

## Double Mounting vs. Controlled Air Mounting

'Double mounting', also known as "two-stage mounting" is the scheme commonly used for isolating gen-sets and other machinery onboard superyachts and megayachts. Although very effective in lowering the transmission of vibration at high frequencies, double mounting as with any other passive isolation technique, has its own drawbacks including the design complexity, weight penalty, large space requirement, and **excessive cost** associated with the added seismic mass (also known as auxiliary mass) which depending on the design, could weigh up to 100% of the weight of the isolated machine. Note that a double mounted isolated system has twice as many resonant frequencies (at least 12) as those of a single mounted system; this is assuming the seismic mass is designed and fabricated properly so that it is rigid enough and does not introduce its own flexible-body resonant frequencies into the mix. Keeping all these resonant frequencies from matching any of the harmonics of engine vibration is a major challenge contributing to the design complexity of two stage mounting systems.

An alternative isolation strategy, without all the above-listed drawbacks, that exceeds or matches the effectiveness of the double mounting, over the frequency range of interest, is DEICON's patent-dpending "Computer Controlled Air Isolation System". Under the supervision of a computer, semi-active and active control strategies are used to keep the desirable attributes of air mounting, i.e., unsurpassed isolation specially at low frequencies, and address the undesirable attributes, i.e., lack of damping, low lateral stiffness, etc.

Figure 1 depicts the transmissibilities (a) and motion (b) of a single degree of freedom isolation system, using 3 different arrangements of 1) single elastomeric mounting (black/dotted line), 2) double elastomeric mounting (blue/dashed line) with  $M_{aux}/M_{machine}=0.25$ , and 3) air mounting under the control of a computer (red/solid line). Comparison of single and double elastomeric mounting (black/dotted line and blue/dashed line) clearly shows the advantage of double mounting at higher frequencies. On the other hand, the vibration isolation effectiveness (judged by the transmissibility traces of Figure 1(a) ) of air mounting system is almost as good as double mounting at high frequencies, it is by far superior to double mounting at low frequencies. The lack of damping in air mounts can be addressed by active targeted damping incorporated into the system; note that this damping scheme adds damping to the resonant frequency only without deteriorating the high frequency vibration isolation effectiveness.

The higher motion of the machine at low frequencies can also be addressed by the active and semi-active stiffness control.

*All in all, compared to double mounting, air mounting under the control of the computer provides superior isolation with no weight penalty.*

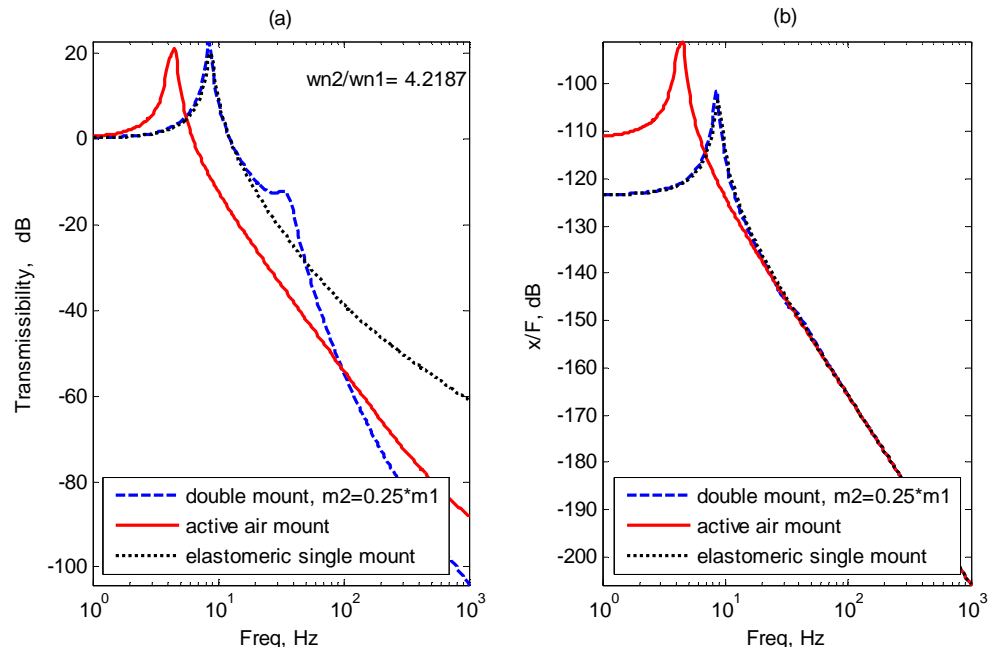


Figure 1 Comparison of transmissibilities (a) and motion of the machine (b) using single mounting (black/dotted line), double mounting (blue/dashed line) and active air mounting