HIGH JUMP

The back layout (flop) technique is used almost exclusively by the premier high jumpers throughout the world. Athletes with good jumping ability can learn the basic fundamentals of the flop and achieve success quickly. Increased approach velocity and resulting improvement in takeoff impulse have been influential in the increasing success of today's high jumpers.

A significant factor in effective flop style jumping is the hinge moment principle. When properly incorporated, it allows the jumper a greater effective approach velocity and provides rotation to the jumper in the layout position for bar clearance. Actually, the term "hinge moment" implies rotation in only one plane, where analysis of the takeoff reveals rotation in three planes (Fig. 1): (A) nearly perpendicular to the bar; (B) approximately parallel to the bar; and a smaller rotation (C) around the jumper's vertical axis. Rotation toward the plane of the bar develops from centrifugal force generated during the curved portion of the approach. Body rotation approximately parallel to the bar results from checking linear momentum at takeoff. Given these two simultaneous rotations (A & B), this principle might be more appropriately labeled a "duo-moment."

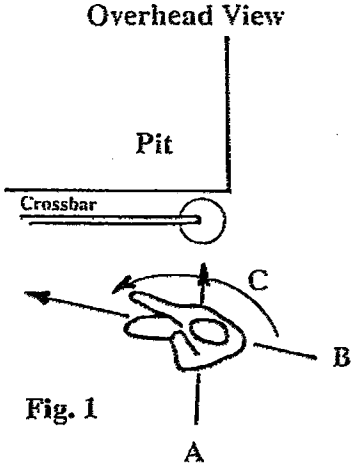


Fig. 1

For simplification, the following technical information is offered for a jumper approaching from the right side of the landing pit (left foot takeoff) and using a ten stride approach (Fig. 2).

APPROACH

The most important part of a successful effort is a controlled, consistent, and effectively plotted approach. Adjustments resulting from inconsistencies usually reduce performance level. A standing start is recommended, however, incorporating a walk or slow jog to the start point is acceptable as long as it is performed **identically** each time. The purpose of the run up is to provide maximum controllable speed, and position the body for a mechanically effective takeoff. Excessive speed negatively effects takeoff position and timing, and commonly produces poorer results. Effective speed utilization varies with strength, timing, and technique.

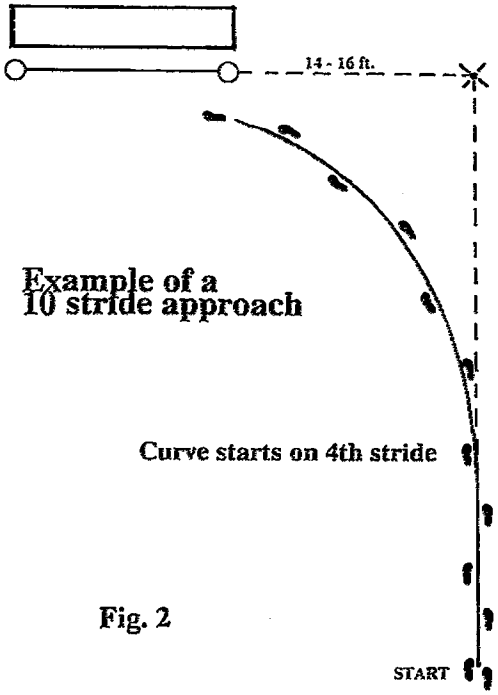
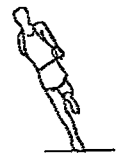


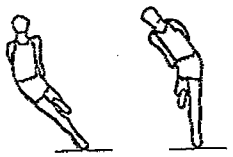
Fig. 2

Approach length is usually 8-12 strides. As the jumper becomes capable of controlling more takeoff velocity, the approach may be lengthened to enable a gradual acceleration to faster speeds. The plot of the approach is often described as a "J" or "Hook" (Fig. 2). Using a 10-stride approach, the first four strides are in a straight line perpendicular to the plane of the bar. As the fourth (left) stride is grounded, the center of gravity is displaced at the **ankle joint** which initiates the curved portion of the approach. The lean and resulting curve are continued to takeoff. Directing the approach toward the "far" standard during the final three or four strides helps maintain proper position and direction.

Fig. 3



Correct Lean



Incorrect Lean

The first two strides of the curve (#'s 5 and 6 overall) are performed with only slight displacement of the center of gravity, creating a gradual deviation from straight line running. Avoid bending laterally at the waist. Maintain a long body axis from head to toe while displacing the center of gravity at the ankle joint (Fig. 3). Always use proper running mechanics during the the approach. Do not overstride, bound, or *force* acceleration at the start of the run. As more velocity is desired, attempt to increase stride tempo (leg alternation speed) while maintaining active, high knee lift and a mechanically efficient run. This method keeps the jumper well positioned for effective conversion at takeoff.

It is widely accepted that acceleration is continued to takeoff. Attempting to press or force acceleration during the latter stages of the approach often increases velocity at the expense of position, rhythm, and timing. Rather than emphasizing the push or drive phase of each stride, velocity can be effectively increased through the curve and takeoff by relaxing, increasing the tempo, and "letting the bar come to you." Maintaining an upright posture and active running mechanics allows acceleration to maximum controllable speed without sacrificing the body position and timing required for a quick, impulsive takeoff. During the final three to four strides the jumper **gradually** turns the shoulder plane to reduce the severity of rotation at takeoff (Fig. 4). Once accomplished, the knee and toe of the swing leg (right) are directed toward the far standard (following the direction of the approach). Swinging the knee across the body to establish this rotation at takeoff is strongly de-emphasized. The second-to-last (penultimate) stride is <u>slightly</u> longer than those preceding. There is <u>slightly</u> more flexion at the ankle, knee, and hip resulting in a lower center of gravity. Emphasizing heel contact often adequately prepares the jumper for takeoff. Key off the **FAR** standard, as looking and running toward the <u>near</u> standard tends to straighten the last two or three strides of the approach rather than continuing a curve to takeoff. This reduces or eliminates necessary centrifugal force for the duo-moment principle and alters the desired mechanics and direction of the jump.

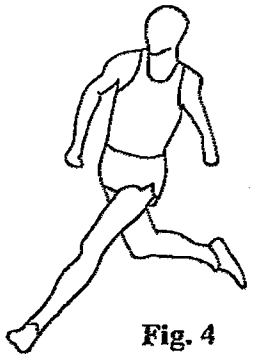


Fig. 4

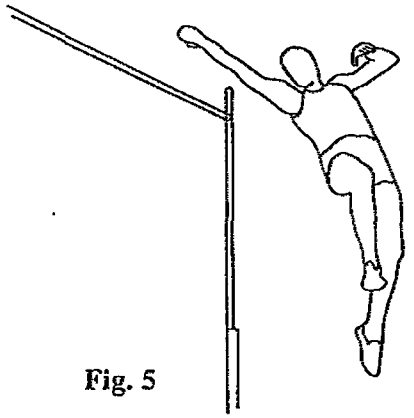


Fig. 5

Utilize a natural and relaxed arm-leg opposition until the last two strides of the approach. At this time, the jumper may select one of two commonly used methods for incorporating additional lift from the arms at takeoff: a) **Single arm** - The jumper maintains natural alternation of the arms and legs arriving at takeoff with the left leg and right arm forward and the right leg and left arm back. During takeoff, the left arm thrusts upward to oppose the swing (right) leg. The right arm remains in front of the body and is extended forward and upward (Fig. 5). During bar clearance, the lead arm (right) remains extended and perpendicular to the body or may be brought to the side; b) **Double arm** - Natural alternation of arms and legs is modified in the last two strides so takeoff is reached with both arms back. This is commonly accomplished with one of two styles. In the first, the penultimate stride (right) is grounded with the right arm back and left arm forward. During the final stride the left arm circles backward naturally while the right arm is **kept back.** From this position, both arms thrust forward and upward during takeoff (Fig. 6). With the second variation, the right arm is kept forward as the jumper contacts the penultimate stride (right) while the left arm moves forward naturally. As the right foot is grounded, both arms

(still bent at the elbow) are in front of the body. During the final stride **both** arms are pulled back and then swung forward and upward during takeoff. During bar clearance both arms are usually brought to the sides of the body. The last stride is the shortest and quickest of the last three. Shortening the final stride raises the center of gravity creating a more effective takeoff. The swing (right) leg is flexed at the knee and moves forward (hip flexion) **prior** to left foot contact, producing greater impulse and a quicker takeoff.

Points of Emphasis

1. Use only as much speed as can be controlled at takeoff.
2. Be consistent in acceleration, stride length, and path to the bar.
3. Center of gravity displacement to initiate the curved portion of the approach occurs on the *inside* leg (4th stride of a 10-stride approach).
4. Lean at the **ankles**, not the waist.
5. Key off the **FAR** standard while rotating the shoulder plane (counter clockwise) during the final three to four strides.
6. Do not **over**-prepare. A flat footed or heel first grounding of the penultimate stride is usually adequate.

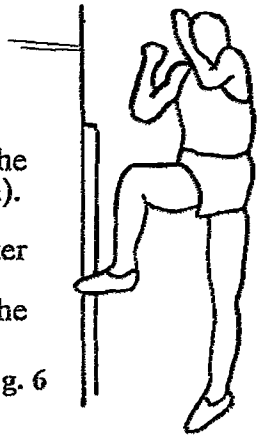


Fig. 6

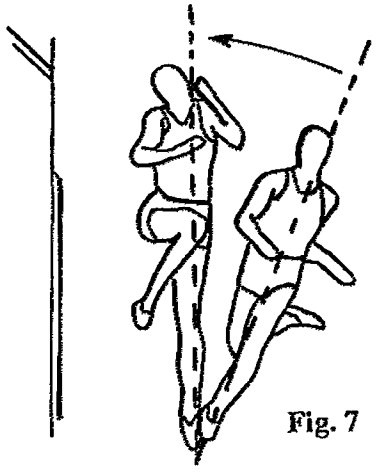


Fig. 7

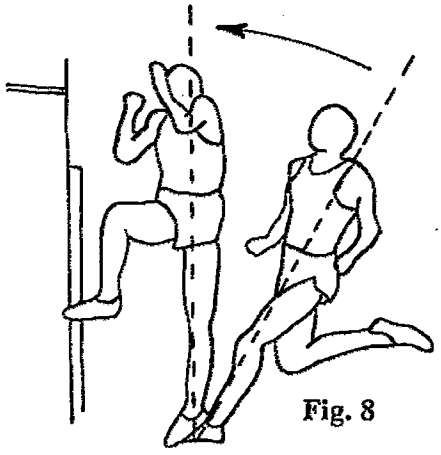


Fig. 8

TAKEOFF

During takeoff, the position and speed acquired from the approach is utilized to project the center of gravity vertically. The effectiveness of this horizontal-to-vertical conversion is dependent upon anticipated and properly timed takeoff mechanics. During the plant and takeoff the jumper experiences simultaneous rotation in three different planes, all hinged at the ankle joint. The first and smallest rotation is around the body's vertical axis (pirouette) turning the jumper so the back is toward the bar during clearance. The second and third rotations result from checking linear momentum at the plant. Centrifugal force (outward pull) acts on the jumper throughout the curved portion of the approach. The magnitude of this centrifugal force is directly proportional to the velocity and radius ("tightness") of the curve. When the takeoff foot is planted, the centripital force (inward push) applied to keep the jumper running on a curve is terminated, resulting in rotation of the long axis of the body toward the plane of the bar (Fig. 7). Simultaneous with the body's *outward* rotation is a *forward* rotation of the body plane toward the far standard (Fig. 8). The combination of these two rotations comprise what has been termed the Duo-Moment Principle. Once airborn, the body plane continues these rotations which promote effective bar clearance. The swing leg (right) and arm(s) stop abruptly when the thigh and upper arms are approximately parallel to the ground. The momentum of these limbs is then transferred to the entire body increasing lift at takeoff. The takeoff foot is usually planted between 2-1/2 and 3-1/2 feet out from the near standard and *in line* with the direction of the run. This distance will vary with the velocity of the approach and

the technical proficiency of the jumper. Takeoff force should be directed as nearly through the center of gravity as possible. As force moves away from the center of gravity, vertical lift is reduced and undesirable rotation is initiated. Remember, rotation over the bar during clearance results from the duo-moment principle discussed earlier.

Points of Emphasis

1. The duo-moment principle is fundamental to effective high jumping. Attempt to time the two major rotations of the body (Fig. 7 & 8) to minimize eccentric (off center) thrust.
2. The takeoff foot is usually planted between 2-1/2 and 3-1/2 feet out from the near standard. Most beginning jumpers takeoff **too close** to the bar.
3. To ensure a quick, explosive takeoff the swing leg and arms should be moving forward and upward **prior** to grounding the takeoff foot. This movement is sometimes referred to as a "punt step."
4. Just prior to takeoff, the swing leg and arms are stopped abruptly when the thigh and upper arms are approximately parallel to the ground. The momentum of these limbs transfers to the entire body lightening the muscular load and increasing lift at takeoff.
5. **DON'T JUMP OVER THE BAR.** Jump **in front** of the bar and allow approach momentum and takeoff mechanics to direct the jump onto the landing pit.

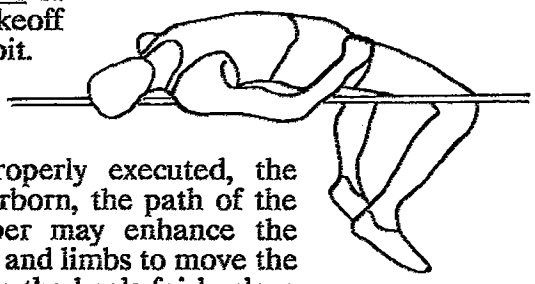


Fig. 9

LAYOUT AND CLEARANCE

If the approach and takeoff have been properly executed, the remainder of the jump is relatively easy. Once airborn, the path of the center of gravity is fixed. However, the jumper may enhance the effectiveness off bar clearance by aligning the body and limbs to move the center of gravity to a point outside the body. Keep the heels fairly close together with the knees spread apart to slow rotation around the vertical axis. The buttocks are pinched together to elevate the hips. This *pinch*, combined with a hyper-extension of the **lumbar** (lower) region of the back, provides an effective position for bar clearance (Fig. 9). An extremely arched body with the head thrown back moves the center of gravity well outside the body and, while the jumper often achieves tremendous hip height, they frequently displace the bar with the calves. An extreme body arch elevates the hips effectively but simultaneously brings the head and heels closer together. This movement often brings the lower legs and heels to a position **under** the bar (opposite to desired body rotation) and makes bar clearance difficult. Once the hips have passed over the bar, bring the head toward the knees by flexing the hips and trunk and extend the legs at the knees to complete clearance (Fig. 10). Since these movements drop the hips (relative to the center of gravity), it is imperative that they be properly timed. Early or late execution will most likely result in displacement of the bar. The landing is usually on the neck and shoulders and since the body is still rotating, the jumper commonly performs a backward somersault to the knees upon contact.

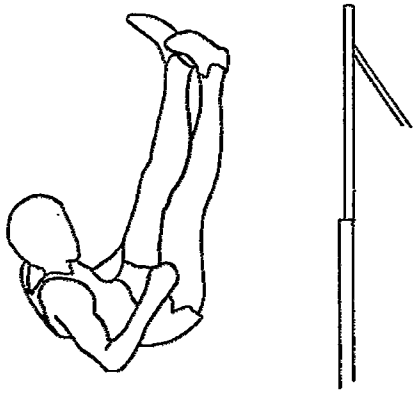


Fig. 10

Points of Emphasis

1. In the layout position, it is beneficial to turn the head slightly to the right for better perception of the bar. Do **NOT** throw the head backward or attempt to arch the back.
2. After the arms are blocked during takeoff, they may be dropped to the sides of the body during layout and bar clearance.
3. Do not jump immediately into the layout position, rather extend the body and CLIMB VERTICALLY before attempting bar clearance. This is a necessity once the bar is raised above the jumper's head.
4. Coordinate clearance technique (trunk and hip flexion/leg extension) with hip/bar location. Late or premature movements will result in bar displacement.