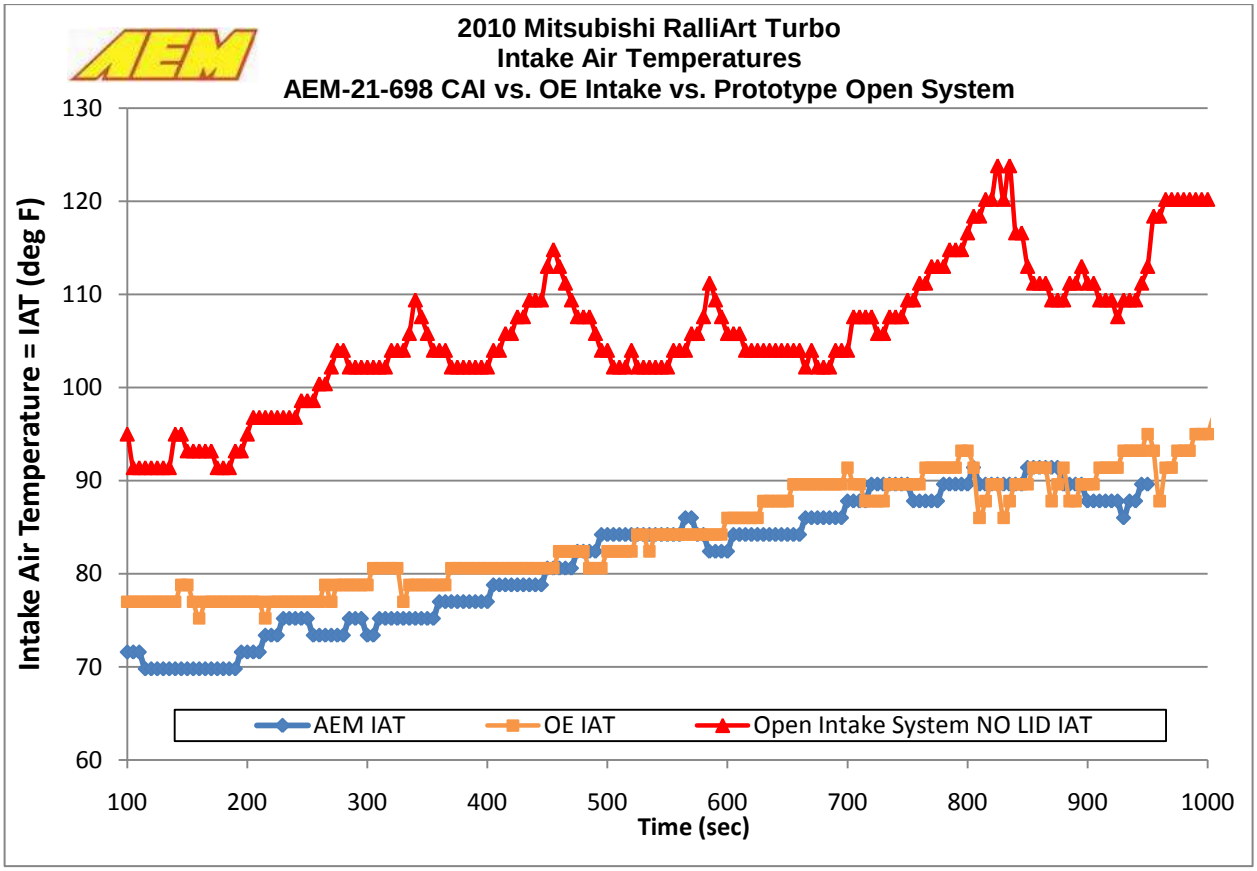
R&D Supplement

AEM-21-698 DRYFLOW CAI Testing Summary

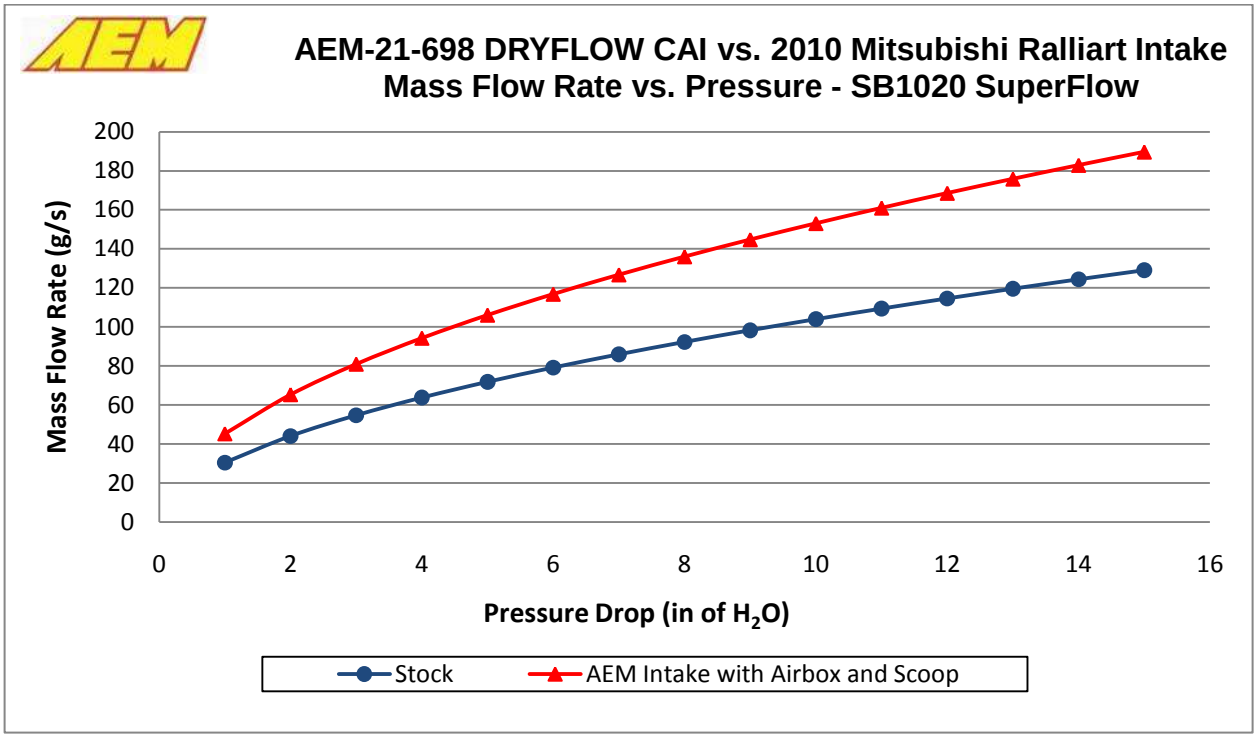
2010 Mitsubishi Lancer RalliArt 2.0L Turbo

05/17/2011

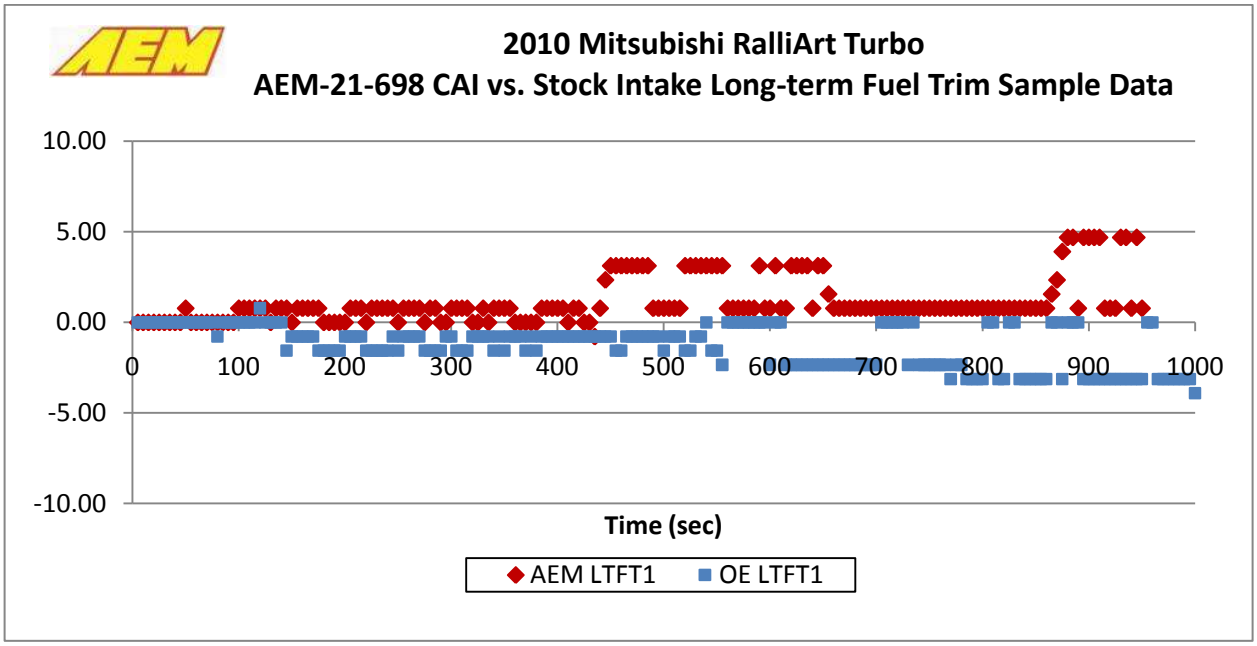
When our engineers started the development of this intake system late last year, we initially ran several open intake prototypes under the hood to maximize air flow to the turbo. However, during our fuel trim loops we found that intake air temperatures (IAT) would soar uncontrollably in traffic. Once IAT exceeded 100F, it would never come down to match ambient air temperatures again. This had a negative effect on ignition timing and therefore limited any power gains. It became readily apparent that while we had determined the right length intake tube to see "streetable" increases in mid-to-high range power and torque, we had to find a way to maintain IAT's near ambient temperature to control ignition timing and increase air density to further increase power. So we created a sealed intake system with an air box that utilized the stock intake scoop, and the improvement in our results was immediate. See Figure 1:



In developing this intake system, we also tested several combinations of tube diameters, DRYFLOW air filter sizes, and sealed or unsealed airboxes to determine the best solution for the RalliArt. Our goal was to maximize the amount air flow to the turbo and minimize intake air temperatures, all while maintaining the proper fuel trims to stay within the stock MAF calibration. The final design yielded a substantial increase in flow over the stock intake system as seen in Figure 2:



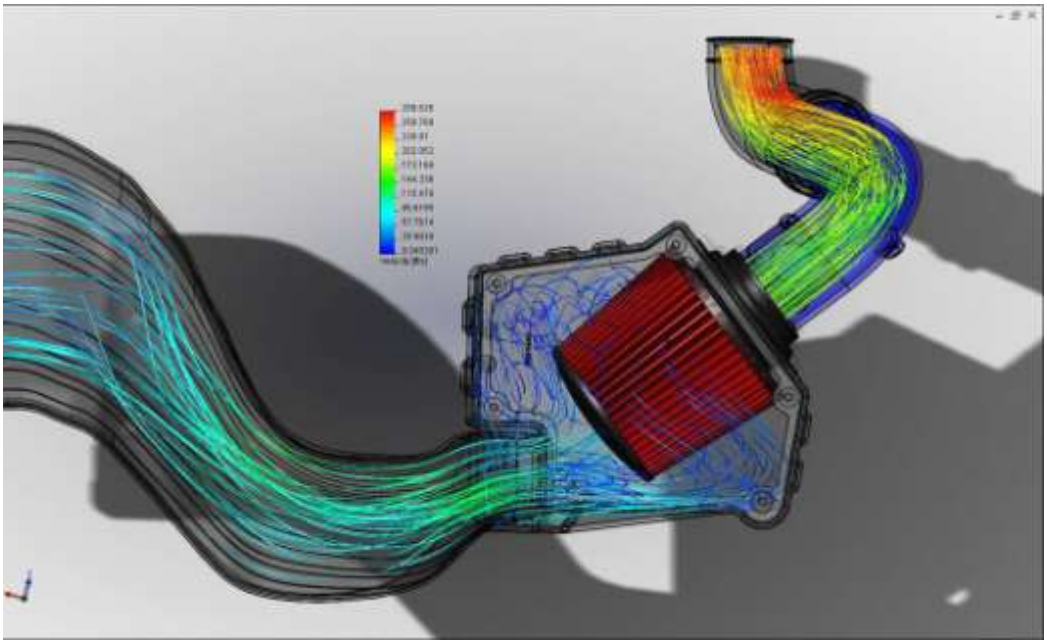
The final design also yielded acceptable long-term fuel trims during testing. Whereas the more restrictive stock intake system ran slightly rich, the higher-flowing AEM DRYFLOW design ran slightly leaner, just as we expected. (See Fig 3) Also, there were no CEL's (Check Engine Light) during our total of over 60 fuel-trim and dyno test runs on 4 vehicles:

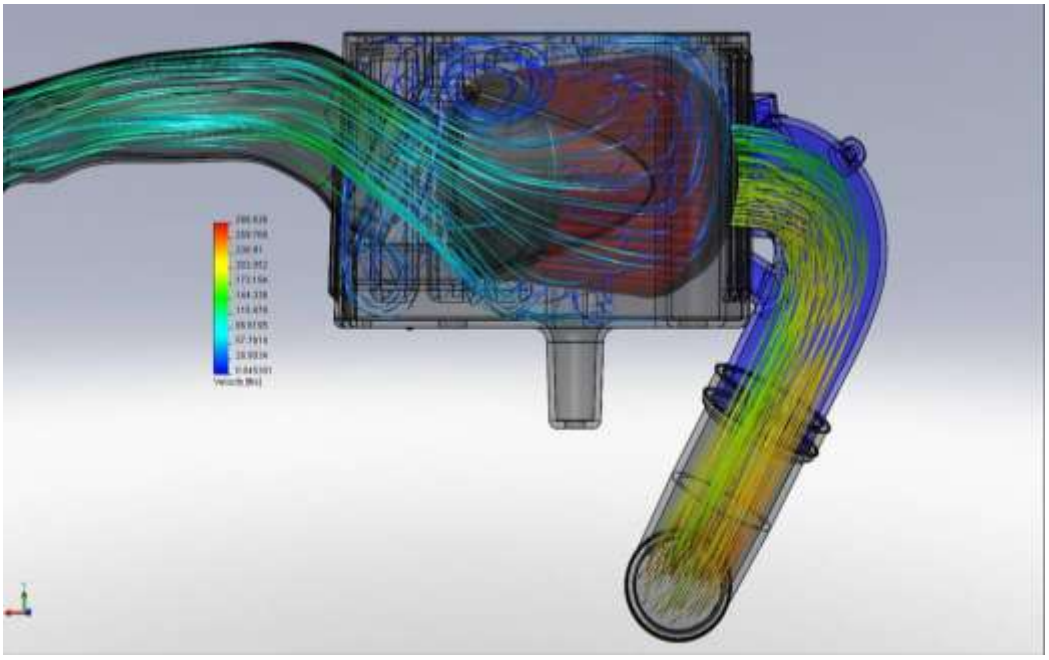


The final design includes a bulb seal between the filter airbox and the intake tube. This caused IAT at idle to drop, matching ambient air temperatures. We went back to the dyno with the sealed system and saw a 17HP* gain.

Finally, the AEM-21-698 RalliArt CAI kit was developed using extensive CFD analysis and temperature studies. The main focus was not only to maintain near ambient IAT's but also to make sure the flow pattern around the NO OIL AEM DRYFLOW air filter was evenly distributed so that the dust loading and flow would be optimal. The CFD figures below illustrate the flow distribution and velocity around the filter in the air box. Note that the velocity around the AEM

DRYFLOW filter is lowest which allows the filter to evenly load dust. This is important because there are no velocity “hot spots” on the filter surface which may cause dust penetration or uneven flow characteristics that may affect the MAF sensor readings (a.k.a. signal noise). We tested three iterations of air box and 2 DRYFLOW filters to get the flow distribution correct. (Figures 4 & 5.)





*Horsepower gains are based upon specific or similar vehicle dynamometer tests. Results will vary based on environmental conditions, engine condition, vehicle mileage, and the dynamometer used. For more information, look up vehicle testing at www.aemintakes.com/hp_gains.htm.