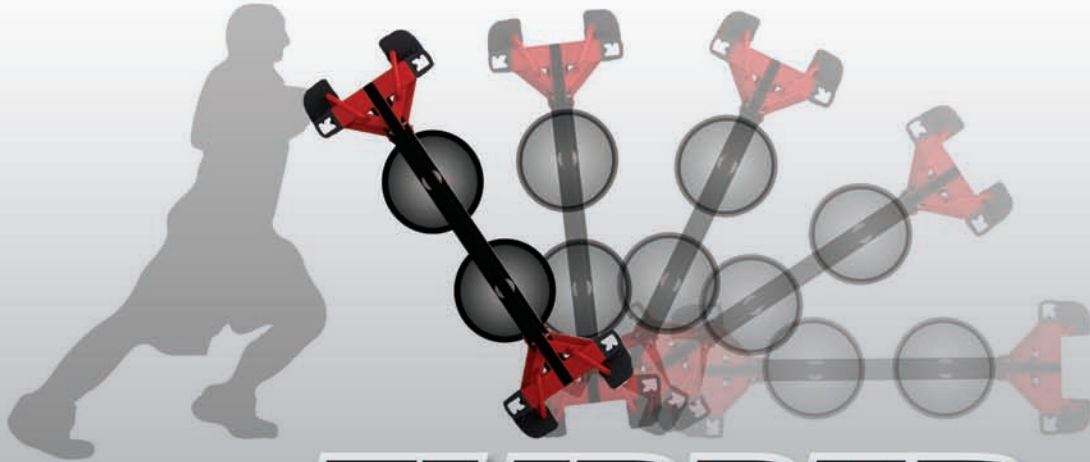

FLIPPER

TRAINING MANUAL

Models TS-03 and TS-04

Please refer to the Owner's Manual for assembly instructions, product registration and information on accessory products.

U.S. PATENTS PENDING

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Flipper Training Manual, 1st Edition
Published by Milo Fitness, LLC
Fort Collins, CO 80525

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"Because Strength Matters"

The publisher is not responsible for any injury resulting from any material contained herein. This publication contains information relating to the use of an exercise device but is not considered exhaustive of all information related to the use of this device. As with any exercise device, use caution and only use this device under supervision of a trained strength and conditioning professional.

Table of Contents

Overview

Why Flip?

Tire flipping has long been used as a test of strength in Strongman competitions and more recently as a training tool for numerous sports athletes (Corcoran & Bird, 2009; Hedrick, 2003; Hendrick, 2008; Keogh, Payne, Anderson, & Atkins, 2010; S. M. McGill, McDermott, & Fenwick, 2009; Waller, Piper, & Townsend, 2003). Given the number of years Strongman and Functional Training have been around, a limited amount of scientific information has been produced (Hendrick 2008, S.M. McGill, et al 2009), let alone with regard to the event of tire flipping. More research has recently been published, as the value of *Functional Training* becomes more apparent to athletes and strength and conditioning professionals.

Research on Tire Flipping has shown this event to exhibit a great deal of muscle activation compared to other Strongman events (S.M. McGill, et al, 2009). In Figure 1 a graph is presented from some of the data published by McGill, et al. This graphically shows the mean values of the average peak muscle activation of sixteen muscle groups (eight on each side - right and left - of the body) some acting as core muscles (rectus abdominis, external obliques and internal obliques), back muscles (Latissimus dorsi and erector spinae) and hip/knee extensors (gluteus maximus, biceps femoris, and rectus femoris).

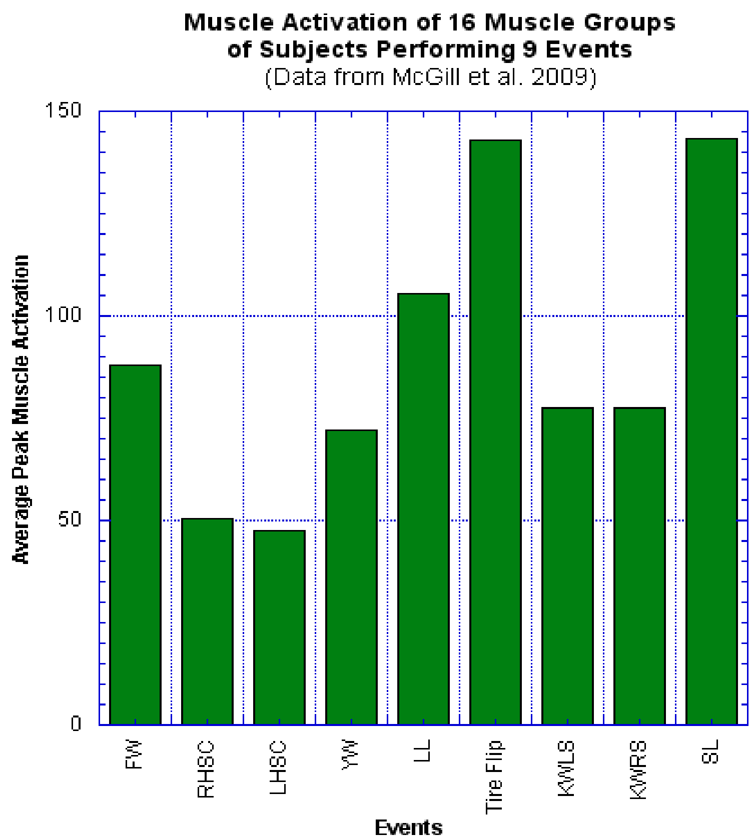


Fig 1

In Figure 1, the nine strongman events [Farmer's Walk (FW), Right-Hand Suitcase Carry (RHSC), Left-Hand Suitcase Carry (LHSC), Super Yolk Walk (YW), Log Lift (LL), Tire Flip, Keg Walk-Left Shoulder (KWLS), Keg Walk-Right Shoulder (KWRS) and Atlas Stone Lift (SL)], the Tire Flip had the greatest average peak muscle activation in eight of the sixteen muscles and second greatest in the other eight. The Atlas Stone Lift (SL) was the only other event which reported similar overall peak muscle activation. Strongman events mimic functional movements, lifting, carrying, pushing, pulling and throwing. These movements are also commonly found in many sporting activities. Therefore, using functional or "strong man" training for sports athletes is a valuable training addition and the Tire Flip is a top choice.

The scientific literature has been overwhelmed with "core training" and "core conditioning". A recent single article search in the area of Sport Sciences revealed over 230 published papers on "core training". Is the strength of the muscles of the abdominal cavity and lower back important? Yes, they are. We are also learning that abdominal flexion may not necessarily be the best way, and certainly not the only way, to train these muscles. Functional training, where objects are lifted in a less than stable environment, requiring spinal posture, may be most beneficial. Several concepts exist that support this, including a rapid muscle contraction for stiffness, enhancing muscular binding where several muscles contract together, and also eliminating "muscular leaks" where the weaker muscles are forced into eccentric contraction by stronger muscles (S. McGill, 2010). As an example, dead lifts have been shown to elicit a greater muscle activation of the rectus abdominis, external oblique, longissimus and miltifidus muscles compared to stability ball abdominal and lower back exercises (Nuzzo, McCaulley, Cormie, Cavill, & McBride, 2008). As shown on the facing page, tire flipping had one of the greatest core muscle activation results of several functional training events (S. M. McGill, et al., 2009).

Lifting and carrying objects is probably one of the oldest forms of exercise, therefore it is no wonder that so many modern competitive sports simulate the movement and physical demands of a tire flip and other lifting events (Waller, et al., 2003). As noted by Waller, et al, a concern with these activities is low back stress. It is interesting to note that McGill et al (S. M. McGill, et al., 2009) noted the smallest A/P lumbar joint shear forces with the tire flip compared to all other events, even with the highest mass of load lifted in the tire flip. Part of this reason may be the support the tire gives to the chest during the initial phase of the lift. This will be discussed more in the "***Lifting Techniques***" section of this manual.

Another important feature of tire flipping in general is the feedback to the lifter. These functional activities break up the otherwise typical and possibly monotonous training with something different and in the process create some competition to the athletes (Bennett, 2008). The knowledge of a successful lift gives positive feedback to the lifter (Randell, Cronin, Keogh, & Gill, 2010). Few activities offer a more empowering feedback to an athlete as grabbing a loaded FLIPPER and throwing it over. That is a big "I beat it! It is on its back, and I put it there". This builds confidence as well as physical strength and power in your athletes.

What is a FLIPPER?

The FLIPPER is a functional training tool designed to simulate “Tire Flipping”. The FLIPPER is the first tire flipping implement that has been designed as an exercise device. Using discarded truck and tractor tires brings with it a series of limitations, perhaps most importantly, the inability to alter the resistance of the device. What the removable weight plate did for training with barbells, the FLIPPER has done for tire flipping.

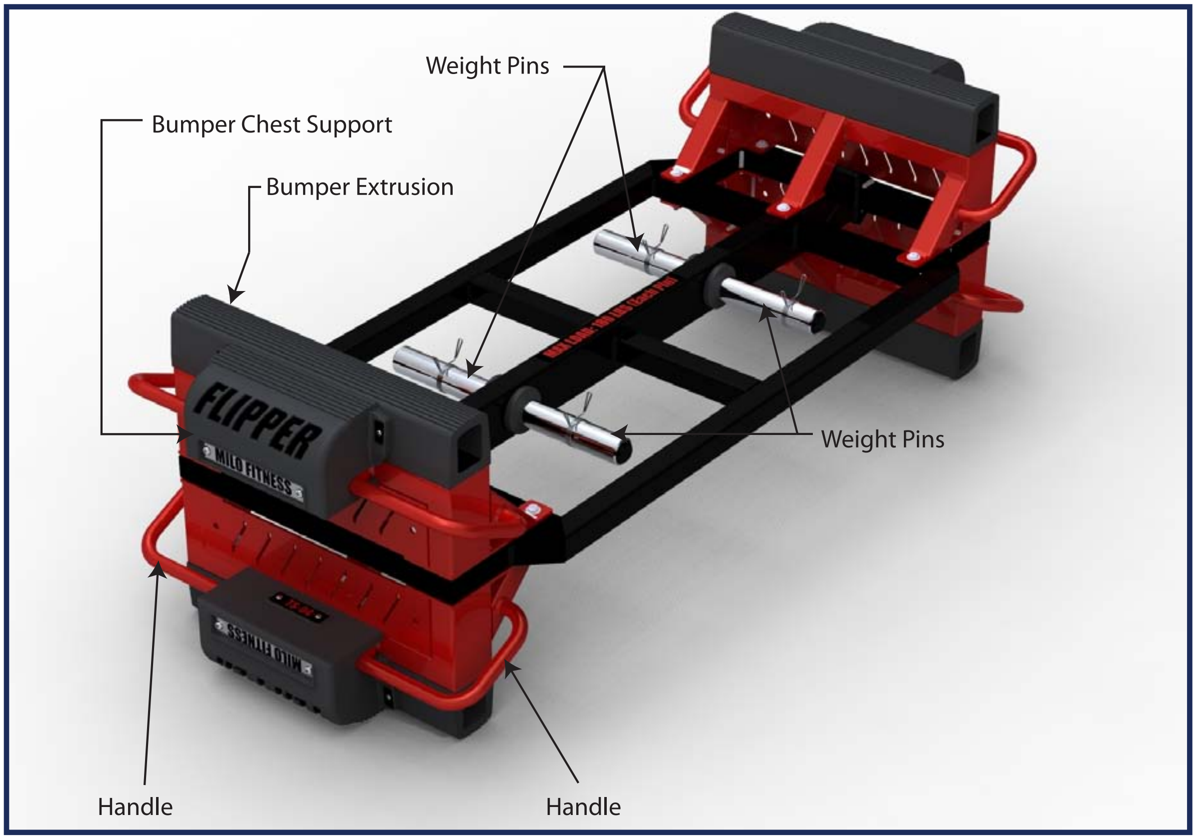


Fig 2

The basic components of the FLIPPER are shown in Figure 2. The FLIPPER is symmetrical about the left and right, the front and back as well as the top and the bottom. In doing so, the FLIPPER may be positioned in any orientation and the same features will be available to the lifter.

The handles can be grasped on the front horizontal section or further toward the center of the device on the angled section. Most lifters prefer to use the horizontal section of the handles or the junction between the horizontal and angled sections as these provide the greatest leverage and the most comfort to the lifter during the lift. More detail on hand placement may be found in the “***Lifting Techniques***” section of this manual.

There are two types of bumpers, the Bumper Chest Pad and the Bumper Extrusion. The Bumper Chest Pad provides a comfortable "cushion" to position against the chest of the lifter during the initial phase of the lift. The Bumper Extrusion gives impact absorbing protection to the frame as the FLIPPER is flipped over and contacts the ground.

The Weight Pins are used to hold weight plates to vary the loading of the FLIPPER. It is recommended that whatever weight is placed on a weight pin on one side (right or left) the same weight is placed on the adjacent weight pin across the center beam. This allows for even weight placement between the right and left side of the user and helps the FLIPPER to track straight when flipped over. The front to back loading of the Weight Pins may be altered to vary the simulated "Total Weight" of the FLIPPER with a single load setup. This is explained in detail in the "***Using the Loading Charts***" section.

Indoor versus Outdoor Training:

Outdoor training involves flipping the FLIPPER end over end. Indoor training uses a Docking Station to keep the FLIPPER in a predefined location. Athletes may also lift the FLIPPER to vertical and then lower or drop the FLIPPER back to the starting position, rather than flipping it over. Outdoor training, flipping the FLIPPER end over end, should only be done where space is not a concern due to the presence of other people or objects that may be hit by the FLIPPER when being flipped. When the FLIPPER is released from the Athlete's grip, the device may not track in a straight line. Large open areas may be used for Outdoor training even if there is a roof overhead. The location of using Outdoor Training is left to the discretion of the Athlete or Coach in charge of the training area.

Spotters:

Spotters should always be used. The lifter is intended to use the lower handles on one end of the FIIPPER, leaving the upper handles on the same end for a spotter on each side of the lifter. The spotters should stay near the lifter to be able to grasp the handles if the lifter misses a lift. The spotters should never be too far in front of the lifter so as to be in danger of being hit by the FLIPPER when it is flipped by the lifter. In most cases, if the lifter cannot complete a lift, the lifter will stop and intentionally step back and drop the FLIPPER. if this is done, the spotters need not assist in lowering the FLIPPER. As with any lifting movement, communication between lifter and spotters is important.

Warnings:

Consult the Owner's manual for product detail, care and maintenance. Always inspect your FLIPPER before use and comply with all warnings listed in the Owner's Manual. If your Owner's Manual is lost or damaged you may download one from the website at: www.MiloFit.com, or by contacting your distributor, or Milo Fitness at FLIPPER@Milofit.com.

Using the FLIPPER - Lifting Techniques

Standard Lift Technique:

The literature varies to some degree, but in a tire flip, there may be considered four distinct phases (Keogh, et al., 2010). The first phase is the “initial pull” or “first pull” where the device is first moved from the ground. The next phase is the “second pull”. In this phase, similar to a hanging clean, the device is rapidly accelerated up by a rapid extension of the legs, hips and back, of the user. Upon reaching maximum height of the device relative to the user, a “transition” phase occurs where the hands come off the tire, to be repositioned for the final “push” phase to flip the tire over. Other authors prefer to describe the lift in more generalized phases (Hendrick, 2008; S. M. McGill, et al., 2009; Waller, et al., 2003). Regardless of the terminology, the process starts with the device on the ground, and ends with the device flipped over away from the lifter.

Grips:

To use the FLIPPER, squat down on one side of the device. The lifter should grasp the handles with both hands. The lifter may use a supinated grip (wrists forward - Fig 3) or neutral grip (wrists facing in toward each other - Fig 4). The supinated grip is used when the lifter grabs the horizontal portion of the handles and the neutral grip is used when the lifter uses the forward facing outside portions of the handles. There are two lifting styles. The Lifter’s hands may be inside of their knees with the feet spaced wide. This is a Sumo Grip (Waller, et al., 2003) and is the supindated grip of Fig 3 with a narrow hand position.

The lifter may, alternatively, use a pronated or overhand grip (wrists facing backward, toward the feet). Some athletes and coaches prefer the overhand grip, as it is similar to performing a clean with an Olympic bar. If this grip is used, the transition phase does not require the hands to leave contact with the handle, and the pronated wrist may reduce tension in the biceps tendon. This reduction in tendon tension may also be seen with the neutral grip (Fig 4).

Fig 3
Supinated grip

Fig 4
neutral grip

Things to watch if this overhand grip is used include: room for the knuckles to clear the frame during the lift; increased friction against the hands as the handle must rotate in the hand of the user, unlike a bar that rotates in the lifter's hand; and losing grip when the palms are facing down during the lift. This may be especially apparent if the lifter uses "supplementary second pulls" (see "***Second Pull Phase"*** section). Different coaches and athletes will have their grip prefernces, which may also vary with lighter or heavier lifts. As a general rule, the neutral grip (Fig 4) is recommended for both comfort and stability. Ultimately it is the coaches' decision how their athletes train, including what grip is used.

The lifter may also choose to grasp the handles wider with their feet only slightly wider than the shoulders. The hands will grip the handles slightly wider than the feet with the knees flared out slightly, as in doing a squat. Some lifters prefer to have their knees rest on the outside of their arms. This is the standard or back style (Waller, et al., 2003) and is shown in Figure 5. The feet should be behind the hands. How far behind may vary. This issue of foot placement is discussed in detail in the ***"Foot Placement"*** section. The lifter's chest should be touching the Bumper Chest Support (item #11).

Fig 5
Standard grip prior to lift

First Pull Phase:

From either lifting stance, the lifter will extend their hips, knees and ankles (triple extension) to drive one end of the FLIPPER up (Figure 6). During this "First Pull" phase of the lift, the arms should remain substantially straight and the hips and knees should extend in a relatively equal manner. This "simultaneous" extension is similar to a squat, as opposed to a deadlift which is a "sequential" lower body extension, as the bar has to be manipulated around the knee (knee pass)(Escamilla et al., 2000; Hales, Johnson, & Johnson, 2009). This being stated, it is important not to first elevate the hips, by extending the knees, then the hips. This may put excessive stress on the lower back of the lifter. By simultaneous extension, the hips stay lower during the lift requiring less extension of the lower back. For proper lifting mechanics, the hips should never be higher than the shoulders. The improper lifting mechanics is shown in Figure 7, where the hips are higher than the shoulders. The spotter is positioned to the side of the lifter to assist the lifter if necessary.

Fig 6
Start of first pull (proper)

Fig 7
Start of first pull (improper)

Second Pull Phase:

As the hands of the lifter pass the knee, the "Second Pull" phase of the lift begins (Figure 8). This is considered the highest power production phase of the lift. The lifter rapidly extends the hips, knees and ankles and shrugs the shoulders to drive the end of the FLIPPER as high onto the torso of the body as possible. During this phase, the lifter's feet may come off the ground. Some lifters prefer to "kip" or kick the device up with the thigh of one leg contacting the bottom Bumper Extrusion (see Figure 2). This is not necessary and may not be desirable as the training goal is to build explosive power and strength. This is best attained by centering the body on the device and generating as much power as possible by rapid simultaneous extension of the legs and hips. Maximal force and power generation will not happen if one leg is in the air. With both feet on the ground, there may be a lower risk of injury (Waller, et al., 2003).

Fig 8
Beginning of second pull

Lifting heavier loads, nearing the athlete's 1RM, the lifter may use multiple "second pulls" to get to the transition phase. The Standard Lift with the FLIPPER has many similarities to an Olympic clean and jerk. Though many of the lifting phases are similar, one of the differences is after the second pull of a clean, the athlete must catch the bar in a balanced stance, with the bar on shoulders of the lifter. With the FLIPPER, there is a type of "catch", but with the FLIPPER, the cushioned rubber bumpers can contact the torso of the lifter, even resting against the body of the lifter. In doing so, the lifter may perform several sequential "supplementary second pulls" to work the implement up their torso until they are able to rotate their grip, thereby reaching a modified "transition phase". If multiple supplementary second pulls are used, the lifter will bend their arms and with the lower bumper on the torso of the lifter, squat slightly and drive the FLIPPER up, then flexing the arms and shrugging the shoulders for each supplementary second pull. Each supplementary second pull should increase the height of the FLIPPER on the lifter, until the lifter can position the FLIPPER on their body to perform the transition phase of the lift.

Transition Phase:

After the second pull(s), the lifter should have the handle height of the FLIPPER at mid-chest. At this point, with flexed arms, the lifter rotates their grasp from a pull grip (underhand grip) to the push grip (overhand grip). This is referred to as the transition phase. The transition phase is shown in Figure 9.

Getting the device high enough on their body to make the transition phase may be the most challenging phase for the lifter. If the lifter cannot complete the lift to the transition phase, the spotter may step in and assist the lifter or the lifter may step back out of the path of the device and let it fall to the starting position. If the lifter elects to "scratch" on a lift, ensure the lifter is fully aware of the path which the device will fall to the ground and the lifter's feet or any other body part is clear of this path. Since the FLIPPER acts like it is "hinged" to the ground, the lifter may lean against the cushioned rubber bumpers while they step back away from the device prior to releasing it and allowing it to fall.

Push Phase:

The final phase of the flip is the push phase. The end of the transition phase and the beginning of the push phase is shown in Figure 9. As the name "Push Phase" implies, the lifter extends their arms, keeping their torso upright. The lifter pushes the FLIPPER to the vertical position and over. The bumpers of the FLIPPER cushion the impact with the ground. After this, the "Flip" is complete. Now the same lifter, or another lifter, may approach the close end and repeat the process or they may go to the other end and flip the FLIPPER back to the starting position.

Fig 9
End of transition phase
and beginning of push phase

When used inside, it is suggested to use the FLIPPER Docking Station or a large open space, such as a practice field. For outdoor training, any large open space with an appropriately stable and durable surface may be used. It is recommended that the FLIPPER be used on a grass, turf, or rubber surface as compared to concrete or asphault, as the harder and more abrasive surface will wear the bumpers more rapidly. The resistance to the lifter may be altered by adding or removing weight plates from the weight pins as described in the "***Using the Loading Charts***" section of this manual.

Side Lift Technique:

If you are not tired enough of hearing about "core training", that's good, because we are not yet finished. Previously we discussed the rather overwhelming amount of literature published in this area, and for good reason. If the lower body is the foundation of our athletes, and the arms are the application of force (blocking, throwing, pushing, pulling, tackling, etc.) the trunk, or core, is the connection between the upper body and the lower body. If that is a weak link, the chain of the body will fail. This may mean injury or at the very least a sub-optimal performance on the field, court or mat.

When you examine many movements in sports, there is an element of trunk rotation with a stable base on the ground. Think about a batter at the mound, a tennis player striking the ball, a discus, shot, or hammer thrower in competition. These are obvious applications of power where the legs provide stabilization and the upper body moves to drive through and hit or throw an object. In some cases the "object" may be an opponent. When a guard pulls, a running back makes a cut, or a wrestler makes an escape or a takedown, for a moment, the feet do not face the direction of movement. A key element is the athlete is driving through the opposition to hit or "throw" the object or person.

It has been shown that the speed of movement as well as the force applied is different when the athlete is able to "throw" the object as opposed to maintain control throughout the movement (Newton, Kraemer, Hakkinen, Humphries, & Murphy, 1996). In this study Newton and associates showed an average power output that was 70% greater when the athletes were allowed to perform a bench press throw as compared to the same movement except they could not release the bar at the end of the movement. With few exceptions, this "throwing" movement is how our athletes perform. For example, running and jumping is actually "throwing" their own body.

So how does this apply to training? A similar system used by Newton et al., was used to train a group of athletes in the jump squat (Hori et al., 2008). One group had to catch the weighted bar on their shoulders as they completed each repetition of their jump training, and the experimental group used a braking system to catch the weight for the athletes, as if they were truly throwing the weight. After eight weeks of training, the results showed a relative increase in the squat strength was 76% greater in the group that was allowed to throw and not have to "catch" the weight. The relative countermovement jump height increase was over 212% greater (yes, over twice as much) in the group that did not have to catch the weight as compared to the group that had to catch the weight. This suggests that the movement alone may not be enough to optimally train your athletes. The ability to follow through and "throw" is also important.

The FLIPPER allows a very unique type of team training that simply cannot be done with a tire. This movement is called a Side Lift. The Side Lift is performed by two athletes of similar height. Each athlete stands on the side of the FLIPPER grasping the lower handles, one on each side, as is shown in Figure 10. Their feet should have a wider than shoulder width stance with their toes facing the FLIPPER. On command, both athletes extend their hips, knees and ankles to drive the FLIPPER upward. The movement of the FLIPPER should continue through the beginning of the second pull phase, as shown in Figure 11, the transition phase, as shown in Figure 12 and the push phase, as shown in Figure 13. Between the second pull and the push phases the athletes should rotate their bodies from facing one another, to be in line with driving through the motion of throwing the FLIPPER over. The action of the Push Phase should leave the FLIPPER flipped away from the athletes.

The next repetition is up to the coach, as to another flip in the same direction or flipping the FLIPPER back to the starting position. It is recommended that for every rotation the athlete makes to one side the same rotation is made to the opposite side. This may be accomplished by keeping the athletes on the same side of the FLIPPER and for each flip they make “north” they make the same number of flips “south”. Athletes will tend to want to use only their dominate side. To help prevent injury and maintain uniform development of the core muscles, equal training to each side of rotation is highly recommended.

In that there are two lifters, an additional spotter is not mandatory, as each lifter is acting as a spotter to the other lifter. If an additional spotter is desired, this spotter may stand between the lifters on the end of the FLIPPER being lifted. In essence, the traditional lifter/spotter roles are reversed in that the center athlete is now the spotter and the athletes positioned on the sides of the FLIPPER are the lifters. Many of the drills as presented in this manual may be used for the Standard Lift Technique or the Side Lift Technique. The direct application to drills and testing is intended to be left to the Strength and Conditioning Coaches.

Fig 10
Start of first pull - Side Lift

Fig 11
Start of second pull - Side Lift

Fig 12
Transition phase - Side Lift

Fig 13
Push phase - Side Lift

Using the FLIPPER - Foot Placement

Foot Placement:

The relative foot placement of the lifter to a tire has some different opinions. In using the FLIPPER, some of these variations are also apparent. A biomechanical and training goal basis will be presented here for different foot positions. Much of the non-scientific data from strongman competitors suggest the feet be placed back away from the close end of the tire. The lifter is instructed to drive not up, as in the deadlift, but up and into the tire to maximize the lifting torque applied to the tire.

The scientific literature presents a different perspective. Waller et al, specifies the initial movement be similar to a "barbell deadlift" and shows the toes of the lifter to be near the same frontal plane as the hands of the lifter (Waller, et al., 2003). Consistent with this, Hedrick suggests the lifter not allow the knees to drift forward of the toes (Hendrick, 2008). Keogh et al, did not specify the foot location in their study but in their pictorial representation, at the start of the lift, the lifters toes are adjacent to the tire and lifters hands (Keogh, et al., 2010).

There appears to be a discrepancy between the Strength and Conditioning world and that of the Strongman Competition world. This may be explained by examining the biomechanics of the lift and the relative goals of each lifter. A side view of a lifter on a simulated TS-03 FLIPPER is shown in Figure 14.

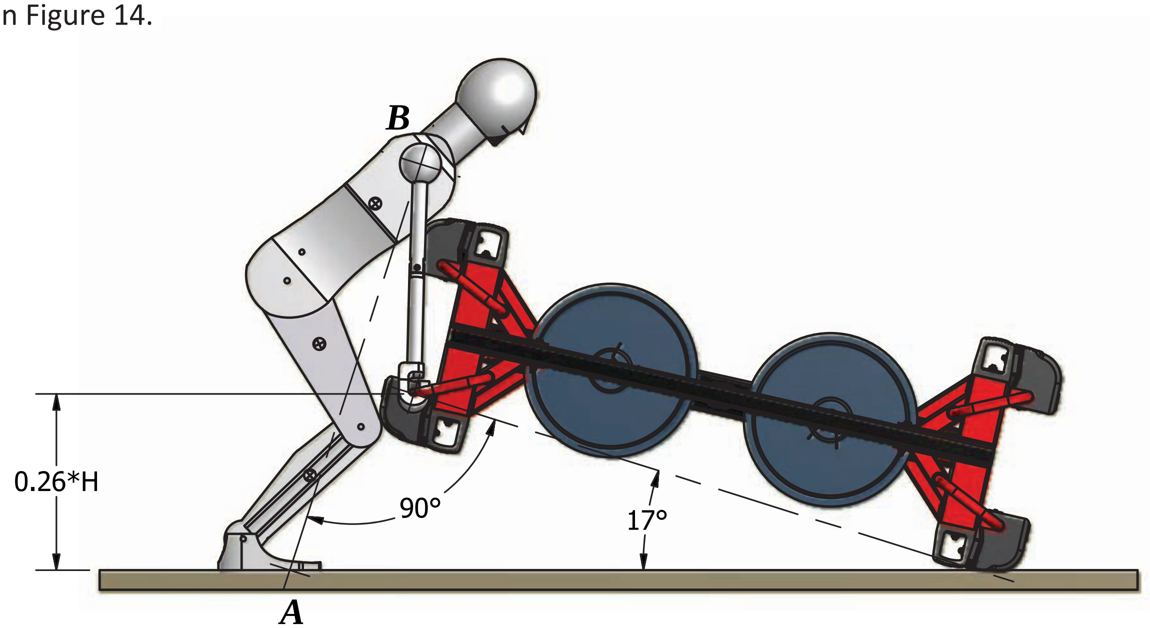


Fig 14

The point of contact with the lifter's ball of the foot is located with the marker "A" and the transverse axis of the shoulder is identified with the marker "B". The model of the lifter is the average height American male, which is 1755 mm (69.1 inches). The height of the handle at the beginning of the second pull is estimated to be 91% of the height of the knee on a fully extended leg.

This calculates to 26% of the height of the lifter or in this case 456 mm (18.0 inches). This position is shown as it is considered to be the start of the second pull phase and therefore the highest power output of the lift and the most instrumental phase in completing a successful flip. If the second pull yields a high position relative to the lifter, the transition and push phases will be possible.

Forces Applied:

A free body diagram of the image in Figure 14 is presented in Figure 15 below. The line of action from the foot contact (A) to the shoulder (B) is considered the powerhouse of hip, knee and ankle extension to rapidly drive the FLIPPER up. This force of the body is represented by force vector $\mathbf{F_B}$. The connection of the body to the FLIPPER is made by the lifter's hands on the handles. This tensile force of the arm is represented by force vector $\mathbf{F_T}$. This vector ($\mathbf{F_T}$) is made up of two component vectors, the force against the chest pad ($\mathbf{F_C}$) and the rotation force ($\mathbf{F_R}$) which drives the motion of the FLIPPER up. Optimally the rotation force $\mathbf{F_R}$ and the power force of the body $\mathbf{F_B}$ will be parallel, as this is 90 degrees to the line of action from the handle to the point of contact of the FLIPPER with the ground (pivot point). Any additional horizontal forces applied to FLIPPER will act to try to drag it on the ground. These forces would not be transmitted to the torque of rotating the FLIPPER up.

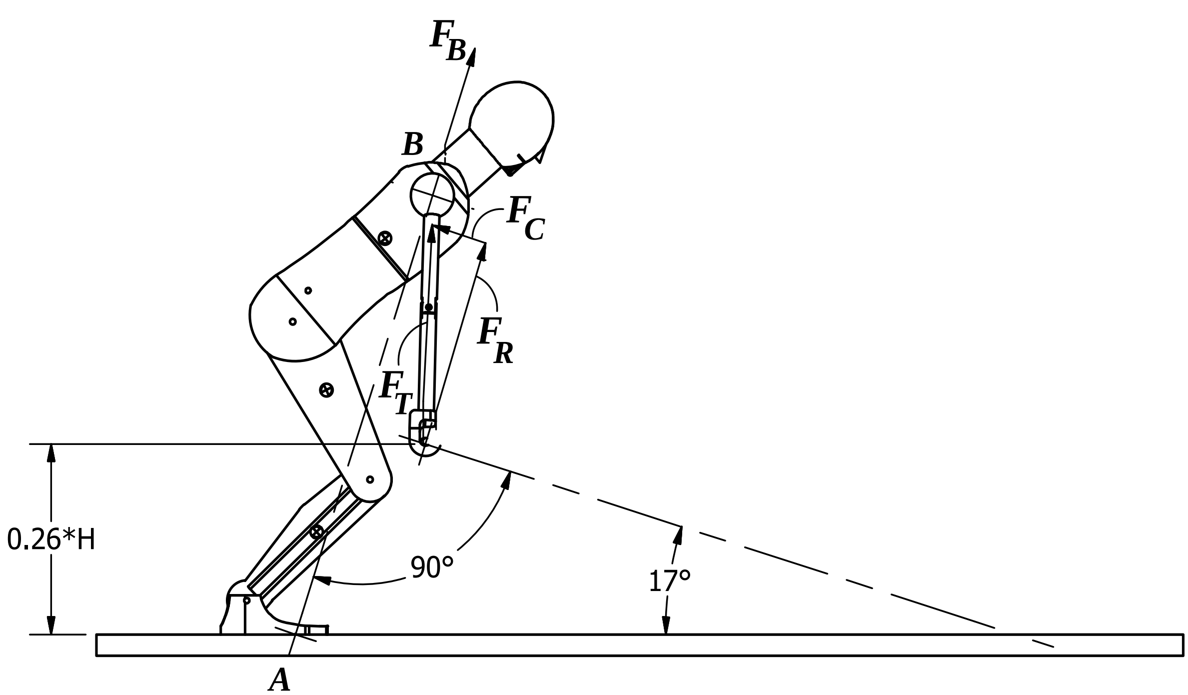


Fig 15

With this, we see a theoretical optimal relationship between the foot position and the FLIPPER. The small force of the chest on the pad ($\mathbf{F_C}$) is used to stabilize the body against the FLIPPER as the arms cannot be straight in line with the body due to the physical position of the FLIPPER. In comparison, a second pull in an Olympic style lift, the optimal direction of the force vector against the bar is always vertical, as the bar is desired to be lifted up against gravity. In contrast, the FLIPPER is rotated about a point of contact with the ground. To generate the greatest amount of torque to rotate the FLIPPER, the force vector ($\mathbf{F_R}$) is optimally 90 degrees relative to the line of action of the point of contact of the lifter (handle) to the axis of rotation with the ground (point of contact). This force ($\mathbf{F_R}$) multiplied by the distance to the point of contact, is the torque applied by the lifter when the FLIPPER is rotating (lifting) at a constant velocity.

For the purposes of our illustrations, we will use the location of the shoulder to the foot ($\mathbf{F_B}$) as the force generation vector. It is understood that the contact with the FLIPPER is the actual force vector ($\mathbf{F_R}$) that provides the torque to lift the FLIPPER. Optimally these vectors are parallel due to a force placed on the chest pad ($\mathbf{F_C}$). Therefore, the body's force ($\mathbf{F_B}$) will be used to generalize the driving force to generate the lifting torque to rotate and therefore lift the FLIPPER.

How long is it?

The diameter of the tire being lifted makes a difference in the lifting torque. This is further evaluated in the "***Size Matters***" section of this manual. Regarding foot placement, it also matters. This difference further reiterates the desire for standards in Strongman implements for both training and testing.

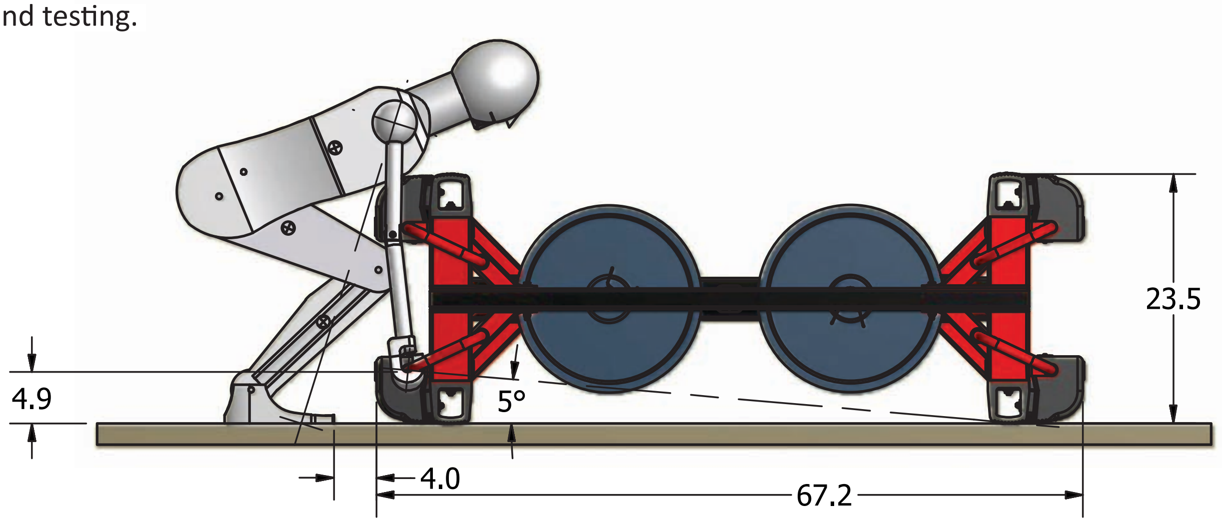


Fig 16

Figure 16 shows a simulated TS-03 in a bottom position with the feet unmoved from the theoretically optimal position preparing for the second pull as was shown in Figure 14. Here, the fronts of the feet of the lifter are 4.0 inches back from the back of the chest pads. If a high power explosive movement is desired, and the feet are not moved from first pull to second pull as there would not be time to do so in a rapid explosive movement, this would be the theoretically optimal position to generate the greatest torque at the start of the second pull.

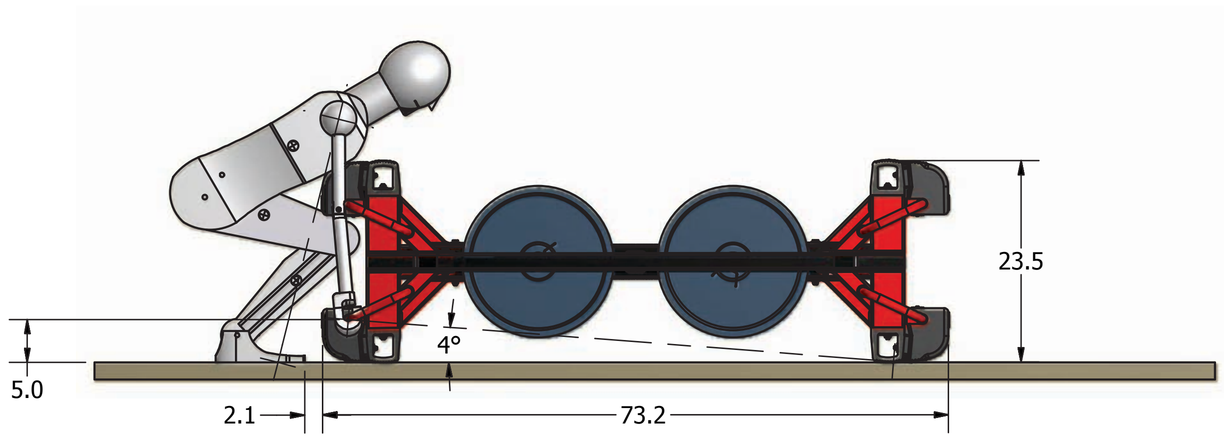


Fig 17

To show how the length of the implement changes the optimal foot position, Figure 17 shows the optimal starting position of a simulated TS-04 (frame simplified for illustration), which is six inches longer than the TS-03. The foot position is clarified in Figure 18 by the 90 degree relative angle of the shoulder to ball of the foot to the line of action of the handle to the floor. This is with the handle located at the same height as it was in Figure 14.

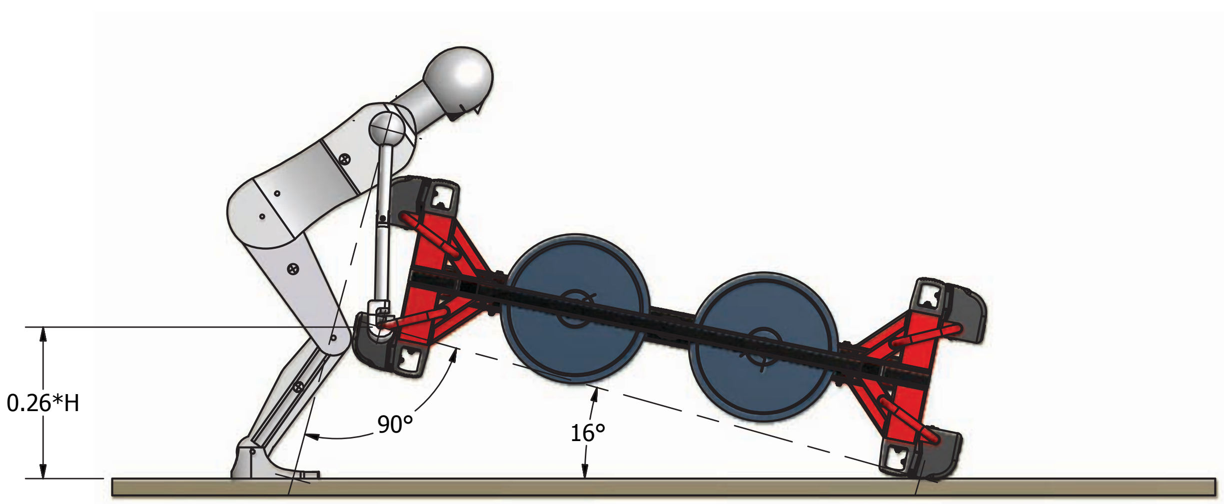


Fig 18

The optimal foot position behind the chest pad went from 4.0 inches on the TS-03 to 2.1 inches on the TS-04. The longer the implement, the less the angular inclination for the same handle height, and therefore the farther forward the optimal foot placement will be in this model. How does this compare to a tire you may ask? Well, a 73.2 inch (1.86 m) diameter tire may not be easy to find. The tires reported in some of the studies were 1.5 m by Keogh et al (Keogh, et al., 2010) and 1.6 m by McGill et al (S. M. McGill, et al., 2009). Most of the other tires appear to be of a diameter smaller than the height of the lifter. In a tire shown by Hedrick (Hendrick, 2008) the diameter appears to be about 1.25-1.3 m. It is not suggested that these sizes are in any way desired by the authors or coaches. In that these tires are typically discarded used truck tires, the strength coaches have had to live by the adage, “beggars can’t be choosers” and take what they can find.

A 50 inch (1.27m) tire is used for illustration in Figures 19 and 20. In Figure 19, the same starting height (5 inches) is used as was on both FLIPPER simulated models (TS-03 and TS-04). In Figure 20, the same vertical height is reached with an estimated hand grip position. Here the angle of inclination of the 50 inch tire is 22 degrees, as compared to the 17 degrees on the TS-03 and 16 degrees on the TS-04. Using the same model as with the simulated FLIPPER models, this produces a starting foot position of 9.3 inches behind the edge of the tire as is shown in Figure 19.

Fig 19

Is optimal positioning for the second pull phase the best criteria for foot placement? In many cases in training athletes for sports, where speed-strength power is desired, yes it may be. The movement from first pull to transition is likely desired to be a fluid continuous motion. To accomplish this, there is not time to step forward and reposition the lifter between phases. To be off balance and on one foot may also not be desirable if the lifter is in the action of stepping when the maximal power should be applied (Waller, et al., 2003).

When lifting closer to the 1RM (1 repetition maximum) of a lifter, the rate of assent will be greatly reduced, as with any lift. Therefore, the transfer of kinetic energy from the first pull to the second pull will be minimal. In this case, it may be desirable to reposition the lifter under the FLIPPER in preparation for the second pull. When that happens, the lifter’s starting foot position may not be as much of a contributing factor to the optimal foot position for the second pull.

The highest load to the lifter is at the beginning of the first pull, not to be confused with the highest power output of the second pull phase. As the FLIPPER is lifted, the center of gravity moves closer to the point of contact with the ground, thereby reducing the torque required to continue the lift. The primary muscles used in the first pull are the extensor muscles of the legs and hips. A lifter can lift more from a rack pull where the bar is 18 inches off the floor as compared to a deadlift where the bar is less than 9 inches off the floor. This is due to the mechanical advantage of the muscle driven linkage of the body at a more extended leg position.

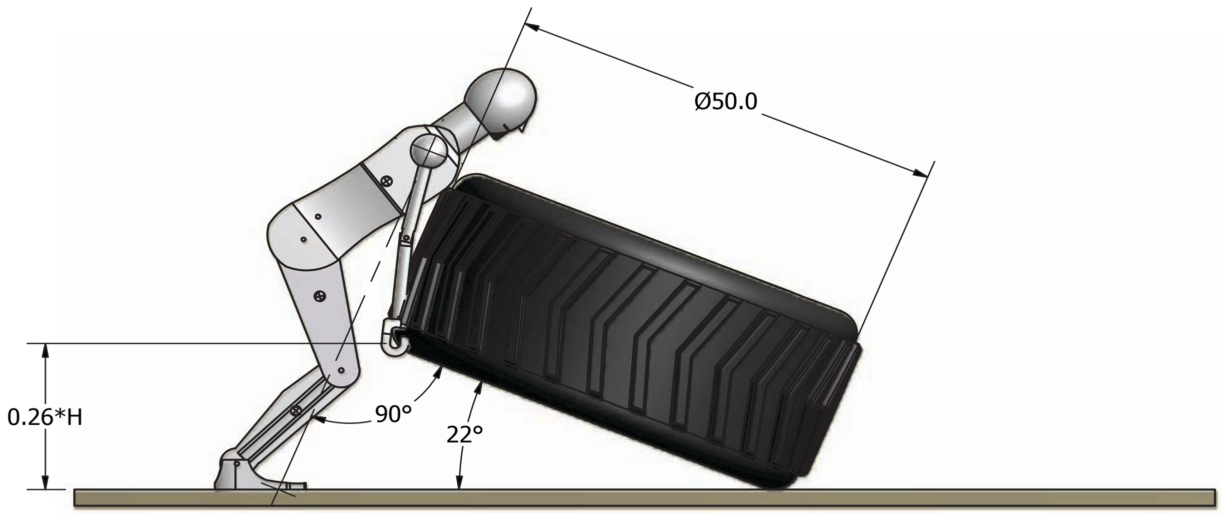


Fig 20

The same may be true with tire flipping. By placing the feet back, the hip and knee joints can be more extended at the start of the lift, thus providing a potential advantage to the lifter. A problem with this theory could be the relative angle of the force vectors at this starting position. As it turns out, the difference in the moment arms is less than 1% using the simulated TS-03 with feet placed at 4.0 inches behind the chest pads as compared to 17.5 inches behind the chest pads. The orientation of the lifters is shown in Figure 21.

Figure 22 (the side view of the same lifters in Figure 21) shows the relative moment arms of the force vector of the body ($\mathbf{F}_B$ in Figure 15). As noted, these are generalized force application vectors to rotate the FLIPPER and are considered representative of the force applied to the handle, as presented in the free body diagram in Figure 15.

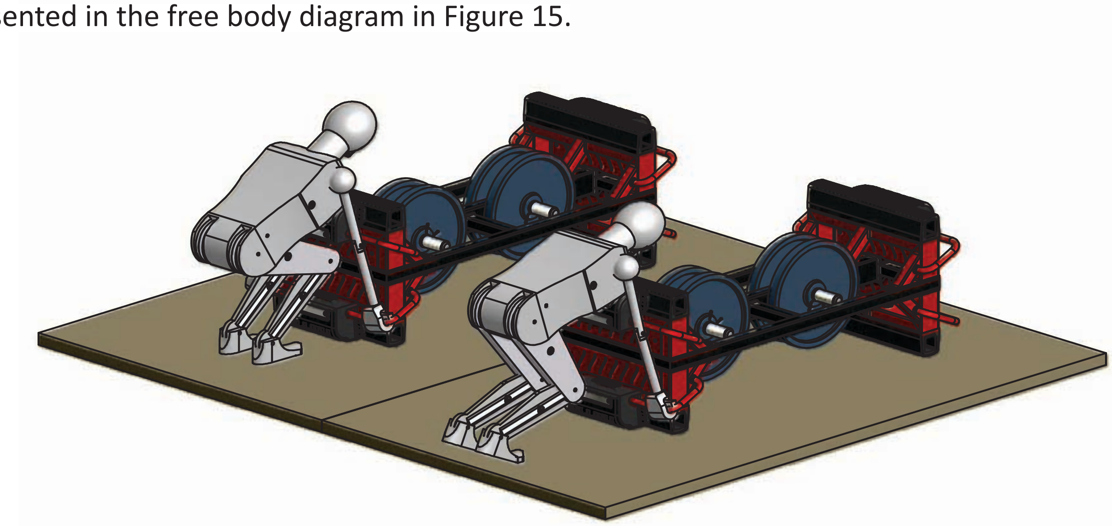


Fig 21

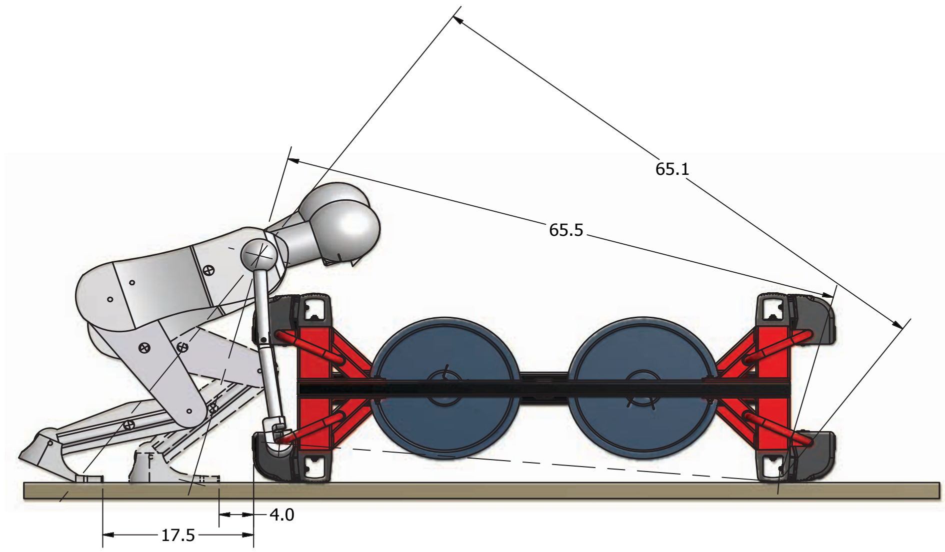


Fig 22

The moment arm applied by the powerhouse of the body is 65.5 inches in this model with the feet 4 inches behind the chest pad, and 65.1 inches when the feet are 17.5 inches behind the chest pad. This relative difference is less than 0.6%. The knee angle has increased by 12 degrees from the 4.0 inch position to the 17.5 inch position and the hip angle has increased by 26 degrees. This could substantially increase in the ability of the lifter to produce force at the beginning of the first pull. The lifter would then walk toward the FLIPPER to position themselves for the second pull. The lifter may set the bottom bumpers on the tops of their thighs prior to beginning the second pull, even though this may be at a slightly higher handle position than a second pull with a lighter weight.

Training or Testing?

So what matters to the strength and conditioning coach and what matters to the athlete? In this case they may differ depending on the goals for the athlete. For training, the old adage of train how you want to perform is the rule to follow. If your athletes need to develop explosive power from a deeper squat position, it is suggested to train the athletes with their feet closer to the FLIPPER at the starting position. Also, if explosive power and multiple reps for muscular endurance training are your goals, then also, train with the athletes' feet closer to the FLIPPER at the beginning of the movement. This allows the athlete to transition through the first and second pull phases with little or no repositioning of their feet, thus enabling a faster and smoother transition from the first phase through the transition phase.

If you or your athletes are training for Strongman, or if you are testing for maximal strength, then it may be beneficial to start with the feet further back, away from the FLIPPER. The higher loads the athletes may be able to lift may help their confidence. For Strongman, if this is how they are to perform, then it follows that is how they should train.

If training is done with the feet further back, there will be a greater force against the Bumper Chest Support. This is a softer rubber that has been designed for this purpose, and the width is intended to be less than shoulder width to eliminate any rubbing as the shoulder articulates during the lift. These design features are done to reduce any skin irritation caused by any rubbing against the chest bumper pad. Even so, some redness in the skin on the chest may occur due to the friction of the lifter's chest against the Bumper Chest Support. If this occurs, it is likely the athlete has their arms slightly flexed during the start of the first pull phase of the lift. As noted, especially if the lifters feet are farther back away from the FLIPPER, the force ($\mathbf{F_c}$) against the Bumper Chest Support may be significant. As the lifter powers through the first pull phase (as with a clean on an Olympic bar) the arms will straighten during the lift. The force ($\mathbf{F_c}$) coupled with the movement of the Chest Support against the lifter's chest may cause some slight redness. If this is seen, it is an indicator of improper form. Correction in the lifter's form to start the first pull phase with arms extended should eliminate any further issue.

Using the FLIPPER - Size Matters

Size Matters

Does size matter? Well when it comes to Tire Flipping, the answer is a definite yes! As was shown in the "***Foot Placement***" section of this manual, the length of the FLIPPER (TS-03 or TS-04) or the virtually infinitely variable diameters of truck and tractor tires, optimal foot placement may vary as a factor of the diameter or length of the device. There is something that is even more important to consider. When a FLIPPER or a tire is flipped, it is never completely lifted, as it is with a barbell. When an object is flipped over, it acts as a Class 2 lever as shown in Figure 23.

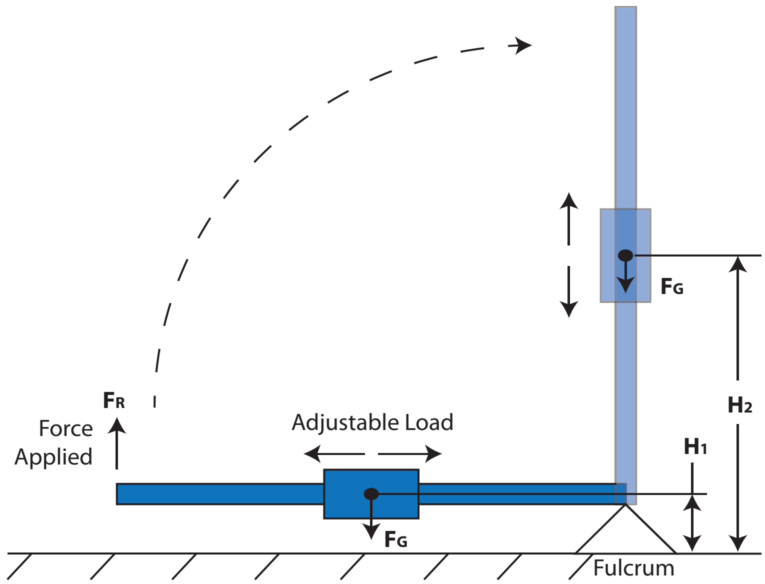


Fig 23

When the load provided by the force of gravity (**F_G**) acting on the device is centered on the device, the applied force (**F_R**) to rotate the device is half as much as the force of the load (**F_G**). This is due to the perpendicular distance from the fulcrum to the force applied (**F_R**) being twice as great as the perpendicular distance from the fulcrum to **F_G**. The total work done by the lifter is the total weight of the device (**F_G**) multiplied by the increase in height (H_1-H_2), when the load reaches its highest point (force x distance). The greater the distance from **F_R** to the fulcrum, the greater H_2 will be, when **F_G** is centered on the device. With the same total weight (**F_G**), the greater H_2 is, with H_1 constant, the more work is done by the lifter.

Therefore, with two devices of different lengths, but the same total weight, the lifter will do more work and apply more lifting force (**F_R**) to rotate the device to the vertical position on a longer device compared to a shorter device. The TS-03 is only six inches shorter than the TS-04. At weights close to 1RM this difference is apparent. Using tires of different diameters may make a substantial difference.

To better illustrate how these changes apply to the lifter, a graph of the torque ($\mathbf{F_R}$ x perpendicular distance to the fulcrum) during lifting a 500 pound evenly loaded TS-03, TS-04 and 50 inch diameter tire is shown in Figure 24. The solid vertical line marks the torques on all three implements at 18 inches off the ground or approximately the beginning of the second pull phase of the lift. The dashed line, at approximately 45.5 inches off the ground, shows the torques at the beginning of the push phase.

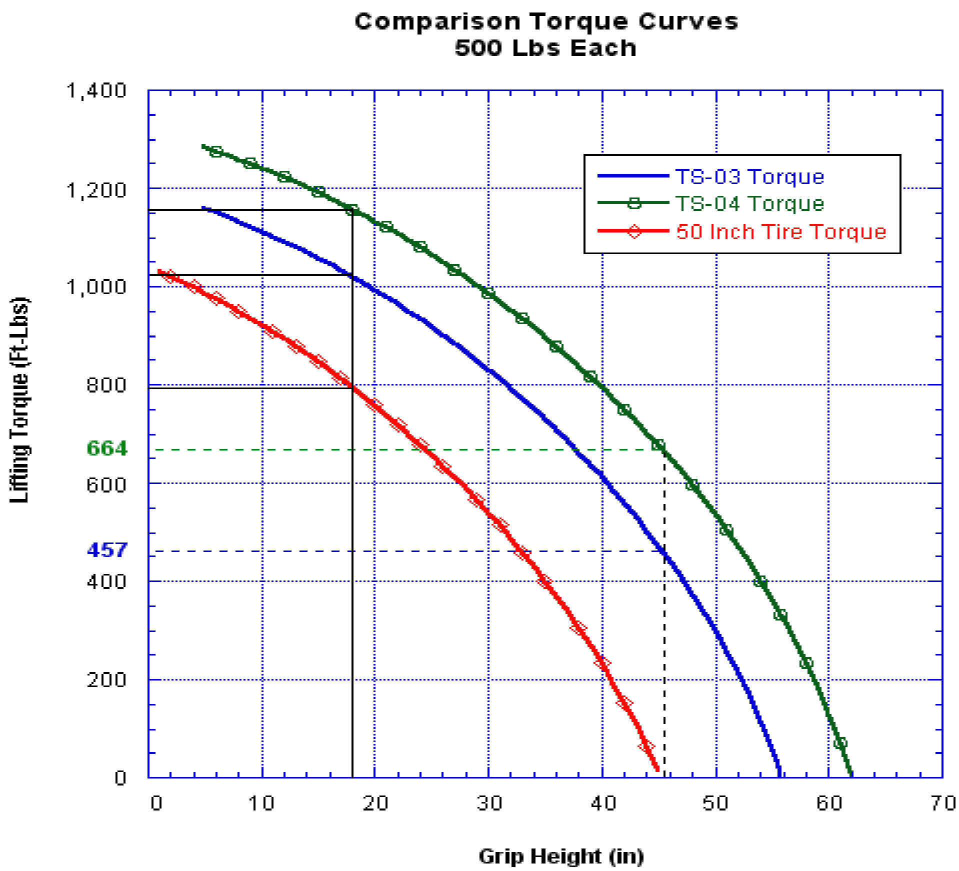


Fig 24

Using the same 500 pounds on three different size implements, the torque required to rotate the 50 inch diameter tire at a hand height of 18 inches is less than 800 ft-lbs. The TS-03 requires 1020 ft-lbs and the TS-04 requires 1155 ft-lbs. Therefore at second pull, the TS-04 requires 46% more torque to lift the same total weight of each implement at a constant velocity.

An even more dramatic difference is seen during the push phase. At hand height of 45.5 inches off the ground, the center of gravity of the 50 inch diameter tire is directly over the fulcrum, as illustrated in Figure 25. This means the torque required to rotate the tire is zero. If the tire is rotating at a constant angular velocity, there is no effort required by the lifter to perform the push phase of this lift. Therefore, a critical component of the lift, the push phase, is nonexistent for this lifter with this size 500 pound tire.

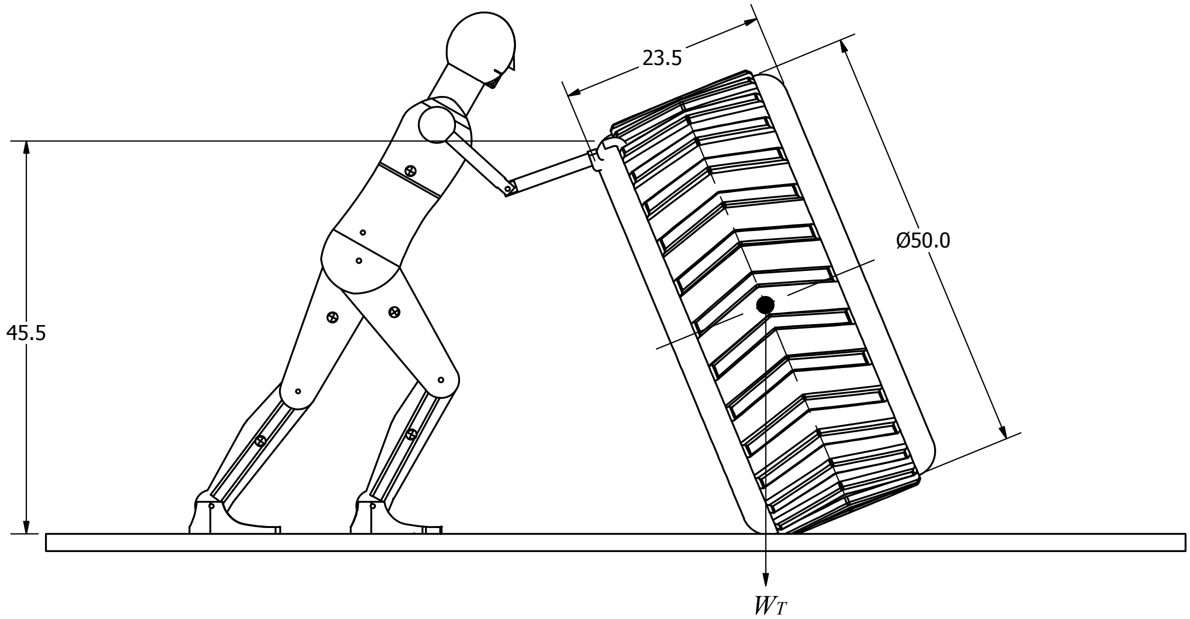


Fig 25

By contrast, the same total weight on the TS-03 requires 457 ft-lbs of torque to initiate the push phase and 644 ft-lbs of torque for the same 500 pound evenly loaded TS-04 (($\mathbf{W}_{\mathbf{T4}}$ * X) as illustrated in Figure 26) . The graph in Figure 24 shows the torque requirements to lift the same 500 pound total load on the TS-04 at the final push phase is about 20% less than that of the 50 inch tire at the higher load second pull phase! The length of the device makes a substantial difference, as well as the total weight.

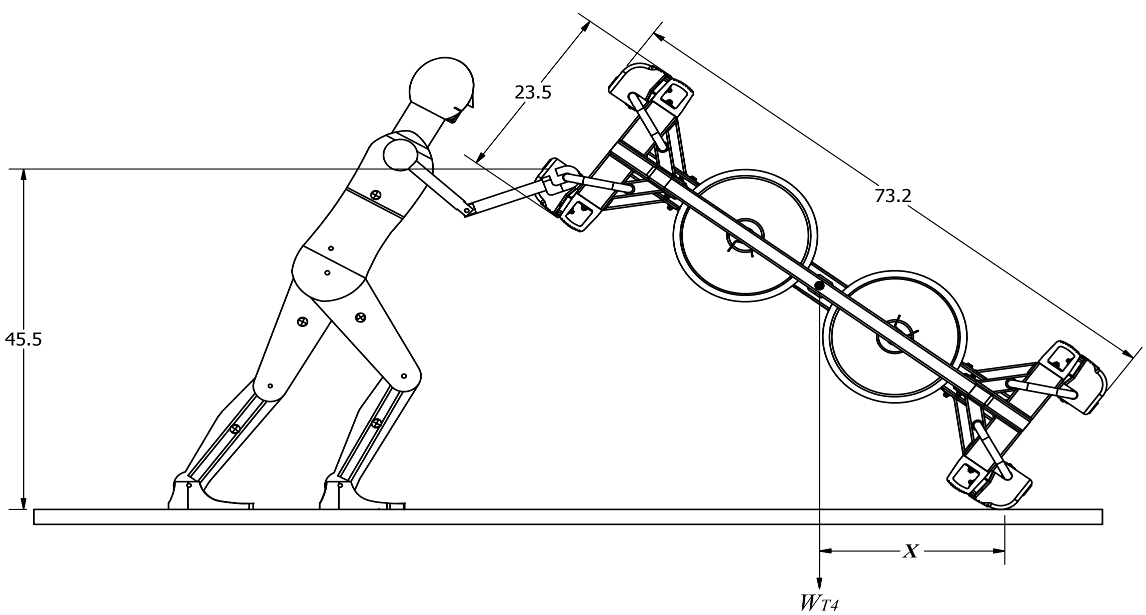


Fig 26

Who should use the TS-03 or the TS-04?

It is recommended that taller athletes (over 5’10”) use, train and test on the TS-04 and athletes not as tall (5’10” and under) use the TS-03. This is a only a general guideline. Less experienced athletes may prefer to use the TS-03. Many athletes prefer to learn on the TS-03 and then later transition to the TS-04.

The TS-03 has a lighter unloaded weight than the TS-04, but is also not as long. So even if the TS-03 is loaded to the same total weight of the TS-04, as previously disclosed, the lifter does less work during each flip. How much less? The TS-03 is about 92% the length of the TS-04, so when making the transition from the TS-03 to the TS-04, reduce the total weight as per the formula below:

$$\mathbf{W_4} = 0.92*\mathbf{W_3}$$

where the total weight of the loaded TS-04 ($\mathbf{W_4}$) is 92% of the total loaded weight of the TS-03 ($\mathbf{W_3}$). If an athlete is lifting 600 lbs. on the TS-03 and wants to use a similar weight on the TS-04, the TS-04 weight would be 550 lbs. (600 * .92 = 550).

Loading % of 1RM

Traditional estimation of reps based on a % of 1RM may offer a guideline, but there are differences with the FLIPPER compared to traditional weight training movements. With a squat or bench press, the active muscles are under load continually, before during and after each repetition. The muscles are never unloaded during the set. With the FLIPPER, or any tire flipping exercise, once the push phase is completed, the lifter is only supporting their own bodyweight and repositioning for the next rep. This allows a greater rest between repetitions to allow the lifter to recover. Therefore, at lower values (less than 80% of 1RM), the repetitions your athletes will be able to perform will be above the values in the % of 1RM charts.

This changes at higher levels of 1RM, depending on the rest period allowed to the lifter. The amount of energy required by a lifter at over 90% of 1RM is substantial. This means the lifter may be limited by their cardiovascular limits as opposed to muscular endurance limits as demand for oxygen may be a limiting factor. For high intensity lifts (over 90% of 1RM) the first two may be a challenge for the lifter, but after four reps with minimal rest, they may be recovering in the supine position for a several minutes. Having said this, a lifter should be able to lift 4-6 reps at 90% of 1RM, but the rest time for the last couple of reps may be 10 seconds or more between reps.

Due to the high level of work done, when training at high intensities on the FLIPPER, it is recommended that the FLIPPER training frequency be no more than once a week. When training at lower intensities, more frequent training sessions may be used.

Using the FLIPPER - Using the Loading Charts

Using the Loading Charts:

The FLIPPER may be used as an endurance training device or to develop strength and power. Just as a barbell can be used with lighter weights and high repetitions, or at 1 repetition maximum (1RM) levels, the FLIPPER is infinitely variable, within the boundaries of the empty weight and maximum loading weight of each machine. This ability to vary the resistance is one of the most important features of the FLIPPER compared to a tire from the junk yard. This ability to vary the resistance not only allows athletes of a wide range of abilities to use the same device, but enables progressive training. Periodization programs requiring variable resistance may be extended to functional FLIPPER training as well as traditional weight training with barbells and dumbbells.

Uneven Loading:

Another unique feature of the FLIPPER is the ability to vary the load on the same unit without changing weights. This can be done by what is called "Uneven Loading". The Loading Charts for each model are specific to that model so the TS-03 Loading chart is to be used only for the TS-03, not the TS-04. The same is true for the TS-04. The Loading Charts tell the athlete or coach what the equivalent "Even Loading" would be for each end of the FLIPPER.

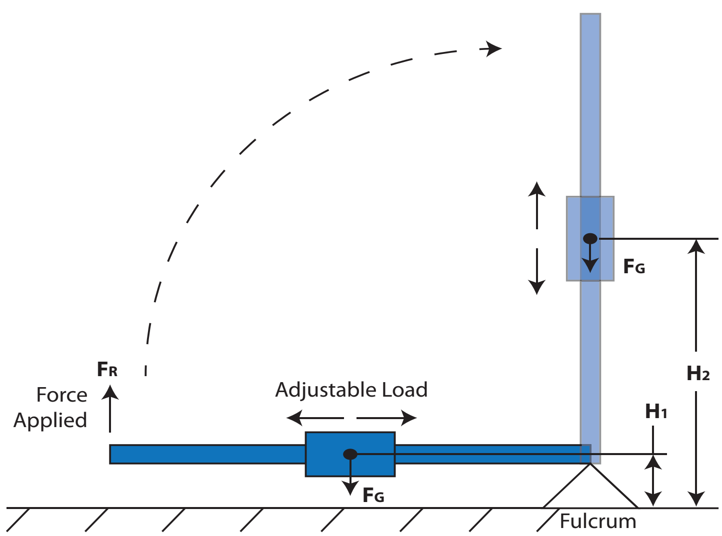


Fig 27

How does this work? It's just physics. In the "***Size Matters***" section, the discussion was made about how the total length of the implement varied not only the torque, and therefore the force applied throughout the lift, but also the total amount of work done by the lifter. These were all based on the FLIPPER, or tire, being evenly loaded so the center of gravity is on the geometric center of the device. The FLIPPER allows the center of gravity to be moved more toward one end or the other, simply by altering the loading of the weight plates on the weight pins. The principle is shown in Figure 27. Here the load is labeled as "Adjustable Load".

By altering the loading, the center of gravity (**F_G**) may be moved to the right or left of the center of the device. If the center of gravity is moved to the left in Figure 27, the distance from the fulcrum increases. This increases the force (**F_R**) required to lift the device and increases the height dimension (**H_2**) when the device is vertical. As previously noted, the greater height (H_2), with a constant initial height (H_1), the more work is been done by the lifter.

The opposite is true if the center of gravity (**F_G**) is moved to the right, or closer to the fulcrum. Then the force required to rotate the device (**F_R**) is less, and when in a vertical position, the center of gravity (H_2) has been raised a smaller amount compared to the center of gravity (**F_G**) being located at the centroid or geometric center of the device. If H_2 is reduced, then the work done by the lifter is reduced.

On the FLIPPER, when the weight pins are loaded evenly, the center of gravity (**F_G**) is at the centroid of the device. The fulcrum is the lower bumper opposite to the lifter, whichever end of the device the lifter is on at that time. If the weight pins farther away from the lifter are loaded with more weight than the weight pins closer to the lifter, the center of gravity has been moved farther away from the lifter. In this case the "weight" of the FLIPPER will appear to be less than if the same weight was evenly distributed on the FLIPPER. If the lifter went to the other end of the FLIPPER, closer to the heavier weights, the FLIPPER would feel heavier than if it were evenly loaded. What this means is one FLIPPER can be loaded for two different "functional weights" at the same time.

How to Uneven Load using the Loading Charts:

To load a FLIPPER for two different weights, simply put more weights on the weight pins on one end and a different amount of weight on the weight pins closer to the other end. How much you ask?...well fortunately the math has been done for you in the Loading Charts for each FLIPPER model. Again, remember the TS-03 and the TS-04 have different unloaded weights and different overall lengths. The loading chart for the TS-03 will only work for the TS-03, and the TS-04 will only work for the TS-04.

An example of a portion of a loading chart is shown in Figure 28. The Top Row ("A" end of the FLIPPER) lists one set of Desired Flipper Weights from minimum to maximum (left to right) for that FLIPPER model. The same weights are listed from top to bottom on the Left Column ("B" end of the FLIPPER) of the loading chart. If a coach wants to train one athlete with a 380 pound weight (shown in yellow), and a 480 pound weight (shown in green) for a second athlete, he finds where the column and row intersect and reads the two numbers in the intersecting block.

In this example, the desired loading is listed in the block where the 380 pound column and the 480 pound row intersect. As shown in Figure 28, the FLIPPER would have the lighter 380 pound end loaded with one 10 pound plate on <u>each</u> of the two weight pins on the "A" end of the FLIPPER. On the other end, <u>each</u> of the two weight pins on the "B" end would be loaded with 75 pounds. This loading is illustrated in Figure 29. The result is the lighter end ("A" end) offers the same load to the lifter and work done in a flip as if it were evenly loaded to be a 380 pound weight. The heavier ("B") end is equivalent to an evenly loaded 480 pound weight.

In some cases a Heavy-Light-Heavy-Light training for the same athlete may be desired. In this case the FLIPPER may have "Uneven Loading" but all lifts may be performed by the same athlete. In other cases, teamwork may be developed by teaming a larger and smaller athlete together and racing another similarly matched team. The "Uneven Loading" allows each athlete to work to their potential while competing against themselves or another group. Many of these programs are described in the "***Training Drills Section"*** of this manual.

Desired FLIPPER "weight" on end B (Left Column)

Desired FLIPPER "weight" on end A (Top Row)

FLIPPER Weight	End	260	280	300	320	340	360	380
260	A	0						
	B	0						
280	A		5	15				
	B		5	0				
300	A		0	10	20	30		
	B		15	10	5	0		
320	A			5	15	25	35	40
	B			20	15	10	5	5
340	A			0	10	20	30	40
	B			30	25	20	15	10
360	A				5	15	25	35
	B				35	30	25	20
380	A				5	10	20	30
	B				40	40	35	30
400	A					10	15	25
	B					45	45	40
420	A					5	15	20
	B					55	50	50
440	A						10	20
	B						60	55
460	A						5	15
	B						70	65
480	A						0	10
	B						80	75

Fig 28

Load each pin on end B to 75 lbs

Load each pin on end A to 10 lbs

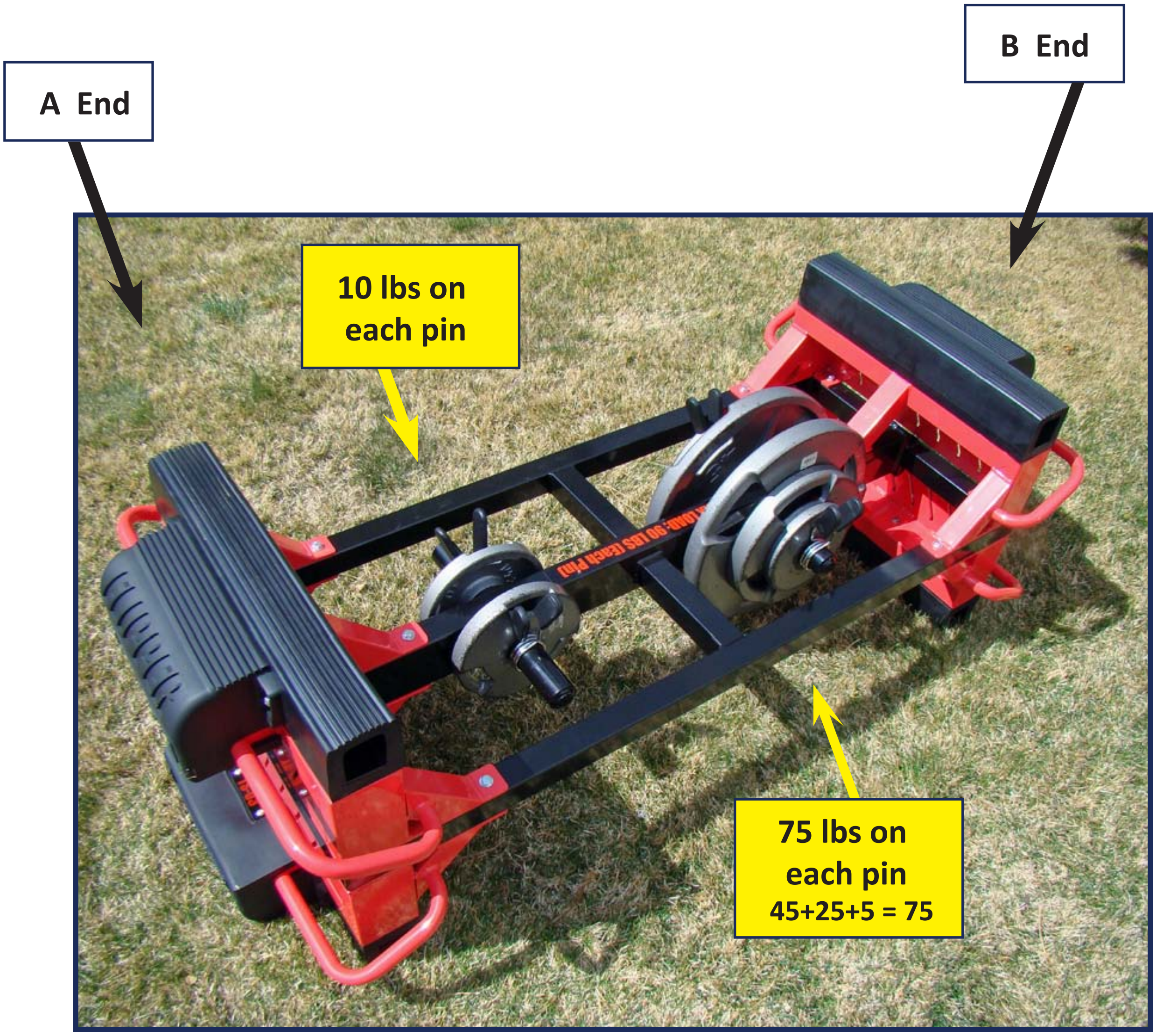


Fig 29

Training Drills - Indoor

Indoor Training Drills

All drills should be performed with one lifter (1) and two spotters (2) and (3). The lifter (1) and spotters (2) and (3) rotate positions after a certain number of lifts. As illustrated in Fig. 30, the lifter (1) will rotate to the right spotter position, (3) will trade positions with (2) and (2) will become the next lifter (Fig. 31). The sequence and duration of the lifts and rotations vary with the Training Drills described below.

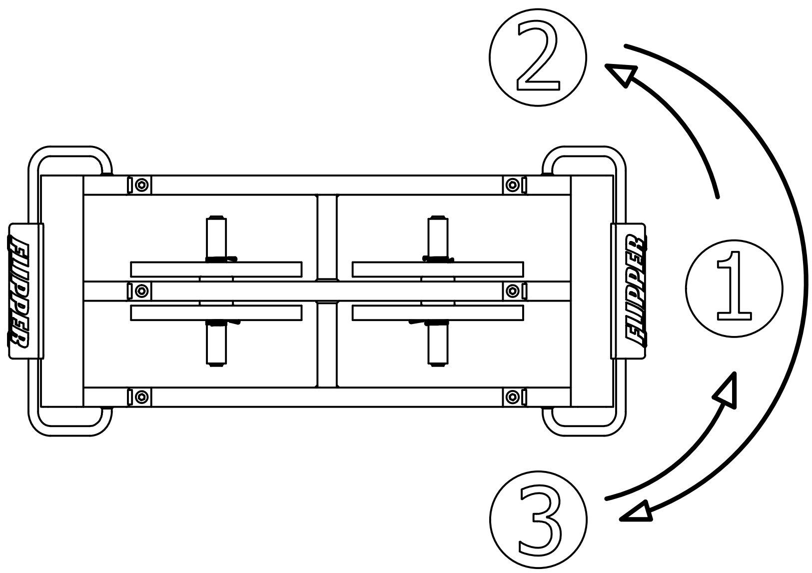
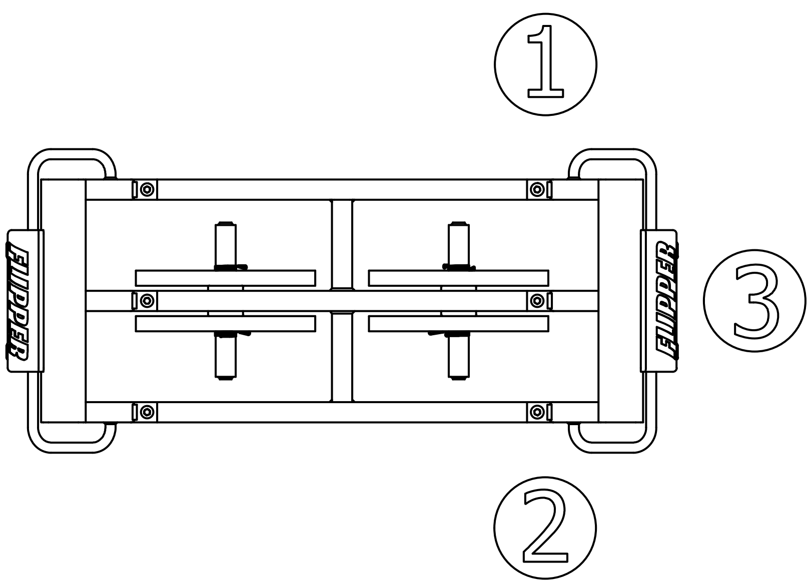


Fig 30



Lifting Indoors:

Fig 31

Indoor lifting varies from outdoor lifting in that if a weight room is used, the FLIPPER is NOT to be flipped end over end. As bumper plates bounce after being dropped, the FLIPPER will bounce upon landing. Therefore sufficient space is needed, the FLIPPER is NOT to be flipped end over end in any confined or high traffic area. For indoor use, the FLIPPER may be lifted to almost vertical and then lowered back to the ground in a controlled manner.

If a FLIPPER Docking Station is used, this confines the drop area to the machine, thus keeping the dropped FLIPPER to a designated area, away from other equipment and people. The deck of the STATION is marked to define the impact area as the "Drop Zone".

Lift Phase: The lifter will raise their end of the FLIPPER to a position slightly below vertical. If using the Docking Station for indoor use, the Docking Station allows the lifter to flip the FLIPPER over in a controlled space, or stopping just below vertical depending on the model of Docking Station.

Lower Phase: Without the Docking Station, the lifter will step back and the spotters will grasp the upper side handles. Together the lifter and the spotters will lower the FLIPPER to the starting position. When using the Docking Station the lifter may let the FLIPPER fall back to the starting position or flip over to the other side. The built-in bumpers in the Docking Station cushion the impact of the FLIPPER to the platform of the Docking Station. The spotters are present to make sure the lifter and everyone else is out of the "drop zone" before the FLIPPER is allowed to fall after a completed lift or in the case of a missed lift.

Drill I-1: Single Lift & Rotate (1-1-1)

Setup: One lifter (1) and two spotters (2) and (3) are positioned as shown in Fig. 30. The weight is loaded evenly on the FLIPPER. Consult the Loading Chart for the appropriate weight loading on each weight pin. The three athletes on each FLIPPER should all be of similar strength and power development.

Procedure: The first lifter (1) lifts the FLIPPER to almost vertical. The FLIPPER is lowered to the starting position with the assistance of the spotters (2) and (3). The Lifters (1) and (3) rotate one place to the right and lifter (2) moves to the left spotting position, as shown in Fig. 31. With minimal rest time, lifter (3) makes his lift. This continues without stopping until each lifter reaches the rep goal of the drill. The lifter should be completing each lift in about 10 seconds depending on intensity and level of fatigue.

Intensity/Duration: The number of reps is inversely related to the intensity (weight loaded on the FLIPPER). The "Lift-Spot-Spot" sequence allows for 10-20 seconds rest between lifts for each athlete. A 10-rep each lifter protocol will put the 3-athlete team in a 2.5 minute to 5 minute training session. Because of the added rest between reps, an intensity at or near 80% of 1RM may be used. This is desirable for developing single event power (linemen, track and field throwers, etc.).

Drill I-2: Multiple Lift & Rotate (2-2-2) or (3-3-3)...

Setup: One lifter (1) and two spotters (2) and (3) are positioned as shown in Fig. 30. The weight is loaded evenly on the FLIPPER. Consult the Loading Chart for the appropriate weight loading on each weight pin. The three athletes on each FLIPPER should all be of similar strength and power development.

Procedure: The first lifter (1) lifts the FLIPPER to almost vertical. The FLIPPER is lowered to the starting position with the assistance of the spotters (2) and (3). This is repeated once more for a (2-2-2) sequence or two more times for a (3-3-3) sequence. Upon completion of the final (2nd or 3rd lift), lifters (1) and (3) rotate one place to the right and lifter (2) moves to the left spotting position, as shown in Fig. 31. With minimal rest time, lifter (3) makes his lifts. This continues without stopping until each lifter reaches the rep goal of the drill. The lifter should be completing each lift in about 10 seconds depending on intensity and level of fatigue.

Intensity/Duration: The number of reps is inversely related to the intensity (weight loaded on the FLIPPER). The "3 Lifts-Spot-Spot" sequence allows for longer burst of repeated effort and then 30-45 seconds rest. The 15-seconds of multiple all out effort each followed by a 30 second rest period is similar to the demands of an offensive or defensive lineman. A 12-rep each lift protocol will put the 3-athlete team through four repeated lifting sessions. Because of the added rest between low rep subsets, an intensity of near 80% of 1RM may be used. If more explosive power is desired, a (2-2-2) protocol may be used with slightly higher weight. If greater endurance is needed, (4th quarter losses or out of gas before the end of the match) a higher rep protocol (e.g. 20 reps each) may be used with a (2-2-2) to a (4-4-4).

Drill I-3: Mixed Lift & Rotate (2-4-3) or (3-4-1)...

Setup: One lifter (1) and two spotters (2) and (3) are positioned as shown in Fig. 30. The weight is loaded evenly on the FLIPPER. Consult the Loading Chart for the appropriate weight loading on each weight pin. The three athletes on each FLIPPER may be of different strength and power development.

Procedure: The first lifter (1) lifts the FLIPPER to almost vertical. The FLIPPER is lowered to the starting position with the assistance of the spotters (2) and (3). This is repeated until that athlete meets his/her sequence. For example, if that lifter is the "2" in a (2-3-4), they make two lifts in a row. If they are the "3" they make three lifts. Upon completion of their final lift, they rotate and the next lifter makes his/her required number of lifts. This continues without stopping until each lifter completes the number of cycles determined. The lifter should be completing each lift in about 10 seconds depending on intensity and level of fatigue.

Intensity/Duration: The number of reps per each cycle is inversely related to the intensity (weight loaded on the FLIPPER) for that athlete. The "Mixed Lift and Rotate" drill allows athletes of different strength and endurance levels to train together. This helps build teamwork between athletes that may otherwise only work together in a game or match environment. The combinations can vary greatly as to the number of reps per cycle for each athlete. One recommendation is if a large discrepancy exists between the 3-person team (receivers and linemen or male and female) use approximately 90% of 1RM of the weakest athlete in the team with 1 or 2 reps per cycle. Then use proportionally higher reps per cycle for the stronger athletes, as high as 5 or 6 reps per cycle. If the athletes are similar in strength, use similar reps per cycle. This is good to push each athlete if one is slightly stronger than the other two. Adjust the number of cycles to achieve the desired result, more cycles and less weight to train for endurance, and less cycles and more weight to concentrate on strength-speed power.

Drill I-4: Last Man Standing (LMS)

Setup: One lifter (1) and two spotters (2) and (3) are positioned as shown in Fig. 30. The weight is loaded evenly on the FLIPPER. Consult the Loading Chart for the appropriate weight loading on each weight pin. The three athletes on each FLIPPER should all be of similar strength and power development.

Procedure: The first lifter (1) lifts the FLIPPER to almost vertical. The FLIPPER is lowered to the starting position with the assistance of the spotters (2) and (3). The Lifters (1) and (3) rotate one place to the right and lifter (2) moves to the left spotting position, as shown in Fig. 31. With minimal rest time, lifter (3) makes his lift. This (1-1-1) protocol continues for two cycles. After two cycles, the reps per cycle increases to two, for a (2-2-2) protocol. This continues for two cycles and again, the reps per cycle increases to three for a (3-3-3) protocol. The entire process continues until a lifter cannot complete a lift or leaves the FLIPPER unmoved for more than 10 seconds. At this time, that lifter is a permanent spotter and the two remaining lifters continue. When the next lifter fails, the last lifter must complete one more than the second failed lifter to claim the bragging rights of LMS champion.

Intensity/Duration: The number of reps is inversely related to the intensity (weight loaded on the FLIPPER). The LSM protocol is intense as the athletes will go to failure. This is a more advanced protocol and should only be used occasionally within the scheduled periodization program and well in advance of any competition.

Drill I-5: FLIPPER Clean (FC)

Setup: One lifter (1) and two spotters (2) and (3) are positioned as shown in Fig. 30. The weight is loaded evenly on the FLIPPER. Consult the Loading Chart for the appropriate weight loading on each weight pin. The three athletes on each FLIPPER should all be of similar strength and power development.

Procedure: The first lifter (1) lifts the FLIPPER from the floor (Fig. 32) through the transition phase (Fig. 33). The FLIPPER is lowered to the starting position with the assistance of the spotters (2) and (3). This movement should be a continuous movement from the floor to the chest if possible. Upon completion of one or more lifts, the Lifters (1) and (3) rotate one place to the right and lifter (2) moves to the left spotting position, as shown in Fig. 31. With minimal rest time, lifter (3) makes his lift.

Intensity/Duration: The number of reps is inversely related to the intensity (weight loaded on the FLIPPER). This is intended to be a high power movement so the weight loaded may be less than the FLIPPER Pull (below) which focuses more on strength.

Fig 32

Fig 33

Drill I-6: FLIPPER Pull (FP)

Setup: One lifter (1) and two spotters (2) and (3) are positioned as shown in Fig. 30. The weight is loaded evenly on the FLIPPER. Consult the Loading Chart for the appropriate weight loading on each weight pin. The three athletes on each FLIPPER should all be of similar strength and power development.

Procedure: The first lifter (1) lifts the FLIPPER from the floor (Fig. 34) up past the beginning of the second pull phase (Fig. 35). The FLIPPER is lowered to the starting position with the assistance of the spotters (2) and (3). Upon completion of one or more lifts, the Lifters (1) and (3) rotate one place to the right and lifter (2) moves to the left spotting position, as shown in Fig. 31. With appropriate rest time, lifter (3) makes his lift.

Fig 34
Starting position of FP

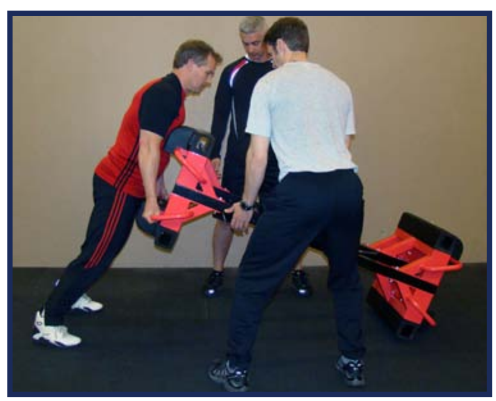


Fig 35
End position of FP

Intensity/Duration: The number of reps is inversely related to the intensity (weight loaded on the FLIPPER). This drill is intended to be a strength movement so the weight loaded may be higher than other lifts.

Fig 36

Fig 37

Drill I-7: FLIPPER Power Clean (FPC)

Setup: One lifter (1) and two spotters (2) and (3) are positioned as shown in Fig. 30. The weight is loaded evenly on the FLIPPER. Consult the Loading Chart for the appropriate weight loading on each weight pin. The three athletes on each FLIPPER should all be of similar strength and power development.

Procedure: The first lifter (1) lifts the FLIPPER from the floor up past the second pull phase (Fig. 35). From this position, the lifter bends the knees lowering the FLIPPER to approximate knee height (Fig. 36) and then he explosively powers the FLIPPER through the transition phase to the top of the chest (Fig. 37). The FLIPPER is lowered back to thigh (Fig. 35) with the assistance of the spotters (2) and (3), and the movement is repeated for the required number of repetitions. Upon completion of that lifter's set, the spotters (2) and (3) assist the lifter in lowering the FLIPPER to the floor. The Lifters (1) and (3) then rotate one place to the right and lifter (2) moves to the left spotting position, as shown in Fig. 31. With minimal rest time, lifter (3) repeats the same sequence.

Intensity/Duration: The number of reps is inversely related to the intensity (weight loaded on the FLIPPER). This is intended to be a high power movement so the weight loaded may be less than other lifts. It is recommended that 5 repetitions or less be used in any set for one lifter.

Training Drills - Outdoor

Outdoor Training Drills

All drills should be performed with one lifter (1) and at least one spotter (2). The lifter (1) and spotter (2) rotate positions after a certain number of lifts. The sequence and duration of the lifts and rotations vary with the Training Drills described below. The spotter's job is to follow at the side of the lifter on each lift. If the lifter falters during a lift, the spotter steps in to assist the lifter to complete the flip or help support the FLIPPER on a missed lift.

Drill O-1: 1-Man Relay, even load (1MR, E)

Setup: One lifter (1) and one spotter (2) are positioned as shown in Fig. 38. The weight is loaded evenly on the FLIPPER. Consult the Loading Chart for the appropriate weight loading on each weight pin. The athletes used in this drill should all be of similar strength and power development.

Procedure: The first lifter (1) lifts the FLIPPER over. This is continued for either a set number of flips (e.g. 5-10) or to reach a certain distance marker on the field (e.g. 20-30 yards). The lifter should be completing each lift in less than 10 seconds. Upon reaching the goal (distance or number of flips) the lifter (1) steps out and the spotter (2) becomes the lifter, flipping the FLIPPER back in the opposite direction. A new spotter (3) takes up the spotting function until the FLIPPER is returned to its starting position. At this time the spotter becomes the lifter (3) and a new spotter (4) joins the team. This is continued back and the original lifter (1) is picked up after the next cycle.

Intensity/Duration: The number of reps is inversely related to the intensity (weight loaded on the FLIPPER). The number of flips per cycle may be any number desired. It is suggested to keep the number of reps less than 10 for more effective power development. Endurance training comes from not only the number of reps per cycle but also the number of cycles the athletes complete.

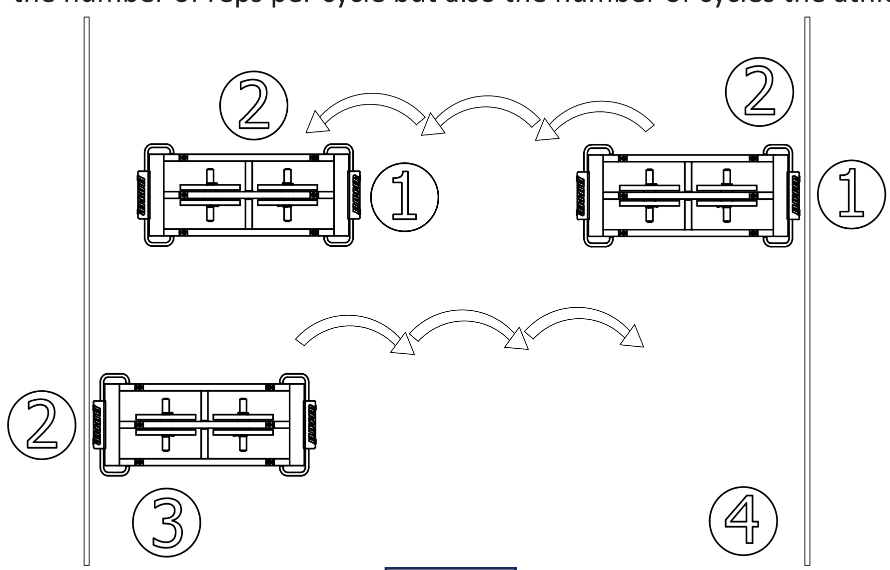


Fig 38

Drill O-2: 1-Man Relay, uneven load (1MR, U)

Setup: One lifter (1) and one spotter (2) are positioned as shown in Fig. 39. The weight is loaded more on one side than the other on the FLIPPER. Consult the Loading Chart for the appropriate weight loading on each weight pin. The athletes in this drill should all be of similar strength and power development.

Procedure: The first lifter (1) lifts the FLIPPER over. This is continued for either a set number of flips (e.g. 5-10) or to reach a certain distance marker on the field (e.g. 20-30 yards). The lifter should be completing each lift in less than 10 seconds. Upon reaching the goal (distance or number of flips) the lifter (1) steps out and the spotter (2) becomes the lifter, flipping the FLIPPER back in the opposite direction. A new spotter (3) takes up the spotting function until the FLIPPER is returned to its starting position. At this time the spotter becomes the lifter (3) and a new spotter (4) joins the team. This is continued back and the original lifter (1) is picked up after the next cycle.

Intensity/Duration: The number of reps is inversely related to the intensity (weight loaded on the FLIPPER). The uneven load provides a "speed/strength power" alternating with a "strength/ speed power) repetition on a repeated basis. The number of flips per cycle may be any number desired. It is suggested to keep the number of reps less than 10 for more effective power development. Endurance training comes from not only the number of reps per cycle but also the numbers of cycles the athletes complete.

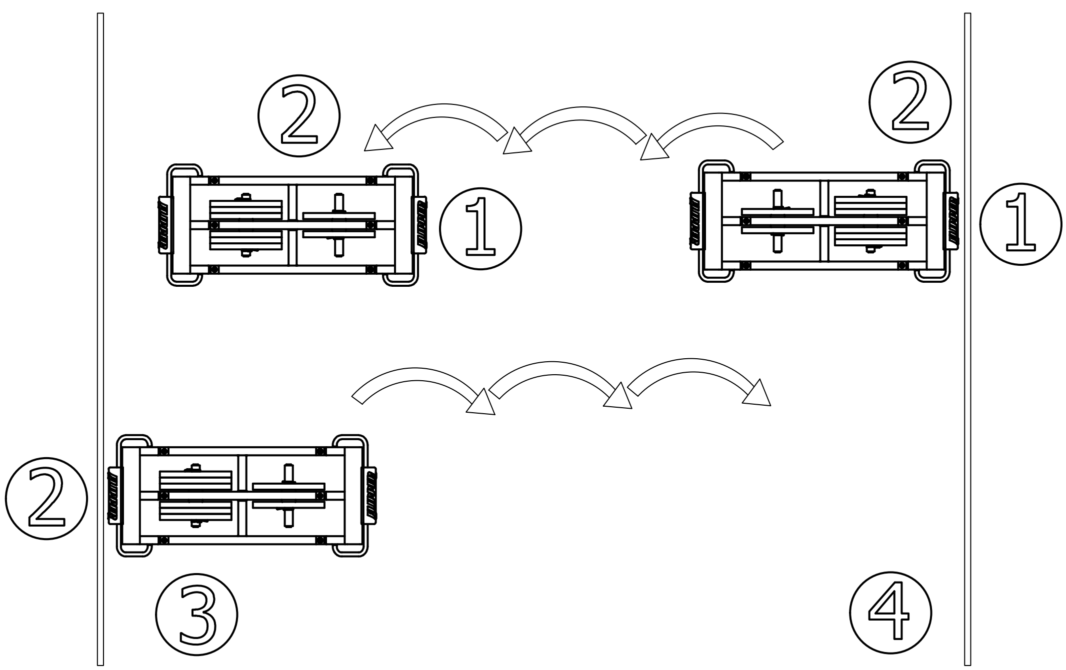


Fig 39

Drill O-3: 2-Man Relay, even load (2MR, E)

Setup: One lifter (1) and one spotter (2) are positioned as shown in Fig. 40. The weight is loaded evenly on the FLIPPER. Consult the Loading Chart for the appropriate weight loading on each weight pin. The athletes used in this drill should all be of similar strength and power development.

Procedure: The first lifter (1) lifts the FLIPPER over. Immediately after the spotter (2) and the lifter (1) switch positions and the new lifter (2) lifts the FLIPPER over. This is continued, alternating lifters, for either a set number of flips (e.g. 5-10) or to reach a certain distance marker on the field (e.g. 20-30 yards). The lifter should be completing each lift in less than 10 seconds. Upon reaching the goal (distance or number of flips) the first Lifter/Spotter team (1) and (2) are replaced by a second pair (3) and (4), who repeat the process back in the opposite direction. A third team ((5) and (6) take over, driving the FLIPPER in the original direction. Upon reaching their goal, one cycle is completed and the original team (1) and (2) take over and the process starts again.

Intensity/Duration: The number of reps is inversely related to the intensity (weight loaded on the FLIPPER). The number of flips per cycle and the number of cycles may be any number desired. It is suggested to keep the number of reps less than 10 per lifter for more effective power development. Endurance training comes from not only the number of reps per cycle, but also the numbers of cycles the athletes complete.

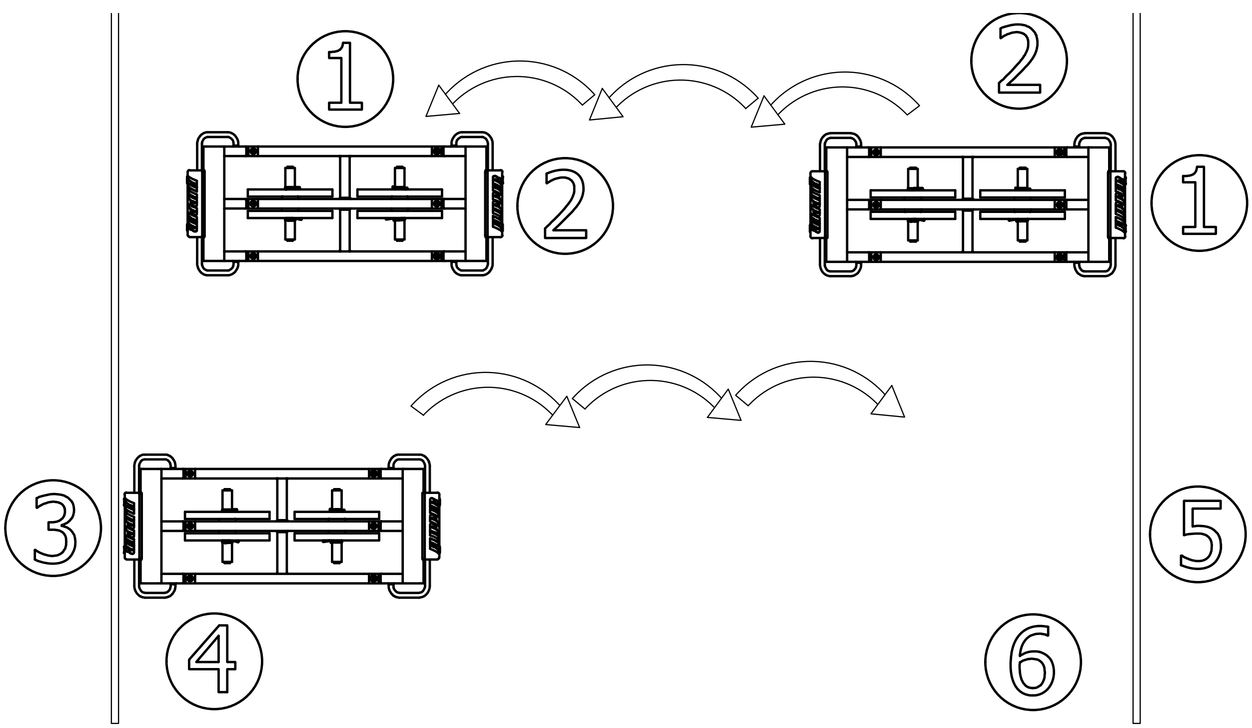


Fig 40

Drill O-4: 2-Man Relay, uneven load (2MR, U)

Setup: One lifter (1) and one spotter (2) are positioned as shown in Fig. 41. The weight is loaded unevenly on the FLIPPER. Consult the Loading Chart for the appropriate weight loading on each weight pin. The athletes used in this drill may vary in strength and power development.

Procedure: The first lifter (1) lifts the FLIPPER over. Immediately after, the spotter (2) and the lifter (1) switch positions and the new lifter (2) lifts the FLIPPER over. This is continued, alternating lifters, for either a set number of flips (e.g. 5-10) or to reach a certain distance marker on the field (e.g. 20-30 yards). The lifter should be completing each lift in less than 10 seconds. Upon reaching the goal (distance or number of flips) the first Lifter/Spotter team (1) and (2) are replaced by a second pair (3) and (4), who repeat the process back in the opposite direction. A third team (5) and (6) take over, driving the FLIPPER in the original direction. Upon reaching their goal, one cycle is completed and the original team (1) and (2) take over and the process starts again.

Intensity/Duration: The number of reps is inversely related to the intensity (weight loaded on the FLIPPER). When using a "lift-spot-lift" protocol, lifters of different strengths may be paired together as teams. This may be male and female, or a lineman and a receiver. As a variation, athletes of similar strength may be used and the lifters can alternate on every second lift, rather than each lift. The number of flips per cycle and the number of cycles may be any number desired. It is suggested to keep the number of reps less than 10 per lifter for more effective power development. Endurance training comes from not only the number of reps per cycle, but also the numbers of cycles the athletes complete.

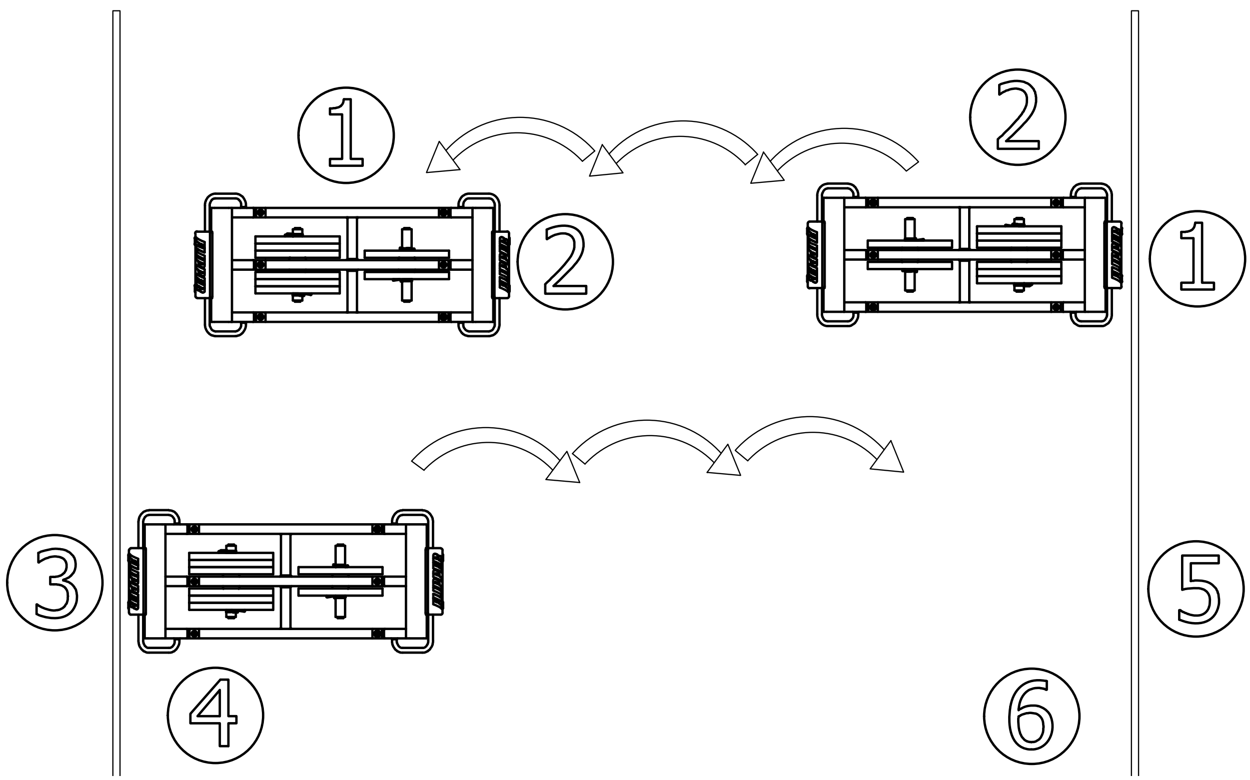


Fig 41

Drill O-5: 1-Man Race, even load (1MRA, E)

Setup: One lifter (1) and one spotter (2) are positioned as shown in Fig. 42 on one FLIPPER and a second lifter (3) and spotter (4) are positioned on a second FLIPPER. The weight is loaded evenly on each FLIPPER. Consult the Loading Chart for the appropriate weight loading on each weight pin. The two FLIPPERS may be loaded differently from each other (heavy and light). The FLIPPERS should be spaced sufficiently apart so that there is no risk of collision between the FLIPPERS as they are moved down the course.

Procedure: The first lifters (1) and (3) lift the FLIPPER over for either a set number of flips (e.g. 5-10) or to reach a certain distance marker on the field (e.g. 20-30 yards). The "Race" protocols put each lifter against the other lifter for time, so minimal rest between lifts is automatic. The optimal time between lifts should still be about 5-10 seconds, but will increase as fatigue sets in if the number of lifts per race is high. Upon reaching the goal (distance or number of flips), the lifters (1) and (3) switch with the spotters (2) and (4) and the process is reversed back in the opposite direction.

Intensity/Duration: The number of reps is inversely related to the intensity (weight loaded on the FLIPPER). The number of flips per cycle may be any number desired. It is suggested to keep the number of reps less than 10 for more effective power development. Endurance training comes from not only the number of reps per cycle, but also the numbers of cycles the athletes complete.

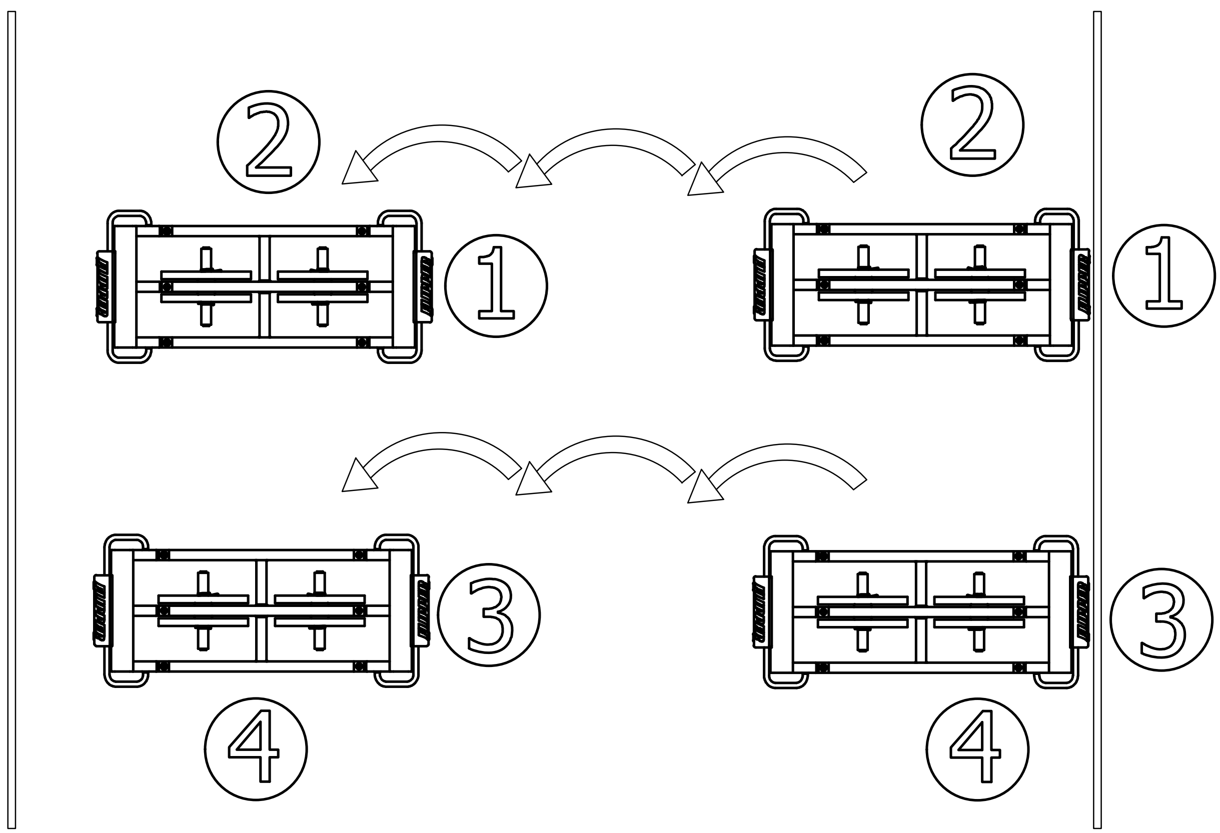


Fig 42

Drill O-6: 1-Man Race, uneven load (1MRA, U)

Setup: One lifter (1) and one spotter (2) are positioned as shown in Fig. 43 on one FLIPPER and a second lifter (3) and spotter (4) are positioned on a second FLIPPER. The weight is loaded unevenly on each FLIPPER. Consult the Loading Chart for the appropriate weight loading on each weight pin. The two FLIPPERS may be loaded differently from each other (heavy and light). The FLIPPERS should be spaced sufficiently apart so that there is no risk of collision between the FLIPPERS as they are moved down the course.

Procedure: The first lifters (1) and (3) lift the FLIPPER over for either a set number of flips (e.g. 5-10) or to reach a certain distance marker on the field (e.g. 20-30 yards). The "Race" protocols put each lifter against the other lifter for time, so minimal rest between lifts is automatic. The optimal time between lifts should still be about 5-10 seconds, but will increase as fatigue sets in if the number of lifts per race is high. Upon reaching the goal (distance or number of flips), the lifters (1) and (3) switch with the spotters (2) and (4) and the process is reversed back in the opposite direction.

Intensity/Duration: The number of reps is inversely related to the intensity (weight loaded on the FLIPPER). The uneven load provides a "speed/strength power" alternating with a "strength/speed power) repetition on a repeated basis. The number of flips per cycle may be any number desired. It is suggested to keep the number of reps less than 10 for more effective power development. Endurance training comes from not only the number of reps per cycle, but also the numbers of cycles the athletes complete.

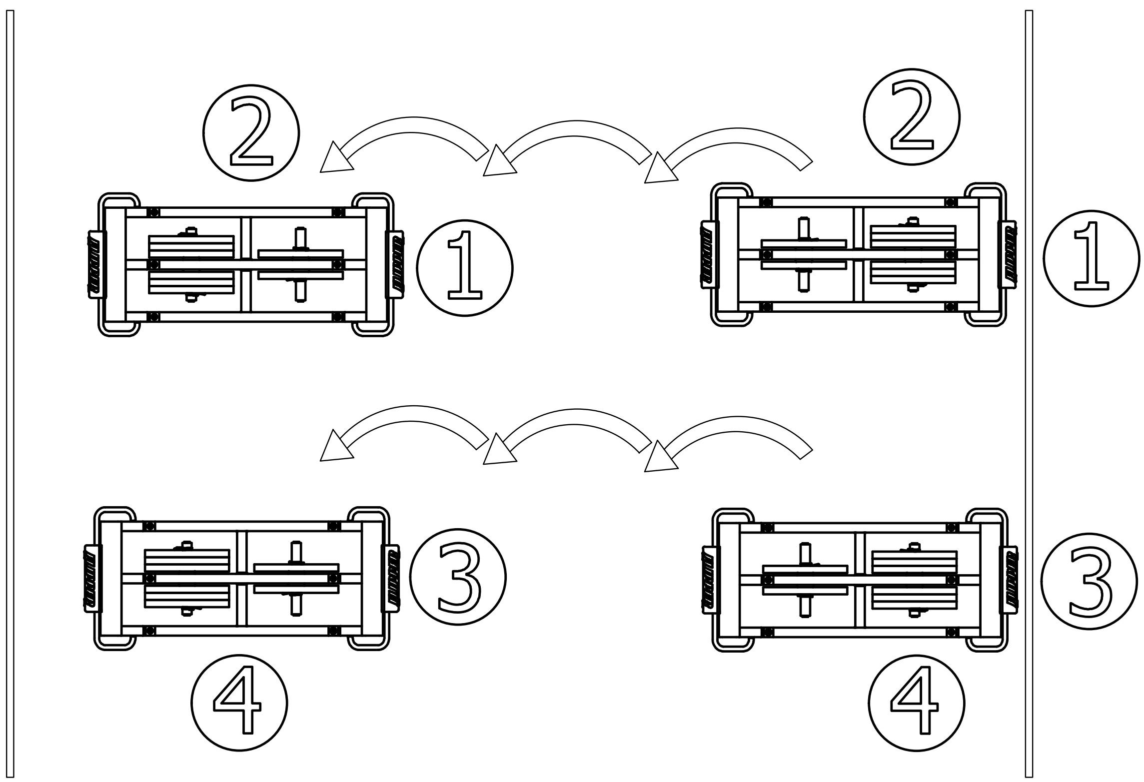


Fig 43

Drill O-7: 2-Man Race, even load (2MRA, E)

Setup: One lifter (1) and one spotter (2) are positioned as shown in Fig. 44 on one FLIPPER and a second lifter (3) and spotter (4) are positioned on a second FLIPPER. The weight is loaded evenly on each FLIPPER. Consult the Loading Chart for the appropriate weight loading on each weight pin. The two FLIPPERS may be loaded differently from each other (heavy and light). The FLIPPERS should be spaced sufficiently apart so that there is no risk of collision between the FLIPPERS as they are moved down the course.

Procedure: The first lifters (1) and (3) lift their FLIPPERs over. Immediately after, the spotters (2) and (4) switch positions with their lifters and the new lifters (2) and (4) lift their FLIPPERs over. This is continued, alternating lifters, for either a set number of flips (e.g. 5-10) or to reach a certain distance marker on the field (e.g. 20-30 yards). The "Race" protocols put each lifter against the other lifter for time, so minimal rest between lifts is automatic. The optimal time between lifts should still be about 5-10 seconds, but will increase as fatigue sets in if the number of lifts per race is high. Upon reaching the goal (distance or number of flips), a second group of 2 lifters and 2 spotters may repeat the process back to the original starting position. A third group may then take over to then be replaced by the first group.

Intensity/Duration: The number of reps is inversely related to the intensity (weight loaded on the FLIPPER). The number of flips per cycle may be any number desired. It is suggested to keep the number of reps less than 10 for more effective power development. Endurance training comes from not only the number of reps per cycle, but also the numbers of cycles the athletes complete.

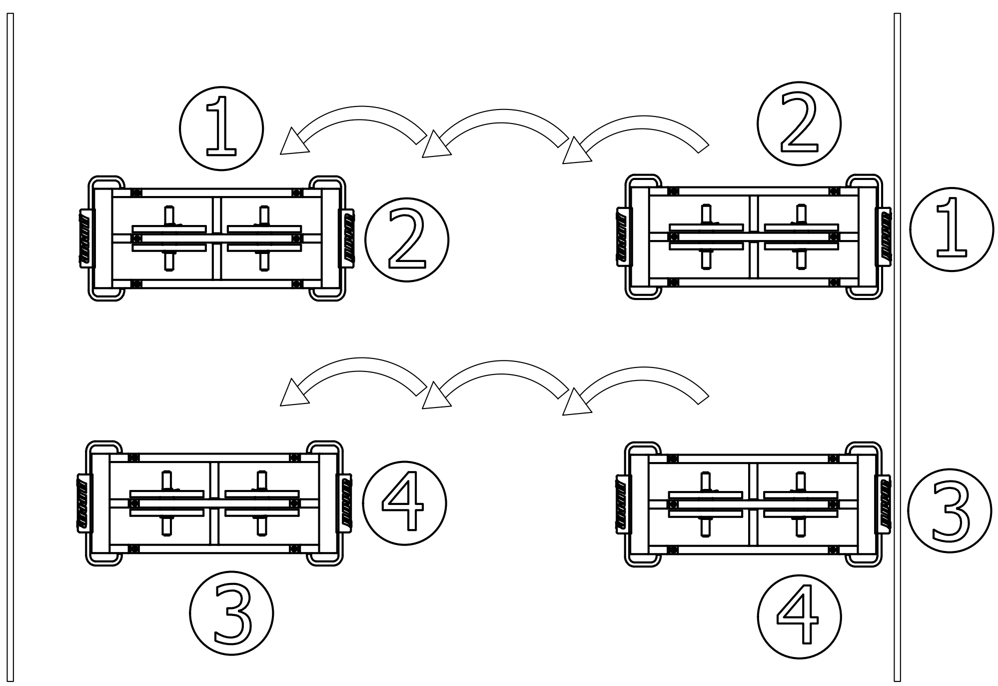


Fig 44

Drill O-8: 2-Man Race, uneven load (2MRA, U)

Setup: One lifter (1) and one spotter (2) are positioned as shown in Fig. 45 on one FLIPPER and a second lifter (3) and spotter (4) are positioned on a second FLIPPER. The weight is loaded unevenly on each FLIPPER. Consult the Loading Chart for the appropriate weight loading on each weight pin. The two FLIPPERS may be loaded differently from each other (heavy and light). The FLIPPERS should be spaced sufficiently apart so that there is no risk of collision between the FLIPPERS as they are moved down the course.

Procedure: The first lifters (1) and (3) lift their FLIPPERs over. Immediately after, the spotters (2) and (4) switch positions with their lifters and the new lifters (2) and (4) lift their FLIPPERs over. This is continued, alternating lifters, for either a set number of flips (e.g. 5-10) or to reach a certain distance marker on the field (e.g. 20-30 yards). The "Race" protocols put each lifter against the other lifter for time, so minimal rest between lifts is automatic. The optimal time between lifts should still be about 5-10 seconds, but will increase as fatigue sets in if the number of lifts per race is high. Upon reaching the goal (distance or number of flips), a second group of 2 lifters and 2 spotters may repeat the process back to the original starting position. A third group may then take over to then be replaced by the first group.

Intensity/Duration: The number of reps is inversely related to the intensity (weight loaded on the FLIPPER). When using a "lift-spot-lift" protocol, lifters of different strengths may be paired together as teams. This may be male and female, or a lineman and a receiver. As a variation, athletes of similar strength may be used and the lifters can alternate on every second lift, rather than each lift. The number of flips per cycle and the number of cycles may be any number desired. It is suggested to keep the number of reps less than 10 per lifter for more effective power development. Endurance training comes from not only the number of reps per cycle ,but also the numbers of cycles the athletes complete.

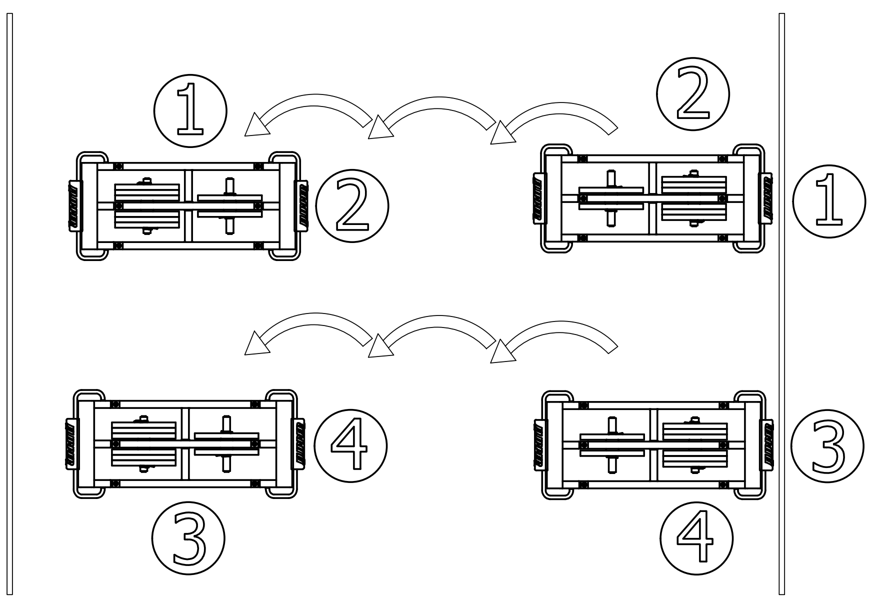


Fig 45

Drill O-9: Last Man Standing (LMS)

Setup: One lifter (1) and two spotters (2) and (3) are positioned as shown in Fig. 46. The weight is loaded evenly on the FLIPPER. Consult the Loading Chart for the appropriate weight loading on each weight pin. The three athletes on each FLIPPER should all be of similar strength and power development.

Procedure: The first lifter (1) lifts the FLIPPER over. Immediately, athletes (1) and (3) rotate one place to the right and athlete (2) moves to the left spotting position. With minimal rest time, lifter (3) makes his/her lift. This (1-1-1) protocol continues to a predetermined distance is achieved on the course (or number of flips for each lifter). After this goal is achieved, the lifters position themselves on the other side to the FLIPPER and head back to the original position but now the consecutive reps increases to two, for a (2-2-2) protocol. This continues back to the starting position where the lifters position themselves to move the FLIPPER again in the original direction, though now the consecutive reps increases to three for a (3-3-3) protocol. The entire process continues until a lifter cannot complete a lift or leaves the FLIPPER unmoved for more than 10 seconds. At this time, that lifter is a permanent spotter and the two remaining lifters continue. When the next lifter fails, the last lifter must complete one more than the second failed lifter to claim the bragging rights of LMS champion.

Intensity/Duration: The number of reps is inversely related to the intensity (weight loaded on the FLIPPER). The LSM protocol is intense as the athletes will go to failure. This is a more advanced protocol and should only be used occasionally within the scheduled periodization program and well in advance of any competition.

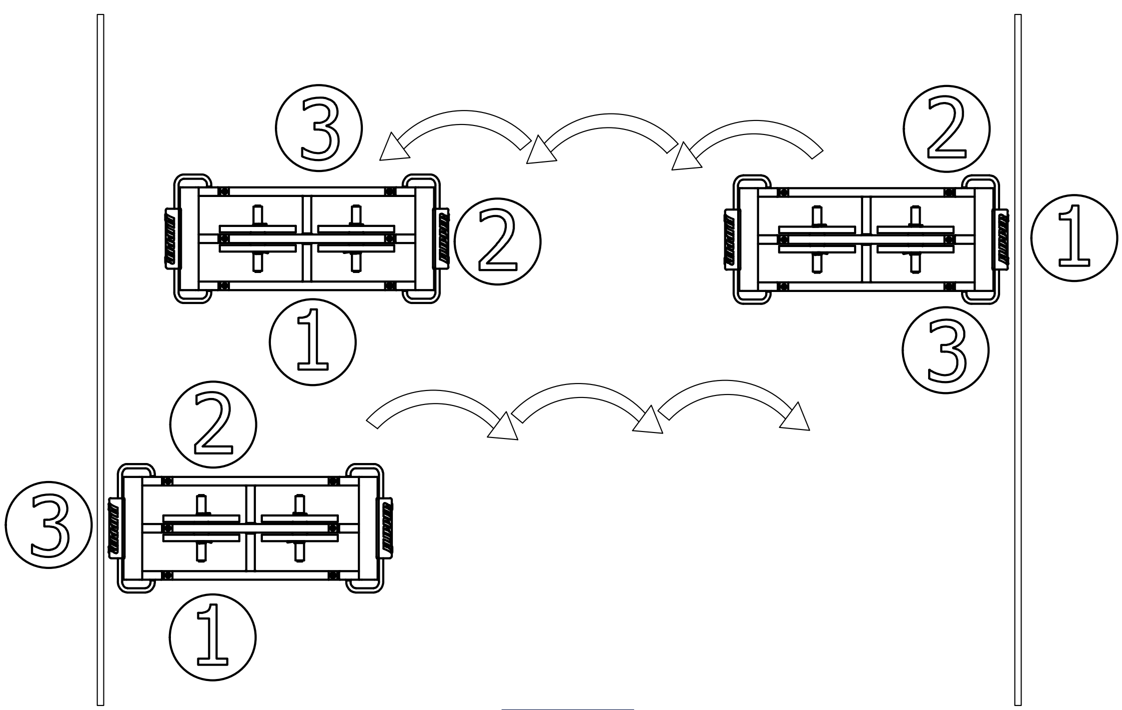


Fig 46

Drill O-10: Single Duel (SD)

Setup: One lifter (1) and one spotter (2) are positioned as shown in Fig. 47 on one FLIPPER. The weight is loaded evenly on the FLIPPER. Consult the Loading Chart for the appropriate weight loading on each weight pin. The athletes used in this drill should all be of similar strength and power development on a FLIPPER. The two or more FLIPPERS may be used for multiple athletes lifting simultaneously. When using multiple FLIPPERS, they should be spaced sufficiently apart so that there is no risk of collision between the FLIPPERS as they are moved down the course.

Procedure: The first lifter (1) lifts the FLIPPER over. Immediately after, the spotter (2) takes a position on the opposite side and lifts the FLIPPER over to the original position with the first lifter (2) acting as a spotter. This is continued, alternating lifters, for a set number of flips. When both lifters have completed their lifts, this constitutes one cycle.

An alternative is to use two consecutive flips per lifter. In this protocol, the FLIPPER may be loaded unevenly so that each lifter has a "heavy/light" or "light/heavy" two-lift sequence. The heavier lift will focus more on strength-speed power development where the lighter lift will focus more one speed-strength power.

Intensity/Duration: The number of cycles is inversely related to the intensity (weight loaded on the FLIPPER). The number of cycles or flips per cycle may be any number desired. It is suggested to keep the number of reps per cycle less than four for more effective power development. Endurance training comes from not only the number of reps per cycle, but also the numbers of cycles the athletes complete. For a single flip per athlete per cycle, a weight of 80% of 1RM for 8-12 flips each is suggested.

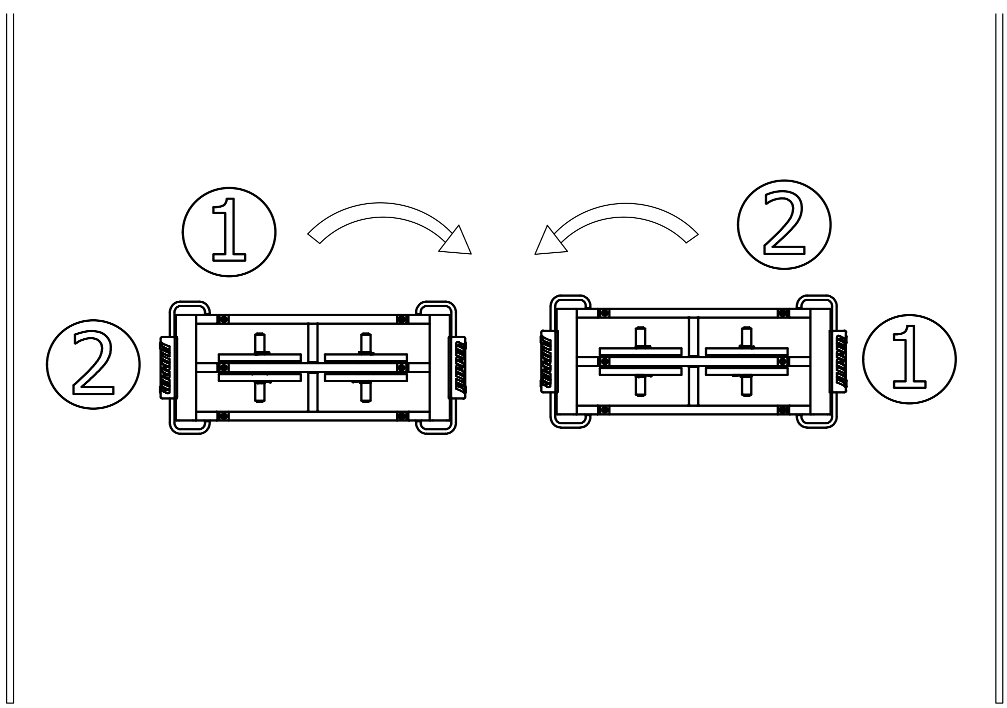


Fig 47

Testing Protocols

60 second Test

Setup: One lifter (1) and one spotter (2) are positioned as shown in Fig. 48 on one FLIPPER. The weight is loaded evenly on the FLIPPER. Consult the Loading Chart for the appropriate weight loading on each weight pin. A weight should be chosen that is representative of about 80-85% of 1RM of what is typical for that group of athletes. When using multiple FLIPPERS, they should be spaced sufficiently apart so that there is no risk of collision between the FLIPPERS as they are moved down the course.

Procedure: At the command "start" the lifter (1) lifts the FLIPPER over. Immediately after, the lifter (1) runs to the opposite side of the FLIPPER, opposite to the side the Spotter (2) is standing, to avoid any collisions. The lifter (1) takes a position on the opposite side and lifts the FLIPPER over to the original position. The Spotter (2) continues to spot the Lifter (1) during lifts in both directions. This is continued, alternating sides for a 60-second time limit, when a "stop" command is given. A total number of completed flips are counted. After a rest period the spotter (2) becomes the lifter and the Lifter (1) takes the duty of spotter.

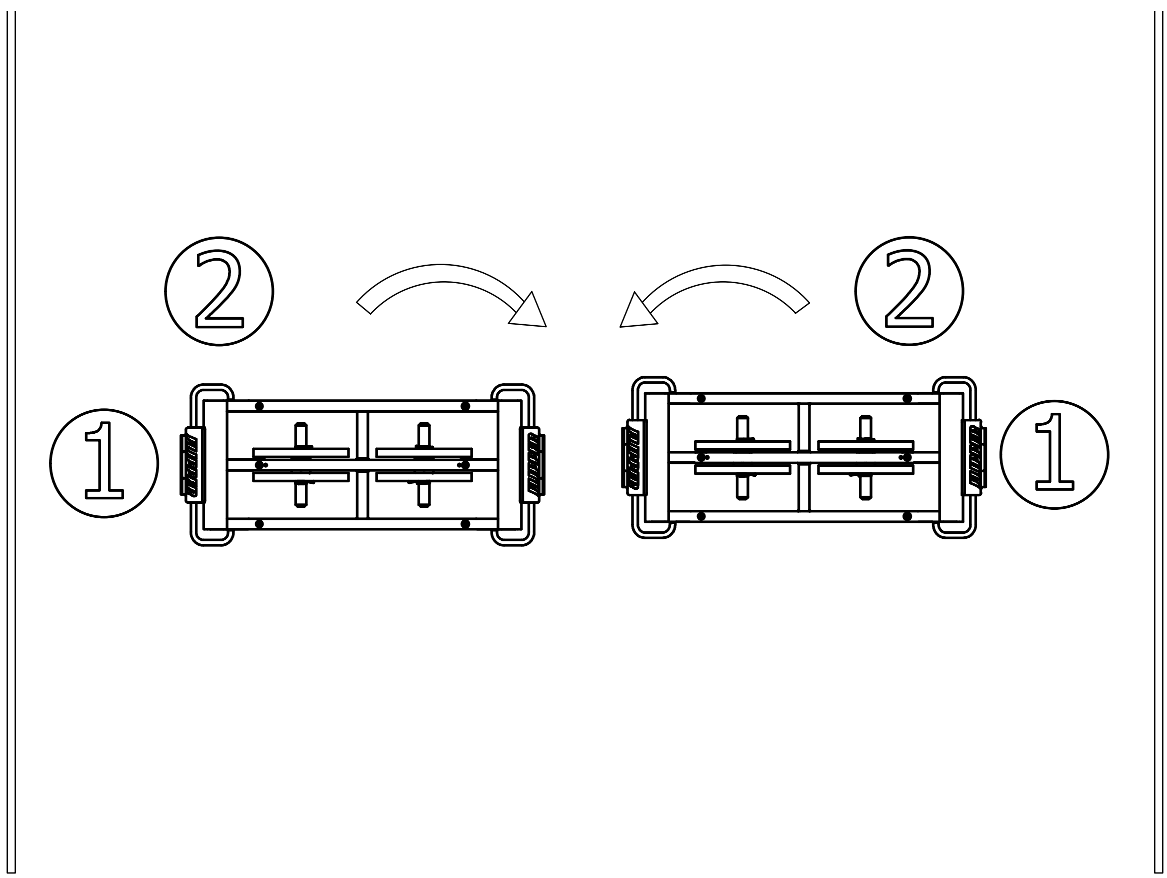


Fig 48

Club Test

Setup: One or more lifters (1) each with one spotter (2) are positioned as shown in Fig. 49, each pair on one Flipper. The FLIPPERS are set up in order of lightest to heaviest. Aspiring "club" members position themselves in line to be a lifter on that FLIPPER for a given weight. It is suggested that multiple FLIPPERs are used and set up such that, for example one is loaded to 400 pounds, the next is loaded to 500 pounds, the next to 600 pounds and so on. If multiple flippers are not available, the coach can call out for "testing for 400 pounds" and after those tests are completed, reload and announce "testing for 500 pounds" and so on. The weight is loaded evenly on the FLIPPER. Consult the Loading Chart for the appropriate weight loading on each weight pin.

Procedure: At the command "start" the lifter (1) lifts the FLIPPER over. Immediately after, the lifter (1) runs to the opposite side of the FLIPPER, opposite to the side the Spotter (2) is standing, to avoid any collisions. The lifter (1) takes a position on the opposite side and lifts the FLIPPER over to the original position. The Spotter (2) continues to spot the Lifter (1) during lifts in both directions. This is continued, alternating sides for a 60-second time limit, when a "stop" command is given. To be a member of the 500 pound Club, the lifter must flip a 500 pound FLIPPER four times in 60-seconds or less.

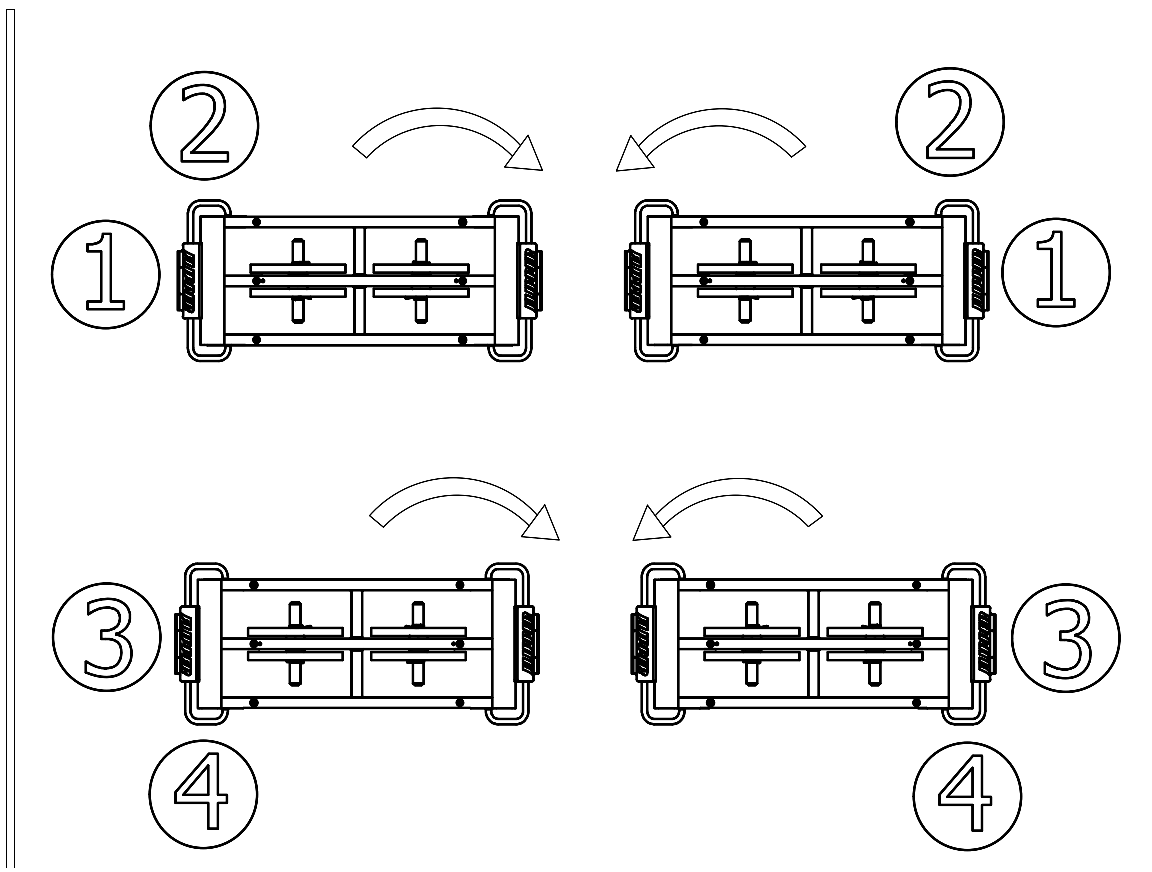


Fig 49

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