks in suspension, leveling valves leaking?
- Hubs, wheels ok?
- You or inspector crawl under the truck and look everywhere with a flashlight. Almost all used trucks will have evidence of some minor fluid leaks

- Request a dyno (hp at wheels, idea of other engine parameters such as blow by) The facility performing the dyno can advise you whether it is a good or bad report. Cost usually around\$300.
- Google truck inspection services if you are interested in a truck that is a long distance from you. HDT resource guide lists several. Cost usually around \$350. and they do pretty detailed job. Don't shy from deficiencies, figure into price offered unless something major.

- Volvos ask about injector harness and oil leaks. Oil analysis
- Ask about any ongoing engine issues or codes. If dealer is inspecting link to computer and see code history.
- Any known suspension issues, vibrations, have king pins been replaced?
- Put your hands on cool exhaust system and see if rusted through especially bottom of muffler on upright stack.
- Most trucks have rust, is it excessive? You can fix with scaler and POR rust products. Repair before bed.

- Tandem vs. single: Budget about \$3000 to remove axle if you have it done elsewhere. May have to have new driveshaft also.
- Exterior: Paint, windows, water damage? Good paint job cost \$10-15,000.
- Interior: Seats comfortable? Tears, rips, clean, dirty, smoking or other odors. Has a hole been cut in the condo floor?
- Please note pre-purchase check lists and inspection services are available online at <a href="www.hhrvresource.com">www.hhrvresource.com</a>.
   Sample from Truck Remarketing Inspection Service is available and gives estimate of repair costs to use in negotiations.

## **Ongoing Costs**

- Insurance for truck and trailer \$1,000-2,000/ year. Miller, Farm & City, Progressive, Major Carriers.
- Maintenance: Oil, fluids \$300-400/year. Plan on \$1,000-1200/year for contingency.
- Tires: Should be aged out every 5-7 years maybe bit longer depending on storage and use. Figure \$300-\$550/tire mounting and balancing.
- Storage: \$0-300 per Month.
- Fuel, Camping etc.: Variable.

## License and Registration

- Varies by state. Best of all worlds is to register as Motor home.
- Federal Motor Home Guidelines:

Motor Home means a multi-purpose vehicle with motive power that is designed to provide

temporary residential accommodations, as evidenced by the presence of at least four of the following facilities:

- a. Cooking a small microwave is acceptable
- b. Refrigeration or Ice Box either a 12 volt, 110 volt or LP powered refrigerator is acceptable
- c. Self-contained Toilet a porta potty is acceptable
- d. Heating and or Air Conditioning factory heat or air is acceptable with separate sleeper berth control
- e. Potable Water Supply System including a Faucet and Sink
- f. Separate 110-125 Volt Electrical Power Supply and or an LP Gas Supply
- generator, inverter or a shore power inlet is acceptable

## **Notebook for LEO**

- Copy of registration to show motor home or support non-commercial.
- Insurance card
- Copy of <u>YOUR</u> states requirements for licensing to operate your HDT. Ex. TN is Class D for Motorhome, TX is noncommercial Class A. <u>Look up the statute and</u> <u>have a copy.</u>
- Statute defining RV, exemptions, etc. in your state of registration.
- Have an index as first page

#### **Tennessee Statute**

- **(B)** However, the following vehicles and groups of vehicles shall not be considered commercial motor vehicles for the purposes of this chapter
- Vehicles designed and used primarily as recreational vehicles as defined in this section;

#### **Tennessee Statutes**

- (13) "Recreational vehicle":
- **(A)** Means a vehicle which is either self-propelled or towed by a consumer-owned tow vehicle, and designed to provide temporary living quarters for recreational, camping, or travel use that complies with all applicable federal vehicle regulations and does not require a special-movement permit to legally use the highways; and
- **(B)** Includes the following basic products:
- (i) Motor home;

Tennesse Statute Of License Plate and Definitions

• Here is the Tennessee statute that proves it:

**55-4-110.** Display of registration plates -- Manner -- Penalty for violation.(a) The registration plate issued for passenger motor vehicles shall be attached on the rear of the vehicle. The registration plate issued for those trucks with a manufacturer's ton rating not exceeding three-quarter (3/4) ton and having a panel or pickup body style, and also those issued for all motor homes, regardless of ton rating or body style thereof, shall be attached to the rear of the vehicle. The registration plate issued for all other trucks and truck tractors shall be attached to the front of the vehicle. All dealers' plates, as provided in § 55-4-221, and those registration plates issued for motorcycles, trailers or semitrailers shall be attached to the rear of the vehicle.

## **Questions or Discussion?**

## **Bed Builds**

## **Considerations When Building a Bed**

- Hiring fabricator vs. do it yourself?
- Fabricator: Cost ~\$15,000 for simple steel bed no frills. Up to \$35,000 for the latest greatest.
- Who builds? Herrin in Texas, RVH Lifestyles in Kansas are some know builders. Don't be afraid to go to a local fabricator with pictures and drawings and see if they can do it. Some really nice beds have been built by locals.
- Materials: Wood, aluminum, steel plate (usually 3/16" or greater) so price will depend on materials.
- Be sure the fabricator knows your intended use i.e. smart car, jeep, motorcycles or UTV. Will dictate materials and build strength.

# Thanks To Mark Shelley for allowing me to use some of the following slides and info.

## **Considerations If You Build**

- Design Considerations
  - Load Balance. What are you going to carry and where?
  - Features
  - Structure
- Fabrication
  - Ready Made Components
  - One-Off Components

### **Load Balance**

Single Most Important Consideration is...

What are the axle weights on the finished product?
With the trailer hooked up?
Running Bobtail?

Step 1: Weigh the truck with a full load of fuel

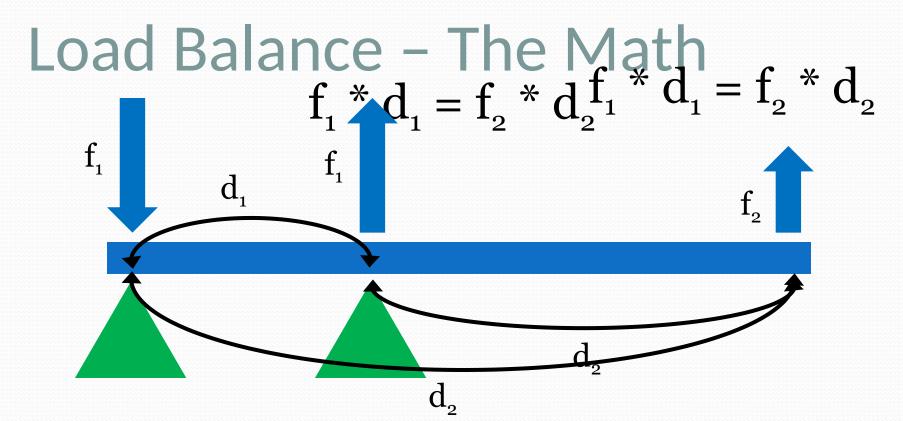
Step 2: Determine what you want for target weight

Excel Tool Available on RVNomad.com in the tools section

## Load Balance

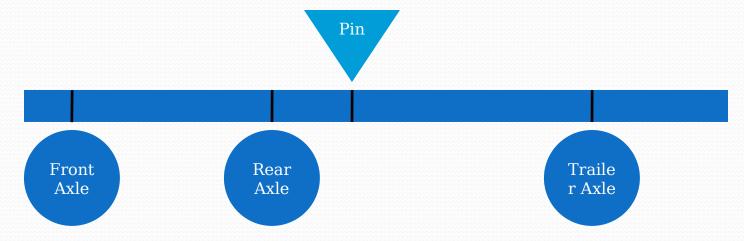






The product of force, distance pairs on a lever are equal. Forces on opposite sides of a fulcrum are in opposite directions. Forces on the same side of a fulcrum are in the same direction. Most of the time, we are solving for one of the forces. So, if we are solving for  $f_1$ ,  $f_1 = (f_2 * d_2) / d_1$ 

## Load Balance - The Math



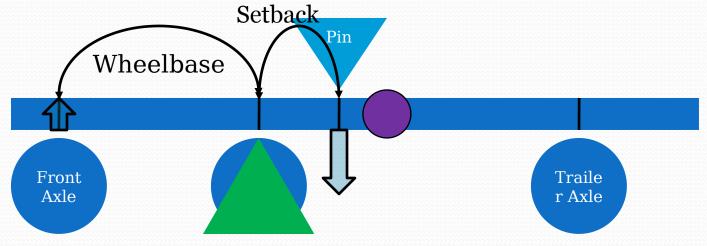
GCVW = Front Axle + Rear Axle + Trailer Axle

 $GVW_{Truck}$  = Front Axle + Rear Axle(s)

 $GVW_{Trailer} = Pin + Trailer Axle(s)$ 

Pin weight is transferred to the Front Axle and Rear Axle

## Load Balance - The Math - Pin



Rear Axle is the Fulcrum

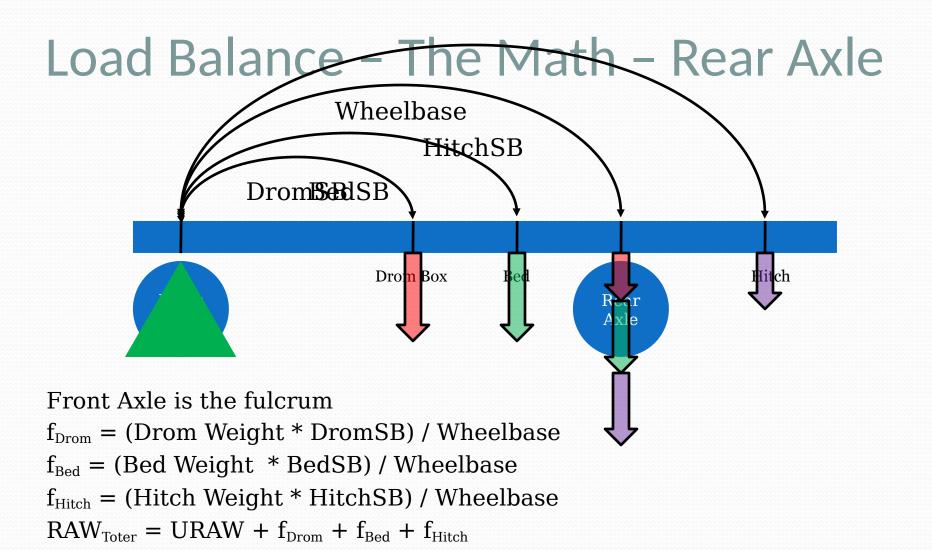
 $Pin * Setback = f_{pin} * Wheelbase$ 

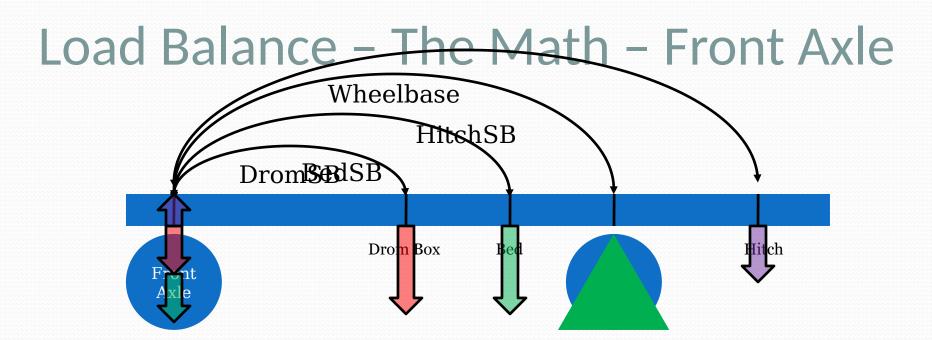
 $f_{pin} = (Pin * Setback) / Wheelbase$ 

 $LFAW = UFAW - f_{pin}$ 

 $LRAW = URAW + Pin + f_{pin}$ 

GVW = LFAW + LRAW = UFAW + URAW + Pin



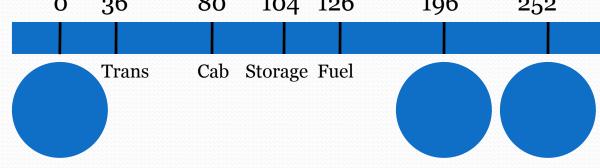


Rear Axle is the fulcrum

$$\begin{split} f_{\text{Drom}} &= (\text{Drom Weight *(Wheelbase - DromSB))} \, / \, \, \text{Wheelbase} \\ f_{\text{Bed}} &= (\text{Bed Weight * (Wheelbase - BedSB))} \, / \, \, \text{Wheelbase} \\ f_{\text{Hitch}} &= (\text{Hitch Weight * (HitchSB - Wheelbase))} \, / \, \, \text{Wheelbase} \\ FAW_{\text{Toter}} &= UFAW + f_{\text{Drom}} + f_{\text{Bed}} - f_{\text{Hitch}} \end{split}$$



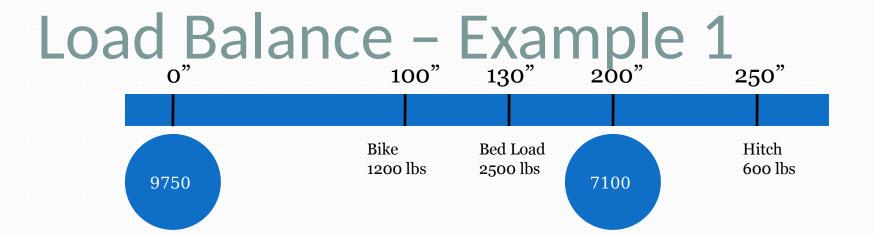
## Design Consideration - Singling 80" 104" 126" 196" - Singling



$$\begin{split} f_{Trans} &= (2500*(196\text{-}36))/196 = 2041 \\ f_{Cab} &= (3000*(196\text{-}80))/196 = 1776 \\ f_{Storage} &= (400*(196\text{-}104))/196 = 188 \\ f_{Fuel} &= (1800*(196\text{-}126))/196 = 643 \end{split}$$

$$\begin{split} f_{Trans} &= (2500*(252\text{-}36))/252 = 2143 \\ f_{Cab} &= (3000*(252\text{-}80))/252 = 2048 \\ f_{Storage} &= (400*(252\text{-}104))/252 = 235 \\ f_{Fuel} &= (1800*(252\text{-}126))/252 = 900 \end{split}$$

Singling to the rear position transfers weight from the rear axle to the front axle. In our example above: 678 lbs.

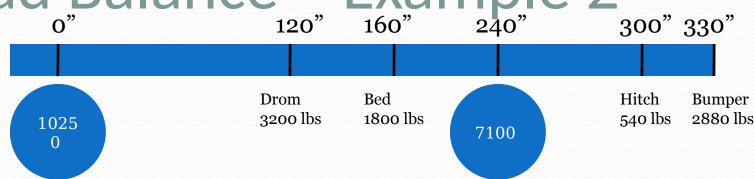


$$\begin{split} f_{\text{Bed}} &= (2500 * 70) \, / \, 200 = 875 \\ f_{\text{Bike}} &= (1200 * 100) / \, 200 = 600 \\ f_{\text{Hitch}} &= (600 * 50) / \, 200 = 150 \end{split}$$

$$\begin{split} f_{\text{Bed}} &= (2500*130) \, / \, 200 = 1625 \\ f_{\text{Bike}} &= (1200*100) / \, 200 = 600 \\ f_{\text{Hitch}} &= (600*250) / \, 200 = 750 \end{split}$$

$$RAW = 7100 + 1625 + 600 + 750 = 10075$$
  
 $FAW = 9750 + 875 + 600 - 150 = 11075$ 

## Load Balance - Example 2



$$f_{Bed} = (1800 * 80) / 240 = 600$$
  
 $f_{Drom} = (3200 * 120) / 240 = 1600$   
 $f_{Hitch} = (540 * 60 / 240 = 135)$   
 $f_{Bumper} = (2880 * 90) / 240 = 1080$ 

$$f_{Bed} = (1800 * 160) / 240 = 1200$$
  
 $f_{Drom} = (3200 * 120) / 240 = 1600$   
 $f_{Hitch} = (540 * 300) / 240 = 675$   
 $f_{Bumper} = (2880 * 330) / 240 = 3960$ 

RAW = 
$$7100 + 1200 + 1600 + 675 = 10575$$
  
FAW =  $10250 + 600 + 1600 - 135 = 12315$   
RAW =  $7100 + 1200 + 1600 + 675 + 3960 = 14535$   
FAW =  $10250 + 600 + 1600 - 135 - 1080 = 11235$ 

## Calculate Max Pin Weight O" 120" 160" 240" 300" 330" Drom Bed 1600 lbs 700 bs 2880 lbs

$$RAW = 14535$$
,  $GAWR = 19900$ 

$$FAW = 11235$$
,  $GAWR = 12350$ 

Available axle weight is 19900 - 14535 = 5365

$$f_1 * d_1 = f_2 * d_2$$

$$f_1 * 300 = 5365 * 240$$

$$f_1 = (5365 * 240)/300$$

$$f_1 = 4292$$

Assuming 20%-25%, Trailer Max is 17168-21460

## Calculate Result on Front Axle



$$\mathbf{f}_1 * \mathbf{d}_1 = \mathbf{f}_2 * \mathbf{d}_2$$

$$\mathbf{f}_1 * 240 = 4292 * 60$$

$$\mathbf{f_1} = (4292 * 60) / 240$$

$$f_1 = 1073$$

$$FAW_{LoadedToter} = 11235 - 1073 = 10162$$

## Prove using scale tickets



$$f_1 * d_1 = f_2 * d_2$$
  
 $f_1 = 5560$ ,  $d_1 = ???$   
 $f_2 = 7060 (16880-9820)$ ,  $d_2 = 194$   
 $d_1 = (f_2 * d_2) / f_1$   
 $d_1 = (7060 * 194) / 5560$   
 $d_1 = 246$ , 52" behind the axle

## What Features Do You Want?

- Bed
  - Carry Stuff?
  - Add Weight?
- Drom Box
  - Tool Storage?
  - Satellite Dish Storage?
  - RC Helicopters?
- Support for 5<sup>th</sup> Wheel
- Standalone Motorhome

- Storage Boxes
  - Special Items Cookery
  - Concert Organ with Footboard
  - OMIG Welder w/ Tank
- Smart Car Loader
- Extended Boondocking
- Hitch
  - ET, ET TSR
  - O TrailerSaver
  - OBRP Head?
  - Comfort Ride

## **Design Considerations**

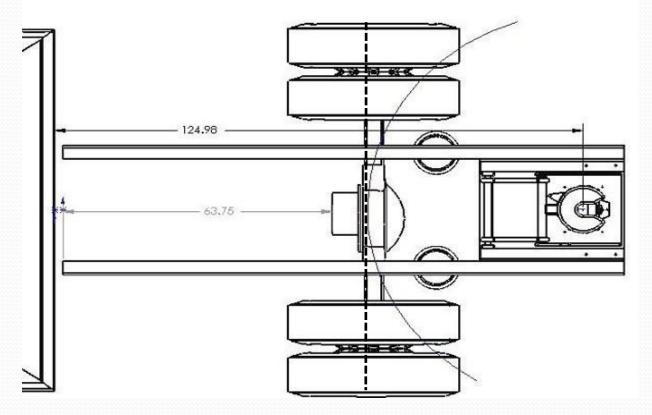
- What wheelbase do you need?
  - Single or Dual?
  - If single, front, rear, mid?
- Where do you place the hitch?
- What total length can you live with?

## **Other Considerations**

- Mounting Techniques
  - O Direct Bolt On. Will the bed torque with the frame?
  - Brackets
  - Isolation Bushings/wood slats
- Miscellaneous
  - Access to Fuel Fillers
  - Operature Angle Clearance if carrying vehicles or mc.
  - Rear Flat Tire
  - Cab Shocks and Air Bags
  - ODOT Lights and Reflectors

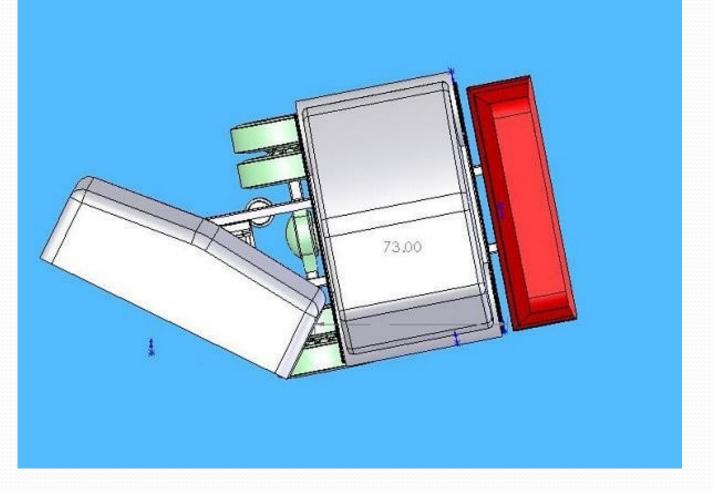
- One Piece
  - Installation and Removal requires heavy equipment
  - Minimizes storage box panels
  - Access to mounting points is difficult
  - Access to repair items is more difficult, adds \$\$\$ to repair
  - Would advise access panels even if someone building
- Modular
  - Allows for manual installation of parts.
  - More labor during fabrication.
  - Flexible structure
  - Removal of parts for repairs possible
  - More difficult final assembly

#### Hitch Placement Liceable Deck Snace

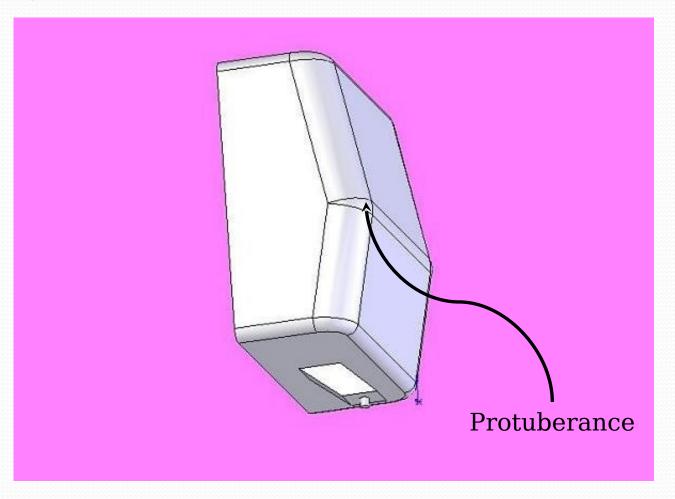


Usable deck space is the area tangent to the Arc at it's midpoint.

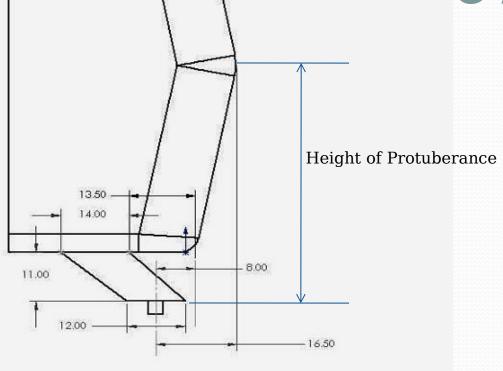
#### Hitch Placement - Avoid Jack Knife



## Design Considerations - Hitch

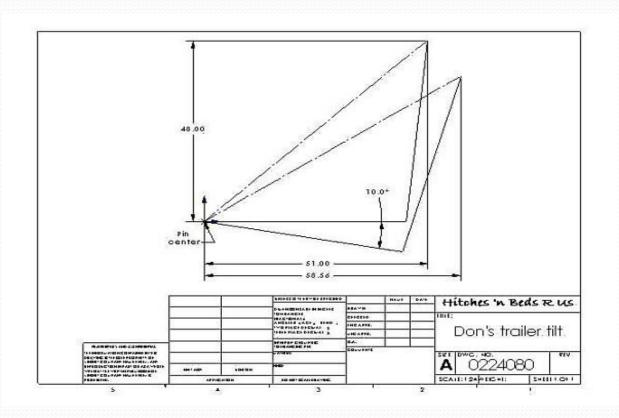


## Hitch Placement - Calculate Arc



The distance from the furthest point is given by the Pythagorean equation.  $A^2+B^2=C^2 \ , \ A=16.5, \ B=51, \ therefore \ C=56.1$  Always use 51 for "B"

#### Hitch Placement - Account For Dip



As the trailer and truck move off-angle, the cap of the trailer moves towards the truck as specified by Sin 10° \* Height of Protuberance. 5° is trucking standard minimum. 10° covers just about every campground.

a= distance from cap to pin

b= ½ width of trailer (but with tilt use 51" rather than 48")

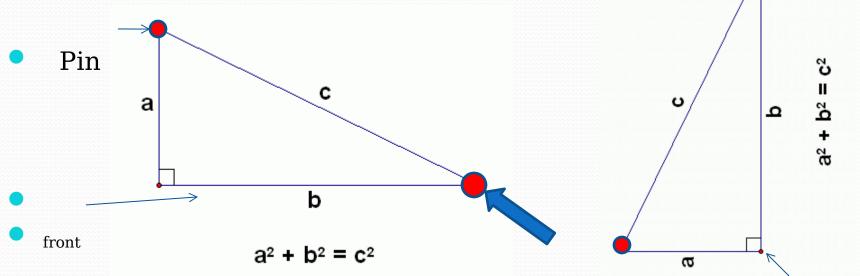
B= furthest distance from pin (corner of trailer)

Example: 1. a=20", b=51", c=54.78"

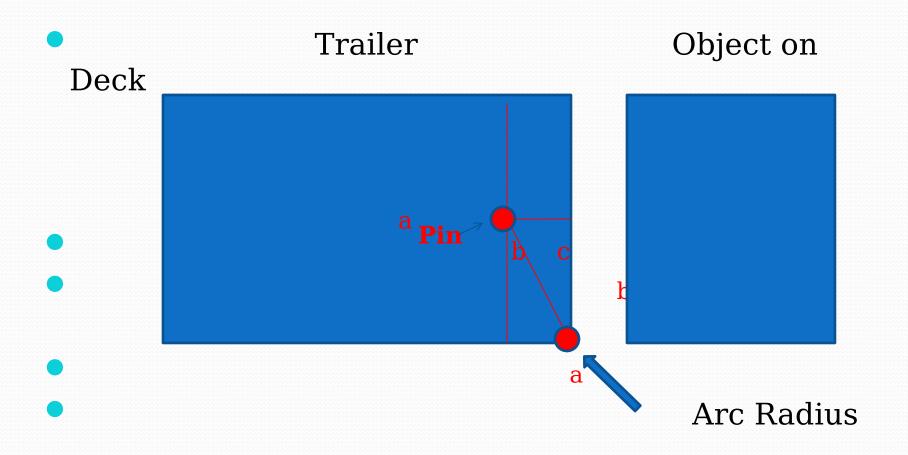
• 2. a=16", b=51", c=53.45"

 So at 45 degrees the closest to the truck/vehicle is point "B" (line c) not

• "b".



## So you cannot use 48" separation and still make 90\* Jackknife.



- Most trailers are 96" wide so full jackknife would swing edge of trailer at 90\* to 48"
- Allowing for tilt and safety need to add 12-14" from hitch pin location to nearest obstruction i.e. Smart car, motorcyles, drom etc.
- Therefore, good rough distance is 60" from pin.

# So What Safety Requirements Should Be On Your Bed And Truck? David Dixon

## Questions or discussion?