

HOT ROD Magazine / GM Performance Division Solstice V8 Project

LS7 Test Vehicle

This is the presentation given at the kickoff meeting for the LS7-powered HOT ROD Solstice. What started as casual conversations between HOT ROD's Matt King and GM Performance Division Executive Director Mark Reuss, were officially becoming a buildup project with this meeting. And now you're getting to see what was discussed at that first meeting.

Project Scope

GMPD & HR Mag. Document all phases of project

Define Project Objective: GMPD HR Mag GM Pwt GM Perf Parts Pontiac Marketing

Vehicle Level Target Selection: GMPD HR Mag GM Pwt

Engineering Analysis: GMPD HR Mag

Vehicle Build: GMPD HR Mag

Powertrain Build: GMPD HR Mag GM Pwt GM Perf Parts

Vehicle Integration: GMPD HR Mag GM Pwt

Vehicle Test: GMPD HR Mag Pontiac Marketing

This presentation was created by Project Manager Adam Dean, with help from Engineering Designers John De Witt, Mike McCann, Vince Bommarito and Mike Hodorek. This first slide discussed who was going to do what and when. Like many large businesses, GM has a language of it's own so here are some definitions for the page: GMPD – General Motors Performance Division, HR Mag – HOT ROD Magazine, GM Pwt – GM Powertrain and GM Perf Pts – GM Performance Parts.

As you can see, GMPD and HR Mag worked very closely together on the entire project to end up with an awesome vehicle.

Team Participants

Name	Role
Adam Dean	HPVO DE (Project Mngr)
Al Butlin	AVI Lead DE
Craig Shantz	Performance Division Specialty Vehicles Manager
Jim Minneker	Powertrain Mngr
John De Witt	HPVO DLT
John Heinricy	HPVO Director
Phil Colley	Communications
Mark Reuss	Performance Division Director
Matt Scrase	HPVO Race DE
Matthew King	Hot Rod Editor
Mike Hodorek	HPVO Lead DE
Mike McCann	HPVO DLT
Nick Kayfez	Performance Division Design Group Manager
Tom Conneally	HPVO EGM
Tony Roma	Powertrain Development & Integration Engineer
Vince Bommarito	HPVO Lead DE

This is a list of the team that was involved at the beginning of the HOT ROD Solstice project. This team would eventually grow to over 50, but only for a very short time as this build was done very quickly!

Definitions: HPVO – High Performance Vehicle Operations (this is the portion of the GM Performance Division that engineers vehicles – like the CTS V, Cobalt SS Supercharged and Trailblazer SS), AVI – Advanced Vehicle Integration (a very cool shop inside GM where many of the show cars and early pre-production vehicles are built), DE – Designing Engineer (the engineers that create the very cool 'math data' computer simulations of parts), DLT – Design Lead Team, EGM – Engineering Group Manager (these people are the managers for the engineers).

HR Solstice V8 VTS-Lite

Straight Line Performance:

- 0-60mph: < 3.8 seconds
- ¼ mile: < 10.99 @ 130mph
- 0-100-0: < 12.0 seconds

Braking Performance:

- 60-0 distance: < 105 feet (magazine measurement)

Handling Performance:

- Slalom speed: > 72mph
- Max Lat: > 1.10 g
- MRC Laptime: < 1:55.00

These were the performance goals for the HOT ROD Solstice that were determined at this meeting (these figures were blank at the start of the meeting). The term 'VTS-Lite' stands for 'Vehicle Technical Specifications - Lite' and is a term that represents the expectations of the project. These are considered a '-Lite' version of the VTS because production car VTS documents can be hundreds of pages long! Obviously, a performance hot rod has a shorter list of requirements: go fast, turn tight, stop hard and look cool!

HR Solstice Project LS7/ T56 PROPOSED CONTENT

ENGINE:

2006 C6 LS7 (7.0L) w/ Dry-Sump Lubrication

AIR INDUCTION:

C6 LS7

EXHAUST:

Possible Short Headers + Catalysts with C6 Z06 Pipes & Active Mufflers

ACC'Y DRIVE:

C6 LS7 or possibly 2006 CTS-V

CRFM (radiator):

Solstice 2.0L Turbo Package

TRANS:

CTS-V T56 w/ SSR T56 Output Shaft, Tail Housing & Shifter

PROP SHAFT:

New with Cardon Style Joints

DIFF:

Sigma (CTS/STS/Solstice)

FUEL TANK:

Carry Over Solstice Tank (Pump Upgrades Required)

Rear Tire:

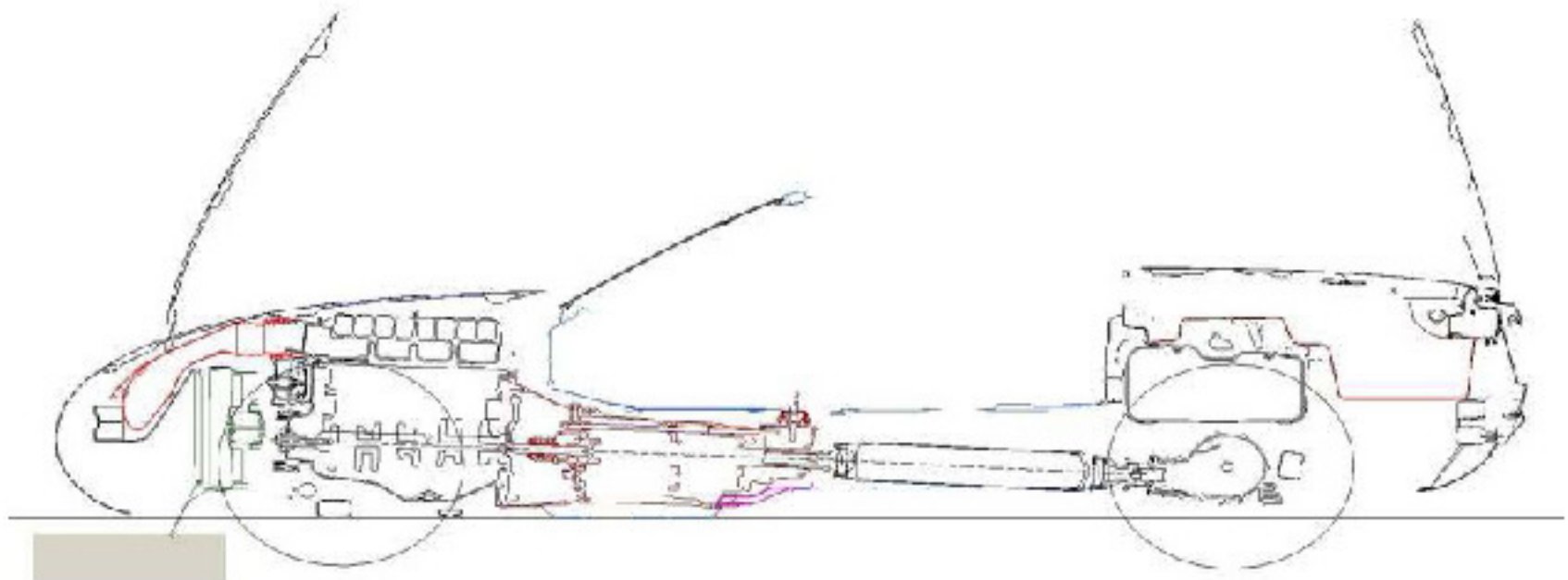
Currently studying 295/30R19 rear tire

As a discussion starter, these components were proposed to use in the buildup of the HOT ROD Solstice. If you are familiar with the project, you know the LS7 and T56 engine/trans combo were used, but a custom air tube, long tube headers/exhaust, radiator and fuel tank were required to handle the enormous potential of this vehicle. As you'll see in the next pages, the detail to which the GM Performance Division Engineering team was able to prepare for this project with computer 'math data' is truly astounding.

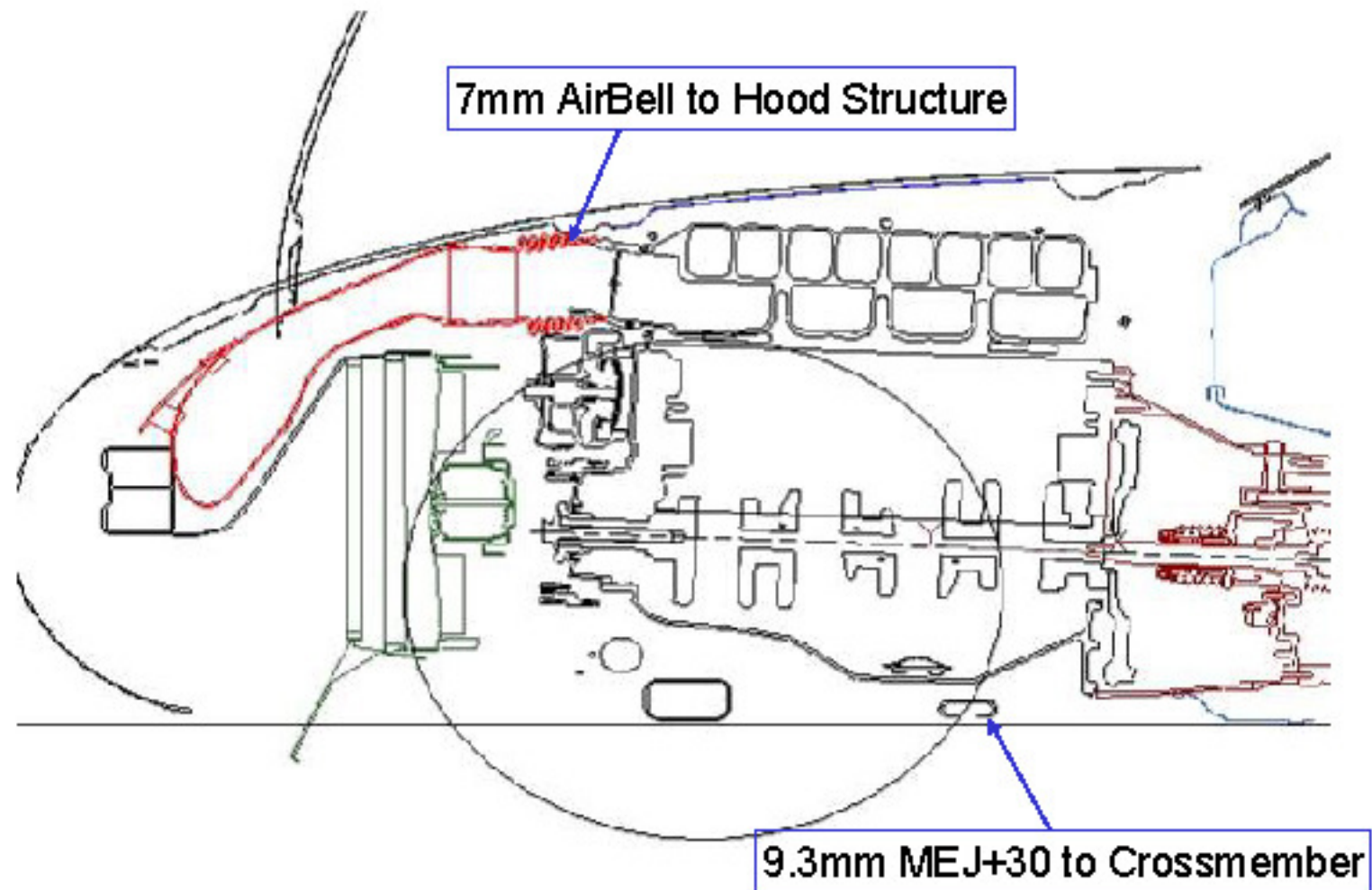
Detailed Content

Engine:	RPO: LS7 w/ modifications = 575 HP (crank) w/ dry-sump lubrication w/ E38 controller.
Radiator:	Modified Solstice or New
Trans:	Tremec T56, Prototype unit w/ integral pump
Shifter:	Modified SSR Shifter
Clutch/Flywheel:	C6 Z06
Brake Calipers:	Brembo hardware from Sigma
Brake Rotors:	2-pc Brembo
Front Suspension:	Springs, Adjustable Ohlins Dampers, Custom-bent Stabilizer Bar
Rear Suspension:	Springs, Adjustable Ohlins Dampers, Custom-bent Stabilizer Bar
Front Tire/Wheel:	275/30R19 19x10" wheel
Rear Tire/Wheel:	295/30R19 19x11" wheel
Differential:	CTS-V "Super-V" Cast Iron Differential, 3.73:1, LSD
Differential Cooler:	GM Performance Parts CTS-V Diff Cooler
Axlehaft/Propshaft:	Modified/New
Bodywork:	Fascia for cooling (brake/PTC) & front lift reduction, Hood for heat rejection & weight
Interior:	Near factory w/ aftermarket seats & belts
Roll Cage:	6-point weld-in cage
Roof:	Hardtop included

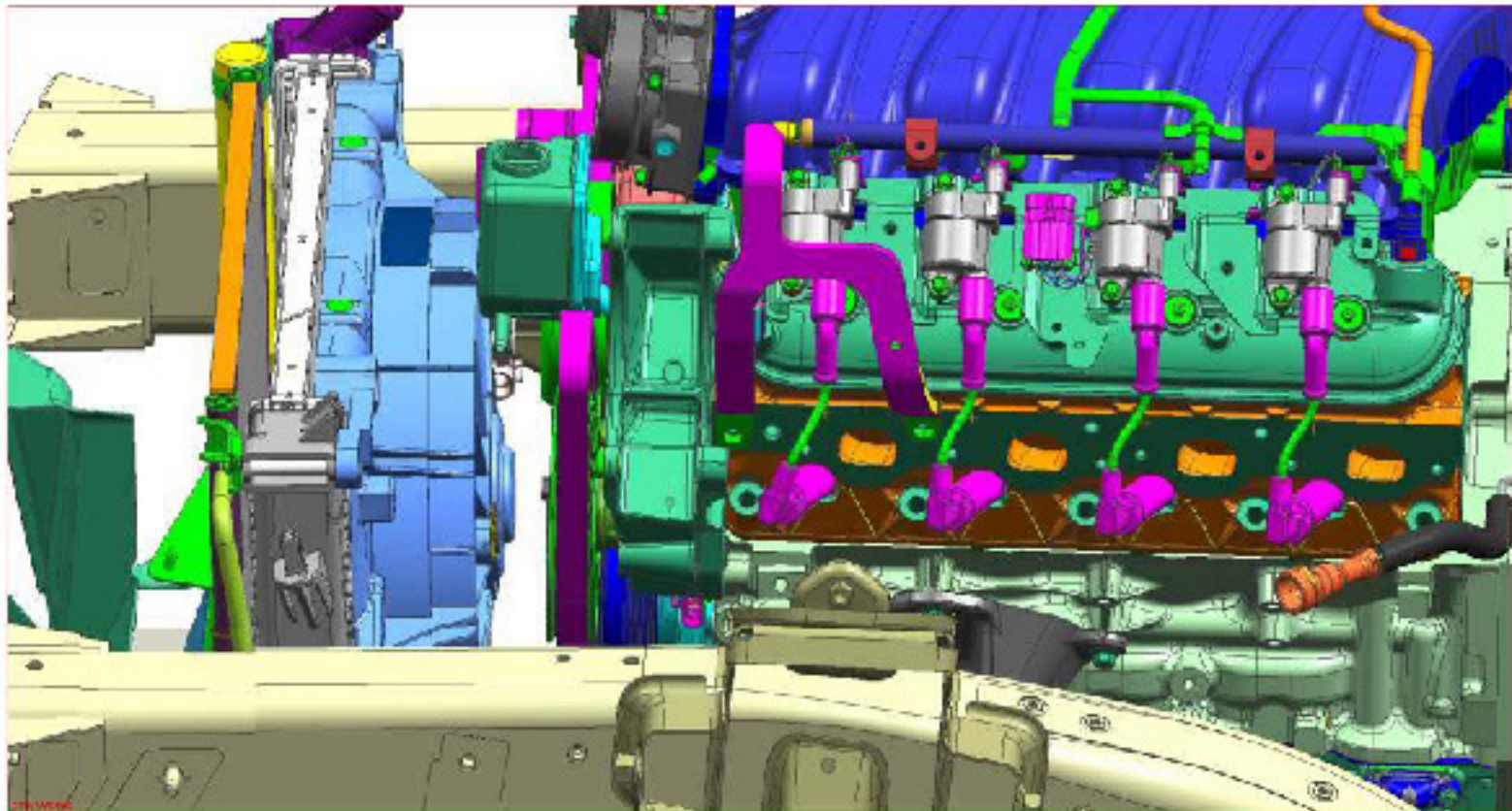
This detailed parts list was created at the meeting to include the proposed GM production parts and aftermarket parts the HOT ROD Solstice would require to meet its VTS-Lite. Notice that the T56 used in this HR Solstice was leftover from a prototype vehicle that was never built and has an integral cooling pump in it—which is not available in a production vehicle. The differential cooler is available from GM Performance Parts (see their website at gmperformanceparts.com).



This is where the meeting really got going. The GM Performance Division DE team outdid themselves by building a 'virtual' HOT ROD Solstice long before the meeting even started! This is a 'slice' down the middle of the virtual 'math data' representation of the HOT ROD Solstice to show how the bigger radiator, engine and trans would fit.

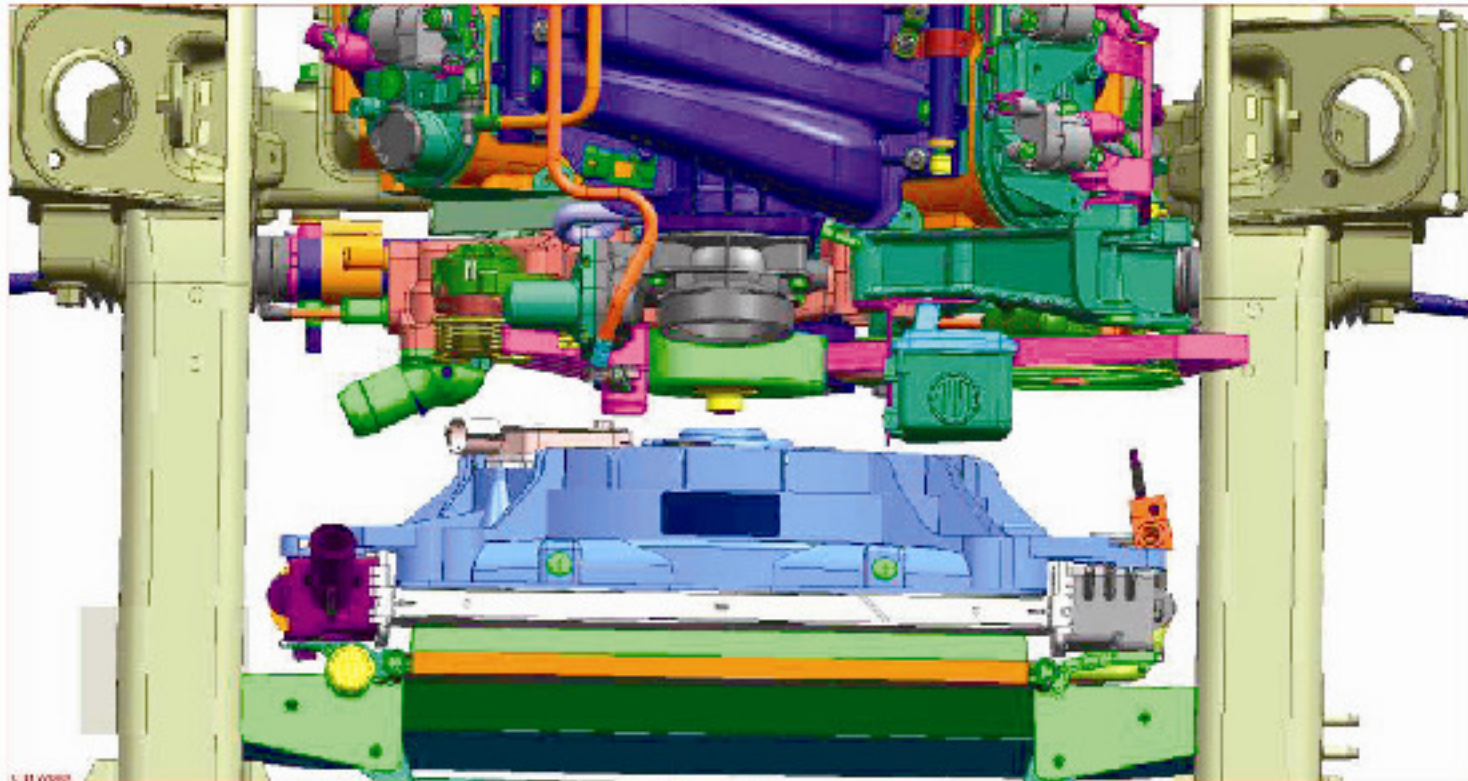


This closeup of the math data cutaway shows how tight the LS7 engine fit is under the hood and to the framerrail crossmember—but it does fit! You've got to admit, it's pretty cool looking at this vehicle cut right down the centerline—notice the crank throws and transmission internals sliced open. Wild!



- LS7 and carry-over Solstice CRFM
- HVAC content? (i.e. No A/C = no condenser and more engine cooling flow)

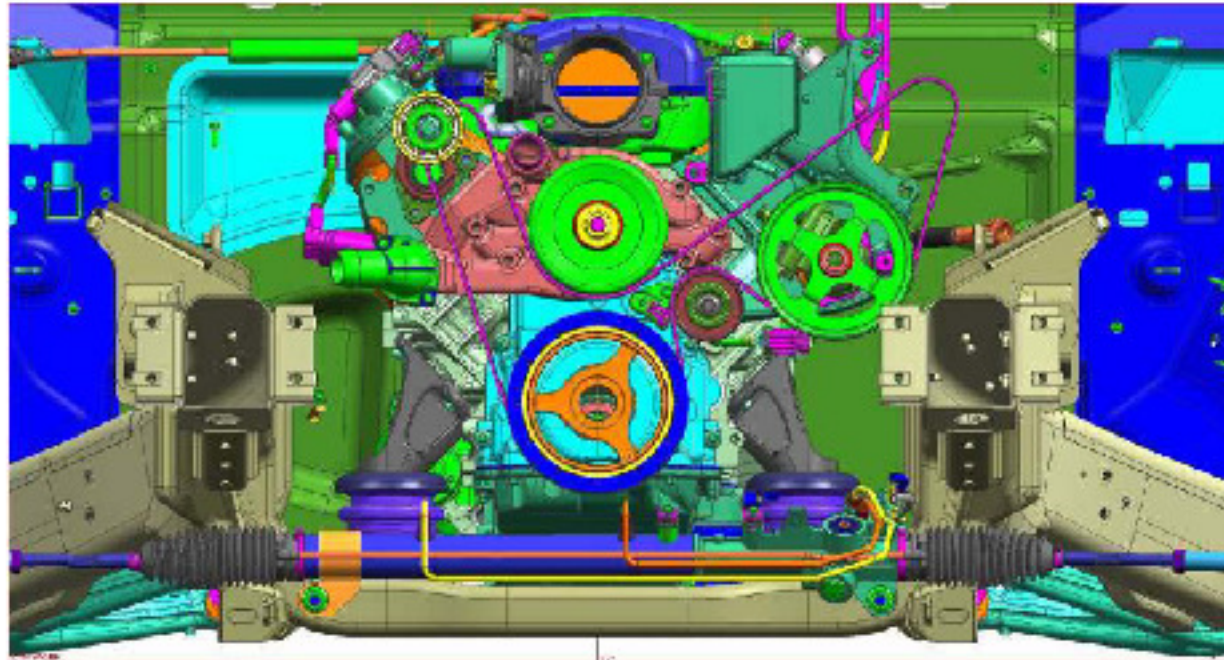
And here is where the meeting got even better! How would you like to start a project by 'looking' at the finished work? This color 3D 'math data' image showed how the bigger engine and radiator would fit in the engine bay (something a few nay-sayers said was not possible!) with minimal rework. Notice how the slide indicates the HOT ROD Solstice would not have any air conditioning equipment--it was determined early on it wouldn't be needed on this killer ride.



- LS7 and carry-over Solstice CRFM (radiator).

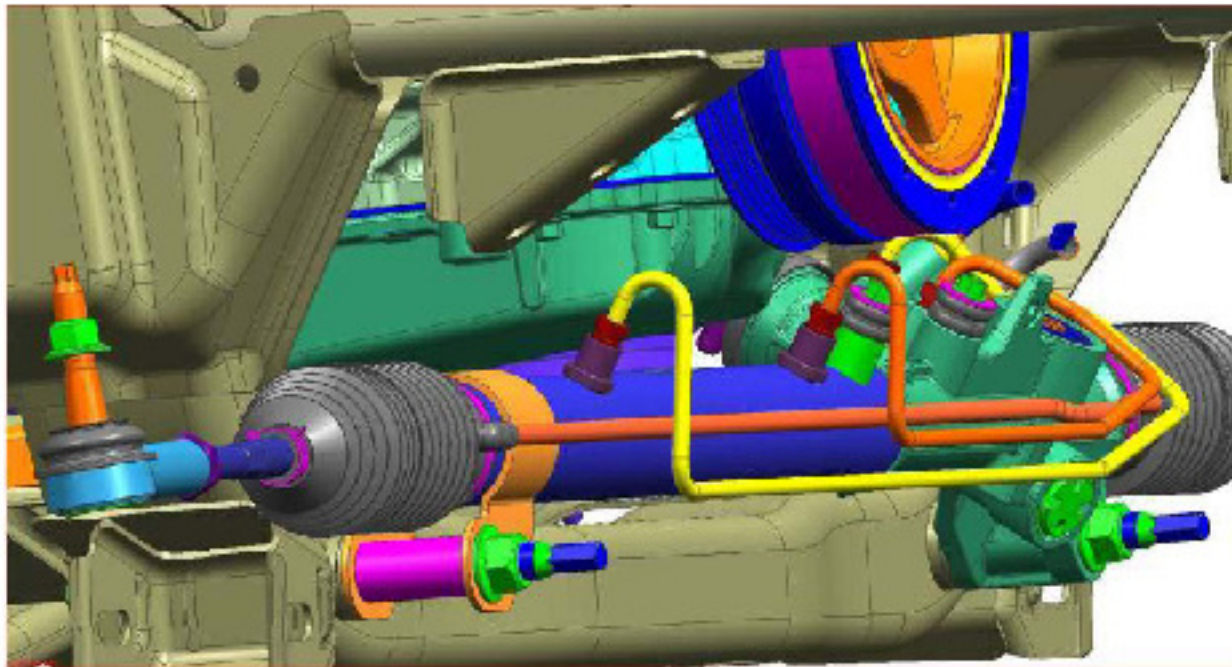
Obviously, getting a spectacular 'math data' overhead view of the radiator assembly and LS7 stuffed in a Solstice helps to understand what it will take to actually build the vehicle.

Definition: CRFM - Condensor Radiator Fan Module



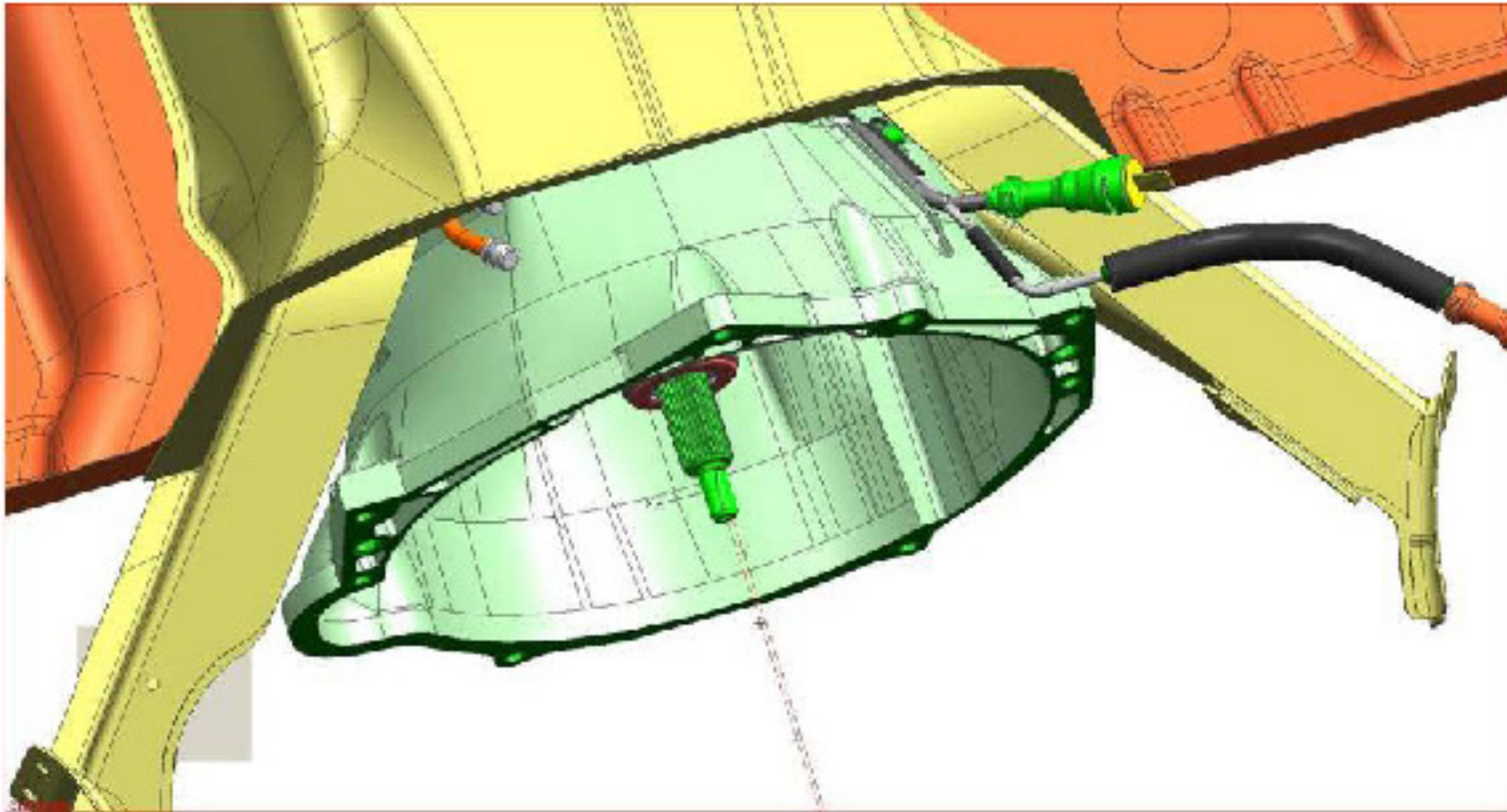
- LS7 and carry-over Solstice steering gear.
- Current package gives balancer clearance to:
 - Rack 45mm
 - P/S pressure line 10mm
 - P/S pressure line banjo style fitting 18mm
 - Oil pan to rack 23mm

This math data image from the front looking rearward with the CRFM removed shows how the LS7 V8 engine fits nicely between the frame rails, how the harmonic balancer/lower pulley just barely misses the steering rack-&-pinion hardline and how the A/C compressor is going to be deleted (notice the belt going up to nothing in the upper right corner of the image). The dimensions given on the slide are the clearances to these various components.



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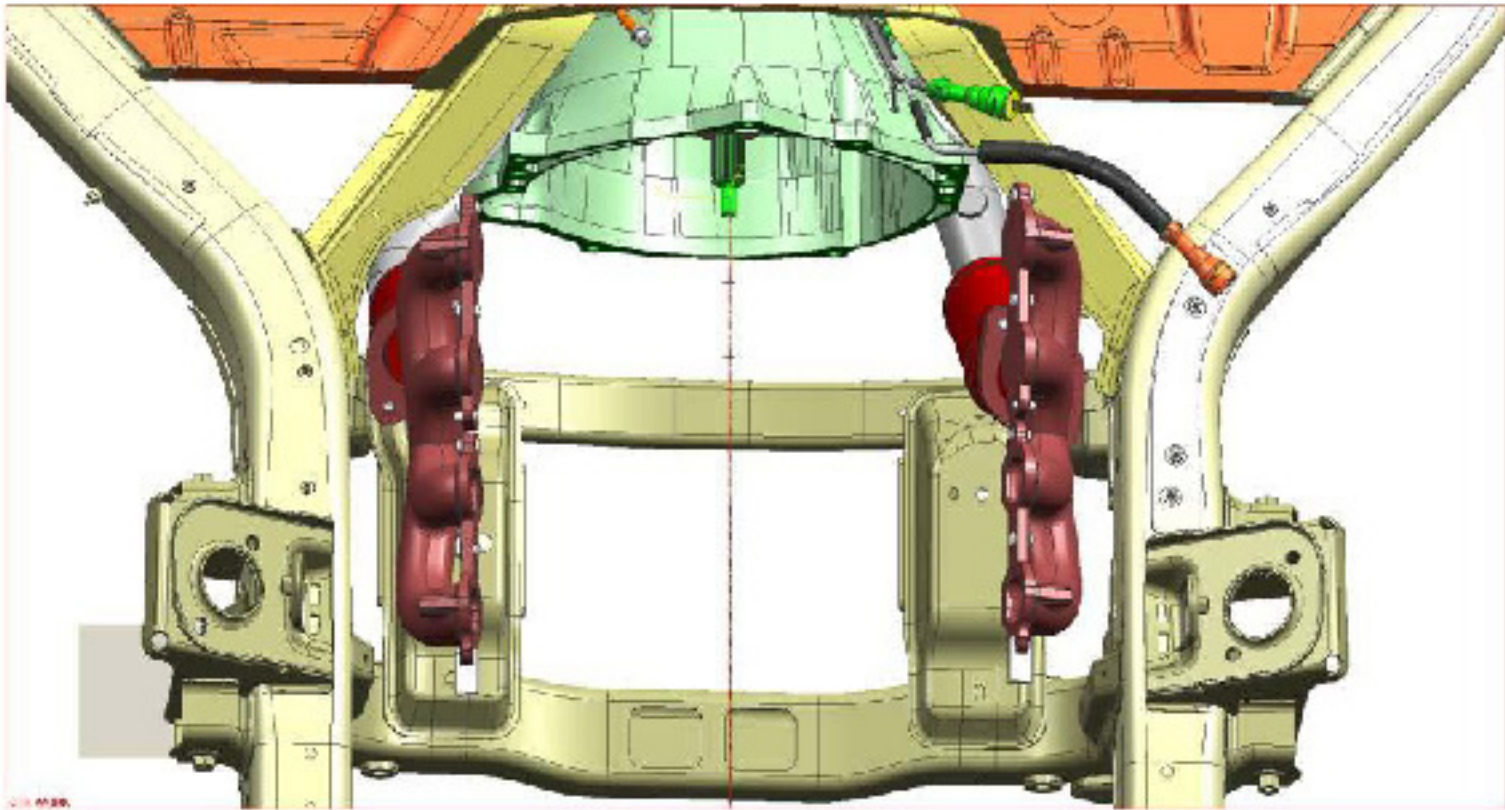
This math data image from the passenger side of the vehicle shows how close the lower pulley came to the steering rack hard line in the early proposal. This was addressed in the build to make sure there was no interference of these parts—but it was good to know the build team needed to be prepared for this before turning a single wrench!



- **Bell housing to batwing flange clearance 5mm LH & RH.**
- **Unaffected by vertical position of powertrain / driveline.**

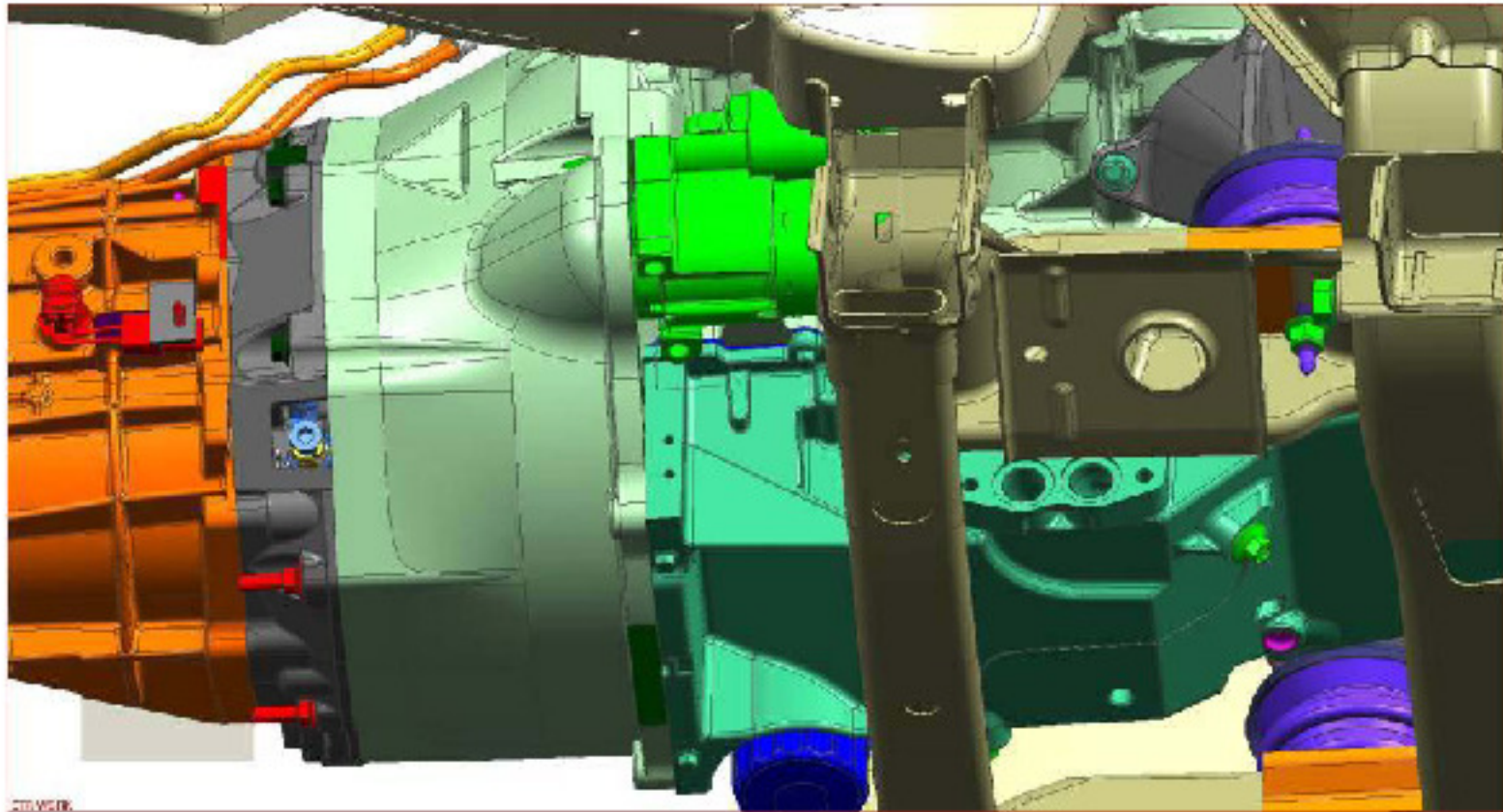
The T56 six speed manual transmission appeared to have 5 mm clearance to the top section of the framerrails, but in reality, the top horizontal edge of the rail required being bent down to provide sufficient clearance for the transmission once the final positioning of the engine/transmission was determined.

Definitions: LH – left hand, RH – right hand



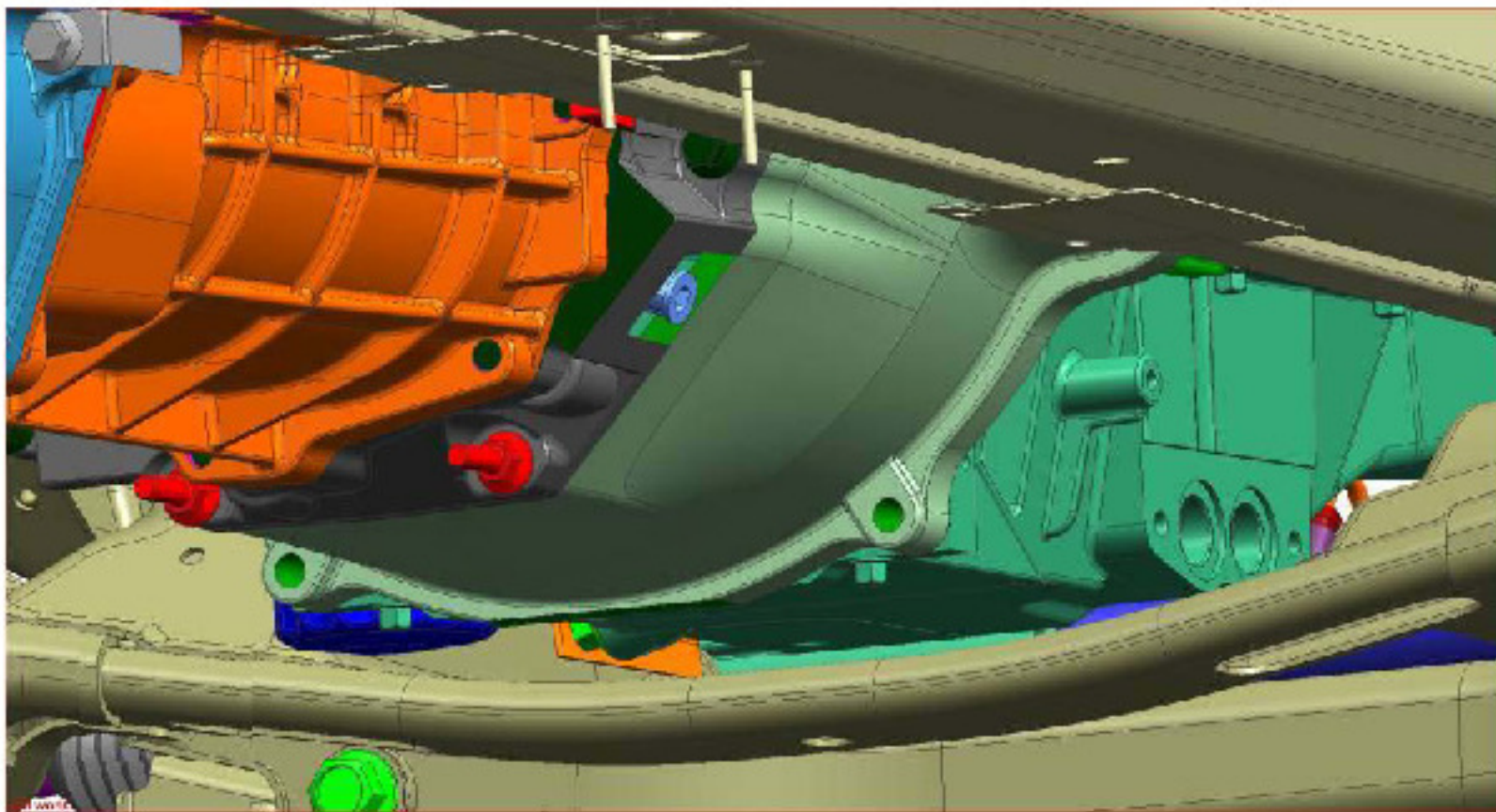
- New exhaust manifolds (TBD), catalyts and C6 exhaust pipes.

The early discussions for the exhaust system centered around using various Corvette components. This was one of the most challenging aspects of the build as there just isn't any room in the engine bay or under the vehicle for a big V8 exhaust system. The system created works great, but the team had to dig down deep to make it all fit and work as good as it does.
Definition: TBD – to be determined, C6 – the latest version of the Corvette



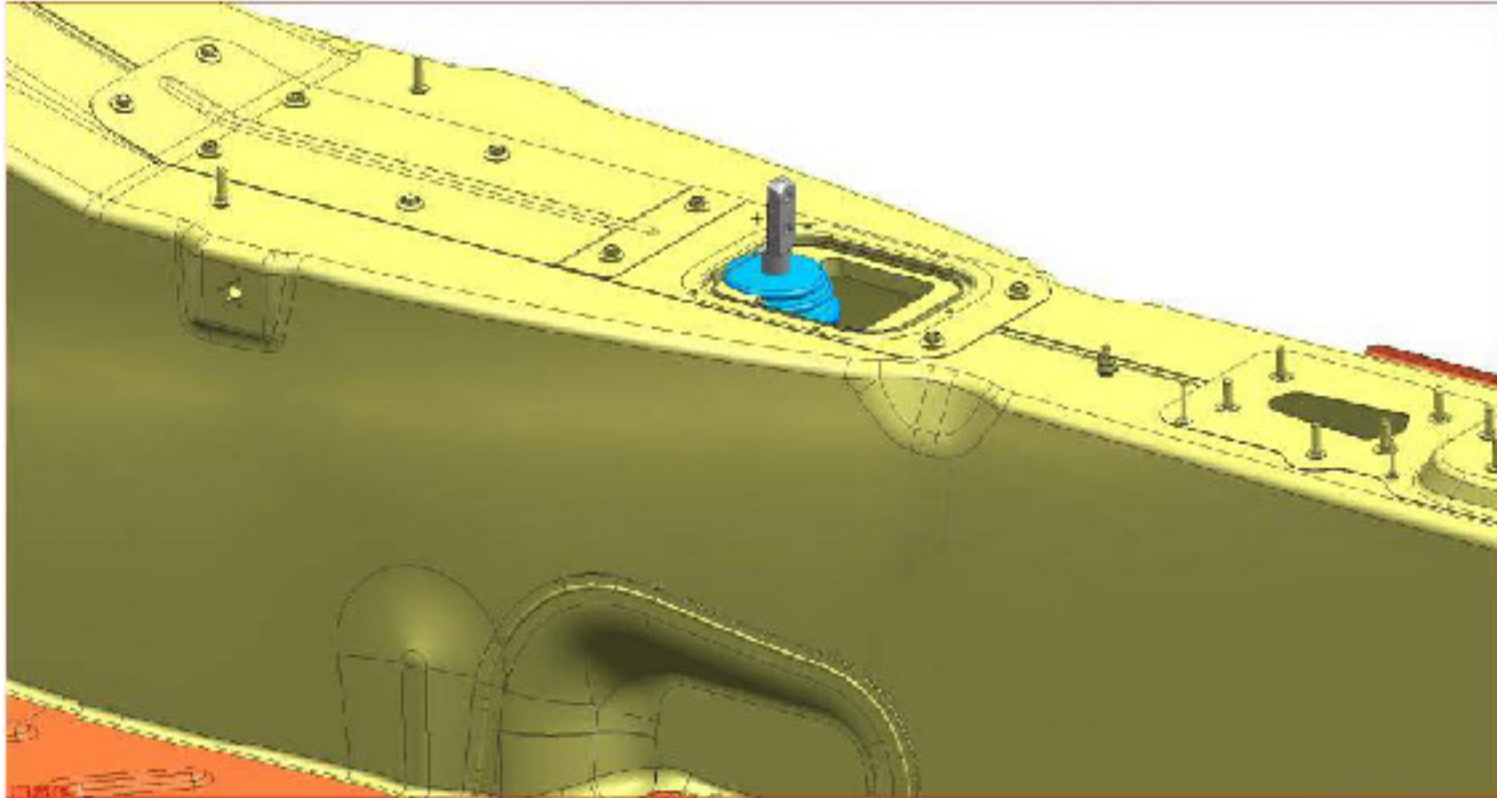
- LS7 oil pan ports have good potential for piping.
- Pan clearance to front cradle rear crossmember 13mm.

The outlet and inlet ports for the stock LS7 dry sump oil pan came perilously close to a frame crossmember in the math data study, so the team knew early on that they would need to create a compact 90 degree turn into the system out of the oil pan. Look for details on this in the buildup.



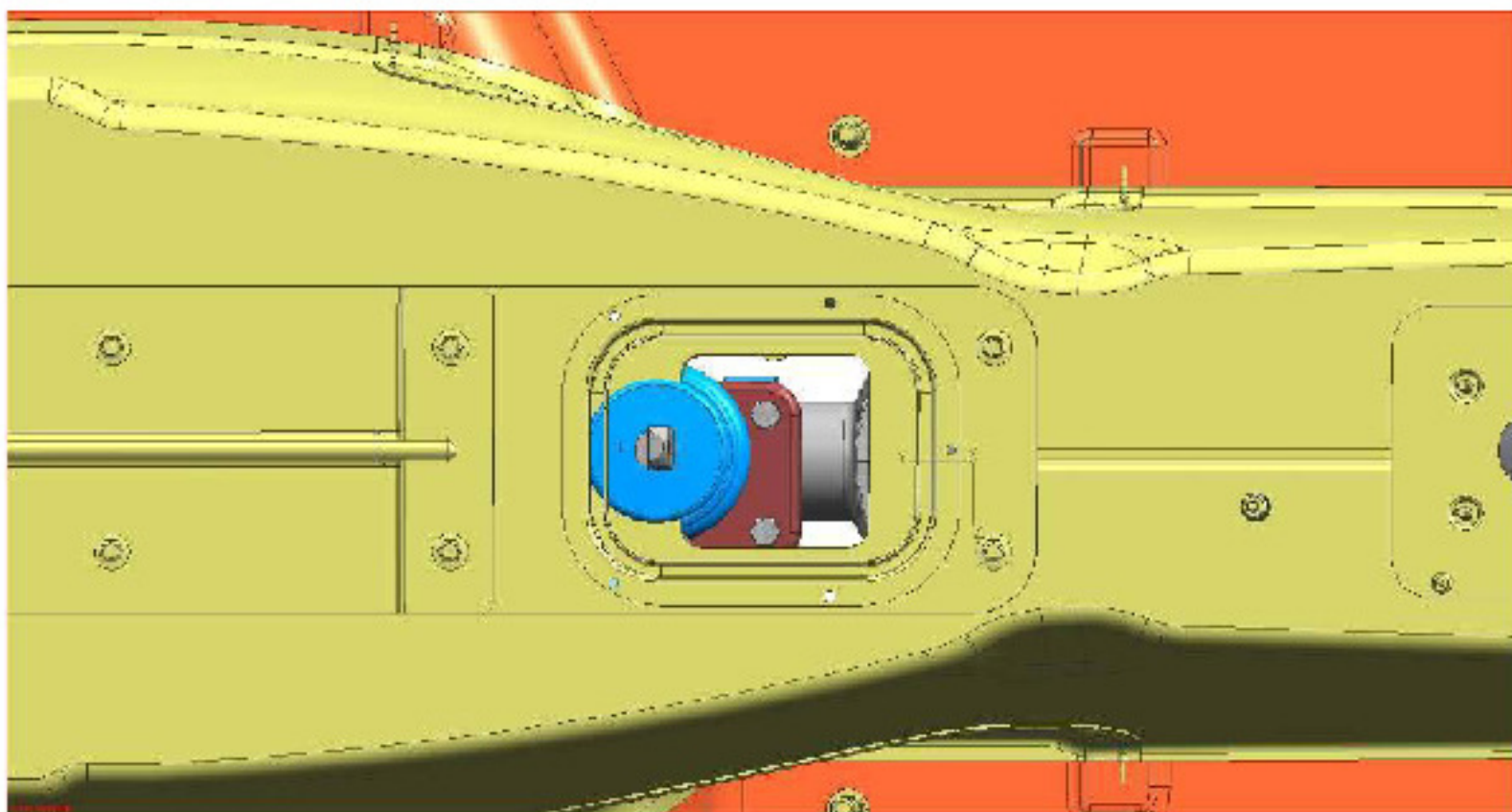
- LS7 oil pan ports have good potential for piping.
- Pan clearance to front cradle rear crossmember 13mm
- Crossmember to MEJ +30 9.3mm (Max Effective Jounce)

Further indications of the proximity issues of the oil pan and piping to the frame elements.



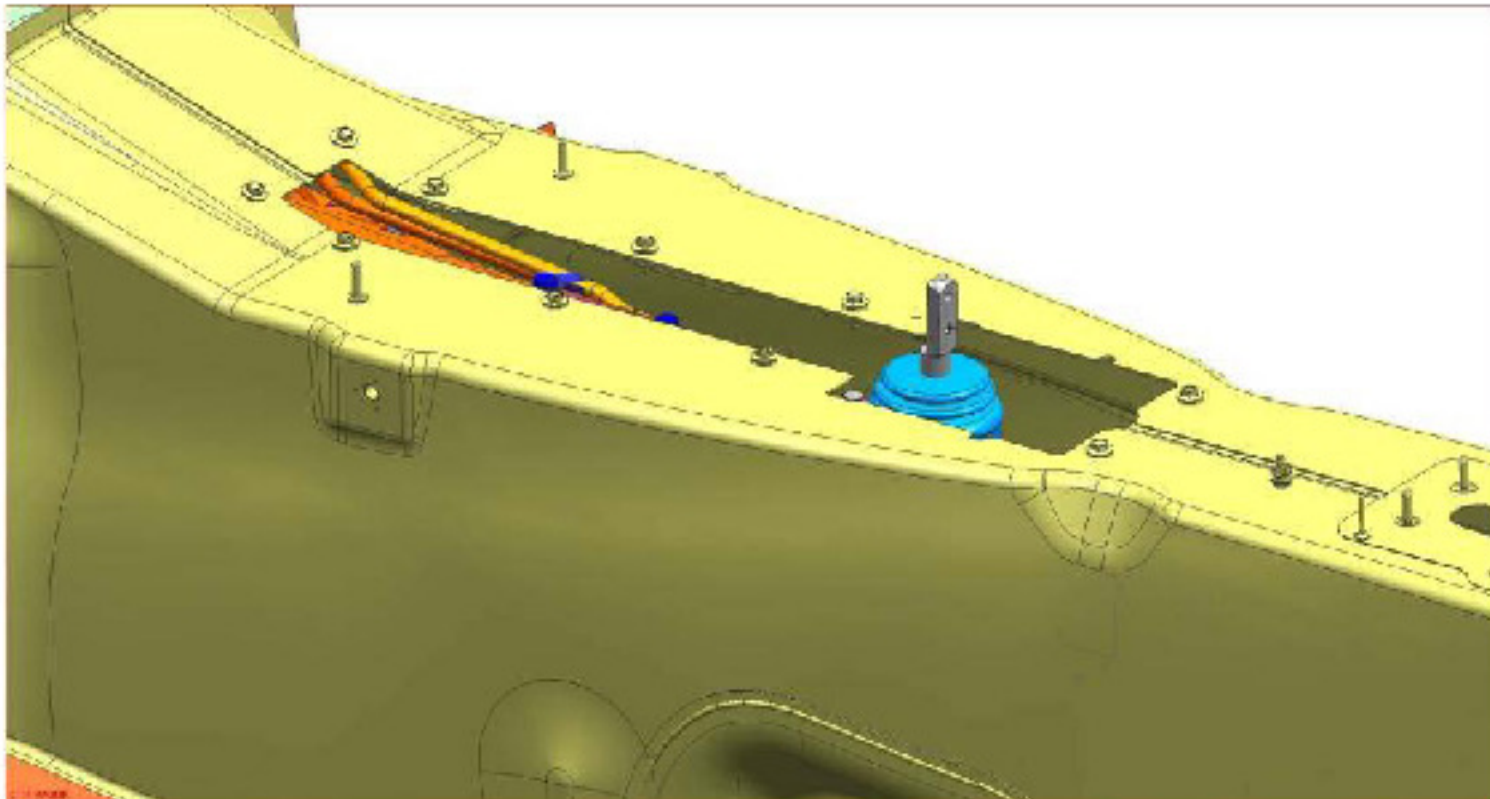
- SSR T56 shift lever package...new tunnel close out.

This is what GM Designing Engineers (DE's) call a 'crash' of two parts. In the math data study, the T56 shifter entered the interior slightly forward of the stock Solstice transmission shifter. This was resolved in the buildup by building a new interior closeout panel and slightly shimming the transmission rearward off the engine.



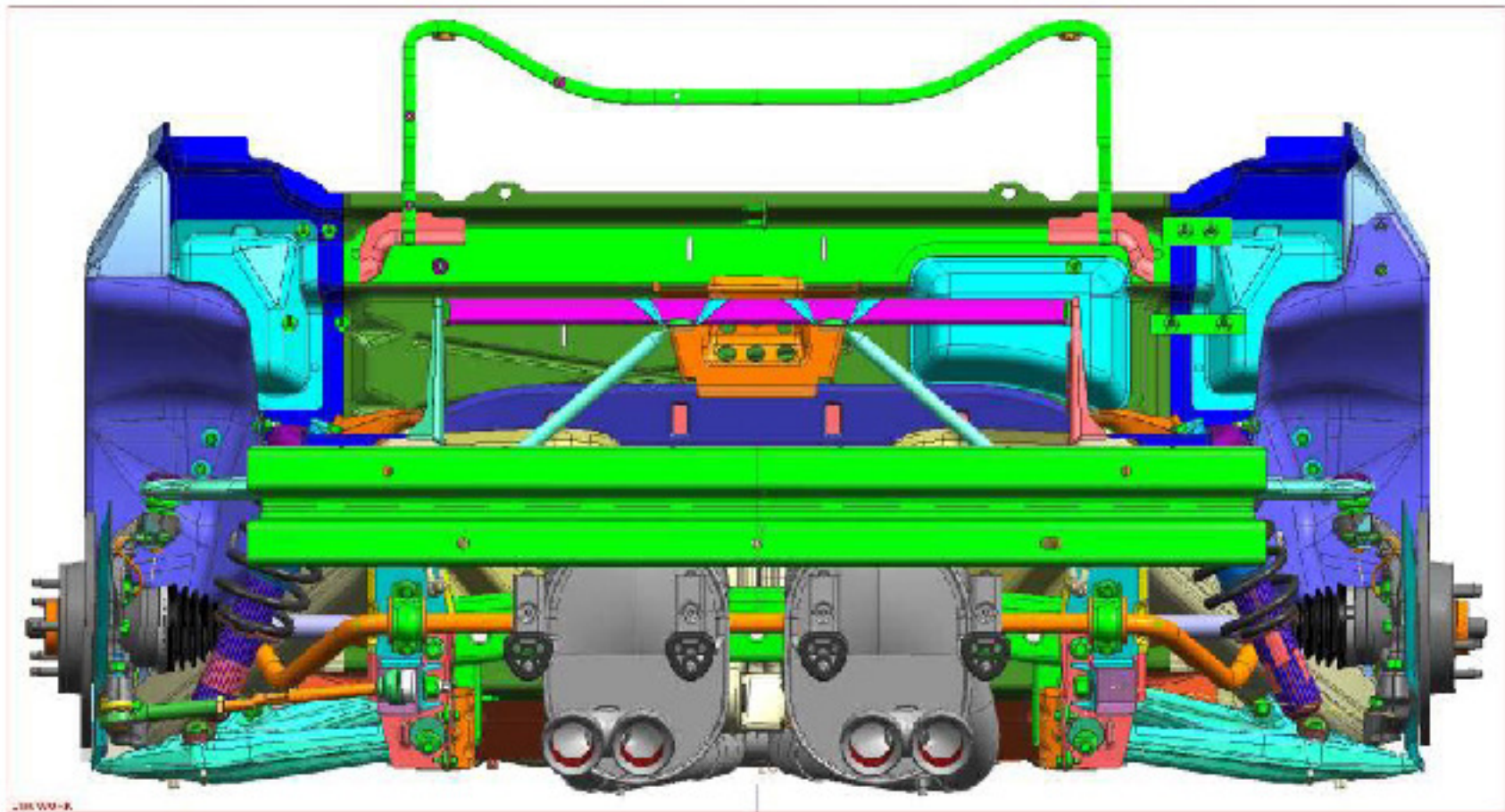
- SSR T56 shift lever package...new tunnel close out.

Additional math data indicating the 'crash' of the components and the requirement of the shimming/buildout.

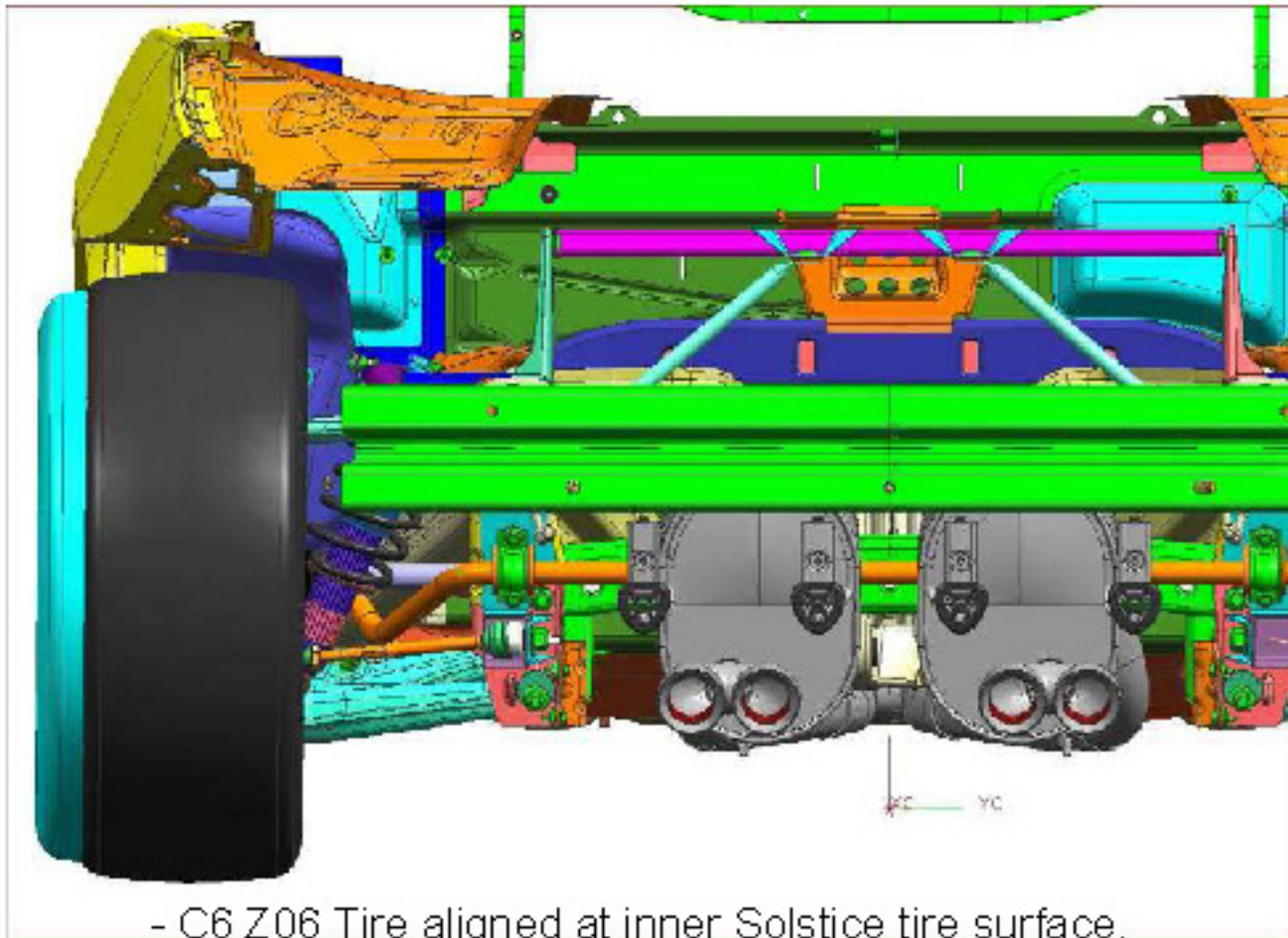


- SSR T56 shift lever package...new tunnel close out.

Resolution of the component interference.



Here is an early proposal of what to do with the exhaust exit at the rear of the vehicle. These were the active Z06 mufflers, but were ultimately not used due to packaging issues.



- C6 Z06 Tire aligned at inner Solstice tire surface.
- Requires high wheel offset. Investigating envelopes and offset options (wheel inner panels?).

Obviously, when making incredible power in a lightweight, short-wheelbase vehicle, the biggest rear tire you can stuff in the vehicle is only right. With that, the early math data study looked at shoving the 295/30R19 C6 Corvette Z06 tire in the fenderwell on a 19x11" wheel. How the team got a monster tire in the vehicle without any fenderflares is a story in itself—look for more in the buildup on how it was accomplished.