T&L 1.4 USE OF Kolmogoroff microscale:

$U = 50\ m/s$

$u \sim .5\ m/s$

$l \sim 100\ m$ (largest)

Find the smallest scale $\rightarrow$ $\eta = \left(\frac{\nu^3}{\epsilon}\right)^{1/4}$; $\epsilon \sim \frac{u^3}{l} = \frac{(.5)^3}{100} = 1.25 \times 10^{-3}\ \frac{m^2}{s^3}$

$$\eta = \left(\frac{(15 \times 10^{-6})^3}{1.25 \times 10^{-3}}\right)^{1/4} = \underline{1.33mm}$$

the associated highest freq. $\rightarrow$ frequency = $f = \frac{1}{\tau} = \left(\frac{\epsilon}{\nu}\right)^{1/2} = \left(\frac{1.25 \times 10^{-3}}{15 \times 10^{-6}}\right)^{1/2} = \underline{9.1\ sec^{-1}}$

effect of convected motion $\rightarrow$ freq. due to plane = $\frac{50}{1.33 \times 10^{-3}}$ = 37.6 kHz (~ 4000X greater than if stationary)

<u>length of sensor</u> $\rightarrow$ $l_{wire} < 1.3mm. = \eta$

<u>smallest vel. scale</u> $= (\nu\epsilon)^{1/4} = (15 \times 10^{-6})(1.25 \times 10^{-3})^{1/4}$

$= \underline{.012}\ m/s$ (needed to be detected).

relative turb. intensity at the smallest scales

is $\sim \frac{(.012\ m/s)}{50} = \underline{2.4 \times 10^{-4}}$

$\therefore$ electronic relative noise $< 2.4 \times 10^{-4}$

need to convert velocity ratio to voltage output ratio based on calibration (King's Law)