

NSA Photosequence 8 - Triple Jump

Khristo Markov (BUL)

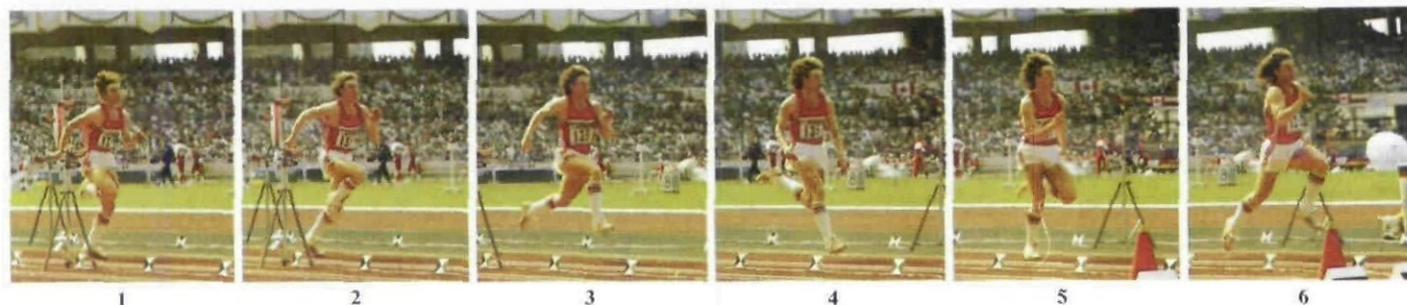
Sequence by Helmar Hommel (© Hommel AVS 1989)

Born - 27 January 1965; Height - 1.83m; Weight - 77 kg

Best Mark - 17.92m (1987)

Gold medallist at the European Championships 1986, II World Championships in Athletics 1987, Olympic Games 1988

This sequence shows Markov's first round attempt in the triple jump final of the Games of the XXIVth Olympiad in Seoul, 1988. On this jump Markov achieved 17.61m to set an Olympic record and win the gold medal. The wind assistance was an allowable 0.7 m/s.





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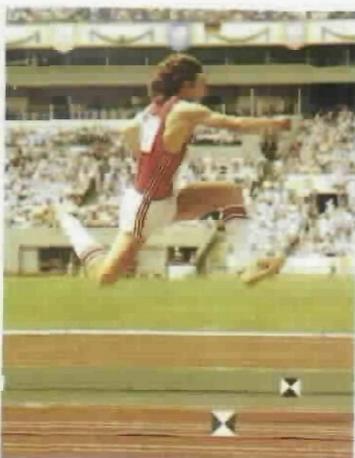
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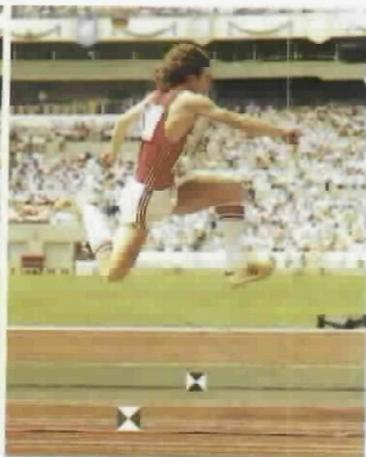
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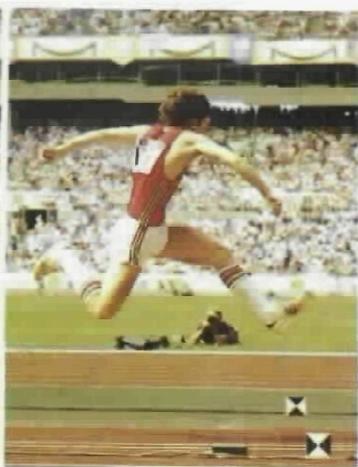
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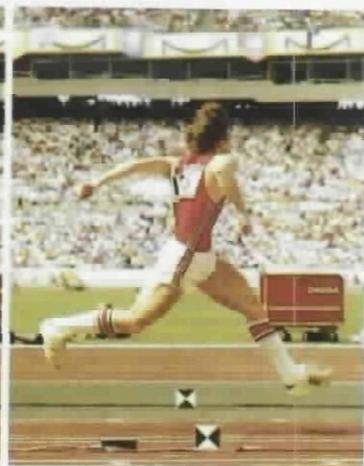
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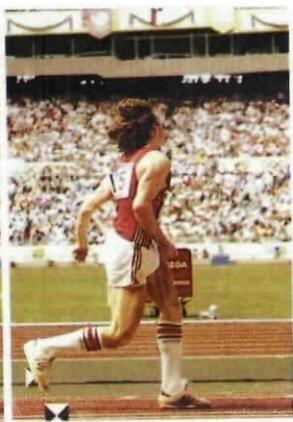
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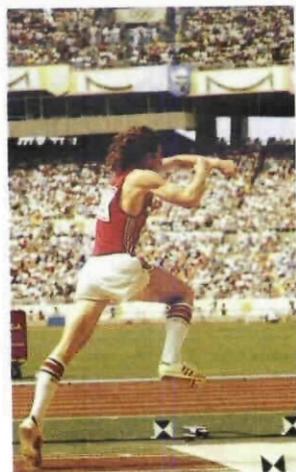
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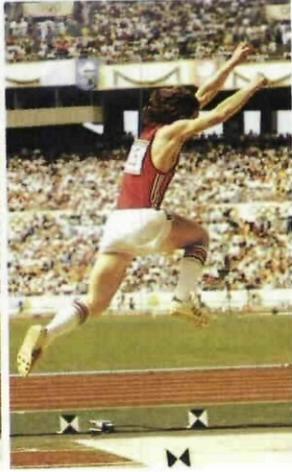
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Commentary by
Eckhard Hutt

National Triple Jump Coach
for the Federal Republic
of Germany

Of current triple jumpers Khristo Markov of Bulgaria has the greatest jumping strength and he certainly demonstrates this on the jump shown in this photo sequence. This strength is vital for overcoming the fact that, in spite of very active landings, a biomechanical analysis of this jump shows that his loss in horizontal velocity is considerable (see the International Athletic Foundation Scientific Report on the Games of the XXIVth Olympiad).

For his jumps in Seoul, the structure of Markov's run-up was as follows:

— 14 stride pressure run with continuous acceleration.

— 4 strides with a simultaneous straightening of the trunk and an increase in stride length.

— 5 strides with increasing stride frequency (take-off preparation).

Up to the penultimate contact, this run-up could be called exemplary (pictures 1 to 8).

Pictures 8 and 9 show that during the penultimate stride, Markov lowers his centre of gravity (CG) a little by planting the left leg with more flexion (compare to pictures 1 and 2). However, this flexion is not as marked as during the penultimate stride of a typical long jump run-up.

By lowering his CG, Markov prepares for his hop phase, which at 6.56m was the longest of all finalists in Seoul. To initiate the hop, the foot of the take-off (right) leg is placed very

actively on the board (pictures 10 and 11) and the knee extension begins during the front support (pictures 12 and 13). Leaving the take-off board, the acutely angled use of the swing leg causes the knee to be lifted up to almost hip-height (pictures 14 and 15). During the hop, Markov prefers a forward rotation of his counter-arm (pictures 16 to 23).

After the take-off, Markov is very successful at allowing the shank of his swing leg to "run out" (picture 16). The subsequent moving backward of the almost fully extended swing leg is also very good (picture 18), which is an indication of Markov's looseness during the hop.

The fact that Markov raises the thigh of his take-off leg beyond the horizontal is excellent (pictures 20 and 21). By this thigh-lift, an active and pawing landing is introduced (pictures 23 and 24). The way the foot synchronizes with the ground prior to the plant is also exemplary. (Note the forward movement of the trunk against the visible measuring mark in picture 23 and 24 and the simultaneous vertical movement of the take-off leg against the ground, almost without a horizontal change as compared with the ground. This indicates that the movement is synchronized.)

The striding out of the extended take-off leg (picture 22) is a special technical variant, which has been mastered by only a very few triple jum-

pers (Peter Bouschen (FRG) is one of these athletes). For this striding out, extraordinary hip-extension strength is necessary, otherwise this movement can lead to a decrease in performance. The very slight amortization of the take-off (right) leg during the step take-off (pictures 25 and 26) is indication of excellent muscle strength and rigidity.

During the step take-off, the swing leg is moved as a long lever (pictures 24 to 28). However, in spite of this, the speed of Markov's swing leg is remarkably high. A result of this considerable speed is that, at the moment of leaving the ground, the knee of the swing leg has almost reached hip height (picture 28).

Markov's body posture during the flight phase of the step is ideal (pictures 30 to 33). The high movement of the swing leg is also very good.

Through the high back kick of the foot of the swing leg (pictures 32 and 33) and its subsequent forward movement (in order for it to be used effectively when initiating the jump), a forward rotation is introduced. This leads to a more marked forward lean of the trunk during the jump take-off (pictures 37 to 42). This forward lean reduces the height of flight and the distance of the jump a little.

During a step, Markov prefers a counter-arm-movement which leads to a double arm swing during the jump

take-off. Similar to his behaviour at the end of the hop flight phase (picture 22), Markov prepares for an active landing prior to the jump with an almost completely extended take-off leg (picture 35). Because of the forward rotation of his body mentioned above, he does not completely achieve the quality of the step take-off (pictures 24 to 28 and pictures 37 to 42). However, his amortization is much deeper (pictures 39 and 40).

Through the longer duration of the support contact (167 ms) and the movement of the swing leg, which is somewhat shorter than during the step take-off, Markov is very successful at using his swing leg in such a way that, at the moment of leaving the ground (picture 42), the knee of his swing leg has reached almost hip height.

The last phase of Markov's triple jump is a float jump, during which he does not allow his swing leg to fall and moves his left take-off leg close to his swing leg (pictures 43 to 47). By lifting the lower parts of the legs and simultaneously moving the arms backward (pictures 48 to 50), a very late landing of the feet is achieved (picture 51). By a lateral twisting of the trunk, the distance of the jump is increased (picture 53). This twist is brought about by a marked backward and upward moving of the left arm (pictures 50 to 52). □