

## Optimal Body Composition For Performance of 101<sup>st</sup> Airborne (Air Assault) Soldiers

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### *Abstract:*

Research has shown that Soldiers meeting the Department of Defense body fat (BF) standard of  $\leq 18\%$  perform significantly better on a majority of physical fitness tests than those not achieving the standard. Questions remain about the BF threshold for optimal performance on various fitness tests of 101<sup>st</sup> Airborne (Air Assault) Soldiers.

**PURPOSE:** To assess the relationship between BF threshold and performance on tests of anaerobic power, aerobic capacity, and strength in order to determine body composition for optimal performance.

**METHODS:** Data from 153 male Soldiers of the 101<sup>st</sup> Airborne Division (Air Assault) was analyzed (age=28.5 $\pm$ 7.0 yrs, height=1.79 $\pm$ .07 m, mass=86.2 $\pm$ 13.4 kg). Each Soldier underwent tests of mean and peak anaerobic power (MANP & PAnP), maximal oxygen uptake (VO<sub>2</sub> max), and bilateral isokinetic strength testing of knee flexion/extension, shoulder internal/external rotation, and torso rotation. Body fat was determined with air displacement plethysmography. Maximal VO<sub>2</sub>, MANP, PAnP, and cumulative strength (CS) rank were each plotted against BF and a best fit line was used to determine an inflection point for BF threshold. An independent t-test was calculated to determine significant differences between scores above and below each BF inflection point, and Spearman's Rho was used to determine relationships between BF and performance.

**RESULTS:** Body fat was correlated with MANP ( $r=-.646$ ,  $p<0.01$ ), PAnP ( $r=-.174$ ,  $p<0.01$ ), VO<sub>2</sub>max ( $r=-.731$ ,  $p<0.01$ ), and CS rank ( $r=.541$ ,  $p<0.01$ ). Best fit lines indicated inflection points at 18% BF for MANP and PAnP and at 14% BF for CS rank. Body fat had an inverse linear relationship with VO<sub>2</sub>max. Mean anaerobic power was higher for Soldiers with BF <18% (8.2 $\pm$ 0.66 versus 7.2 $\pm$ 0.97 W/kg,  $p<0.01$ ) and CS rank was higher for Soldiers with BF <14% (55.9 $\pm$ 31.4 versus 84.9 $\pm$ 36.2,  $p<0.01$ ). There was no difference between groups for peak anaerobic power.

**CONCLUSIONS:** While BF and VO<sub>2</sub>max had a linear relationship, a BF threshold may exist for MANP and CS rank where an increase in BF decreases performance. Although a BF threshold was present for PAnP, the lack of distinction between groups may indicate that a variable independent of BF might also predict power performance. These findings provide insight in determining optimal body composition for task-specific physical readiness.