IT'S MEGA-BUILD SERIES TIME AGAIN AND NIGEL'S RUSH CW460 IS REALLY BEGINNING TO TAKE SHAPE. WITH THE PASSENGER SAFETY CELL COMPLETE, OUR TECH' ED'S ATTENTION HAS TURNED TO INSTALLING THE FINAL DRIVE AND SUSPENSION ASSEMBLIES. JUDGING BY THE NUMBER OF E-MAILS WE ARE RECEIVING AND THE HIT RATE ON NIGEL'S WEBSITE (WWW.NIGELDEAN.CO.UK), KIT CAR READERS ARE OBVIOUSLY ENJOYING THE BUILD. OVER TO OUR MASTER BUILDER, THEN, FOR ANOTHER GARAGE UPDATE.

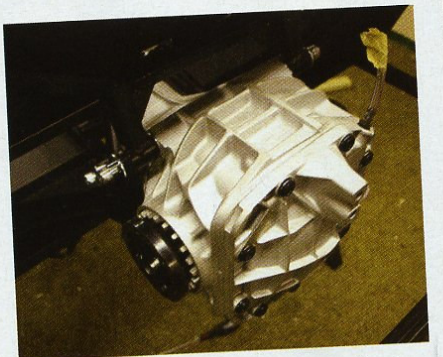
RUSH CW460 CHAPTER 3

Nigel, Kit Car's Tech' Ed' and in-house builder.

At last I can start to make some serious progress on my CW460. The recollection of drilling and pop riveting those damn aluminium panels still keeps me awake at night. Even with my lazy tongs, the whole process was rather repetitive to say the least – but there are always ups and downs with kit car projects! Fortunately, I have been on a prolonged 'up' this month because the Rush has progressed rapidly and now proudly boasts front and rear suspension. To see what I mean, briefly skip to the end of this article and you'll notice the spaceframe chassis has been transformed from a toddler's climbing apparatus into a rather serious-looking roller skate. OK, I have yet to fit the boots, so technically it's not rolling, but you know what I mean. The first task in this transformation was to fit the differential...

DIFFERENTIAL INSTALLATION

The Ford differential is a rather heavy component. Opting for the stronger and slightly heavier 7.5 inch variant didn't help either but, in my opinion, a few additional grams here and there are insignificant to ensure the drivetrain will cope with the large amount of power planned for my beast. Manoeuvring the cast aluminium casing into place required the assistance of a hydraulic jack. Held in situ by no less than six M12 cap head set screws, my optimism for a stress-free insertion was running fairly low. That's not to say I doubted the DAX chassis jigs, but rather that I have been here with several kits before; somehow the process never seems to be as easy as the single paragraph in the build manual portrays! Each set screw was slid through its metalastic bush (previously pressed into the chassis) and a washer was used to ensure the metal inner would not 'eat' into the soft differential casing with use. Almost an hour (and a few bruised knuckles) later the job was pretty much complete. The two front differential mounts, however, required the addition of a stack of washers (as per the build manual) to ensure an interference fit - seven on each side to be precise - which equated to 14 mm total width. Now, I'm one of those perfectionist builders who cannot abide the sight of stacked washers, so thirty minutes on my father's Colchester lathe saw high tensile steel spacers ready for painting prior to insertion. Following the technical specification page in the Ford Sierra Haynes manual, all six set screws were tightened to the specified torque. Only then could I tick the first job on my 'to do' list - a rather long list I must add.



Rare fully reconditioned 3.36 ratio differential in situ.

Spacers turned up on Nigel's father's lathe to accommodate differential in chassis.

DE DION BEAM, 'A' FRAME AND SWINGING ARMS

Feeling pretty confident and with the chassis now accommodating the immaculately reconditioned 3.36 differential, the next task was to install the main rear De Dion suspension components. The first item was the 'A' frame. Its final resting place would be attached to either end of the De Dion tube, with the apex located on the chassis just in front of the differential. Prior to installation two large diameter metalastic bushes were pressed into either end of the assembly. These required the careful fabrication of a wooden former and the use of a rather substantial machine vice. The need for such insertion aids is not essential, but such preparation significantly minimises the risk of damage. This especially applies to larger diameter bushes due to the increased risk of misalignment during insertion.

With the bushes firmly pressed home, the 'A' frame apex needed to be bolted to the chassis utilising a rather large track rod end, the secret to the component's free articulation in all planes. Sounds simple. Hmm, ever tried to solve one of those wire puzzles you get in a Christmas cracker? Initially it looks easy... That's what it's like fitting the 'A' frame to a Rush De Dion chassis. Could I get the bloody thing past the differential? At one point I thought the diff had to come out again, not a pleasing thought whilst still nursing black knuckles. Then suddenly, after ten minutes of cursing, it slid home effortlessly. Don't ask me how it happened, but it's not coming out again that's for sure! My advice if you are following in my footsteps? Fit the 'A' frame before the differential!

Large rubber bush pressed into one end of the De Dion 'A'

Licking my wounds, both physical and mental, I quickly torqued the front location bolt of the 'A' frame and called it a day, retiring to a roaring open fire *(bear in mind these words were penned in late April – Nigel)* and a glass of cognac - an ideal tipple, especially when accompanied by a kit car build manual.

Walking into the garage the following morning I'm sorry to say I was nursing a rather 'thick' head, thanks to Courvoisier's finest. On went the television and that day-glo orange guy appeared, presenting some antiques programme. Not my ideal choice, but background noise in the garage helps me feel less of a social retard when hidden away in my automotive utopia. Flicking open the now-stained front cover of the Rush build manual (courtesy of cognac spillage I might add, not oil) I flicked to the appropriate section. First job: the fitment of the De Dion tube. Hunting around the garage I located the rather large component and hoped installation would be a little less demanding than the previous day's activities, especially considering its weight! I'm very glad to report it was, once I had tied the flailing 'A' frame out of harm's way, that is! Resting on strategically positioning pieces of cardboard to avoid damaging the satin black powdercoating, the De Dion tube was bolted to the 'A' frame through the large bushes. Big progress, little effort: that's what good kit car days in the garage are all about. Feeling a little woozy, I decided to fetch a rather strong cup of coffee. On my return I was elated to hear the red team had won and, even better, the programme was about to finish. Isn't daytime television just cr*p?

The next stage was to fit the two swinging arms from the chassis to the De Dion tube. Finished in rather bright passivate silver, these required some nifty spanner work, but their fitment caused no dramas. Apart from locating the tube, they would soon become the lower anchorage points for the coil over shock absorbers.

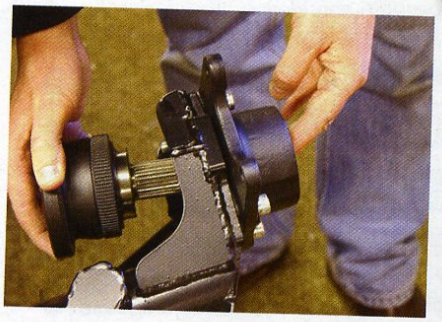
The 'A' frame bolt being tightened to the correct torque.

REAR BEARING CARRIERS AND STUB AXLES

For some reason (which I can't recall) I decided not to fit the coil over shock absorbers at this point. Instead, focus was turned to the final drive components. Working from the outside in, I started with the Cosworth bearing carriers. It's at times like these that all the effort in sourcing and preparing donor components pays dividends. My bearing carriers were brand new, but I had also painted them to match the chassis finish.

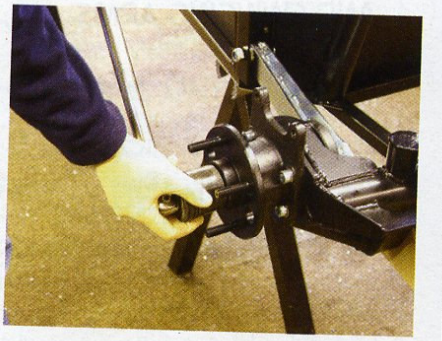
A bearing carrier was bolted to each end of the De Dion tube using four high tensile socket head set screws. The mounts for the brake callipers were positioned upwards as on the Cosworth. Packing the bearings with lithium grease, the splined stub axles were pushed through the carriers and mated to the wheel flanges. It is here that a simple oversight can cause potential disaster. The large nyloc nuts that hold the wheel flanges and stub axles in position are handed. One has a left-hand thread, the other a more conventional right-hand thread. The nuts are distinguished by a different coloured nylon insert – green for the right-hand thread and white for the left. It is essential the **right-hand** threaded stub axle is fitted to the **offside** (driver's side) of the car and vice versa. I need not explain what happens if this advice is not heeded!

These nuts are tightened to a huge torque, 207-221 lb/ft to be precise, but this is only possible when the car is on its wheels. Consequently, to pull the stub axles into place I temporarily used a lower torque setting which would not pull the Rush off its chassis stands! To ensure I don't forget to tighten such bolts in the future, I marked only those at final torque values with a red line. This means once the car is complete, a quick visual check will show any fasteners which need that extra nip. Apart from this invaluable construction aid, any loosening bolts can immediately be identified. This technique is used by many mechanics, especially in the motorsport fraternity. SVA examiners also like to see this attention to detail when scrutinising the belly of your creation with their inspection lamp.



De Dion tube in place. Here you can see the splined stub axle being passed through the bearing carrier.

Rear swinging arms offered up to the De Dion tube.



Wheel flange pushed over stub axle.

DRIVESHAFTS

Insertion of the driveshafts is a messy job. Even though grease is packed inside the rubber Lobro joint gaiters, a significant amount is applied from the outer surface of the UJ. As you can imagine, a grease-laden dumbbell being manipulated within a gap (which seemed far too small) makes a real mess, especially when you consider this grease is dark grey in colour. The word 'manipulation' is mentioned in the build manual text somewhere, so I can't say I wasn't forewarned!

Once the driveshafts were in situ I was faced with two options regarding the method of attachment to the differential and stub axles. At each end there are six threaded holes. The conventional method is to use high tensile Torx bolts available from Ford. Alternatively, you can go the Group 'A' rally car approach. This only utilises three Torx bolts and three small studs per joint and looks a little strange because the holes taking the studs are devoid of any obvious fastening. Initially this may sound foolhardy and you would think the whole assembly would be weakened. Strength is still maintained, in fact, in the rotational plane where all the shearing forces actually occur. The logic behind this is to fractionally reduce rotational mass and allow a faster changeover of driveshafts. This is fine if you are in-between rally stages and only have fifteen minutes to repair your exploded final drive, but trying to explain to an SVA examiner why you have only fitted three bolts rather than six per Lobro joint is not worth contemplating. Hence, I opted for the standard route.

Insertion of the offside driveshaft.

Lobro joint being fitted to the differential using brand new Torx bolts.

Rear final drive and suspension, minus shock absorbers and springs.

COIL OVER SHOCK ABSORBERS

As with many kit cars the Rush utilises coil over shock absorbers. These are not only compact and fully adjustable, but allow a huge variety of spring rates to be accommodated for cars of varying specification. The V8 Rush utilises 8.5 inch, 375 lb/in springs at the front and 8.5 inch, 300 lb/in at the rear. As for the shock absorbers, these are produced by GAZ and come complete with a comprehensive dyno chart. This demonstrates the unit's performance both in compression and expansion cycles.

Sliding the coil springs over the shock absorbers did not require the use of a compressor, but was simply a case of removing and replacing the upper seat. Once assembled, the units were bolted to the swinging arms and chassis, utilising top hat inserts. Prior to final tightening it was noted how the assemblies hung from their upper mounts. This allowed the accurate insertion of shims on the swing arms' mounting points to ensure the shocks were perfectly vertical. A slight misalignment would produce considerable side forces on the sliding mechanism and cause premature unit failure.

Springs being passed over GAZ shocks.

Top hat reducers allow M12 suspension bolts to fix shocks securely.

REAR SUSPENSION AND FINAL DRIVE COMPLETE

At this point I could stand back and say the rear end suspension and final drive was complete. Such confident statements are often hindered by component shortage or something simply not fitting. However, it was time for a small celebration and the mini-fridge offered up an ice-cold Fosters. Sipping on the amber nectar I perched on the bench and surveyed the fruits of my labours. Definitely a day to remember and, thankfully, not a pop rivet in sight.

Rear suspension complete.

Rear suspension and drive components	
Time	32 hours
Difficulty	3 – more involved
Cost	All components previously accounted for
Tools	Selection of hand tools

FRONT SUSPENSION

As in many builds there are periods of time where very little gets done, which is exactly what happened over the few days following my Fosters celebration... work commitments, family stuff, MOT on the wife's car ... all the usual humdrum of life that prevents you from having fun! I was eager to move on to the front suspension and steering. Described as another simple 'bolt-together' task in the build manual, my confidence was high that everything would go smoothly. Starting with the chromium-plated top and bottom wishbone, metalastic bushes were pushed home utilising my trusty machine vice and some washing-up liquid (as a lubricant). Bleedin' good stuff it is too unless, that is, you get caught sneaking it out of the kitchen without prior permission.

The fitment of the front suspension at this point went against the recommendations of the build manual, but that's nothing unusual where my projects are concerned. Since the front wishbones actually pass through the side body panels, these should have been fitted next. Once in place, however, access to the engine compartment is severely hampered. Consequently, my plan was to get the Rush on its wheels, engine installed and only then fit the bodywork. This would mean the removal and refitting of the front suspension at a later date - a small price to pay compared to the benefit of additional access in the meantime. In addition, the idea of fitting my bespoke V8 engine and box with the chassis perched on axle stands was something I didn't want to entertain.

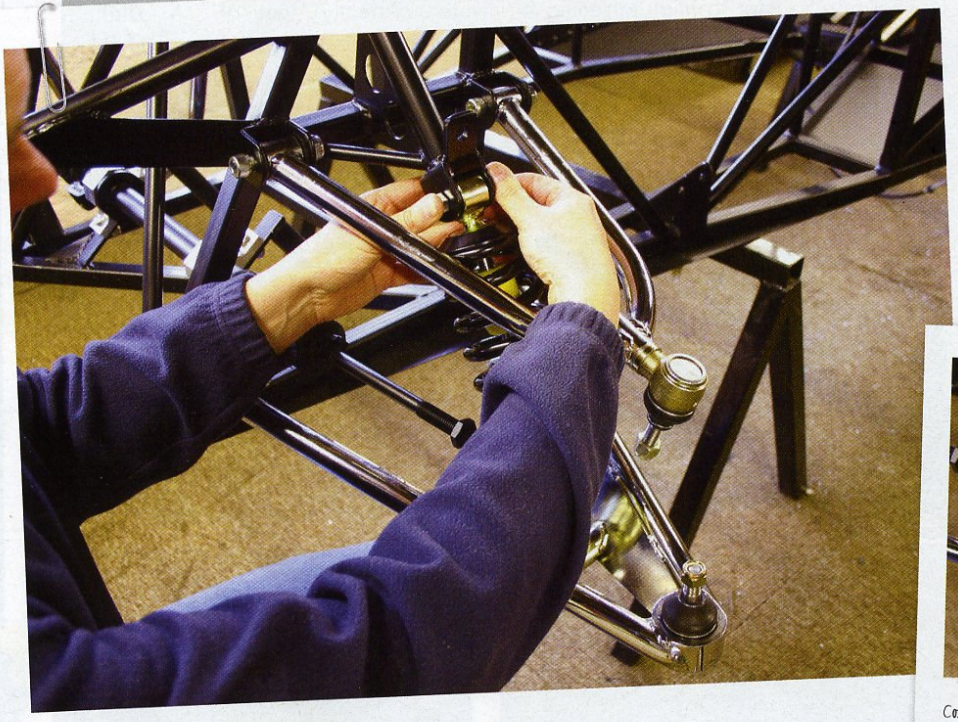
Attaching the wishbones to the chassis was an incredibly straightforward and enjoyable exercise I'm pleased to say, thanks, in part, to preparation work (removal of excess powdercoating) and the comprehensive nut and bolt kit provided by DAX. Once in place, my attention was drawn to the brand new Cosworth front uprights nestled in the corner of the garage. Prior to fitment, the front mudguard mounts had to be pushed home, a rather interesting job. The

Front suspension components for passenger side. Note chromium-plated wishbones, a typical DAX upgrade.

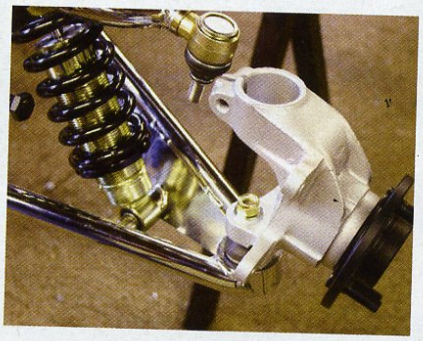
Cosworth upright is a rather awkward component to manipulate and trying to push home the even more ungainly mudguard bracket made for an entertaining activity. Eventually, with the help of my trusty rubber mallet, the two components became one. A location bolt ensured future separation was not an option, and the uprights could at last be fitted to the wishbones. Utilising upper and lower ball joints, large nylocs finalised the assembly. The upper ball joint (connected to the wishbone on the longitudinal plane) can be adjusted inward and outward courtesy of shims. This will have the ultimate effect of altering the camber of the wheels. As for the castor, this was set by the geometry of the Cosworth uprights, leaving the track rods ends for the fine toe adjustment.

Standing back, the front of the Rush had suddenly grown in width, from a slim Colin Chapman vision to a full-on Seven on steroids. This is one of the reasons the Rush appeals to me. Gone is the finesse of the Caterham. In its place is an aggressive road missile capable of accommodating the largest V8 powerplant our country has to offer. Even though the width looks great I've lost count of the number of times I've caught myself on those damn front mudguard stays. It flipping hurts too! Even the missus was wounded the other day... as she keeps reminding me. "Their ferocity will be tamed a little once the wheels are in situ," I re-assured her, "but until then, thighs will have to continue to suffer the consequences."

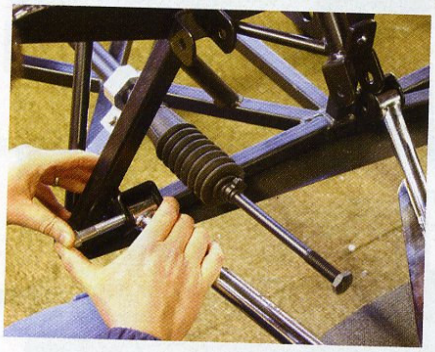
The final part of the front suspension assembly required the fitment of the shock absorbers. Much the same process as the rear, the springs were slotted over the dampers and top hat spacers were used to accommodate the M12 bolts. Final adjustment of the seat and shock absorber valve position would have to wait until the CW460 was fully laden with hardware. However, it is always worth remembering the valve adjuster on the dampers should be positioned inboard. This not only helps later adjustment, but can be a requirement of correct internal valve operation, so always check with your supplier or kit manufacturer prior to installation.



Top wishbone in place, next the shock absorber and spring.



Cosworth upright trial fit.



Steering rack in situ and lower wishbone being fitted.

STEERING RACK

Utilising a Ford Escort rack is no surprise and is the usual steering solution for 99% of Seven-inspired kit cars. I had the option to go with a quick rack - 2.5 (or lower) turns lock to lock - but decided to opt for the standard ratio. It's a personal preference and not a cost-saving approach. Quick racks are fine if you are tracking a car or love those roads which snake up the sides of mountains, but there can be downsides: heavy and twitchy steering to name two. The concept behind my Rush is to combine devastating performance with the ability to simply cruise at a moment's notice. Consequently, the standard 3.5 lock to lock ratio had been ordered from DAX, along with track rod extension bars to accommodate the huge front track.

A nice touch from DAX was the provision of billet alloy clamps to attach the rack to the chassis. A small amount of fettling with a file was required to match the inner profile with the rack's casting and was the only way to ensure clamping pressure was evenly distributed. The worst case scenario if such detail is ignored would be the rack casting being slightly distorted, affecting steering efficiency.

Front Suspension and steering

Time	12 hours
Difficulty	2 – straightforward
Cost	All components previously accounted for
Tools	Selection of hand tools

Front wheel arch stay clamped into place.

SHE'S LOOKING GOOD

Wow..... my frame, as my darling daughter called it, has now become a car. The addition of chrome detailing complements the triangulated roll bar perfectly and the CW460 is starting to come together. Expenditure this month has been zero thanks to having already purchased all the suspension components from DAX and having all the donor bits and bobs to hand. Time- wise, I have only invested forty four hours hands-on. An additional twenty, however, were spent researching alternative hardware. As any kit car builder will tell you, if you try and deviate from the usual route, time increases exponentially. You will have to wait until later in the build to see the fruits of my research but, as with my Tojeiro, I'm sure a few builders will nag DAX to introduce them as an option!

Rolling chassis, minus wheels and tyres.

EXPENDITURE AND BUILD TIME TO DATE

Every month I'll sum up the accumulated costs and time invested to give you a clear idea of what's involved in creating a 'Nigel Dean' show car.

Build	Activity summary	Time (hrs)	Cost
Part 1	Order build packs 1 - 5	0	£5,434.00
Part 2	Source and prep donor parts	8	£1,410.15
	Collect build packs from DAX	8	£75
	Chassis preparation	3	£0
	Panel chassis	24	£0
Part 3	Fitment of final drive and suspension components	48	£0
	Research into non-standard items	20	£0
	Totals to date	**107**	**£6,919.15**

TEENAGER'S TAKE

Hi there! It's me, Evie, once again.

"Dad, I don't think you should be screaming that in front of me. Mum'll go mad, my tender ears and all that!" Oh no, not another injury.

Dad has managed to avoid broken bones so far, but only just. He's always in the house, dripping blood over the carpet from the latest wound. Last week it was skinned knuckles, the week before a particularly deep slice that became infected. I don't mind, but I'm squeamish you see (I'm proud to say I fought off two doctors as they tried to take blood – I was seven at the time) and no prizes for guessing who has to play nurse when Mum is out. How many times do I run through with the first aid kit and stick him back together again? Tell me this: why doesn't he keep a first aid kit in the garage? I'm sure he does it just to annoy me. Either way, that car is a danger.

Take Mum's recent injury. Rushing to get my brother's bike on the back of the car and running late for a mountain-biking course, she ran past the covered frame and – *bang!* After a few swear words these tender ears have never heard before - *yeah, right* - she unveiled the offending item: a sticky out thing apparently something to do with the mudguards. Let's just say the bruise lasted over a month and Dulux could have used her leg for a colour chart.

Back to Dad. He seems to have done a lot to the car this month, but I'm slightly concerned. In bed, he's always reading some 'geek's guide to choosing wheels and tyres'. Even more worrying is that my friends have already asked if he can impress everyone by driving us to school in his Rush when it's finished. *Oh, p-l-e-a-s-e.* The car might impress those milling around the school gates, but *come on... he's my Dad!* How embarrassing is that? What's more embarrassing is that he thinks he's still twenty, not twice that and a bit more.

Sorry, got to go. Plasters are called for. Am I really destined to be a nurse - with abused ears - after all?

Nigel's daughter, Evie, with another of her Teenager's Take.