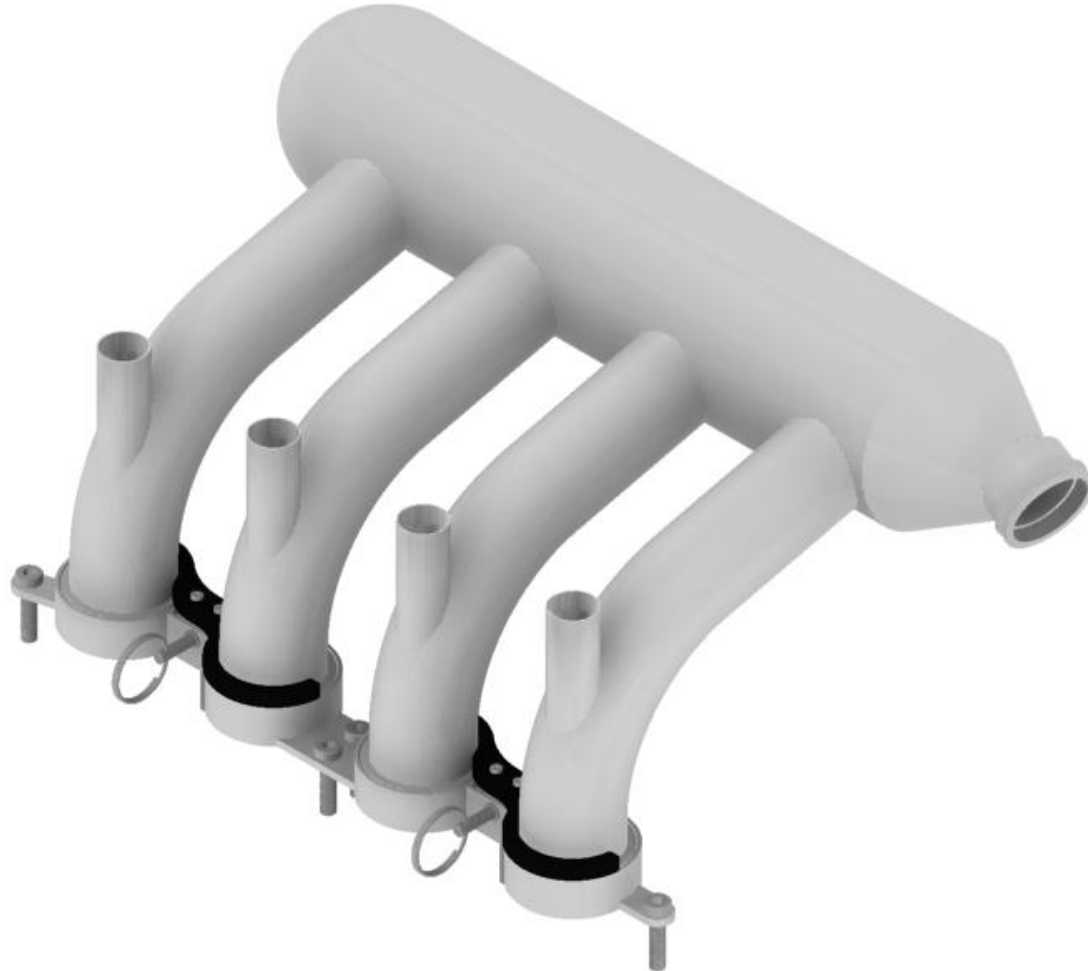


Cornell *Racing*

FSA E MIS 2016
MacLean-Fogg Fastener Challenge

Intake Manifold Fastening



The Problem

- Originally:
 - Bolt intake manifold directly to engine head
 - Very tight packaging in engine bay
- Issues
 - Stripped threads in engine head
 - Bolts dropped into intake ports
 - Bolts dropped into engine bay
 - Time lost dealing with the above issues

The Solution

- Double o-ring seals on each runner mating to an “intake flange”
 - Designed for up to 100 psi seal
- Intake flange bolted to engine and sealed with o-rings
 - Removed very rarely
- Quick release pins
- 2 s-shaped “mustache” armatures to restrict upward movement of intake

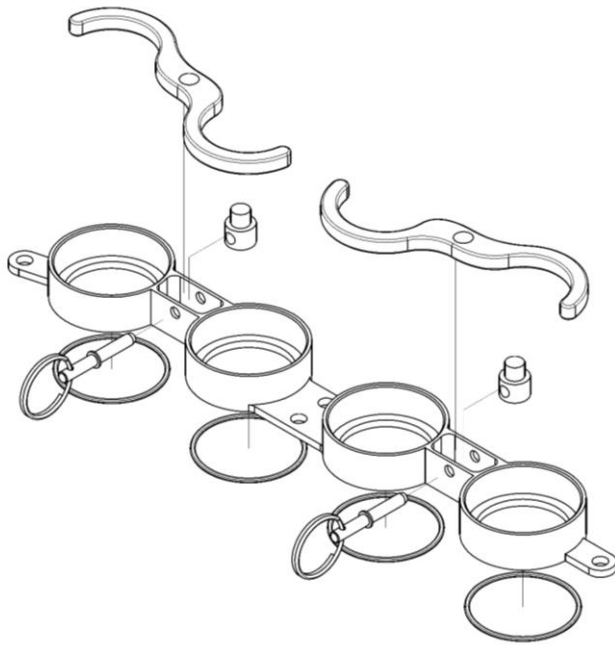
The Solution



Further Design

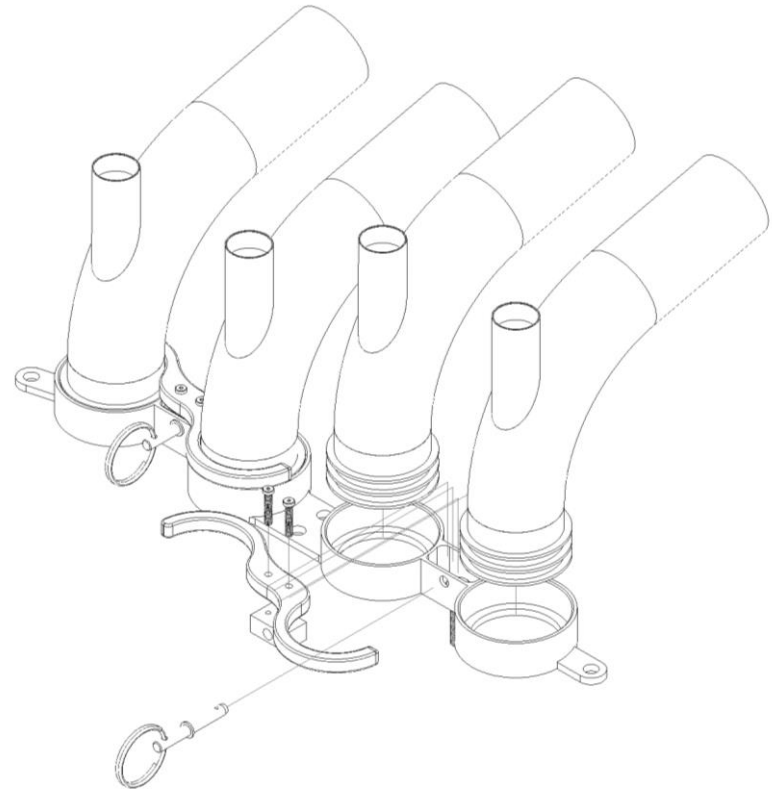
- How does one retain the “mustaches” and the manifold?
- Previous designs
 - Bike seat clamp to hold mustaches down: no loose parts, but difficult to adjust clamping force
 - Quick release pin through flange and a cylinder pressed into mustache
 - Quick release pin through a rectangular block bolted to mustache

Comparison



Press and Pin

Exact clamping height, but no axial retention of mustache, could vibrate loose

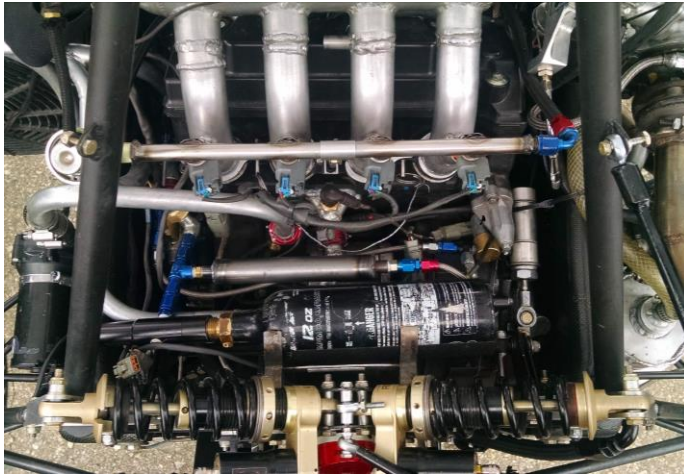


Block and Pin

Fully constrained, simpler to manufacture

- No intake leaks at the engine-intake interface for this design
- No bolts/ o-rings from assembly dropped into engine bay or intake ports
- Fully constrained design
- 5 minute assembly/ disassembly of intake from car
- Backwards and cross-compatible with multiple intake manifold designs

Design Implemented



Tight packaging
in the engine bay



Intake manifold
retention system on car

Lessons Learned

- Reduce parts and tools required to assemble
- Reduce alternative assembly methods
 - Only 1 “right way” to assemble
- Constrain and retain within the requirements of the part
- Iteration is key

Future Improvements

- Integrate mustaches into intake manifold
 - Further reduce number of parts
- Permanent pin retention to flange
 - Reduce loose parts
- Constrained bolts on intake flange
 - Reduce loose parts

Contact Information



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