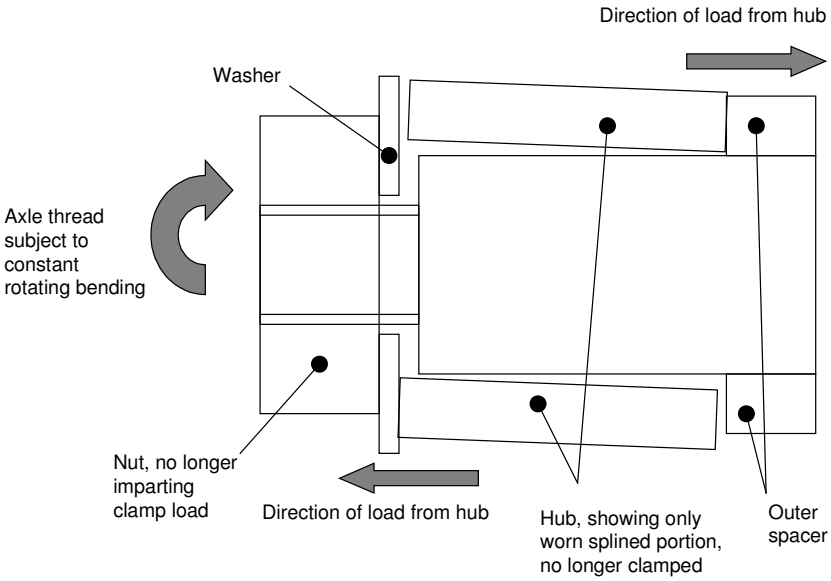
Loose, worn hub showing loading pattern with car driving straight ahead, not cornering



Applying Loctite to the splines stiffens the assembly and offers much greater resistance to transference of rotating bending loads along the axle, but has the disadvantage that should the clamp load drop off it will be masked. It's possible that a Loctited hub will continue to operate satisfactorily whilst inadequately clamped bearings start to create their own problems independently.

Drive forces will likely have a growing influence should a reduction of clamp load occur, hence allowing the onset of torsional fretting. If the nut is fully tightened acceleration loads are not high enough to overcome the friction between the spacers and inner bearing races, hence the whole assembly moves elastically as one without fretting.

I've seen it hypothesised that the D shaped locking washer needs the nut load bearing surface hardening. The numbers don't support this, nor does the condition of my washers, even after the LHS nut came loose. Hardening won't do any harm, but it's not essential.

5) Axle inner bearing abutment wear

Whilst a hardened bearing spacer is an easy cure for that problem area, the hardness of the axle cannot be changed easily without consequences. The question then becomes how much wear can the inherent elasticity of the assembly tolerate? The total stretch/compression of the axle/spacers is c.0.085mm [0.0033"] under load from the 150ft-lb applied to the hub nut. I've not measured the indentation in the axle, it looks to be less than that, but more than just a mark therefore presenting the probability of the nut pre-load reducing over an extended time and torsional fretting causing wear. It's likely that the predominance of failure of the LHS over the RHS [14:1] is a direct result of this torsional movement and the RH threaded nut slackening to the limits allowed by the tabbing on the washer.

Europas with more power and stickier tyres, perhaps used for competition will have increased wind-up of the axle and spacers under heavy acceleration. I have an engine that delivers approximately twice the power and torque of the original Renault. Having done the sums on the capacity of the threaded end of the axle, I have for a couple of years now run my Europa with 210ft-lbs on the nut. Having now done further sums on the loads and materials I can now see that this will help avoid some of the issues by increasing the initial material deformation at the inner bearing faces and thereby increasing the cornering forces necessary to further deform the abutment faces.

But surely this will cause thread failures? No it won't, for the following reasons.

210 ft-lbs is still a long way from the material equivalent grade 5 bolt recommended dry tightening torque of 300ft-lbs, see https://spaenaur.com/pdf/sectionD/D48.pdf