ADVANCED TELEMARK EQUIPMENT

*Skinning uphill with the new 7tm-Tour saves as much work per 100m vertical ascent as if you were to lift approx. 11kg! *

The calculation model shows that while skinning uphill, lifting the higher weight of the new **7tm** tour binding (an additional 400 gram compared to a standard model) requires less total power than the flexing of the stiff telemark boot with traditional telemark bindings.

Definitions:

(1) Average weight difference between a traditional lightweight telemark binding and the 7tm tour: approx.400 grams

(2) test distance: 100 meters of altitude gain

(3) test period: 15 min. (900 sec.)

(4) 600 strides (for the test distance and test period listed above)

(5) torque required to bend the sole of a stiff tele boot at an angle of 45° (0.785 rad): approx. 45 Nm

Symbols and Units:

P Power (Watt) = W Work (Joule) / t time (sec)

W Work (Joule) = G Weight (Newton) * L Displacement (meter)

G Weight (Newton) = m Mass (kg) * g(9.81m/s²)

1 Watt = 1 Joule/sec

1 Joule = 1 Newton meter (Nm)

1 Newton = 1 kg m/s²

A) The power required to lift an additional mass of 400 grams over 100 vertical meters during 900 seconds of climbing is: 0.45 Watts

$$P = \frac{m * g * L}{t} = \frac{0.4\ kg * 9.81 m/s^2 * 100\ m}{900\ sec}$$

P = 0.45 Watts

B) For a single stride, the work required to bend the tele boot from 0 to 45 degree assuming a torque that rises linearly from 0 to 45 Nm is W = 45 Nm * 0.785 rad * 0.5 = 17.7 Joule. Thus, the total power comsumed in a 900 seconds long climb where 600 strides are performed , is estimated as P=11.76 W.

$$P = \frac{W}{t} = \frac{45\ Nm * 0.785\ rad}{2} * \frac{600\ steps}{900\ sec}$$

P = 11.76 Watts

C) Lifting the additional "hidden" weight due to bending the stiff tele boot <u>without a 7tm-tour</u> is approx: 10.8 kg

$$P = \frac{m * g * L}{t} \rightarrow m = \frac{P * t}{g * L} = \frac{11.76\ Nm/s * 900\ sec}{9.81\ m/s^2 * 100\ m}$$

m = 10.8 Kg

Summary:

When using a traditional stiff tele boot with a traditional tele binding, you need to lift an additional 11 kg (that is: you need to spend additional work to lift 11 kg) over a distance of only 100 vertical meters.

This is **27-times** the additional weight of a 7tm-tour!

The results become even more significant (that is: <u>more</u> work is required) in case the bending resistance increases due to an even stiffer boot or a higher bending angle.