

Purchasing new fire apparatus

By Colin Deiner, chief director, disaster management and fire brigade services, Western Cape Government

Most important is to consult the fire fighters who will use and maintain the vehicle and management who will plan the operational strategies for the department



So the time has come for your department to purchase a new fire engine and you are tasked with the project. What could be an exciting challenge at the start might turn into somewhat of a nightmare as you go through the various stages from budgeting-specifying-construction-delivery and realise that it might not be turning out the way you originally intended or that you might not be fulfilling everyone's expectations. Remember that in this country (and many others) a fire truck is a rare purchase. They are expected to work for many years and, depending on your department's culture, become part of the fire station family. So how do you go about this?

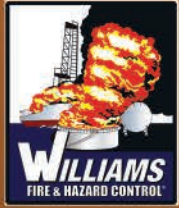
It's a team effort

The first thing that you should realise is that you should not be alone in this process. There are a number of stakeholders that need to be included. The first and most important are the fire fighters who will use and maintain the vehicle. They need to tell you what their challenges are when they respond to incidents, what are the roads like, what call-outs do they respond to regularly, what are the most common risks, what would they like to see on this unit that wasn't on previous apparatus. This will guide you in deciding the size and height of the vehicle,

compartment configuration, types and location of hoses etc. If you are buying a ladder truck, the layout of the multi-storey buildings it will be expected to respond to, will be important. Are these buildings street front structures or office parks set on landscaped lawns? This will say a lot about the outrigger configuration of the apparatus.

You also need to include management, the people who will plan the operational strategies for the department. The type of equipment (vehicle) you buy must fit the strategy of the department. You should also include your maintenance people. In a municipal environment, the workshop folks will do most of the minor maintenance work. There will, however, be a fair number of tasks that will require specialist maintenance and it will be important to know that this kind of service is available in your city or close-by.

Also, make sure that you have sufficient training capacity in your department to train your staff on the apparatus. Usually the vendor will do training on the apparatus shortly after it is delivered. Make sure you have some experienced staff go through this initial training in order for them to pass it on to all members in time. Pay particular attention to the routine maintenance aspects, ▶



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Compressed air foam systems (CAFS) represented a quantum leap in the science of fire fighting

- ▶ which have to be done regularly. Pump tests, lubricating ladder extensions and other tasks that, if not done correctly, could be very costly down the line.

The acquisition process could become your biggest headache, so make sure that you have the supply-chain people on board from the get-go. We all know that in South Africa the spectre of under-expenditure on annual budgets loom large and are not going to leave us. It is therefore important to set out a clear plan with timelines as to when the tender process is to get underway, when the bids received will be adjudicated, when the contract will be awarded and when the vehicle will be delivered. Build in time for possible delays and the chance that the vehicle might have to be returned to deal with any potential snag-lists.

Twelve-months can be an extremely short period to embark upon a tender process, adjudication of bids, awarding of contract and construction, supply and delivery of the unit. As much as you must be assured of the quality of the product, also ensure that the vendor is able to deliver it within the specified time.

Your team should not be dissolved once the contract has been awarded but should continue to function throughout the construction period of the apparatus. Any changes in the original specification or requests/recommendations from the vendor, must be considered by the entire team.

So where do we start?

The most important consideration is to establish what the apparatus will be used for. Dumb question? The first consideration for a standard engine will be its utilisation in a structural fire situation. You will consider the number of crew required as per your department's standard operating procedures (SOPs), the position of your pre-connect attack-lines, equipment placement etc. Don't forget that you also need to appreciate that the unit will also be used for a number of other emergency calls such as emergency medical emergencies, hazardous materials (hazmat) incidents, vehicle extrications and other non-emergency special services.

If the unit is going to be used for a combination of tasks ie rescue-pumper or hazmat-pumper, ensure that there

is sufficient compartment space to accommodate all the additional equipment you may need. If the unit is a first responder to hazmat incidents, you will only be able to carry a limited amount of protective gear, safety equipment and some product control kit on it. A large hazmat incident will not be as forgiving and you will have to respond your service's hazmat unit for those.

Vehicle extrications will require (at the least) a hydraulic rescue set ie cutter, spreader, rams, power unit/pump, hydraulic hose or you might want to opt for an electrical system that will take up less space, medical equipment such as backboard, spinal mobilisation, suction unit, defibrillator, splints, medical jump-bag etc, power-driven hand tools like reciprocating saws, air chisels etc and a bunch of high-pressure lifting bags. You will also have to allocate space for a fair amount of shoring timbers. I appreciate that this becomes a bit much to carry on one unit (together with your fire suppression kit) but you need to ask the question, "Can I achieve an effective extrication with the equipment I have on the apparatus?" If not, don't cut back on your kit you have on the vehicle. Either look at your tactics or try to cut down on what you usually put on the unit. Improvise!!

Your departmental SOP document is the mandate given to your officers and fire fighters on how to respond and manage any incident they respond to. It is therefore important to make sure that you have adequate crew compartment space to cover your pre-determined attendance and all their gear. Fire fighters carry much more gear on their person nowadays, than in the past. You need a cab big enough to accommodate these members as well as the gear they will be carrying the moment they get out of the crew cab. I have often recently seen new vehicles delivered with very narrow crew cabs. These are not conducive to effective response. More fire fighters die or are injured in this country in accidents responding to or returning from incidents. Cab integrity is a very important part of the vehicle construction. Do not compromise on this. More on this later.

Essentially, you will be purchasing the unit primarily for fire suppression operations. Today's structural fires are burning hotter and faster than ever before. The introduction of compressed air foam systems (CAFS) represented a quantum leap in the science of fire

fighting, however, it has, in many countries, been slow to find traction. The ability of CAFS to provide both a level of heat reduction and reduced extinguishment time that is far superior to that of plain water must be appreciated and must be a prime consideration when a new vehicle is specified. CAFS also has the advantage that by applying a good blanket of class-A foam over an exposure, you have effectively removed that problem from your list and are able to redeploy any resources you might have been using for that task.

The late former fire chief of the city of Phoenix, Arizona Fire Department in the USA, Alan Brunacini, is on record saying that any new pumper not equipped with a compressed air foam system is obsolete before it runs its first call.

The less water you need for fire attack, the less you have to use and therefore the less water you have to carry on the rig. In a country that is suffering from severe water challenges, this is a huge advantage. You will also achieve a quicker knockdown. This will greatly assist a balanced fire attack and could allow you to economise on your ventilation equipment. A rapid knockdown will limit the number of fires that will reach flashover stage and, therefore, less risk to your hose teams. CAFS hose lines are also much lighter and more manoeuvrable than conventional hose lines. It must, however, be appreciated that a fair degree of training and maintenance goes together with the use of CAFS. If it is not part of your fire fighting strategy to carry out rapid, balanced attacks with quick knockdowns (supported by good ventilation), you should think carefully about specifying CAFS as a feature.

It will definitely be worthwhile to reference NFPA 1901: Standard for Automotive Fire Apparatus, 2016 Edition, which provides outstanding guidance. You will find "Annex B of the standard, Specifying and Procuring Fire Apparatus". If you are acquiring a number of vehicles for more than one station, you should take into account that a combination of them could respond to the same major incident at the same time. Take care then to ensure that the same types of vehicles are constructed and equipped in the same way. This will eliminate confusion on a fireground and allow the incident commander the dexterity of deploying units from the primary staging area directly to its most advantageous position. In your mutual aid area, it is important that you have a vehicle typing system in place. The incident commander will be aware of what is coming his/her way and it will make it so much easier to properly deploy the necessary resources into the right places.

Engine and powertrain management

When an emergency vehicle responds to an incident, it often is taken to the limits of its capability. Cold starting, rapid acceleration, harsh braking and continuous operation of the engine while the vehicle is stationary (during pumping) are some of these extremes that will place stress on various components of the vehicle. It doesn't take a rocket scientist to maintain and repair modern truck powertrains but it does take specialists with knowledge, experience and good diagnostics that can access the on-board systems.



It is important to consider the safety features when choosing between commercial chassis/cab configuration and custom built

Modern diesel technology requires a high level of awareness of what is going on beneath the engine cover; also, the braking patterns of the driver could be vital in determining the possible causes of overheating, which may have led to an accident supposedly caused by 'brake failure'.

Make sure you specify an effective electronic diagnostic system in your bid specification. It will be of great value on a number of fronts. It will make you aware of certain bad driving practices, engine performance issues and braking problems that may arise. ▶

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Buying fire apparatus

► Custom vs commercial

The current economic climate that we are experiencing is placing a heavy burden on fire departments to utilise their budgets to the maximum and try to get the most for the available funds they have been allocated. The cost of a custom-built fire engine is significantly higher than purchasing a commercial freight chassis and building a cab and load body configuration onto it. This is probably the biggest consideration when these decisions are made.

In South Africa, we are also limited to the regulations of the Department of Trade and Industry (DTI), which limits the percentage of imported content on products (this includes fire trucks).

Before the final decision is made, it is necessary to look at the big picture. Cost should not be the only consideration (although it might be extremely difficult). Will a commercial chassis/cab configuration have the same safety features? Will a truck built on a commercial chassis give you the same years of service as a custom? Will the brake systems, power-to-weight ratio and chassis frame rails provide the necessary performance required of the vehicle? Does the cost-of-ownership of the vehicle substantiate the savings made on the original purchase?



Horses for courses

If you go onto the websites of most of the big truck engine manufacturers, you will inevitably come across a section offering engines made specifically for fire engines. Why is this important? The answer lies in the fact that the standard freight truck engine was designed for a specific purpose, travelling under a controlled speed for a specific distance where after it is turned off, refuelled and then either continues its journey or is parked for a period of time. Fire pumpers don't have that luxury. It is often required of fire engines to hard start in very hot or cold conditions and proceed at speed to an incident where it will be required to be stationary while the power take-off (PTO) is engaged and the pump is operated off the engine for (sometimes several) hours.

I have previously mentioned crew space. A typical 4-door commercial chassis seats five people. Considering that additional space will be required for the breathing apparatus (BA), this could cut effective space down significantly. A custom chassis is designed to include breathing apparatus seats and would generally comfortably accommodate six people with five BA seats.

It is simple, normal freight chassis were simply not designed for fire service applications. A custom-built chassis/cab configuration is built as a single unit, focussing on the maximum safety margins and operating efficiency. They have an inherently higher power-to-weight ratio, which keeps them well within the necessary safety margins. A commercial chassis will generally have an independent cab configuration and in many cases, manufacturers will be required to extend the crew cab to include the desired number of fire fighters. This is usually done by removing the rear bulkhead of the existing cab and extending it from there. What does this do to the structural integrity of the cab?

The driveline alignment on a custom unit will, through its heavier and purpose designed frame rails, better accommodate the fire pump installation and PTO configuration. All of this will need to be retrofitted on to a commercial unit.

Consider that the lifespan of a custom chassis could be up to 20 years while the ongoing maintenance and repairs to the brake systems and other stresses on a commercial chassis being loaded to the edge of its capability will severely limit its lifespan. The cost of ownership should be a major factor when deciding on the best chassis to purchase. In the long run you could end up paying more for your "cheaper" commercial chassis.

In closing

There is a myriad of websites on the internet giving advice and sharing opinions on the subject of custom vs commercial chassis. None of the ones I have researched have shown a preference for commercial chassis over custom (except for pricing). As a fire service, we must make the decisions with our main priority uppermost in our minds: the safety of our fire fighters. ⚠