

Material

The material for all studies was 1020 Mild Steel for the frame, and 6061-T6 for the engine cases

Loads & Restraints

The swingarm pivots were considered “fixed” in all studies.

Braking Study Loads

1. 1200lbs normal to the bottom face of the steering head
2. 8400lbs rearward, normal to a side to side plane running thru the steering head axis, acting on a 17mm wide face at the bottom of the steering head
3. 8400lbs forward normal to a side to side plane running thru the steering head axis, acting on a 15mm wide face at the top of the steering head

Torsion Study Loads

1. 1200lbs normal to the bottom face of the steering head
 2. 50000lbs sideways, normal to a front to back plane running thru the steering head axis, acting on a 17mm wide face at the bottom of the steering head
 3. 5000lbs sideways, normal to a front to back plane running thru the steering head axis, acting on a 15mm wide face at the top of the steering head, in the opposite direction of load #2
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There were some questions raised on the chassis forum as to what role welded downtubes would play in chassis stiffness versus a bolted downtube. There was also a comment that a properly designed chassis didn't need the stiffness of the cases as part of the design. This got me thinking that I should create some studies to look at these 3 situations;

1. No downtube
2. A bolted downtube
3. A welded downtube

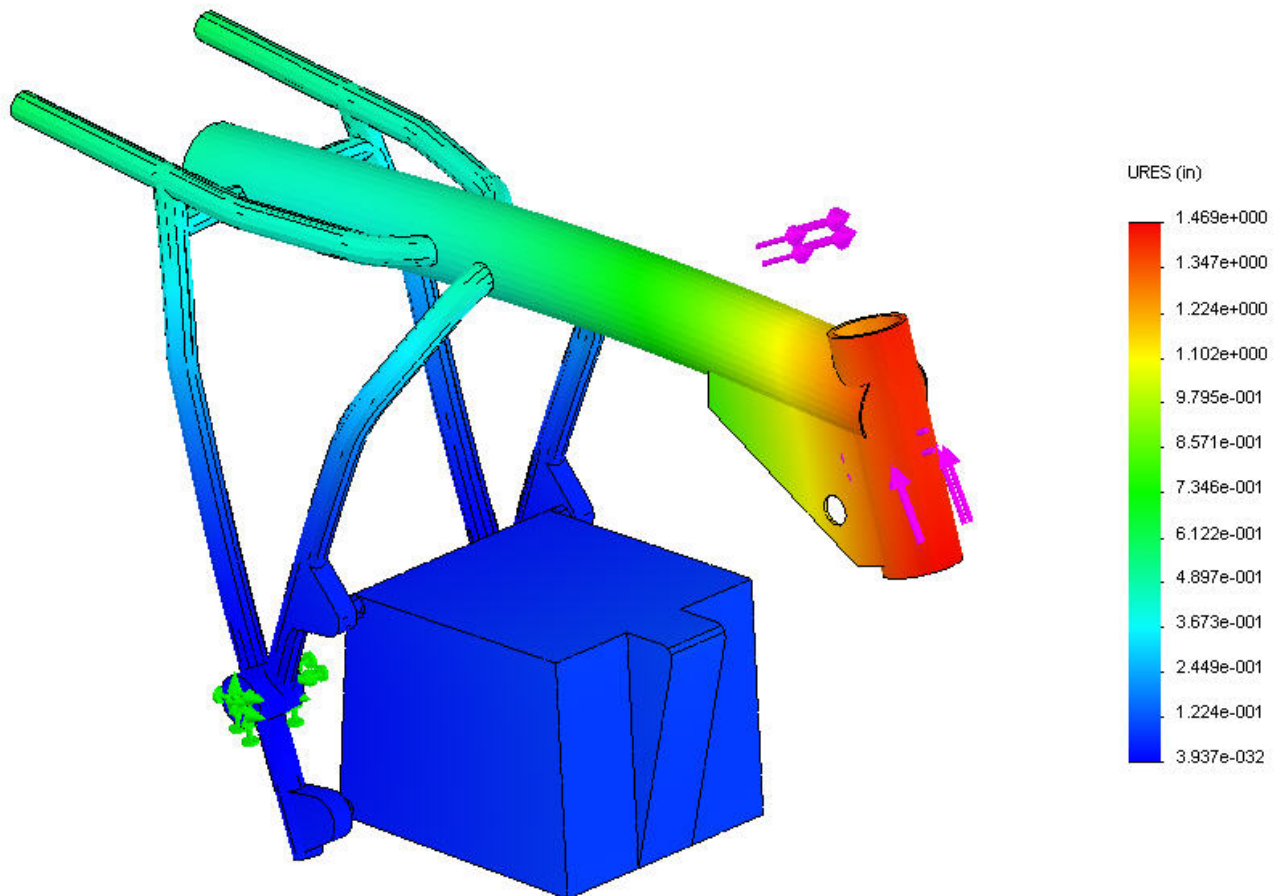
I created a “Foale” style round backbone frame built around an existing CB400F CAD model, using a 3” dia x .063” wall backbone, a single 1.5” x .063” wall downtube, and 1” od x .063” wall tube for the rest of the frame

Study #1– No Downtube

Study 1 Braking

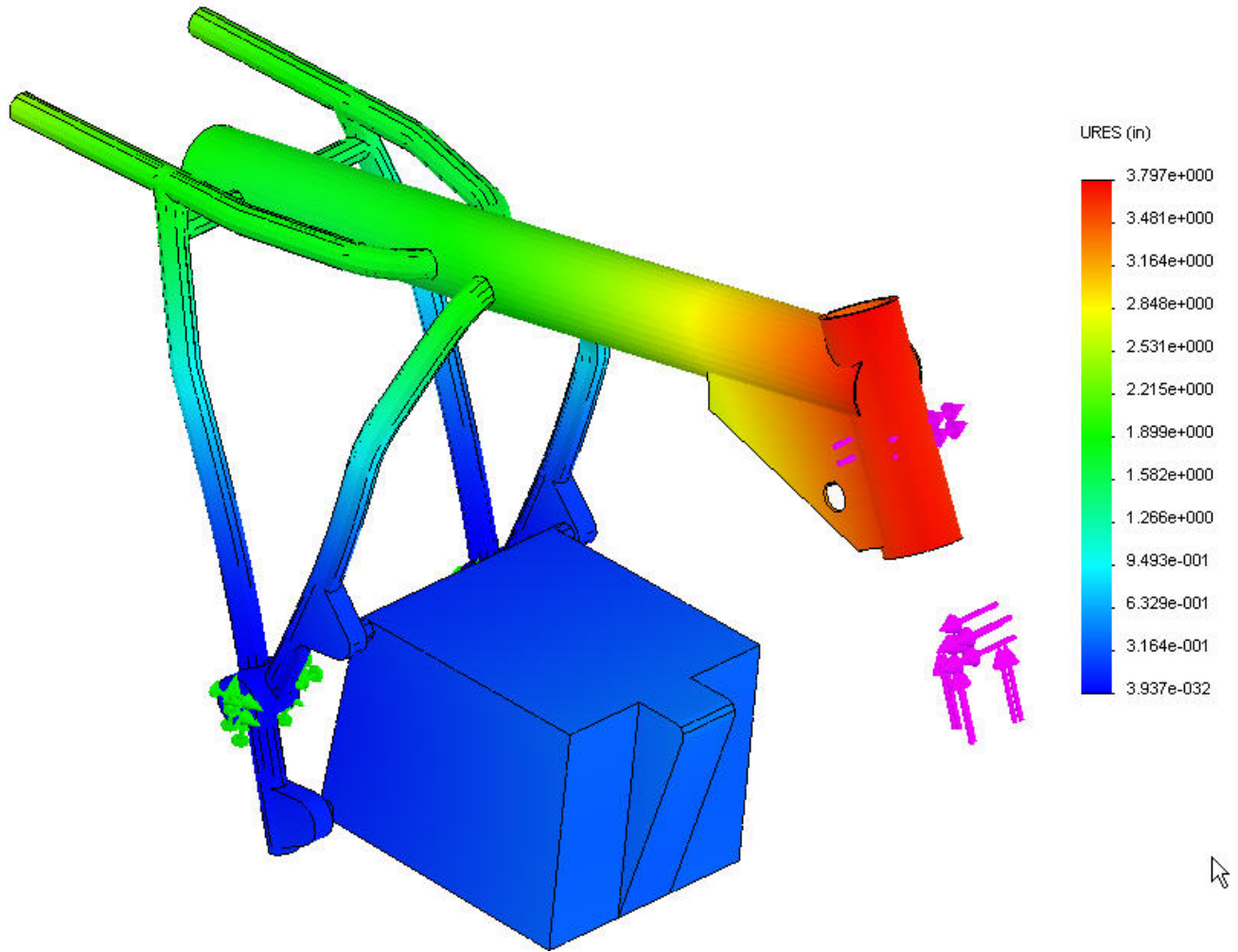
The FEA program generated a warning that I should switch to “Large Displacement Mode”, whereby the program will only allow a certain amount of deflection, then it resets the parameters based on the current deflection, and re-runs the study, going thru multiple iterations until it stops deflecting. I opted not spend the time to do this, and just took it on face value that the loads were generating extreme displacement. (Which it was, in the range of 3 x the displacement of Studies 2 and 3)

Model name: Tone Foale FEA
Study name: Study 1
Plot type: Static displacement Displacement1
Deformation scale: 2.63777



Study 1 - Torsion

Model name: Tone Foale FEA
Study name: TF1 Torsion
Plot type: Static displacement Displacement1
Deformation scale: 1.13378

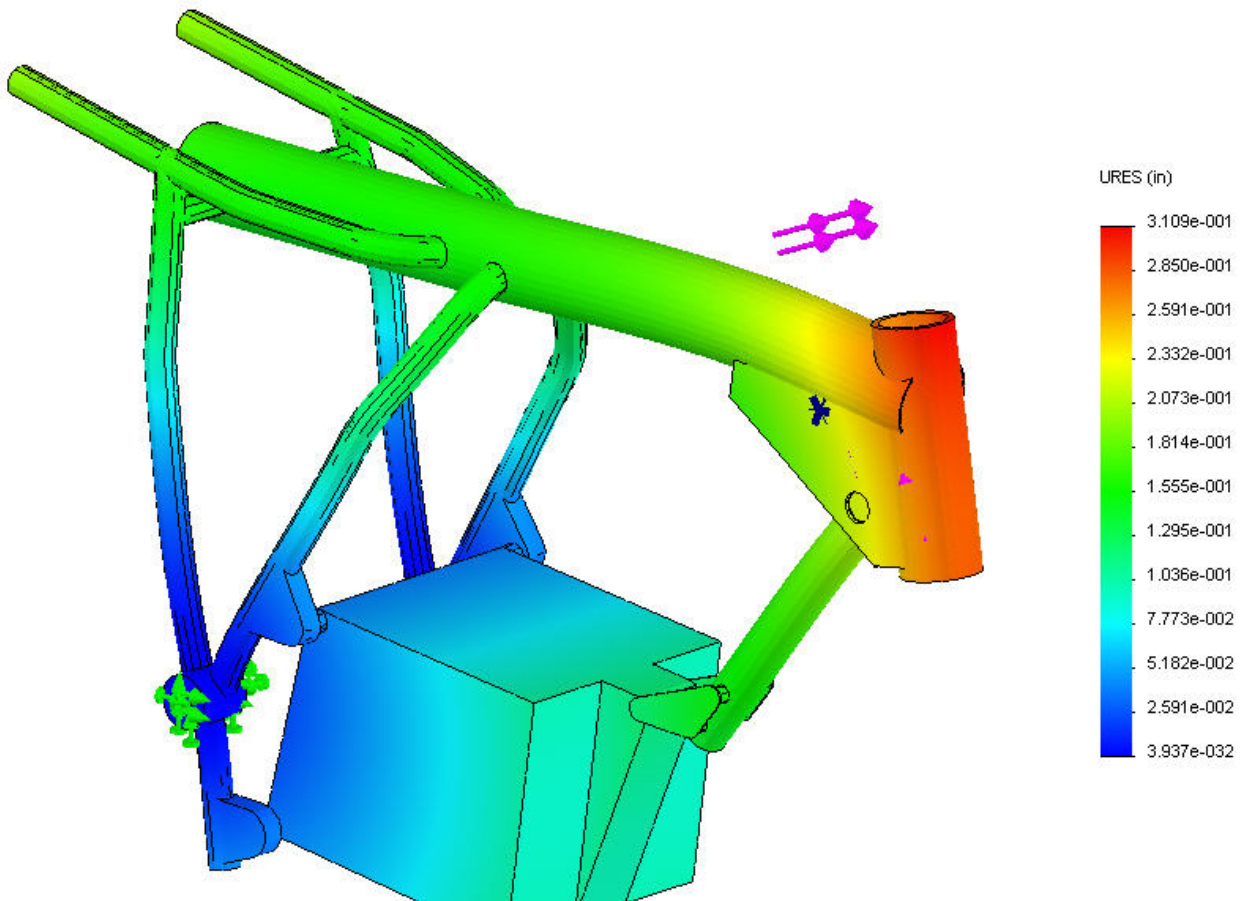


Study 2 – “Pinned Downtube”

The downtube in this study was considered bolted at the crankcase, but pinned and free to rotate at the frame connection.

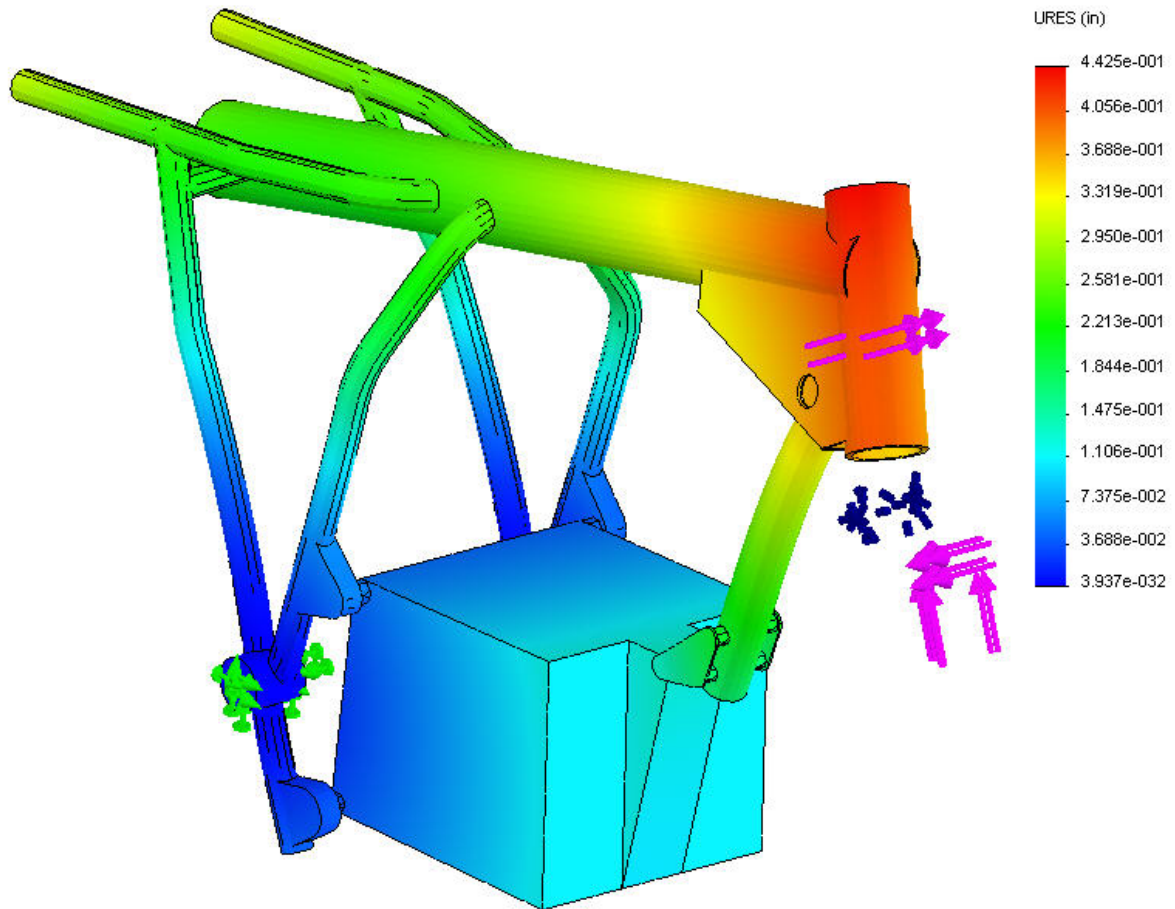
Study 2 - Braking

Model name: Tone Foale FEA
Study name: Study 1
Plot type: Static displacement Displacement1
Deformation scale: 14.4693



Study 2 – Torsion

Model name: Tone Foale FEA
Study name: TF1 Torsion
Plot type: Static displacement Displacement1
Deformation scale: 11.1319



Study 3 – Welded Downtube

The downtube was considered bolted at the crankcase, and welded at the frame.

Study 3 – Braking

Model name: Tone Foale FEA
Study name: Study 2
Plot type: Static displacement Displacement1
Deformation scale: 12.1449

