# The JETS Challenge

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## Challenge 76 — The Liquid Nitrogen Challenge

### Problem:

When hauling liquid nitrogen at 240 °F below zero, thermal expansion of the aluminum tank must be considered. The coefficient of thermal expansion for aluminum is $\alpha$ = 1.3x10–5 foot of expansion per foot of length for each °F of temperature change.

If a 36-foot long tanker goes through a temperature change from 80°F to –240°F, find the change in length in inches that must be considered.

### Solution:

$\alpha = 1.3 \times 10^{-5}$ ft. of expansion per ft. of length for each $\Delta$ °F.

Length = 36 ft.

From 80° to -240° F, $\Delta$ °F = 320° F

So change in length

$$= \left(1.3\times10^{-5}\right)(36 \text{ ft})(320°F)$$

$$= .14976 \text{ feet}$$

$$= 1.80 \text{ inches}$$