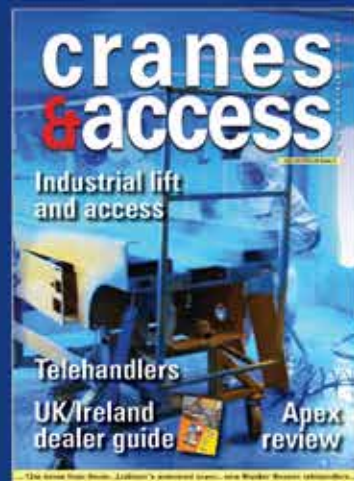
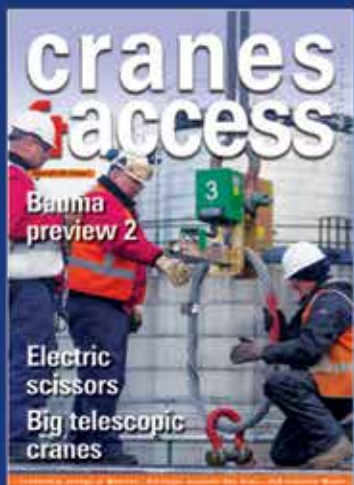


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# Crane safety issues

Continuing on from last month's safety feature which looked at the principle causes behind fatal aerial work platform incidents, the following article attempts something similar with cranes. What quickly became apparent however is that there is nothing comparable to IPAF's accident database report for the crane industry, while finding good quality statistical evidence proved most challenging.

10 years ago, when [www.vertikal.net](http://www.vertikal.net) began to regularly report crane accidents online, the question was asked: "What is happening with all these cranes suddenly turning over or collapsing"? The truth was - as time and hindsight has shown - that there were far more crane accidents than people ever realised. They were simply hushed up or the news kept local. And given that they were spread around the world and over a wide number of machines, no one had a clear and inclusive picture of what was going on.

The natural tendency to blackout information concerning an accident or near miss is still true today, preventing the industry as a whole from learning from what happened, or implementing steps to prevent it happening again. In the UK, the Health & Safety Executive

encourages this mentality with its main stress on seeking blame and prosecution.

In the past, most crane accident information was picked up via word of mouth - and like any game of 'Chinese Whispers' the truth was usually embellished and exaggerated, while the causes remained highly speculative. While the instant availability of information on the internet and advances in camera/phone technology has contributed a great deal towards highlighting incidents, an impartial, well-documented statistical database for crane incidents is still sorely lacking. The problem with current reporting systems worldwide is that crane incidents tend to be lumped in with a wide range of workplace accidents. To make matters worse, the word 'crane' is often mistakenly used for any large piece of equipment - from big

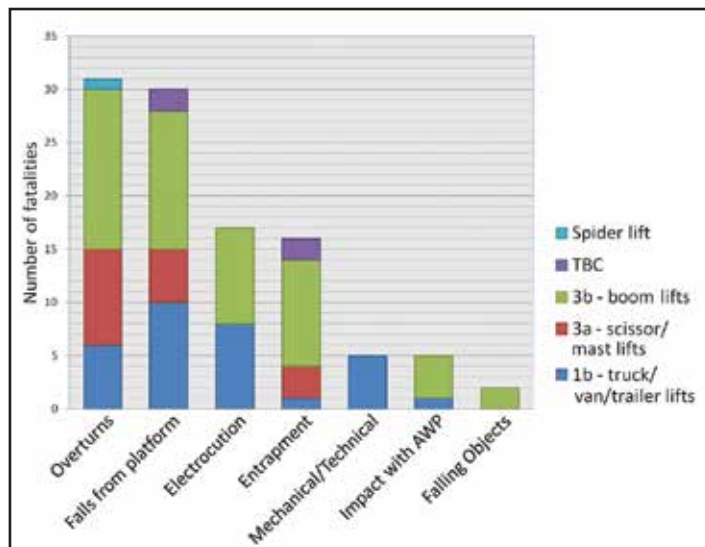


A consequence of programming in the wrong counterweight and deviating from plan



Failing to take ground conditions, such as soft ground, into consideration

## IPAF's accident reporting statistics to date



Although IPAF's accident database report is only in its third year, its already providing clear and detailed information on the causes of aerial work platform fatalities.

excavators to concrete pumps.

Even where data on crane incidents is more accurately collected, the data is rarely formatted in a user friendly format, or one that can be used to analyse trends. One place where progress is being made is Singapore, where the Ministry Of Manpower is not only collecting crane data more diligently, but also carrying out more inspections. Its latest enforcement action - Operation Goldcrest - found 194 crane contraventions on the 80 job sites that its inspectors visited in July and August. As a result it took action against 79 companies, issued 98 contraventions involving fines of \$95,000 or more and a further 96 notices of non-compliance. This almost three years after it introduced new crane safety rules! Vertikal.net has now built up an extensive database of accident reports. In fact, put 'crane accident' or 'crane incident' into the search box on the website and a combined

1,250 reports pop up, and yet we believe that at least as many go unreported...

Although not a definitive source, the reports on [vertikal.net](http://vertikal.net) at least provide an indication of the principle types of crane accidents. The most common crane incidents are:

- Overturning - due to:
  - Overloading
  - Incorrect Outtrigger/counterweight set up (including LMI programming errors)
  - Ground condition related
- Electrocution
- Crane rigging - assembly/disassembly
- Mechanical failures

### Overturning

The most common crane accident is overturning. The failure to take ground conditions, such as soft ground and hidden voids, into consideration and a failure to properly spread the load is the main

cause of overturning, but improper crane set up is also a significant factor. Outrigger set-up errors range from not using them at all - yes it does still happen - to programming the wrong outrigger configuration into the cranes overload system - this is of course related to overloading - or forgetting that the crane is short-rigged on one side.

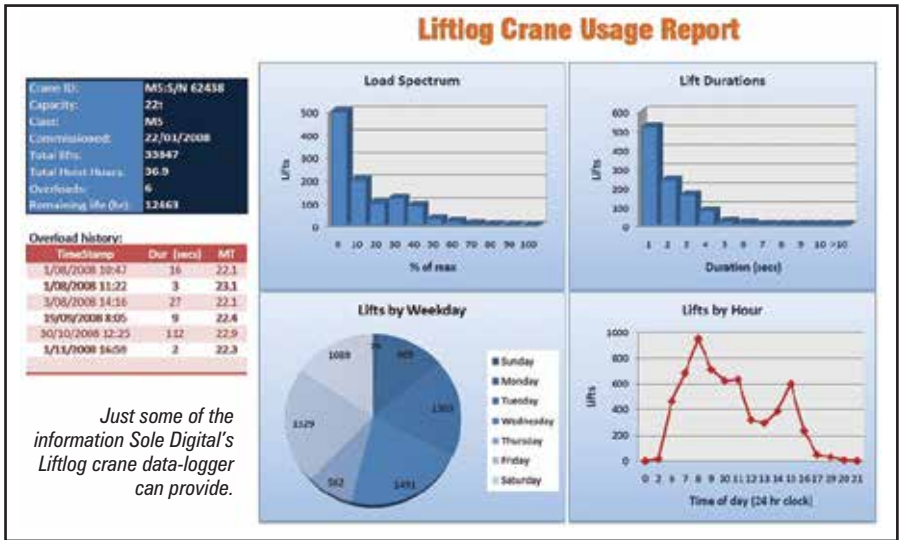
**Overloading**

Overloading tends to be the result of operators either purposely overloading the crane or accidentally programming in the wrong counterweight or outrigger setting. Conversely it can also result in lifting loads that are unexpectedly heavier than planned for – such as tree limbs or raising a load from water.

As regards to purposely overloading a crane, the issue of the override switch on the load limiter has long been a 'hot potato'. In 2010, the European EN13000:2004 standard was updated to address, among other things, the ease in which overload protection systems could be bypassed. This included locating

the override key in lockable container on the outside of the cab. This is currently under review and subject to change.

While this set of guidelines prevents operators overriding the system without a specific need or without authorisation, it does not exactly solve the overloading problem, which can be also caused by improper set up or the wind taking a load out of radius. The use of data loggers and telematics could prove to be a useful tool to improve safety. The latest systems can send an alert to the crane owner and in some cases the manufacturer warning that the crane has just been overloaded or used outside of the manufacturer's parameters. An example might be operating of a tower crane in excessive wind



speeds. This will also highlight those operators who take the most risks. While data logging makes it easier to determine the cause of an incident, it also creates clear accountability. Operators are less inclined to take liberties if they know they are being monitored.

In the aviation industry the first thing that is located and analysed after an accident is the plane's black box. The openness in the way incidents are investigated and reported, and the greater acceptance of the need to learn from mistakes is what

prevents similar incidents from reoccurring. If only the same could be said about the lifting industry...

**Outriggers**

In the last couple of years there has been substantial progress to introduce systems that can help improve crane safety. In the USA and Europe, the new OSHA Crane Rule and updated EN13000 standards have been introduced (or will soon be) and include requirements intended to reduce the number of outrigger set-up related incidents. Although they vary

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*New outrigger monitoring standards will reduce the number of short rigged incidents.*

slightly in the detail, both standards require manufacturers to incorporate outrigger monitoring systems to ensure they are correctly deployed and to automatically configure the crane's load moment system to match.

A system already available, which satisfies both the OSHA and EN13000 requirements, is Liebherr's VarioBase system. Launched at Bauma last year, the system automatically calculates the maximum lifting envelope based on the position of each outrigger and the total weight of the crane, in order to avoid incorrect operation during the set up process or when handling loads. Each outrigger can be deployed at any length, with the crane automatically modifying the lifting chart to match the outrigger and ballast configuration that is detected. By factoring in the weight of the crane also solves the problem of incorrectly programming the counterweight. In February, UK rental company Southern Cranes and Access took delivery of the UK's first 130 tonne Liebherr LTM 1130

5.1 All Terrain crane which featured the VarioBase technology.

Talking about the technology, Southern Cranes managing director Clive Sadler said: "We have found that the VarioBase technology leads to improved levels of safety during lifting operations, as the crane operator knows exactly how much weight can be lifted in any given circumstance. He also knows the exact pressure in every outrigger at any given time and can set an alert to inform him if this pressure goes below a set amount. This extra safety feature is extremely useful in keeping the operator informed on what is happening during lifting operations."

**Ground conditions**

For as long as we have been reporting crane incidents we have also highlighted the importance of understanding the composition of the ground before starting work and the use of outrigger mats or other forms of ground protection to spread the load and reduce the likelihood of overturning.

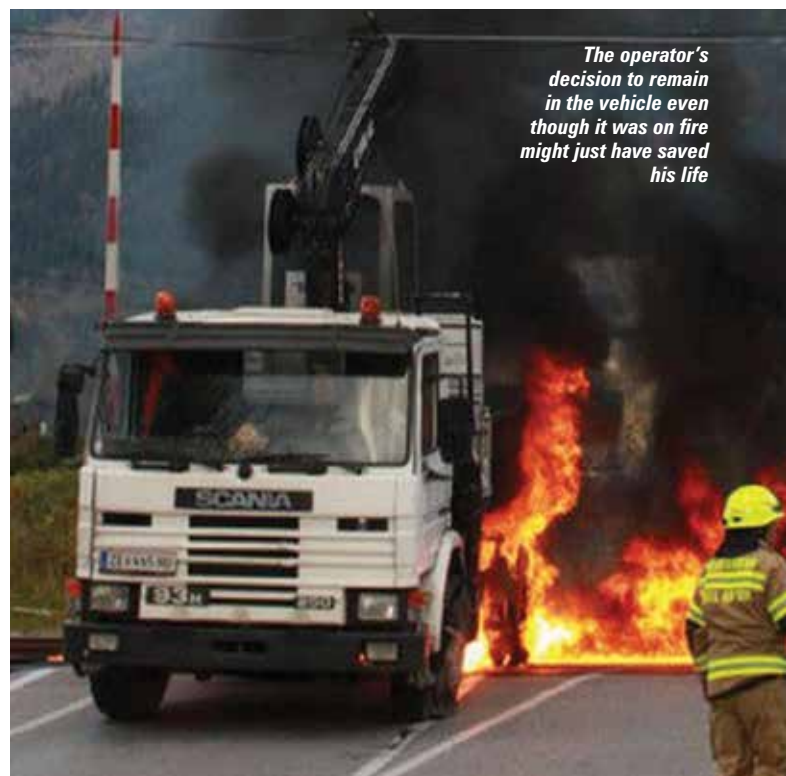
Not wishing to repeat last month's Cranes & Access feature on ground conditions, it is still worth mentioning that the UK's Strategic Forum has now formally launched its 'Ground Conditions for Construction Plant' good practice guide. The 73 page document provides comprehensive guidance on assessing ground conditions and measures needed to reduce ground pressures. See Cranes & Access 16.7 - October Page 35 for an overview.

**Electrocution**

Another common incident is when a crane - usually the boom - comes into contact with an overhead



*Soft grass is not the only ground condition to watch out for*



*The operator's decision to remain in the vehicle even though it was on fire might just have saved his life*



*Southern Cranes making full use of the VarioBase technology at Newhaven Port.*

power line. This is particularly prevalent in North America and Australia, where far more power lines are routed overhead in urban areas than in Europe. If maintaining the recommended safe clearance distance is not an option, additional protection including grounding the equipment, covering the line with an insulating sleeve and using insulating links and nonconductive tag lines are required. The use of wireless remote controls, especially when operating loader cranes, has dramatically reduced the number of cases of electrocution. It is also important to appoint someone whose sole job is to monitor the crane boom in relation to the power lines.

If contact is made, it is important to

be aware of the correct procedure, as more often than not, it is only after the operator leaves the vehicle that he is electrocuted. Last month a crane operator was spared his life, after remaining in his cab - even though the tyres had caught fire - when his poorly stored loader crane struck power lines in Zell am See, Austria.

If possible the operator should safely drive out from under the line or away from the source of electricity. If this is not possible however, it is important to remain in the cab until the power has been switched off. If it is absolutely crucial to leave the cab the operator must make sure that no part of his body or clothing touches the vehicle and the ground at the same time. Jump out and



*Standfast's TRAM prevents users from falling from the boom*

away from the vehicle, and be sure to land with feet together, before shuffling away from the downed line ensuring feet are always touching and not lifted off the ground. This will prevent a circuit for electricity to travel through.

**Rigging/Assembly/ disassembly**

Incidents that occur during the rigging of the crane only account for a small number of mobile crane fatalities but is a cause of a large number of injuries, while a significant number of tower crane incidents occur during assembly/ disassembly or when climbing. It is important that the correct procedures are followed when erecting and that the process is properly supervised. Fall protection, steps, handholds, rails or walkways can all help reduce falls and slips while rigging or maintaining the

crane. An interesting product on the market that is gradually gaining a following is Standfast's TRAM (Travel Restraint Access Module) which enables those rigging crane booms to attach a safety lanyard and still be free to move along the length of without detaching their fall protection.

**Mechanical failure**

Counting for a very small percentage of incidents, there is very little that can be done about mechanical failures apart from keeping the crane well maintained, regularly tested and inspected and ensuring that it is always used within its safe working range and manufacturer's guidelines (something telematics can help with). Any malfunctions should be fixed immediately and where possible measures put in place to prevent them occurring again.



*A boom truck which overturned after trying to lift a tree from the rear of the house*



*With some incidents no amount of technology can help*

**Operator error**

Let's be honest, most crane accidents are down to operator error, including most of the incidents listed above. In too many cases, particularly with smaller cranes and those operated by end users, the errors are caused by a lack of training. Experienced operators can of course make errors, usually due to a lapse of concentration or taking a short cut, but lack of training is by far the greater cause.

For some incidents, such as lifting trees or overturning a crane on a narrow country road, technology cannot help - only better planning and a good operator. While any operator can have a bad day or a lack of concentration, a really good, well-trained, experienced operator is the most important factor for safe lifting. All the technology in world cannot make a bad/ignorant operator safe, which is why an increasing number of jurisdictions are now mandating operator training and certification. The biggest such programme is in the USA, where the federal requirement for all crane operators to be certified has just been postponed until November 2017. The delay follows last minute, arbitrary changes by OSHA to the wording contained in its new Crane Rule. The change sparked a debate over the difference between the requirement for crane operators to be 'qualified' to operate a given crane and being 'certified'. The latter simply requires the passing of a test/exam while the former is more open to interpretation as to its meaning. It can be argued for

example that a certified operator is still not 'qualified' to operate a particular crane. In addition existing testing regimes which would already have struggled to meet expected demand, were not set up to test and certify by capacity class, another last minute OSHA addition.

In Europe, ESTA - the pan European crane and heavy moving association - and its members have started pushing for a European crane operators licence/certification programme. The problem is that it is coming late to the game and will struggle to replace existing national programmes, which vary widely from country to country.

Completing a training course and passing a course test does not a crane operator make. Some measure of experience and on the job training has traditionally been the way, especially with good crane companies. Potential operators start out assisting on large cranes and then move to operating a small crane, progressing gradually to more complex ones as they prove themselves. Many believe that there is a need for a system of recognition of the level of experience that an operator has gained. A recent poll on Vertikal.net asked the question: "Do you think a widespread Experienced Operator ranking/ qualification system would help raise standards?" By the time the poll closed 632 readers (87%) had voted Yes, while 96 (13%) voted No. The challenge of course is how to turn this into reality. Is this perhaps a starting point for the ESTA crane licence?



*In a recent poll 87% voted that a widespread experienced operator ranking/ qualification system would help raise standards.*

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