Moving in the same direction

Last month the International Organisation for Standardisation (ISO) published a new standard for the design of aerial work platform controls - ISO 21455:2020 Mobile Elevating Work Platforms - Operator's Controls. C&A chatted with Chris Wraith of Access Safety Management (ASM) who has been involved with the issues and events leading up to the new standard for more than 15 years while working with Nationwide Platforms, IPAF, and - more recently through ASM - Australia's EWPA. We also spoke with manufacturers and rental companies to gauge reactions to its introduction and the effect it will have on platform controls going forward.

Are diverse controls a problem?

Chris Wraith

"To a regular operator who has their own machine or always hires the same make or model of platform then it is not an issue," says Wraith. "However, to someone who uses multiple platforms from different manufacturers or for the occasional user hiring a platform, it could range from being an annoyance right through to life threatening."

Since its introduction more than 60 years ago, the powered access industry has grown consistently to the point where there are more than 1.5 million platforms available for rent with hundreds, if not thousands, of different models in use every day worldwide. Most manufacturers have designed controls in isolation, based on risk assessment and their views of what is intuitive, safe and user friendly. But with many different layouts in circulation, it is easy to see how an operator might become confused when switching between different platforms. The fact that most platforms are rented means an operator can receive a completely different platform every time they rent one, even if they always use the same type of lift.

In the majority of incidents, where an operator unintentionally moves the controller in the wrong direction, or selects the wrong function, it comes to nothing more than going up for an instant, rather than down, left instead of right or forward rather than back etc… but there have been cases which have resulted in significant damage to platforms, the work area, or more critically serious injury and fatalities.

When did standardisation become an issue?

The subject was first raised at an IPAF manufacturer's meeting in the 1990s, but apart from a general agreement that controls should be laid out in a logical and intuitive manner it came to nothing. Trying to quantify logical and intuitive was never considered, in the fear that a standard would inevitably be 'over prescriptive' and stifle innovation and development.

This began to change after a major contractor and the UK's Health & Safety Executive (HSE) began following up on a series of fatal entrapment/crushing incidents in the early 2000s.

"In 2005 the HSE advised manufacturers of the possible need to address controls against sustained involuntary operation. Then in response to a number of entrapment incidents between 2003 and 2009, the HSE commissioned the Health & Safety Laboratory (HSL) to undertake a three phase research programme gathering and analysing data on all worldwide entrapment incidents, analysing control designs to verify they met current standards and finally, interviewing the industry to identify hazard and risk perceptions," says Wraith.

Four years later the HSE published its RR961 and RR960 research reports. Designed to 'identify possible human factors behind entrapment and sustained involuntary operation incidents', results revealed that in 21 percent of the 47 entrapment incidents analysed, operators had chosen the incorrect control, while in 60 percent of cases it was attributed as a possible factor in the incident.

As well as offering a range of possible causes of entrapment incidents, from poor ground conditions to operator training

The number of different lifts in use is enormous.

and experience - the report stated that the "standardisation of control designs would reduce the occurrence of skill based errors which occur when an operator changes from one platform to another".

Intervening years

In the four years it took the HSE to compile its report, the issue of entrapment became a hot topic with several major UK contractors - which was slightly unexpected given the relatively few incidents - however manufacturers were obliged to take the issue more seriously. The general consensus among manufacturers was that control layout played a relatively minor role in such incidents and that improved awareness to the risk, correct planning and improved operator training and familiarisation would be a far better solution. In the UK this led to the Strategic Forum for Construction Plant Safety's 'Best Practice Guidance for MEWPs in 2010.

During 2011/12 while awaiting the research reports, and perhaps prompted by initial findings and further entrapment incidents, the HSE approached individual manufacturers to try to understand the standards and criteria they considered when designing controls.

"Concerns were raised during a meeting of the IPAF Manufacturer Technical Committee regarding the HSE design access request to individual manufacturers," says Wraith. " members told the HSE they were willing to co-operate in a positive manner but only as a collective body."

Given the global implications of the work being carried out and with many major manufacturers based in North America, IPAF reached out to the Association of Equipment Manufacturers' (AEM) to form a joint working group, which became the MEWP Industry Manufacturer Group (MMIG). In 2013 the industry group began a positive co-operation with the HSE and the HSL to identify human factors and ergonomic considerations for control design.

"Once the data was collated, documents were exchanged and an in depth consultation followed," says Wraith. "The result of this frank, open and positive co-operation was that the HSE acknowledged that 1) manufacturer's design standards did consider ergonomic and human factors and 2) manufacturers were exceeding the requirements of current design standards."

The discussion then turned to how best to document the work. "All agreed the most effective way to influence control design was through a new ISO standard. Developing guidance or a white paper would have been quicker but not as effective. On top of which, creating an ISO standard would also reduce any barriers to adoption by individual countries."

So in June 2016, the first meeting of ISO TC214 WG1 took place in Seattle to start work on the ISO 21455 standard which was introduced last month.

What is in the new standard?

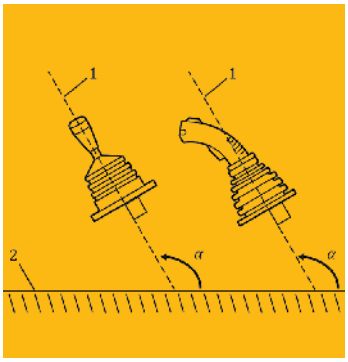
"Currently the major manufacturers do have some standardisation of layout – drive controls for booms are generally on the right and lift/lower controls are on the left," comments Wraith. "The new standard starts to recognise and formalise that fact, it also adds spacing and size requirements and directions of movement. So it is far better than the void we had previously as it provides an international benchmark for manufacturers to consider when designing controls."

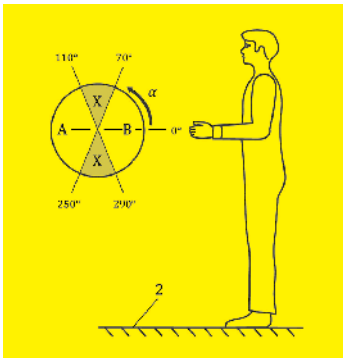
The standard builds on existing work done carried out by manufacturers to provide the performance requirements, position, location and markings of all finger, thumb, hand, and foot controls used by an operator.

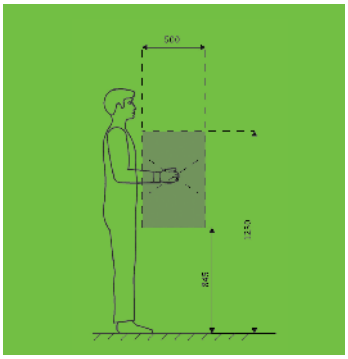
The areas that have been defined include:

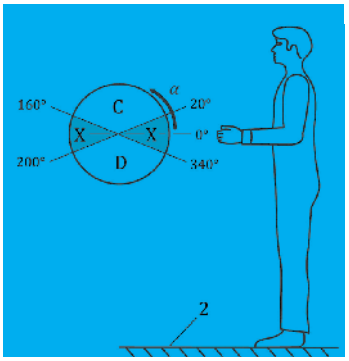
- Maximum/minimum forces of controllers
- Maximum/minimum sizing of controllers
- Location and distances of controls
- Movement, operation, and orientation of controllers
- Layout and grouping of controls

Markings of controls









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For the most part, guidance on the positioning, layout, grouping and markings has been based on current practice and standards as well as user comfort and usability. Most if not all modern control boxes are likely to comply already, with a few requiring minor adjustments to do so. Other areas of the standard, such as direction of travel and boom movements, might be a little more challenging.

"For some, little change will be required while others may require significant redesign of the control panel layout and orientation. One of the burning questions throughout the drafting stages concerned the movement and orientation of the lift and drive controls," says Wraith.

The new requirement ensures the movement of the controller - both for travel and boom/platform movements - corresponds to the general direction of the response. Put plainly, up goes up and down goes down. It sounds like an obvious decision but given that most controls are mounted on a horizontal plane where 'up or down' is actually 'forward or backward' it is actually anything but simple - something that was confirmed during the research undertaken by IPAF and EWPA on behalf of the standards drafting committee, which asked operators of varying experience to instinctively choose which way operated up and which was down using a dummy controller set at various angles.

In order to help operators visualise and orientate which way up and down is, work platform controls will now need to be mounted at an angle to the work platform floor when in the neutral position. In this position, up and down should always be relative to the angle of the platform floor and instinctive to anyone looking at it.

Broader requirements have also been introduced to ensure controls are laid out in a similar fashion - just as a car's clutch, brake and accelerator are always in the same position. Also that all 'up, forward, clockwise, to the right and pressing down' movements result in either turning equipment on or causing the selected function speed to increase, while all 'down, backwards, anticlockwise, to the Left, or releasing' movements turn a function off or decrease the speed. Likewise, when using stacked/banked lever operated controls up should always be slew/rotate right while down should be left.

Additional changes which are likely to affect some manufacturers is the need for a separate enable function to protect against inadvertent activation, it will require the controller to be in the neutral position before it can be activated and only to remain activated while operating the function, with a reset required after no more than 10 seconds of inactivity.

"Some manufacturers have voiced concerns over the challenges they face to comply with the movement of the controls, but I believe the

greatest challenge to conforming will come from manufacturers of multi sectional booms and 'complex' jib designs as well as ones that fold under," says Wraith.

The standard means that control panels will need to be tilted to a particular angle, enable switches added and where necessary the direction of movement in relation to the controls changed.

How important is its introduction?

This is simply an international standard, not legislation, however given how well it has been received by the manufacturers and rental companies we spoke to, it is likely to be adopted rapidly, particularly on new models. Although in the short term it may of course add to the confusion.

"While it will not happen overnight I believe most manufacturers will conform over time. It could be 10 years post adoption before we really start to see the benefits of control standardisation," says Wraith.

"However, it was agreed that it was wrong to sit back and do nothing. Perhaps customer demand will drive the speed manufacturers adopt the standard? Manufacturers may also want to minimise any exposure to legal action following an incident where their control design differs from the new standard."

The point is any change - however small - that has the potential to prevent an incident or to save a life should be encouraged and welcomed. And although the effects will not be immediate, over time operators should be able to move between machines of a similar type and be instinctively familiar with the controls. Training and familiarisation will of course also be simplified.

Wraith adds one more point: "The HSE lead in the early days was Joy Jones and towards the second half of the project, Ray Cooke these two individuals should receive a great amount of credit for the time and effort they dedicated to this matter with a willingness to co-operate with the industry to further improve the safe use of powered access."

So what next?

"I would like to see improvement in telematics and common accessibility to analysis of control/function movement. Such data would be invaluable when investigating accidents as it would confirm which control was moved in which direction and in what sequence. Currently we only have the operator's word - if they are alive! The standardisation of placement and functionality of ground control emergency lowering function will hopefully be considered in the next revision of ISO 21455."

Timeline of Events

- Early 2000s - UK's HSE voices concerns over control design following entrapment fatalities.
- 2005 - Following another fatal entrapment incident, the HSE advises manufacturers of the need to safeguard controls against sustained involuntary operation.
- 2005 - HSE begins working with the joint CPA-IPAF Powered Access Interest Group on controls and sustained involuntary operation.
- 2009 - HSE commissions research programme on entrapment incidents.
- 2011/2012 - HSE approaches individual manufacturers for access to their control designs, before IPAF's MTC agrees to represent them as a collective body. AEM and IPAF form a joint group - the MMIG - to address the issue with the HSE.
- 2013 - HSE publishes its RR 961 and RR 960 research reports
- 2013-2016 - The MIMG and HSE start work on identifying human factors and ergonomic standards for control design.
- 2016 - The first meeting of ISO TC214 WG1 starts work on the ISO 21455 standard.
- 2020 - ISO 21455:2020 Mobile Elevating Work Platforms - Operator's Controls is published

Manufacturer and rental company comments

"Although the standard was written to provide to promote consistency in both control operation and operator interaction with the controls, there is still opportunity for innovation to improve that functionality. The most noticeable change for an operator will be the mounting angle of the controls to help distinguish the directionality of lifting and driving operations. Our controls are currently mounted at an angle to make this distinction, but the new standard specifies a higher angle is used."

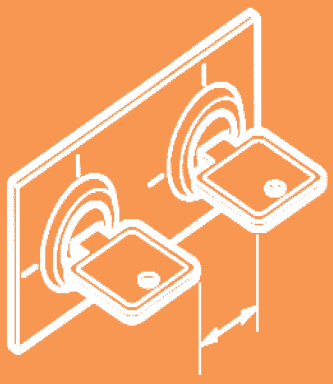
Ian McGregor, director of product safety Skyjack

"At Snorkel, we believe that controls that are intuitive are the most easily understandable for an operator. From an ergonomic perspective, standard positions of controls are good guidelines to ensure the majority of operators can see and use the controls without undue stress. Most manufacturers have already ended up with these philosophies based on common sense and experience. While there are certainly some benefits of a standard like this, it must not be so strict that it limits future innovation and improvement."

Jeffrey Eckhardt, chief engineer Snorkel

"Despite some truck mounted manufacturers being present on the ISO group, the development of this standard is led by the self-propelled manufacturers. The current version does not perfect fit the requirements and needs of the truck mounted market. We must also consider the next revision of the EN 280, which will, we think introduce new principles resulting in some control system improvement."

Roberto Marangoni, international sales director Multitel Pagliero



"We first called for standardisation of controls over 10 years ago when our incident analysis began to show there was a potential risk of trained operators making a mistake when moving from one make of machine to another. It may sound simple to solve but determining the best way for any particular control to function is anything but simple and has involved wide ranging engagement to ensure the best solution possible. I have been impressed in the way the manufacturers have worked together to determine a common standard. It will be incumbent on hire companies and equipment owners to ask the question though as part of the tender process."

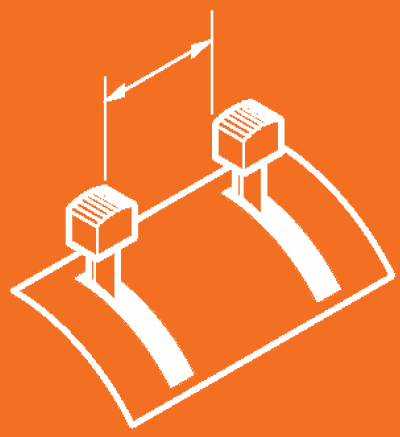
Mark Keily, HSE director Loxam Powered Access Division

"Changes to ease the learning curve of platform operation and to make achieving the goal of safe and productive operation easier are a good thing. Most platforms already have similar types of functions, the standard has done a good job in standardising the similarities, while allowing flexibility for each manufacturer to differentiate themselves in the details. It is not overly constraining and should be an overall positive change for the industry. Most of Genie's controls already comply with the standard, in intent, if not in full technical detail, but this could be achieved with 'tweaks' rather than redesigns."

Zach Gilmor, product manager Genie

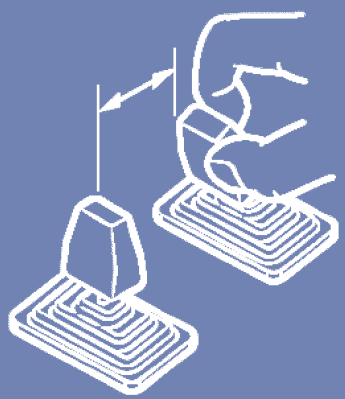
"When I was the president of IPAF in 2004-2006 we proposed work on the standardisation of controls – so we are really pleased to see the standard is now published. The main objective was to increase safety for users, but it has required many meetings between the HSE, IPAF's Technical Committee and manufacturers, to investigate the similarities and differences between control panels from various manufacturers. Today the question is: will all manufacturers conform to the new ISO or not?"

Pierre Saubot, president of Haulotte



"The standard brings together the latest guidance and best practice on platform ergonomics and presents the key requirements in one place for manufacturers and designers to use. Although we have always met or exceeded existing standards, this one will fill the gaps in relation to ergonomic and human factor requirements and is a positive step in reducing the issue of diverse control layouts. The majority of Niftylift machines will already comply with ISO 21455, however older models, such as full flow hydraulic designs, will be updated as part of continuous improvement programmes to introduce any new principles from the standard."

Steve Redding, development director Niftylift



"The current lack of standardisation across platform controls is a significant issue, especially for the operation of scissor lifts. The lack of consistency around which direction to operate the controller for lift/lower operation across various models available for rent must increase the risk of accidents. Ensuring the effective familiarisation to every operator, for every hire, is a real challenge. Often the operator is not on site when the equipment is delivered and when they are, they frequently refuse to accept a familiarisation, insisting they have used the equipment previously and as the hire company we have no way of confirming this. Standardised control systems should reduce the risk in these instances.

Ben Hurst, chief executive Horizon Platforms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