WORK & SAFETY ANALYSIS 2022

irata International
Industrial Rope Access Trade Association

ABSTRACT

The report examines employment, incident and accident data, submitted by IRATA members over the period January – December 2021. Data submissions were received from 558 IRATA members which is an increase from 530 in 2020, a rate of increase approaching pre-pandemic levels.

Total employed rose to 18,527, short of the 19,257 recorded pre-pandemic. Associated work hours increased to 21.2 million hours, also short of the 22.6 million hours recorded in 2019.

The resulting ‘Full Time Equivalent’ (FTE) workforce increased to ~ 10,609, below the pre-pandemic level of ~ 11,300. Training hours recovered to near pandemic levels of ~ 3% of total hours, equivalent to ~ 35 hours per employee for the year.

Effects of the pandemic continued to be inconsistent between regions, most recovering virtually back to normal but some suffering significant continuing reductions in employment and work hours.

There were 256 incidents and accidents; comprising of 182 ‘Near Miss’ events, and 74 ‘Accidents and Illnesses’, of which 15 were ‘Reportable’ to UK authorities, and very sadly, included 3 fatalities.

The ‘Reportable Injury’ rate remained in the range 10-50% of ‘All industry’ rates in comparative UK, EU and USA figures.

The summary and conclusions highlight specific issues raised by the accident and incident data. Notable factors that contributed to the reported accidents and incidents were ‘Failure to Identify Hazards’, ‘Lapse of Concentration’ and ‘Lack of Experience’. Recommendations primarily relate to encouragement of enhanced hazard identification and implementation of effective preventative measures to reduce risks wherever practicable.

Dr C H Robbins
1 September 2022

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1. INTRODUCTION

This report presents a summary of accident and incident events together with employment data submitted by all members of the Industrial Rope Access Trade Association (henceforth IRATA) for the period January - December 2021.

Calculation of accident rates requires details of employment numbers and associated work hours. Gratitude is extended to those who were tasked to assemble and present data, both within individual IRATA member companies and IRATA Head Office. The continuing effects of the COVID-19 pandemic must have hindered the process for all concerned.

All data, both employment and accident incident events, were inclusive of regional identification, exclude the identification of individual IRATA members and were subjected to quality checks prior to analysis.

It is important to note that the employment data relate to IRATA member company employees only. As such, IRATA qualified individuals who were not employees of IRATA member companies are not covered by this report.

In 2012, it was decided that zones or regions around the world would be established, overseen by Regional Advisory Committees (RACs). IRATA members' data are reported under their RAC.

During 2021, there were 15 RACs:

- Australasia
- Benelux
- Brazil
- D-A-CH (Germany, Austria and Switzerland)
- Eastern Europe
- Far East Asia
- Mediterranean
- MECASA (Middle East, Central Asia & Southern Asia)
- North America
- North Sea Operators
- Other
- Scandinavia
- Southern Africa
- South East Asia
- UK

The report is arranged with figures, graphs and tables incorporated within the text to which they apply. It presents conclusions and makes recommendations, based on the data supplied.

(See **Appendix II** for description or explanation of various terms used in this report).

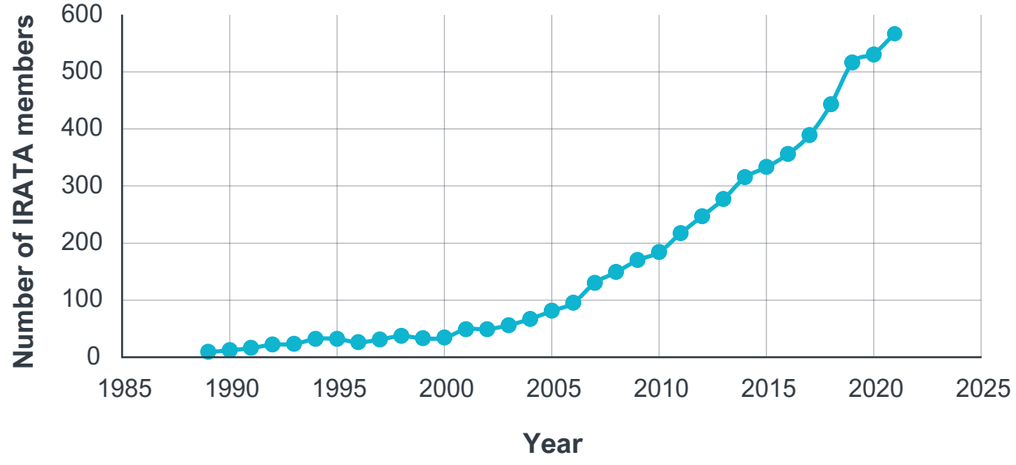
2. IRATA MEMBERSHIP

Figure 1, the number of IRATA members submitting data by Q4, shows the continuing increase in IRATA membership from 530 in 2020 to 558 in 2021, almost resuming the rate of increase in membership prior to the onset of COVID-19.

Despite the continuing pandemic, membership increased in most RACs but there were significant falls in South East Asia and Far East Asia membership towards the end of 2021 (together with employment and work hours). However, losses were more than compensated for by gains in Australasia, MECASA, North America, South Africa and UK.

The 'Membership' referred to in this report is the number of companies submitting data by Q4 of the 2021 year required by April, 2022. This may not equate to membership figures recorded by IRATA but is consistent with results for previous years based on Q4 data submissions.

Figure 1 ¦ IRATA Membership Numbers at Q4 2021



3. EMPLOYMENT STATISTICS

3.1 EMPLOYMENT LEVELS

Distribution of employment between the grades is shown in **Figure 2**. The total recorded employment recovered from the average quarterly figure of 16,389 in 2020 but fell short of the figure of 19,527 in 2019 reaching 18,527 in 2021. This is less than expected by the rise in IRATA membership.

Recovery was apparent for all grades except for Level 1s which remained 900 below the 2019 figure but individual regions varied greatly. Why Level 1s recovery lagged behind is not known. The significant increase in managers, approaching 10%, was noted.

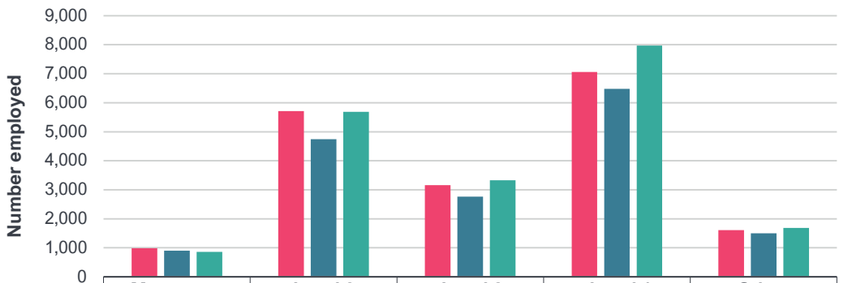
A pro rata increase in employment with IRATA members, based on 2019 figures and assuming similar utilisation of 1.16, would give an expected employment number of ~ 21,000, well above the 18,527 actually recorded. The apparent shortfall, largely Level 1s, may reflect the continuing effects of COVID-19 in some specific regions.

Increases in employment were recorded by Australasia, Brazil, MECASA, North America, North Sea Operators and UK.

Far East Asia and South East Asia were the two RACs showing the greatest decrease in employment. Whether these falls were related to COVID-19 challenges in these particular areas is not known because other RACs, that also had continuing concerns with COVID-19 during 2021, showed static or even improving employment. It may reflect more stringent containment measures within these areas, inhibiting work and movement.

It is important to note that the employment data relates to IRATA member company employees only. As such, IRATA qualified individuals who were not employees of IRATA member companies are not covered by this report.

Figure 2 ¦ Employment by Grade



	Managers	Level 3	Level 2	Level 1	Others
2021	984	5,709	3,159	7,062	1,611
2020	903	4,745	2,761	6,478	1,501
2019	865	5,684	3,326	7,965	1,687

Image courtesy of Beal UK © 2022

3.2 HOURS WORKED

The total hours worked in 2021 was **21,217,275**, more than a 9% increase from the figure of 19,412,219 in 2020, but still a 6% reduction compared to 22,573,961 in 2019. Thus, recovery of work hours does not match the continuing increase in membership.

As with employment, a pro rata figure, based on 2019 figures, would indicate that a figure of ~ 24.6 million hours would have been achieved in the absence of COVID-19.

Hours worked by the various grades are shown in **Figure 3**. This reflects the employment levels in **Figure 2**. As expected, there were notable variations between RACs. For example, there were significant falls in work hours recorded by Australasia (0.5 million), Far East Asia (0.17 million) and South East Asia (0.33 million) whereas, increases were reported for MECASA and South Asia (0.77 million), North Sea Operators (0.3 million) and UK (1.44 million).

Year	Utilisation (Hours/Worker per annum)
2018	1,201
2019	1,156
2020	1,184
2021	**1,145**

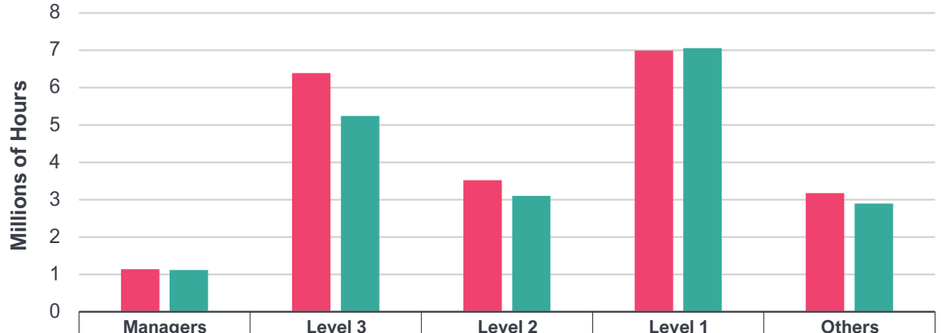
Utilisation figures (hours worked divided by number of employees) for the last four years were as the table above.

They are well below a maximum utilisation of about 2,000 hours per worker per annum, with the latest figure falling still further. Traditionally, it has been assumed that the low figures probably reflect a tendency for technically trained technicians also having employment in non-rope access related working. However, it may now also include the possible effects of COVID-19, limiting work opportunities.

Closer examination of utilisation for individual grades does, indeed, show that for Managers, Level 3s and Level 2s technicians, utilisation were about 65-70%, whereas for Level 1 technicians it was only 54%.

The importance of submitted work hours lies in the calculation of accident rates. The reported workforce of 18,527 reduces to a Full Time Equivalent (FTE) workforce of 21,217,275 hours/2,000 hours per employee = 10,609, which is the figure that will be used later in calculating accident rates.

Figure 3 ¦ Work Hours for Grades



	Managers	Level 3	Level 2	Level 1	Others
2021	1139581.82	6389973.65	3522852.87	6990923.79	3173942.97
2020	1118341.71	5243305.39	3103833.30	7053086.54	2893652.21

The 2,000 hours is used internationally as the annual work hours per employee for full time employment or FTE.

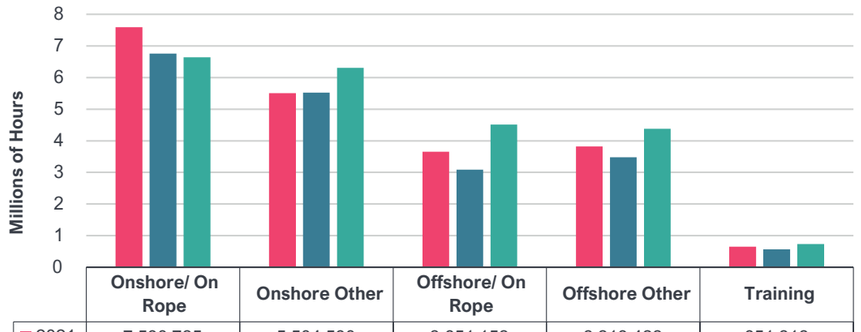
3.3 LOCATION OF HOURS WORKED

Work hours are shown distributed between ‘Onshore’ and ‘Offshore’ working and training in **Figure 4**. During the early years of IRATA, most rope access work of founder IRATA members was carried out on North Sea ‘Offshore’ platforms, hence the division between ‘Onshore’ and ‘Offshore’ working.

The only area that recovered fully from 2019 was working ‘On Ropes’ ‘Onshore’. This may be a ‘catch up’ effect in attempts to recover from deferred work or start up of new projects perhaps delayed. Although ‘Offshore’ working increased work hours, it still had not reached 2019 figures.

The proportion of ‘Onshore’ working is 64% of the total, as in 2020, up from the 59% in 2019. This trend was apparent even before onset of COVID-19.

Figure 4 ¦ Location of Work Hours



	Onshore/ On Rope	Onshore Other	Offshore/ On Rope	Offshore Other	Training
2021	7,590,785	5,504,590	3,651,158	3,819,428	651,313
2020	6,758,002	5,522,747	3,087,325	3,475,025	569,122
2019	6,641,396	6,310,132	4,510,080	4,376,937	735,416

Training also did not reach 2019 figures but maintained a 3% share of the total work hours. However, as with employment and work hours, there were large variations between regions in the changes to training, as shown in **Table 1** (green shows increases).

Some IRATA members and RACs appeared to have benefited from the circumstances and increased training; others reduced the amount of training or were forced to due to unavailability of training courses. In some cases, such as UK, Eastern Europe and North America, availability restrictions may have contributed to reduced training and were still recovering. If training hours are equally distributed across all grades, it equates to 35 hours per employee for the year.

Table 1 ¦ Training Hours

RAC	2021	2020	2019
Australasia	30,627	46,133	40,095
Benelux	6,822	8,530	7,800
Brazil	145,496	103,169	119,711
D-A-CH	2,161	2,266	5,423
Eastern Europe	48,100	40,065	58,536
Far East Asia	*	*	**
Mediterranean	30,193	25,598	19,984
MECASA	112,015	41,104	88,570
North America	62,730	48,156	78,107
North Sea Operators	7,626	9,437	10,456
Other	30,627	70,323	42,807
Scandinavia	3,316	3,976	4,315
South Africa	24,816	16,732	12,671
South East Asia	49,726	77,706	94,404
UK	97,058	75,927	152,537
Total	**651,313**	**569,122**	**735,416**

* 14,006 added to South East Asia for comparative purposes
** Previously within South East Asia and Far East Asia

3.4 REGIONAL ADVISORY COMMITTEES (RACs)

A more detailed view of data supplied may be of interest to individual RACs. Accordingly, the 'Summary Table of RAC Hours by Location (**Appendices III)** and the 'Summary Table of RAC Employment by Grade'.

Appendix IV presents summary data which were used for the summary charts above. Totals for the previous year are shown in the tables for comparison.

SUMMARY OF EMPLOYMENT DATA

Total number employed	18,527	(average quarterly figure)
Total work hours	21,217,275	
Equivalent workforce	10,609	(2,000hrs per employee)
Total training hours	651,313	(included within total work hours)

4. ACCIDENT AND INCIDENT STATISTICS

4.1 INTRODUCTION

See **Appendix II** for explanations and descriptions of terms used for 'Fatality', 'Major Injury', 'Serious injury'/'Over 7 Day Injury', 'Minor Injury'/'Less than 7 Day Injury', 'Incident' or 'Near Miss', 'Medical Condition', 'Sprains/Strains' and 'Reportable Accidents'.

There seems limited value in examining more closely 'Near Miss' incidents that had low probability of leading to serious accidents. Nevertheless, after the removal of non-rope access related accidents and incidents (e.g. road traffic accidents) all reports were included in the analysis that follows.

Disappointingly, there were many errors and/or omissions in the data presented. For example, two dislocations were not reported as 'Major' accidents, as is required. Where obvious and possible, corrections and amendments were made to received data in an effort to present a more accurate analysis.

4.2 OUTCOMES OF ACCIDENTS AND INCIDENTS

A total of **256** acceptable reports were received, almost equivalent to 2020 (260). There were 15 'Reportable Accidents' and these are shown in the table below alongside those for 2017/18/19/20. Sadly in 2021, the results include three fatalities.

Reportable Accidents	2021	2020	2019	2018	2017
Fatal	3	0	1	0	3
Major	4	3	2	1	1
Serious (over 7 days)	8	7	7	4	9

('Reportable Accidents' is the term used for those accidents normally reportable to various national authorities).

The table below summarises the data for the remaining 241 ‘Less than 7 Day Injuries’ and ‘Near Miss’ or non- injurious incidents. ‘Near Miss’ figures relate primarily to reporting the vigilances of IRATA members, but it is interesting to note the consistency of both the ‘Less than 7 Day Injuries’ and ‘Near Miss’ figures over the past three years.

Not reportable	2021	2020	2019
Minor (less than 7 day injuries)	59	62	63
Near Miss	182	188	173

4.3 RISK OF ACCIDENTS

All reports are tabulated below according to activity type, being ‘On Rope’/‘Other’/‘Training’.

‘Medical Condition’ covers several instances where work or training was halted for individuals suffering strains, feeling unwell or onset of conditions requiring medical help. Three cases involved COVID-19 illness. ‘Medical Condition’ events are included elsewhere in the table, usually within ‘Less than 7 Day Injuries’.

	Fatal	Major	Serious	Minor	Near Miss	Medical Condition/Strain
On Rope	2	2	4	25	122	5
Other	1	0	3	14	47	2
Training	0	2	1	20	13	7

The numbers do not take into account the ‘population’ differences or, in effect, the ‘time at risk’. Thus, it is necessary to divide the figures by the reported hours for each of the activity headings. For ‘On Rope’, this was 11.24 million hours, 9.32 million for ‘Other’ and 0.65 million for ‘Training’ transforming the figures to:

	Fatal	Major	Serious	Minor	Near Miss	Medical Condition/Strain
On Rope	0.18	0.18	0.36	2.22	10.9	0.97
Other	0.11	0	0.32	1.5	5.04	0.21
Training	0	3.1	1.54	30.8	20	10.8

Numbers per million work hours

The significantly higher injury risk, on an hourly basis, for training now becomes obvious. The ‘Near Miss’ in ‘Training’ was generally related to ‘student errors’. Risk of injury was marginally greater when ‘On Rope’ relative to ‘Other’ or ‘Off Rope’ working.

A similar relationship exists when comparing ‘Onshore’ and ‘‘Offshore’‘ working against ‘Training’, as will be apparent next.

Location – ‘Onshore’/’Offshore’/ Training

The table below provides a similar summary based on the locations of work, (‘Training’ have the same figures).

Taking reported hours into account with ‘Onshore’ of 13.1 million hours, ‘Offshore’ of 7.5 million and ‘Training’ of 0.65 million, the figures transform to the ones shown on the second table below.

	Fatal	Major	Serious	Minor	Near Miss	Medical Condition/Strain
‘Onshore’	1	1	4	30	152	6
‘Offshore’	2	1	3	9	17	1
Training	0	2	1	20	13	7

Number of accidents/incidents reported

	Fatal	Major	Serious	Minor	Near Miss	Medical Condition/Strain
‘Onshore’	0.08	0.08	0.31	2.29	11.6	0.46
‘Offshore’	0.27	0.13	0.4	1.2	2.27	0.13
Training	0	3.1	1.54	30.8	20	10.8

Numbers per million work hours

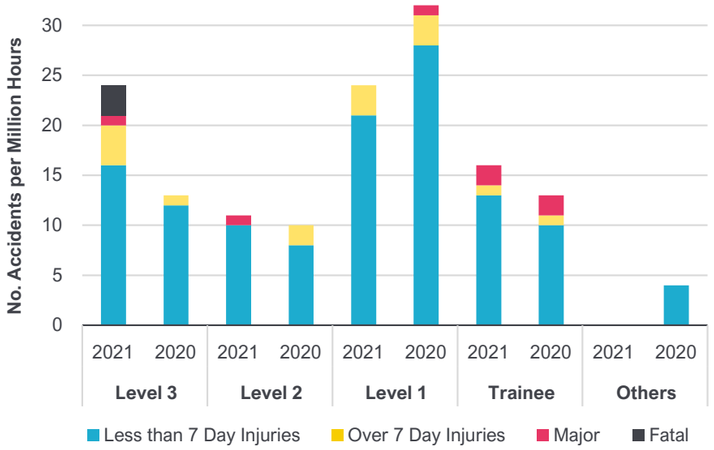
This table now gives a more realistic comparison of the figures between the different locations; however, the figures for ‘Fatality’ and ‘Major Injury’ are too small for comparative purposes. Risk (number per million working hours) for other injuries working ‘Offshore’ or ‘Onshore’ are similar but well below those for ‘Training’. The risk of ‘Less than 7 Day Injury’ or ‘Minor Injury’ is slightly greater working ‘Onshore’ than ‘Offshore’.

The significantly greater risks associated with ‘Training’, on an hourly basis, is a consistent finding year after year, possibly reflecting a combination of novice trainees unaccustomed to ‘On-Rope’ working, the intensity of training exercises leading to a higher frequency of actual injury and errors, and the onset of medical complaints. It may also reflect a higher likelihood of reporting by trainers. It should remain a priority for trainers to ensure trainees are suitably assessed before starting training and to continue to maintain close surveillance during exercises, as they currently do.

At its simplest, risk of injury and medical Issues, on an hourly basis, is greatest when training.

The smaller proportion of ‘Near Miss’ reports from ‘Offshore’ possibly reflect commercial concerns whilst working under platform management and a natural reluctance to disclose errors when possible. This would be more easily done in the relatively remote work sites ‘Offshore’. More positively, it may also reflect higher standards of work control, personnel selection and awareness of hazards when working ‘Offshore’.

Figure 5 ¦ Accident Data for Grades



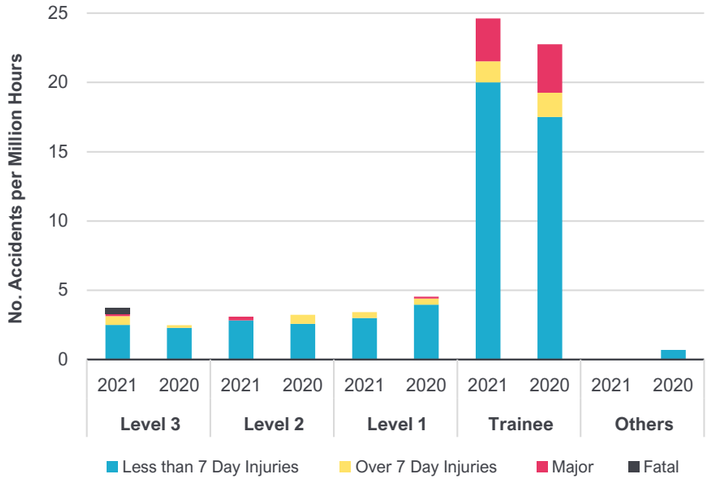
4.4 ACCIDENT EVENTS BY GRADE

The fatalities and injuries sustained by individuals according to grade, are shown in **Figure 5** alongside the data for 2020. Although figures for trainees and Level 1s & 2s are similar, there was a doubling of injuries to Level 3 technicians, that sadly included three fatalities.

Although **Figure 5** shows considerably more injuries for Level 3 technicians in 2021, this does not take into account the ‘populations’ of the grades. Using the employment hours and converting FTE, gives the following result in **Figure 6**. It is important to recognise that the figures involved are small; particularly for ‘Reportable Accidents’. The similarity of data between 2020 and 2021 may be noted. Taking populations into account shows that the risk of injury of all qualified grades lie roughly in the range 1,500 - 2,000 per 100,000 FTE, which translates into about one to two injuries per 500 FTE.

However, the figure for trainees is approximately six times higher overall. This is perhaps biased because training hours were relatively low and even single events will have a significant impact on the rate and IRATA training members will be aware of hazards and increased risks when dealing with trainees. However, the injury numbers involved, particularly for ‘Reportable Accidents’, remained low.

Figure 6 ¦ Accident Rates for Grades



Note that figures in the chart cannot be used for comparison purposes as they include all injuries however trivial.

Before moving on to examine the various factors involved in accidents and incidents, it is important to recognise that the data in the various charts presented will include numerous instances of 'linked' markings. This occurs when an individual event may be associated with more than one factor.

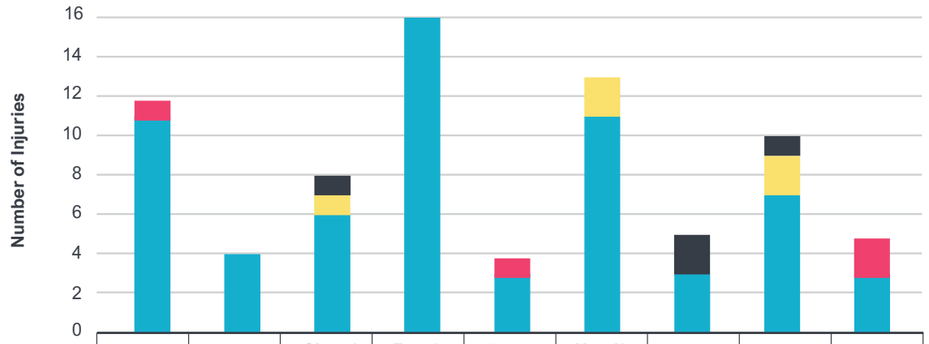
For example, in **Figure 7** some accidents incurred more than one injury or in **Figure 13** some events were associated with several human factors. Thus, individual factors may not be numerically 'added' as this would give an exaggerated negative view.

4.5 BODY PART INJURIES

Figure 7 shows the distribution of reported injuries sustained in 2021. It should be noted that the chart is of actual numbers of injuries and takes no account of 'populations'. The total number of injuries in the chart exceeds reported accidents because of multiple injuries. This was particularly the case for one of the fatalities that involved multiple injuries. It should be noted that injuries incurred for one of the fatalities were not disclosed at the time of writing. 'Stomach' and 'Torso' figures are combined as the distinction is considered unnecessary for report purposes.

Of the 14 arm injuries, one was a 'Major' broken arm sustained during training. Eight further injuries were reported during training or assessment. Only three injuries were recorded during work, one being a wrist cut on a sharp edge. All four back injuries were minor, three of which occurred during work and a pre-existing back condition halted training. The one chest and six torso injuries included a serious injury due to a fall onto a valve and one of multiple injuries of a fatality. Two injuries occurred during training and the remaining four during working on or with ropes.

Figure 7 ¦ Body Part Injuries



	Arm	Back	Chest/ Torso	Face/ Eye	Foot/ Ankle	Hand/ Fingers	Head	Leg	Neck/ Shoulder
Less than 7 day	11	4	6	16	3	11	3	7	3
Over 7 day	0	-	1	-	-	2	-	2	-
Major	1	-	-	-	1	-	-	-	2
Fatal	0	0	1	-	0	0	2	1	0

Of the nine facial injuries, eight were the usual debris in eyes problem, frequently when adjusting or removing eye protection. Six facial injuries were a result of impact from a variety of items, two of which were during training and caused by impact from rope access items. One item was a detached retina and one facial rash as a result of an allergic reaction.

Of the four foot injuries one was a 'Major' accident due to a broken ankle after a slip when 'On Rope'. Two were caused by impacts and one was a twisted ankle during training assessment. The 13 hand/ finger injuries included two serious thumb injuries, one twisted and one fractured. Two were hand crush injuries, four were cut fingers from sharp edges, a burn from contact with hot welded metal, three hand or finger injuries during training and an allergic reaction resulting in a rash on the hands.

Two of the five head injuries were associated with fatalities. The remaining three head injuries involved striking unprotected head on steelwork (helmet temporarily removed), blow to head from soil slippage that had also caused one of the chest injuries and a strike from a tool dropped by another technician whilst climbing a ladder.

Ten leg injuries included two 'Serious Injuries', one associated with one of the fatalities and the other a knee injury following extended kneeling without knee protection. Five injuries followed impact or being struck on the leg by moving or falling objects. Two leg injuries resulted from swings or slips onto sharp objects and one was a groin strain.

Neck/shoulder injuries were primarily due to shoulder Issues including two 'Major' dislocation injuries, one whilst ascending rope and a second during training (a recurrent injury). One shoulder injury was caused by a reflex move to avoid a dropped shackle whilst another was a strain when lifting. The last shoulder injury had no explanation as to the cause.

COVID-19

The report produced in 2020, showed the extent of reductions in employment and work hours that the pandemic probably caused. Although there was the start of some easing in 2021 it was by no means universal and this was reflected in the data supplied.

INJURIES

Injuries were marginally higher when ‘On Rope’ compared to ‘Other’ or ‘Off Rope’ working and were the highest when training (on an hourly basis). The implementation of realistic measures to reduce significant risks may be needed.

MEMBERSHIP

The rate of increase in IRATA membership overall nearly returned to pre-pandemic levels, increased in some cases but continued to fall in some regions.

WORK HOURS

Although there were recoveries in employment and work hours , the 21.2 million work hours recorded were expected to reach over 24 million hours, based on the rise in IRATA membership.

EMPLOYMENT

Major recoveries in work hours were recorded by UK, MECASA and Australasia. The continuing pressures in, particularly, Far East Asia and South East Asia may explain the large reductions seen in those regions.

INCIDENTS

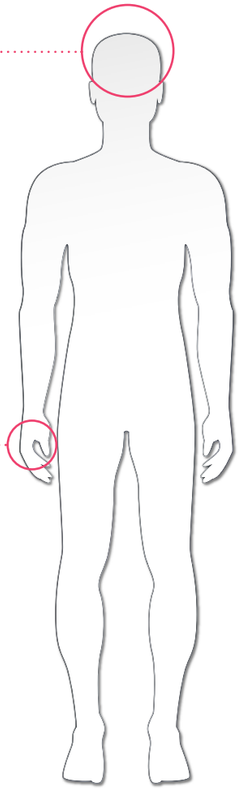
Pre-use inspection of all rope access equipment frequently identified defective or damaged items, confirming the value of all technicians checking gear thoroughly and no reliance placed on as-issued equipment.

SUMMARY OF ACCIDENTS AND INCIDENTS

Ineffective eye protection led to incidents of eye contamination

Most vulnerable body parts: face/eyes, hands/ fingers and arms.

Most injuries were caused by ‘Rope Damage’, ‘Rope and Rigging Errors/Omissions’.



Main reasons for reporting accidents/incidents are ‘Operator Error or Omission’ followed by ‘Medical Condition’/‘Strain,‘Plant and/or Work Equipment Failure’ and ‘Falling or Dropped objects’.

Although less cases were reported, the greatest concern is, lapses in concentration, lack of experience, and failure to follow rules

Not included in **Figure 7** are instances of COVID-19 related incidents. Although the initial pandemic threat commenced in December 2019, there were no reports of issues throughout 2020 by IRATA members, whereas several were reported in 2021.

Some incidents were not included as they did not relate to actual working, but three cases did arise during work, which were included.

4.6 CAUSES OF ACCIDENTS AND INCIDENTS

Several changes to the pro-forma for submission of data have been made.

These include:

- ‘Manual handling’ is omitted.
- ‘Rope access equipment failure’ and ‘Rope access equipment malfunction’ are combined into ‘Rope access equipment failure’.
- ‘Medical condition’ is combined with ‘Sprains‘ (includes three ‘COVID-19’ items also shown separately.)
- ‘Rope and rigging error’ added.
- ‘Potential dropped or falling objects’ added and relevant items removed from ‘Falling or dropped objects’.
- ‘Collapse’ is extended to include ground instability.
- Conventionally, ‘Falls’ include slips and trips. ‘Falls from height’ are separated in this analysis, being more appropriate to this industry.

Figure 8 presents the data supplied which, unfortunately, required extensive amendment, addition and correction. Note that some events may be associated with more than one ‘cause’ such as one of the fatalities.

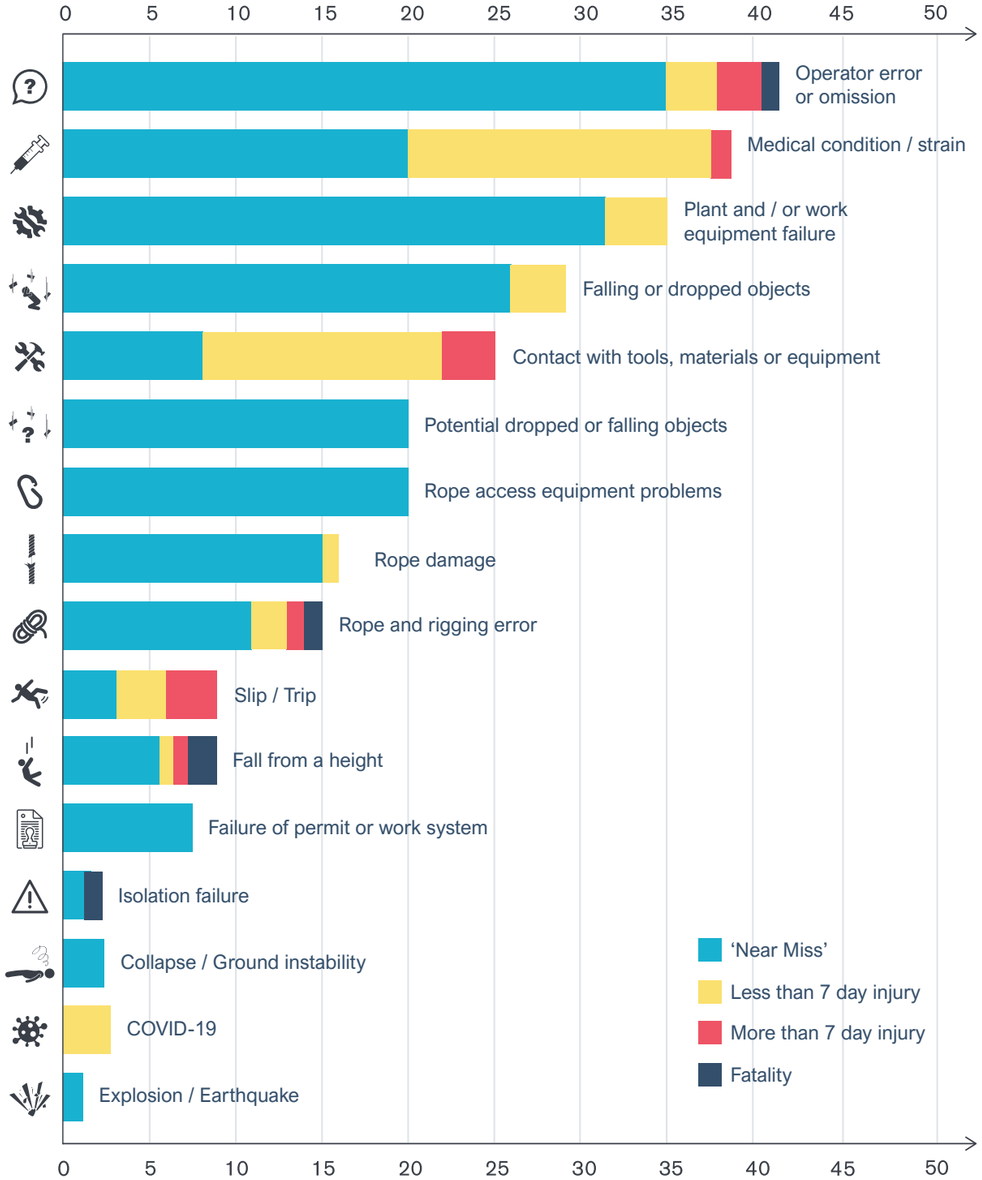
Only categories that most closely described the immediate cause of an accident or ‘Near Miss’ were generally submitted in reports.

‘Operator error or omission’, unsurprisingly, was the most common cause of accidents and incidents but this may have been a reflection of ‘lack of training’. This was closely followed by onset of ‘Medical condition/Strain’ that included eye injuries due to debris and particulates, muscular strains, becoming dehydrated and possible COVID-19 related infections. The latter is also shown separately in **Figure 8** and is the first time it has been identified in reports.

Although ‘Falling or dropped objects’ (29) was still a significant cause of reports, only two resulted in ‘Minor Injuries’ and were less than the 42 identified in 2020. ‘Potential dropped or falling objects’ (20) identified by technicians was a slight increase over 2020 figures (17). Some items were substantial and likely to cause significant injury. The important point here is that the figures emphasise the necessity to survey or examine work sites before work starts for any threats and this will include loose items or defective plant – an important item in risk assessments/ hazard identification.

The majority, in numerical terms, relate to trainee errors, as would be expected.

Figure 8 ¦ Reasons for Reports



The ‘Rope access equipment failure’ (20), combining both failed and malfunctioning hardware, reinforced the need for pre-use inspection of all items of rope access equipment. One point of concern from several of the reports was that items had evidence of wear and/or damage that possibly had existed prior to use, casting suspicion over the efficacy of routine inspection before issue to technicians, such as loose ferrules on slings.

A total of nine ‘Falls from height’ were identified. Four were ‘restrained’ by

rope or, in one case, cow's tail. Delays in operation of back up or fall protection were reported, one due to 'greasy' rope. It is assumed that one of the two fatalities, caused by a rock fall, included an element of a fall. The second fatality was a free fall of 18m. One fall of approximately 4m occurred when an un-roped technician fell through a skylight but, fortunately was unhurt.

One technician was reported to have fallen on rope and sustained hand injuries. An 'Over 7 Day Injury' was reported when a technician, after disconnecting a cow's tail temporary attachment, stepped back 'into space' and fell onto a valve causing a chest injury. Another fall was reported when a technician fell through degraded fabric covering. One fall occurred during training whilst aid climbing, the candidate restrained by cow's tail anchors and, perhaps, a 'technical' fall with fall factor 0.5.

Rope damage was recorded in 16 reports but one report was associated with a minor injury. Most were 'self inflicted' but three were deliberate 3rd party interference and cutting of ropes. Allowing ropes to contact hot surfaces occurred in several cases, suggesting that site inspection perhaps failed to identify the potential threat. Rope damage was reported in only seven cases in 2020 and eight in 2019.

There were three cases of 'ground instability' one of which, sadly, led to the fatality of a technician whilst engaged in geotechnical survey when caught in a rockslide.

Another technician engaged in geotechnical activities was struck on the foot when a rock fell whilst climbing on a vertical rock face, but was uninjured. In the third case, a driller was overtaken by a soil slide during nail stabilisation and was rendered unconscious but, recovered shortly after for rescue.

Of the 38 'Medical conditions', six involved particulates entering eyes, seven due to fatigue, exhaustion or dehydration, three COVID-19 cases and a variety of strains, dislocations and an infection/ allergic reaction.

Two more unusual items may be of interest. In the first case two technicians were on a 60m high chimney that shook by half a meter when an earthquake struck. They understandably promptly left the location. The second involved an air horn that was in danger of not working due to very low ambient temperatures. The air horn was needed as a bear deterrent as the local bears had not yet gone into hibernation.

Finally, a newly installed anchor rail rope access system was defective. As a technician moved along it, one rope detached and his second rope was within 1cm of allowing him to fatally fall, when fortunately, the technician stopped progressing. This is an example of potential 'common mode failure' with catastrophic outcome.

4.7 MANAGEMENT FACTORS

Figure 9 presents management related factors identified in reports of incidents and accidents, some of which were supplemented upon inspection. Two items were eliminated as they related to failings of 3rd parties and were not pertinent to rope access activities. The results are broadly similar to those submitted in 2019 and 2020.

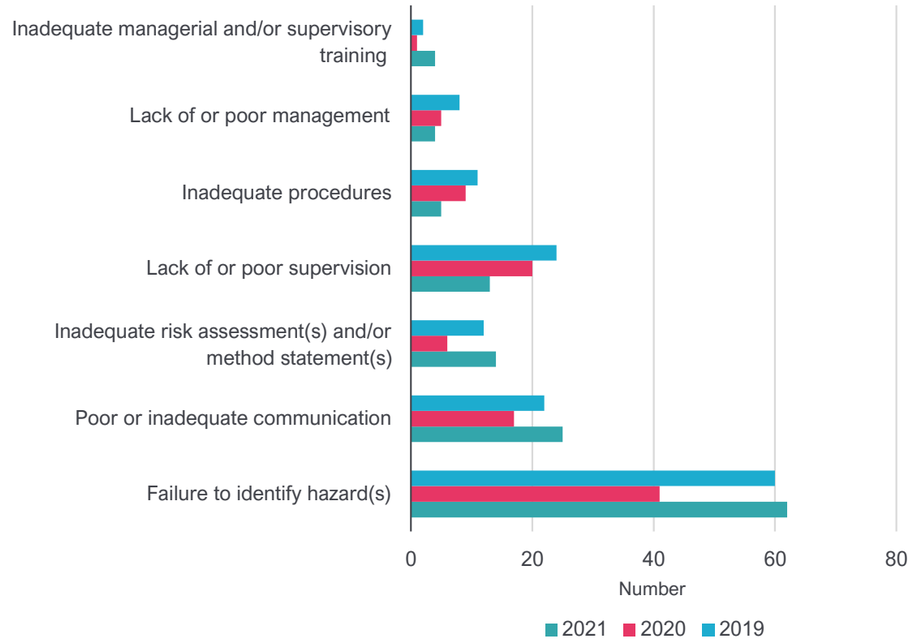
Of the 256 reports, 85 identified one or more management factors considered contributory to the accident or incident. In most other reports the absence of management factors might be considered reasonable. For example, reports of potential falling objects, individual errors such as tripping and slipping, mistakes during training and, in most cases, defects encountered with rope access hardware during use may be beyond management or supervisor control.

As in 2019/20, the most common item in reports was 'Failure to identify hazards' or potential hazards. In some cases, this may have been a shared failing with clients or site controllers but it reinforces the need and value of site visits and inspections prior to commencing work.

'Poor or inadequate communication' was reported in 25 cases. These varied from issues with radios or lack of them, noisy ambient conditions, broken barrier tape allowing site ingress, and simple misunderstanding of instructions or information.

There were seven instances of communication issues with 3rd parties on site. One of the fatalities included 'communication' as one of the contributory causes.

Figure 9 ¦ Management Factors



4.8 WORKING ENVIRONMENT

Working environment issues were identified in 96 reports, with some having multiple factors identified. **Figure 10** presents the results alongside those for 2019/20. However, as will be seen, there was insufficient diligence in reporting to rely on Figure 10 for detail.

As for 2019/20, the most concerns (24) were associated to issues with ingress/egress to work sites, including tight hatchways or openings, presumably something taken into account in risk assessments. Many of these issues were closely allied to a 'Lack of room' at work sites. These included working in confined spaces.

One significant difference between 2019 and 2021 data was the doubling of 'Lack of maintenance' figures, more so for instances of 'Poor lighting'.

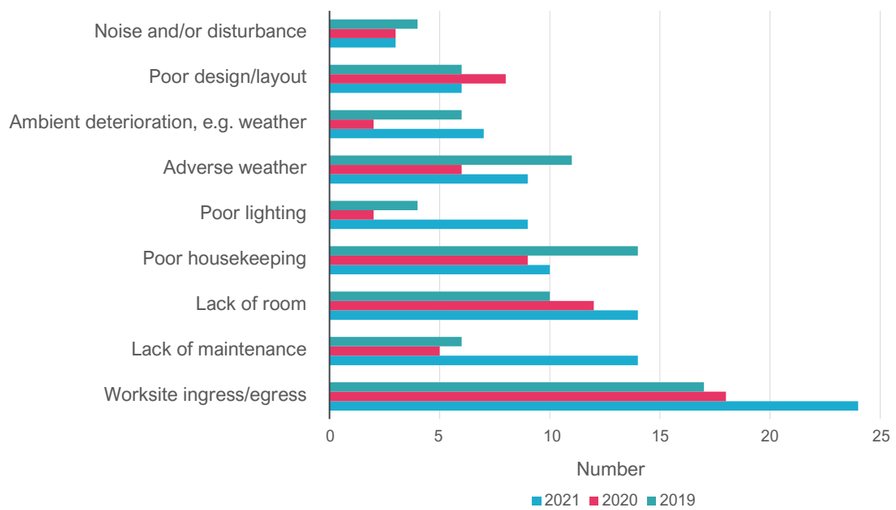
'Poor housekeeping' (10) may be taken to refer primarily to rope access working.

However, there were eight instances of reports that related to site conditions. A scan of reports revealed at least 12 unidentified instances of 'Poor housekeeping' that should have been included such as:

- faulty rope access hardware;
- a missing scaffold locking (at a training point);
- open tool bag and untethered or unsecured tools;
- harnesses stored with sharp tools;
- one side of a Y-hang unattached (in a training location.

Adverse weather or ambient conditions were identified to be a problem in nine cases. The examination of reports, reveals that four were due to low temperatures (icing/snow and battery capacity limitations), two to wind (particulates blown into eyes despite eye protection) and one complaint of heat in a training facility. The ninth case appeared unrelated to any weather concern.

Figure 10 ¦ Work Environment Issues



4.9 PLANT AND/OR WORK EQUIPMENT

Issues with accuracy of reporting and the correct identification of factors involved in accidents and incidents is demonstrated in **Figure 11**. What should be the simplest and easiest of pro-forma topics to identify relevant items for individual events gave lower 'scores' than expected when initially examined, shown in blue in **Figure 11**. Re-examination of data revealed significant failures to identify factors that, in most cases, were reasonably obvious, but not applied.

The 'corrected' data, shown by the red bars, highlight the concern and reveal differences in both the extent and frequency of issues encountered by rope access technicians. This demonstrates the danger of accepting data as supplied without checks, and when necessary, applying corrections.

The highest number of issues were encountered with rope access equipment itself, including five ropes damaged by rope access devices including winches, seven faults with descenders and karabiners, six faulty slings (usually ferrule faults on wire slings) and edge protection devices. In some cases the faults were allied to other causes such as mechanical failure. The remainder were miscellaneous items such as face masks, a rail safety system, gas monitors, a lanyard and a pulley.

'Lack of maintenance' (19) included seven dangerous items associated with ingress/egress to work sites such as gratings missing, loose items of equipment, defective steelwork, unguarded holes, loose or detached fireproofing and a missing handrail.

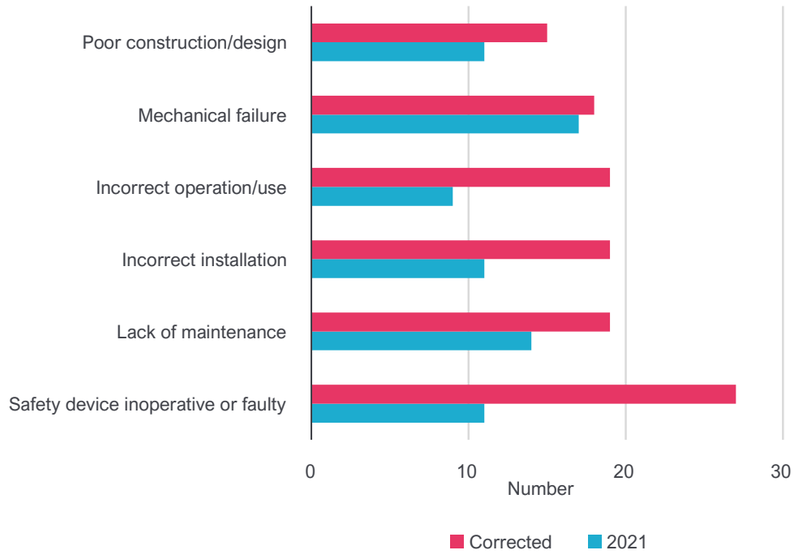
There were four instances of defective tools and miscellaneous issues with vessel defects, local leaks, loose or defective pipework cladding, corroded anodes and degraded fabric roofing (leading to a fall).

'Incorrect installation' (19) occurred in 12 instances of rope rigging that included faulty or lack of rope protection. Three cases of faulty structural installations were encountered (scaffolding locking, unsecured grating and pipework cladding).

Perhaps the faulty anchor rail rope access system, that nearly resulted in a fatal fall, was the most serious. 'Mechanical failure' (18) was involved in six rope access devices, six hand tools, two plant or pipework leaks and a crane failure when in use. Corroded steelwork failed when being used as a sling support. Degraded fabric tearing and a faulty valve completed the list.

Most examples of 'Poor construction/design' (15) are included above but additional items highlighted were sharp edges left on flashing (causing a wrist laceration), rope anchor points installed directly above non load bearing building cladding, a fixed ladder rung partly obstructed by electrical conduit and, during construction, an unbolted handrail not flagged as unsafe.

Figure 11 ¦ Plant or/and Work Equipment



4.10 PPE ISSUES

It is important to recognise that ALL items that feature in rope related work, that have rope contact in whatever capacity, are included as PPE. Examples include slings, edge protectors, rigging plates, back-up devices/descenders, anchors, karabiners, lanyards/cow's tails, rope winches as well as the more obvious harnesses, the ropes themselves and energy absorbers. This is in addition to the usual PPE items of helmets, gloves, boots and eye/ear protection.

Before considering data relating to PPE the following should be noted:

- Reports that include damage to rope access equipment, including the ropes in use, have been added to the data provided, either as 'Defective' or 'Incorrectly used' according to perceived cause of damage. For example, accidental rope damage by contact with a hot pipe would be classed as 'Incorrectly used'.
- 'Not suitable' and 'Wrong type' have been merged as the distinction is considered unnecessary.
- Comparison with previous reports in 2019 and 2020 has not been made due to concerns over the quality of reporting data (see WASA reports for 2019/20).

The originally reported PPE items totaled 47 but included radios. The corrected total, excluding radios, increased to 74, distributed as shown in **Figure 12**. In common with data in 2019 and 2020, 'Incorrectly used' was the most common cause of reports. Of the 26 identified issues, seven occurred during training, most in use for descent on ropes.

Errors in deploying and handling ropes and rigging accounted for eight items that included, for example, setting up deviations (two times), no stopper knot on descent ropes and deploying ropes (four times), three of which resulted in rope damage when trailed over hot pipes. Two rope edge protectors were not properly attached, with one allowing rope damage.

Miscellaneous items included knee protectors not deployed properly and allowing injury when kneeling.

The temporary removal of a helmet allowed a minor cut on the head from striking steelwork. The 19 items of 'Defective' PPE included five rope attachments (karabiner, descenders), five slings found with faults (usually wire strands or ferrules damaged) and an edge protector, potentially damaging the rope when it failed. There were three damaged ropes (to be added to ropes damaged in other ways). One rope was damaged by exposure to nitric acid, a second by abrasion against a cable tray and a third by a power ascender.

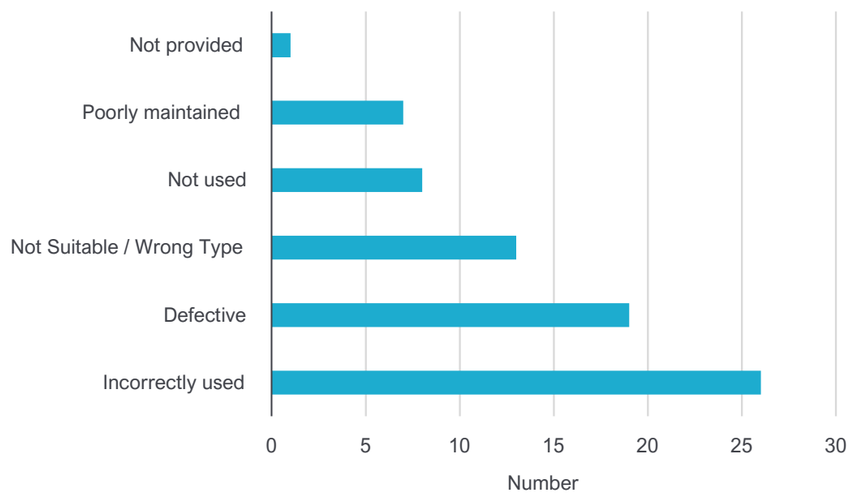
Miscellaneous items such as a face mask, pulley, gas monitor clip, and perhaps most worrying, the defectively installed anchor rail rope access system.
'Not suitable or wrong' items were a varied collection, from edge protection device, karabiner not self-closing (locking), harness not fitting (all too large for small person), wrong type of fall arrest supplied, gloves inadequate (two times) and an inflating life jacket that inflated whilst in amongst constricted steelwork.

Ascending on pre-rigged but untagged anchors was also noted. Two incidents of eye contamination due to ineffective eye protection were identified.

The eight 'Not used' items, included edge protection that was not used and a double deviation only using a single karabiner. 'Poor maintenance' was responsible for seven items, noting particularly, a power ascender (damaging a rope), dirt preventing an auto-locking karabiner working, a back-up device with a loose locking screw and a harness stored together with sharp tools.

The only item 'Not provided' (actually not installed) was a missing second anchor that should have been attached to a Y-anchor at a training venue.

Figure 12 ¦ PPE Issues



4.11 HUMAN FACTORS

It could be argued that each and every reported event must be allied to a human factor, by act or omission. In many cases these factors might be presented by 3rd parties such as designers, manufacturers or other site personnel (e.g. potential falling objects left by previous workers).

But, before examining the data it is important to recognise that true cause(s) involving human factors may be subjectively 'redirected'. For example, 'Undue haste' may, in fact, have an underlying cause of excessive supervisor pressure. There may be the temptation to 'blame' the individual rather than identify other underlying causes.

Of the total 256 reported accidents and incidents, 106 identified a total of 167 individual 'Human factors' (158 and 218 respectively in 2020). Many identified more than one factor, up to seven factors in one case. **Figure 13** presents the distribution of responses within the identified categories, alongside those obtained in 2019 and 2020. They show surprising consistency in general with 'Lapse of concentration', 'Lack of experience' and 'Failure to follow rules', collectively, accounting for more than half of all factors identified (90 out of 167) and will be examined in more detail.

'Lapse of Concentration' was reported in 35 cases, significantly fewer than previously. They varied considerably, from only four during training to 11 whilst handling tools, lifting and other working accidents and incidents. Errors during rigging and descending added another eight events. Various additional items included allowing a rope to contact a hot pipe, wearing an over jacket that interfered with a monitor worn beneath it and three dropped objects, one by a 3rd party.

One particular item, forgetting to obtain an EMF permit (working within an area subject to electromagnetic radiation), led to a disconcerting situation where subsequent working bypassed the formal Permit To Work system, potentially leading to exposure to EMF. Surprisingly few training numbers (4) highlighted 'Lapse of Concentration'. 'Lapse of Concentration' was a significant factor in four 'Over 7 Day Injuries' and nine 'Less than 7 Day Injuries'.

'Lack of experience' was cited in 30 cases. Although generally Level 1s were involved, this was not always the case.

There were six dropped items, mainly rope access items (ascenders, pulley) but one, a dropped ratchet that struck another technician, involved a Level 2 and a Level 3. A 3rd party dropped four cable spindles onto technicians exiting their ropes below narrowly missing them. There were five instances of issues handling various objects including a swung load, a snagged hook and moving a steel frame.

Eight rope related incidents were recorded such as ascent/descent issues, slings removed by a Level 1 when still in use, a single point deviation, a cut rope and a rope damaged by a Level 3.

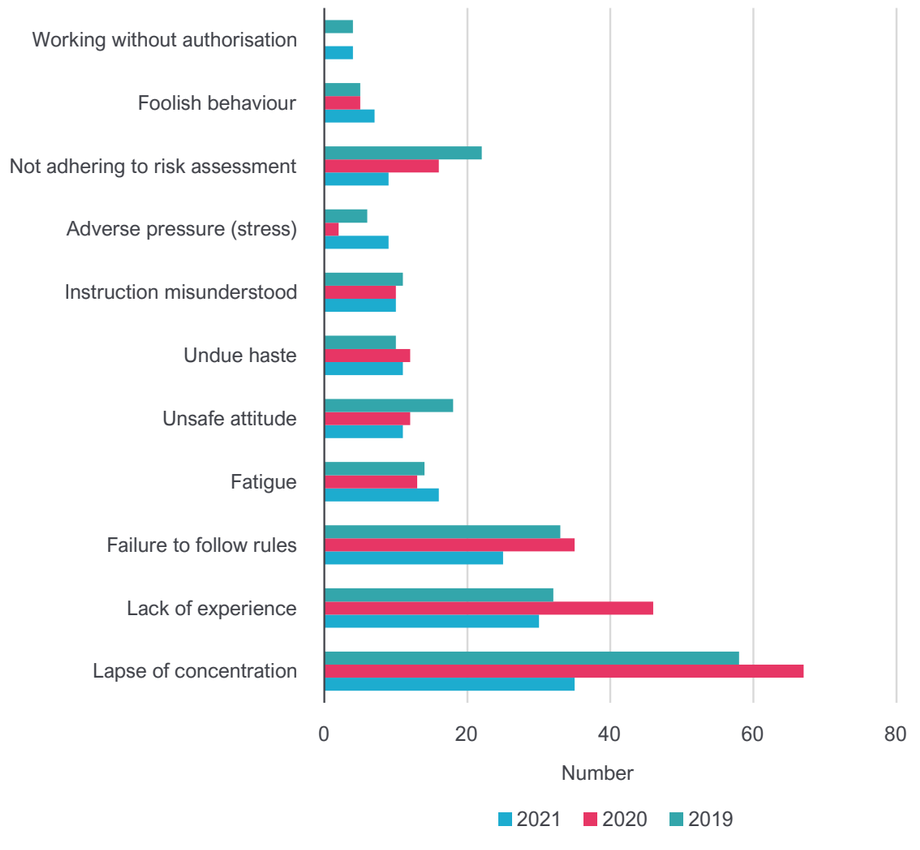
Various miscellaneous items included a medical condition arising after the extended wearing of a harness, and harnesses deposited with sharp tools, all associated with 'Lack of experience'.

'Failure to follow rules' (25) and 'Not adhering to risk assessment' (9) are examined together as the distinction is not considered significant. Four reports combine both. 'Rope and rope related items' totaled 11, from rope edge protectors not correctly placed, to using non-tagged pre-rigged anchors, unauthorised moving work station anchors, not carrying out daily checks on power ascenders and a working line damaged on a sharp edge.

Three instances of 3rd party intrusion, interference with rigged ropes and dropping of cable spindles through rope access worksite were noted.

Other items noted included a Level 2 starting work without supervision, another removing PPE whilst still within a hazardous area, failure to watch a lowering hook despite being instructed to do so, then it snagged (blamed on fatigue), fitting two ascenders to both ropes and finding a damaged rope left by a previous shift crew. The failure to obtain an EMF permit, described previously, would fall into this category also. Perhaps surprisingly, there were only two items related to training.

Figure 13 ¦ Human Factors



‘Fatigue’ was identified as a factor in 16 reports, predictably the majority (10) being with trainees, in one case leading to a free fall onto a cow’s tail. Most trainee cases of fatigue were associated with some form of strain injury or other minor injury. There were two cases of fatigue during work brought on by severe dehydration. A welder, inexperienced in rope access, was exiting a silo via a ‘double drop’ of ropes rigged inside. He became ‘fearful and anxious’ as he tried to negotiate the manoeuvres required. He was eventually understandingly coached out. It appears in several cases that underlying causes brought on fatigue as an outcome.

Of the remaining factors identified, most were connected to one or more other factors. For example, in the case of a Level 2 who commenced working without direct supervision, the event was identified with four factors: ‘Failure to follow rules’, ‘Not adhering to risk assessment’, ‘Unsafe attitude’ and ‘Working without authorisation’.

As noted at the outset, 106 cases identified 167 factors. Thus, the numbers involved in specific factors, say ‘Foolish behaviour’, cannot be added to, say, ‘Unsafe attitude’ since they might both include the same person and the same event.

Of the 35 instances of ‘Lack of concentration’ reported, 12 were linked to other factors including:

- ‘Failure to follow rules’ (5)
- ‘Fatigue’ (2)
- ‘Adverse pressure’ (2)
- ‘Instruction misunderstood’ (2)
- ‘Lack of experience’ (2)
- ‘Undue haste’ (3)
- ‘Working without authorisation’ (1)
- ‘Unsafe attitude’ (1)

Unfortunately, the pro-forma does not include ‘Lack of adequate training’ either in respect of rope access or, for example, use of tools or work equipment that may explain some of the incidents and accidents recorded such as winch operation.

Positive results, over previous reports, include the significant reductions in instances of the major factors, namely:

- ‘Lapse of Concentration’
- ‘Lack of experience’
- ‘Failure to follow rules’ and, collectively, ‘Not adhering to risk assessment’.

Taken together, the implication is that, in general, there had been a significant improvement in the safe behaviour of rope access workers over recent years.

4.12 OTHER FACTORS

3rd Party Acts or Omissions
A specific area of concern in the supplied data was that 26 ‘3rd party acts or omissions’ that affected rope access working either directly or indirectly. The following is a summary, broken down into main headings with some examples:

- **Potential falling objects (9)** - Objects encountered by technicians included a range of tools, pipe lengths, plates, loose detached fire proofing and pipe cladding. The objects were directly at or above working areas or ingress/ egress walkways.

- **Site defects (7)** - Though not necessarily directly interfering in the rope access work, included site defects which were of concern to the rope access workers in some cases. They included a range of items such as a leaking hose, suspicion of hydrogen sulfide leakage from a missing vent blind, newly installed but unsecured handrail not flagged and an old cable still attached to an access ladder. Note that issues caused by constricted hatchways, confined working conditions, congested steelwork and pipework are excluded here, accepted as a normal part of rope access working (see **Figure 10** for a more detailed view of work environment issues).

- **Site control issues (6)** - Though relatively trivial (e.g. wrong dates), three cases of PTW defects were reported, which indicates poor or defective site control. One case of failure to obtain an EMF permit, but with work allowed to continue without it effectively did not comply with the PTW conditions for work in the area and relied on verbal communication. There were three instances reported of site penetration past barriers, one of which was the dropping of cable spindles from above.

- **Rope access gear interference or damage (4)** - There were three instances of actual damage and removal of rope access equipment rigged on site, including cut ropes carried out by individuals intruding into work sites. A further case was reported of interference of rigged ropes by a site worker. A pre-rigged rope used by three shifts, was found damaged by a burn. It was concluded that a previous shift, that included a welder, was responsible – not technically a ‘3rd’ party.

Allied to the above, a note may be taken of work in a grain bin that was filled during the night. Rope access equipment, presumably left rigged, was subjected to an estimated 15 to 27kN loading when the bin was drained some hours later.

There was also one instance of an earthquake which forced a rapid evacuation of a crew from their worksite which was 60m up a chimney.

Exclusion Zones
There were nine identified issues involving exclusion zones. Four involved hazards due to falling ice, with two zones being too small and allowing ice to fall outside the exclusion zones. An object dropped by other workers above, fell

close to technicians who were just about to exit their exclusion zone. Similarly, four cable spindles were dropped from above close to technicians, some distance below in their exclusion zone.

Two other reports noted a technician, moving horizontally along pipework, who subsequently exited their exclusion zone, whilst in another case, technicians preparing to rig ropes were inside another contractor's poorly marked exclusion zone. Finally, a contractor entered an exclusion zone and was reluctant to leave when challenged.

Weather

Sadly, the pro-forma did not ask the simple question 'Was the weather or ambient conditions a factor in the accident or incident?' A search of all reports revealed that a total of 21 events (1 in 12 of all reports) had an element of weather and poor ambient conditions involved, distributed as follows:

- **Sub-zero/Cold conditions** – Of the 12 events noted, six involved ice removal or the potential for falling snow/ice. Three of these events resulted in ice falling outside exclusion zones, one slightly damaging a parked car. The remaining six items involved a variety of issues, from fogged and frozen glasses temporarily removed, allowing debris to enter an eye, to snow covering and hiding a flange resulting in a trip hazard and a slip.

- Another slip was caused by the accumulation of ice from a steam leak condensing and freezing. In one case, extreme low temperatures shortened the life of gas monitor batteries.

- **Wind (3)** - Two events directly resulted from gusts of wind (up to 90 km/hr in one case), which caused dusts and debris to bypass eye protection and contaminated the eyes. During the third incident, technicians were removing insulation from a flare stack when they experienced wind gusts of over 50km/hr.

- **Hot/Dry conditions (6)** – Not surprisingly included three of dehydration, one case exacerbated by travel fatigue. One of the three involved a technician working at an upper level in a sports stadium. Possibly the relatively remote and exposed location may have made rest and access to water more problematic. One event in extreme temperature conditions was a crane failure mid lift whilst handling a spool piece and leaving the load suspended over a walkway. In one case, to prevent the potential of eye contamination from dust or debris, it was decided that all workers must wear full face respirators. Under hot conditions, this resulted in over-heating and prevented water consumption on site, which when required, necessitated leaving the worksite, increasing the amount of rope work required as a result.

Rescue

The need for the rescue of individuals was reported in 18 cases, though specifically nine needed rescue and nine needed assistance to reach a place of safety. The distinction in some cases was somewhat blurred:

- **Rescue** - The 9 cases included two of the fatalities, a very sad and sobering exercise for those undertaking the task. Both shoulder dislocations required rescue, one was sustained during training and required a 5m lower from a rope to ground and the second occurred whilst ascending ropes during inspections. Two rescues were required following the loss of consciousness, which was fortunately temporary in both cases. One was a medical condition which the team were aware of and prepared for the possibility of rescue.

- The second was caused by a land slip overwhelming a driller who was working below during soil nailing and was rescued by his team. The remaining three all involved significant injuries, one technician's hands were crushed in a fall on ropes, another sustained a broken arm during training, when their arm was jammed by the backup during descent and the third was a fractured thumb during bolt tightening on a wharf. In most cases it seems that the injured persons, to a greater or lesser extent, might have been able to give some assistance to their rescuers depending on circumstances and location of the accident and seriousness of injury in each case.

- **Assisted Evacuation** - In nine other cases there was no actual injury or, if sustained, was relatively minor but, in all cases help was required to reach a place of safety. Four incidents occurred during training; a cut nose, a case of fatigue, a cut finger (requiring winch rescue to the ground) and a bruised abdomen (descent on ladder from ropes). 'Frozen' descenders, encountered by a Level 1, necessitated intervention to help descent. Two injuries, one, a lacerated leg during a swing after passing a ledge and the other, a kick back from a grinder injuring an arm, required help in the subsequent escape to the ground for medical assistance. A third required help in ascent out of a confined space after debris entered an eye.

- An inexperienced Level 1 was exiting from a 200ft high, 60ft in diameter concrete silo. Multiple rope manoeuvres were required that, eventually caused the technician to become anxious and fearful, before eventually regaining the exit with coaching and support. Notably, the care and understanding of the 'assisted evacuation' was later supplemented by consideration being given to future use of mechanical aids in similar confined vertical entries from above.

Time Lost

Reported days off work for injured persons was 256.5 days (178.5 days in 2020) with only an additional eight days lost by others, giving a total of 264.5 days lost. However, the figure is less than actual injuries and incidents would indicate. With an equivalent full time workforce of approximately 10,609 (see section 3.4), this equates to ~ 0.025 days per FTE (0.02 in 2020) for time lost for the year. The equivalent rate for, say, UK HSE would be ~ 1 day per employee, some 40 times greater for injuries alone.

Similar figures would be found elsewhere. The difference extends

further still if illnesses were also taken into consideration. Similar conclusions would be reached if other agency figures were examined (e.g. US Bureau of Labour Statistics (BLS), EU Eurostat). Thus, time lost due to accidents was well below normally reported figures. These figures remain almost identical to 2019 and 2020 figures.

The continuing low figure of time lost may be partly explained by the low injury rate and a degree of under-reporting. Even by doubling the reported lost time there would still be a significantly lower lost time rate than reported for other industries and occupations.

This may also reflect the age range, general fitness and inherent resilience of workers involved in rope access as well as close adherence to safe working practices, no doubt encouraged by the obvious hazards of working at height.

Lost time is sometimes calculated on a per million hours basis, termed Lost Time Injury Frequency Rate or LTIFR. This would give 256.5/21.2 = ~ 12 days per million work hours.

SUMMARY OF ACCIDENT DATA

	2021	2020
Total Reports	256	260
Fatalities	3	0
Major Injuries	4	3
Serious (>7 days) injuries	8	7
Minor (<7days) injuries	59	62
Near Miss	182	188

5. SUMMARY

5.1 MEMBERSHIP AND EMPLOYMENT

- **Membership:** increase to 558 IRATA members by Q4 December 2021. *Rate* of increase recovered to the pre-COVID-19 level.
- **Employment:** partially recovered to ~ 18,500 from ~ 16,400 (2020). Change in workforce numbers varied considerably between regions.
- **Working hours:** partially recovered to 21.2 million from 19.4 million (2020). Increases in some regions partly offset by reductions in Far East Asia and South East Asia.
- **Training hours:** partially recovered to 0.65 million from 0.57 million (2020). Changes for individual regions varied considerably.

- **Work hours:** 'Onshore' work hours 13.1 million (12.3 million in 2020). 'Offshore' working 7.4 million (6.6 million in 2020, well short of the 9 million in 2019).
- **'On Rope' working:** 11.2 million work hours, recovering from 9.9 million in 2020, slightly exceeding 11.1 million hours in 2019.
- **Distribution of work hours: the main grades are as follows**:
  * Level 3 6.4m (5.2 million 2020)
  * Level 2 3.5m (3.1 million in 2020)
  * Level 1 7m (7.1 million in 2020)

5.2 ACCIDENT AND INCIDENT REPORTS

Risk of any Injury

- Marginally higher when 'On Rope' compared to 'Other' (or 'Off Rope') working.
- Marginally higher 'Onshore' than 'Offshore'.
- Highest when training.
- Little difference in all injury rates between the three levels, but 6x higher for trainees.

Body Part Injuries

- **Most vulnerable:** face/eyes, hands/fingers, and arms.

Reasons for Reporting Accidents and Incidents

- **Most reported:** 'Operator error or omission' and 'Medical condition/Strain'.
- **Followed by:** 'Plant and/or work equipment failure' and 'Falling or dropped objects'.
- **Injury/illness:** greatest with 'Operator error or omission', 'Contact with tool(s), materials or equipment' and, by definition, 'Medical Condition'.
- **Noted:** 'Rope damage' (16 cases), 'Rope and rigging error/omissions' (15 cases) and 'Fall from height' (9, two of which were fatal).

Management

- **Main item:** 'Failure to identify hazard(s)' (as in 2020).

Working Environment

- **Widespread with major concern:** 'Worksite access/ingress'.

Plant and/or Work Equipment

- Wide spread with the main problem being 'Safety device inoperative or faulty'.

PPE Issues

- **Most common:** 'Incorrectly used' followed by 'Defective'.

Human Factors

- **Greatest concerns:** 'Lapse of Concentration', followed by 'Lack of experience' and 'Failure to follow rules'.

Other Factors

- **3rd Party acts or omissions:** 26 reports.
- **Influence of weather:** 21 events (Hot/cold/wind).
- **Rescues:** nine cases, 'Assisted evacuation' in nine more.

6. CONCLUSIONS

- Overall, employment and worked hours recovered despite the continuing COVID-19 pandemic but both short of pro-rata increases with IRATA membership. However, three regions in particular continued to have greatly reduced employment and associated work hours. Full recovery was hampered largely by a combination of Level 1 ‘losses’ and reduced ‘Offshore’ working.

- The fact that all three fatalities were suffered by Level 3 technicians, and presumably all experienced, cannot be ignored and warrants further investigation for ‘lessons learnt’ along with previous fatalities. Initial indications for the two fatalities that were submitted with some information, indicated that a ‘Lapse of Concentration’ and/or ‘Failure to follow rules’ may have contributed to the accidents. Other factors may emerge on closer examination.

- Of all the factors involved in accident and incident reports, ‘Failure to recognise and identify hazard(s)’ was the most common. The following are highlighted from the reports:

  * Ingress/egress issues included site deficiencies, constricted hatchways, structural defects, loose or missing gratings, adequacy of exclusion zones, potential of falling objects and site security concerns.

  * At work sites, Issues of constricted or congested work zones, adequacy of anchor points, pre-installed rope handling or anchoring equipment and loose or unstable ground conditions reported.

  * Threats to ropes included exposed hot pipes, damaged or loose pipework cladding, sharp or abrasive edges, Issues of fitting and retaining in place edge protection measures.

  * For long, constricted and complex descent/ascent conditions it was suggested that mechanical aids should be considered. This seems a sensible suggestion, bearing in mind the need for training, maintenance, regular inspection and care in use of such equipment as demonstrated in two reports (and related incidents in previous years involving the use of winches damaging ropes).

  * In dusty windy conditions, adequacy and suitability of eye protection measures apparently were ineffective or misused in several reports. This suggests care in selection and use of appropriate eye protection was required, subject to practical considerations. This continued to be a significant cause of eye injury.

  * Continuing ‘Hazard identification’ was needed throughout working where ‘change’ of circumstances such as site operations, communication Issues or changing weather conditions occurred.

- Pre-use inspection of all rope access equipment frequently identified defective or damaged items, confirming the value of all technicians checking gear thoroughly and no reliance placed on as-issued equipment. Fortunately, this was extended to equipment and ropes left in place and revealed defects and damage caused by others in at least three reports.

- At the individual level, and applicable to all grades, ‘Lapse of Concentration’, taken together with ‘Lack of experience’ and ‘Failure to follow rules’ continued to be a major concern and were important factors in 14 injuries, five being serious and also possibly, at least two fatalities. The significance of these findings in terms of recruitment and selection may be considered.

- The general reduction in ‘negative’ human factors attributed to accidents and incidents may be an indication that the ‘quality’ of technicians in respect of rope access activities had improved in recent years.

- There was a high incidence of errors and omissions in submitted accident and incident reports.

7. RECOMMENDATIONS

Based on the data examined and the conclusions presented, the following recommendations are made:

1. **IRATA members** should be congratulated on the recovery of employment and work in most regions, despite the continued threat from the COVID-19 pandemic during 2021.

2. **In view of the deleterious effect on statistics of the fatality rate** prevailing, it is recommended that all seven fatalities in the last five years be collectively examined to determine if any common underlying causes and 'lessons to be learnt' emerge that might not have been revealed by individual case reports.

3. **Whilst IRATA members may not have direct control over actions of individuals** (people make mistakes), there is a collective responsibility to examine their own company activities and workforce with an intent to prevent accidents and loss of life wherever and however possible in the future. Therefore, it is recommended that IRATA members critically examine their working practices and staffing, taking into account, for example, some of the findings in this report such as those identified in 'Reason for reports', 'Management' and 'Human factors'.

4. **Whilst 'life is not without risk', this industry depends more than most on controlling risks.** Thus, risk assessment and hazard identification, including pre-start inspection of work sites, continued to be essential (examples in Conclusions). Further, continued surveillance during conduct of work, particularly when conditions were liable to change, had also been found necessary. Therefore, it is recommended that managers and supervisors should be encouraged to improve endeavours to identify potential hazards.

5. **However, merely identifying hazards alone is insufficient.** The mitigation of significant hazards wherever possible must follow. The implementation of any realistic measures to reduce significant risks may be needed, including the change or modification of working practices and factors involving personnel. Therefore, it is recommended that managers and supervisors always consider what, if any, mitigation measures can be realistically taken to reduce hazards with any and all associated risks. This should include consideration of 'human factors' along with site/job concerns.

6. **Modifications and revisions** to the accident/incident reporting format are required.

Notes on COVID-19

The report produced in 2020, based on 2019 data comparisons, showed the extent of reductions in employment and work hours that the pandemic probably caused. Although there was the start of some easing in 2021 it was by no means universal and this was reflected in the

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data supplied. The following summarises some of the main findings within this report believed to relate to the continuing COVID-19 pandemic:

- **The rate of increase in IRATA membership** overall nearly returned to pre-pandemic levels, increased in some cases but continued to fall in some regions.

- **Employment work hours** overall followed suit. Major recoveries in work hours, for example, were recorded by UK (+1.44 million hours), MECASA (+0.77 million hours) and Australasia (+0.5 million hours).

- **However, these gains were partially offset** by reductions in Eastern Europe (-0.17 million hours), Far East Asia (-0.17 million hours) and South East Asia (-0.33 million hours).

- **Reported employment** numbers were commensurate with work hours with notable increases for Australasia (+454), MECASA (+630) and UK (+539) but decreases with Far East Asia (-231) and South East Asia (-267).

- **Although recoveries in employment and work hours** overall were recorded, they did not reach the levels expected in relation to IRATA membership recovery. The 21.2 million work hours recorded would have been expected to reach over 24 million hours, based on the rise in IRATA membership.

- **The utilisation of employees** still continued to fall, most notably for Level 1s, which may be a direct result of continuing COVID-19 concerns inhibiting 'normal' working practices and unavailability of staff, such as, due to competing non-rope access working or imposed isolation.

- **Continuing pressures**, particularly in Far East Asia and South East Asia, may explain the large reductions seen in those regions.

- **The largest reductions in 2020 work hours** were associated with 'Offshore' working. This seems to have recovered in 2021, perhaps due to the need to 'catch up' on deferred work allied to the easing of COVID-19 measures on many installations.

- **'Onshore' 'On Rope' working** continued to increase but 'Other' working remained static, perhaps reflecting the need to minimise support effort wherever possible.

- **There were no reports of specific COVID-19 issues** in 2020 despite the persistence of the pandemic but several reports in 2021 identified actual COVID-19 concerns whilst at work, one confirmed.

It remains to be seen if recovery continues in 2022 despite the persistence of the pandemic.

ACKNOWLEDGMENTS

The assistance of IRATA Head Office in compiling, arranging and presenting data is gratefully acknowledged. Also recognised is the considerable effort of the IRATA member companies' staff who produce and submit the data required. This report could not be prepared without their collective effort.

Appendix I • Accident Rates for 'On Rope' Working 1989 - 2021

Year	No. of IRATA members	Work hours on ropes	'Not Reportable' (Less than 7 days injury/ Minor)	'Reportable' (Fatal, Over 7 days Injury/ Major)	Reportable All Accidents (per 100,000 FTE)* **	Rate for All Accidents * ***
1989	9	267,504	8	0	0	6000
1990	12	327,645	7	0	0	4260
1991	16	457,928	17	0	0	7420
1992	22	537,920	13	1	380	5200
1993	23	327,000	21	0	0	12840
1994	32	348,749	11	0	0	6300
1995	32	484,285	16	0	0	6620
1996	26	559,035	18	2	720	7160
1997	31	699,688	11	9	2580	5720
1998	37	1,006,538	23	10	1980	6600
1999	33	803,365	29	3	740	7980
2000	34	887,206	21	3	680	5420
2001	49	999,010	25	4	800	5800
2002	49	1,225,930	12	0	0	1960
2003	56	1,634,482	9	0	0	1100
2004	67	1,457,848	22	1	140	3160
2005	81	2,311,265	10	3	260	1120
2006	95	2,132,141	21	1	100	2060
2007	130	2,765,483	21	2	140	1660
2008	149	3,859,584	25	8	420	1700
2009	170	4,582,642	15	14	660	1260
2010	184	5,247,365	18	4	160	840
2011	217	5,209,056	17	5	200	840
2012	247	5,655,637	19	4	140	820
2013	277	7,012,270	28	3	86	880
2014	315	7,591,977	16	5	132	560
2015	333	10,096,489	25	3	60	560
2016	353	9,232,382	13	4	87	368
2017	389	9,124,565	28	8	175	789
2018	443	9,784,618	37	4	82	818
2019	516	11,151,476	36	4	72	718
2020	530	9,845,327	35	3	61	772
2021	558	11,241,943	25	8	142	587
TOTAL		**128,868,353**	**652**	**116**		

Based on 2,000 hours per person per annum

** Col 5 divided by col 3 (x 2000 x 100,000)

* Units for Accident Rate (AR) number per 100,000 workers

*** Col 4 + 5 divided by col 3 then x 2000 x 100,000

Appendix II • Glossary of Terms Used

Throughout the report, reference is made to the following categories of work location:

'On Rope' - Arranging, using and directly involved in rope access work. It also includes access and egress activities to rope access work sites and setting up belays, rigging and de-rigging. Thus, this does not necessarily require a person to be 'roped up' or physically connected to active ropes.

'Other' - Typically includes all other work, both on and off-site, in offices and elsewhere that is in support of rope access and related activities. 'Other' also includes all hours not accounted for by the above category including rope access trainers (unless actively on rope) and all non-rope access training.

'Training' - Activities undertaken at rope access training facilities and establishments by trainees, including assessment. It excludes all trainers and training staff, whose work hours should be reported under either of the above categories. All other training, induction courses, trial work, specialist courses (e.g. use of breathing apparatus, first aid) are excluded, and are reported under 'Other'.

For the purpose of this report, the distinction is made between:

'Accident' - An unintended event when personal harm, injury or fatality occurs at work or is caused at work. This will include sprains, strains, illnesses or Medical Condition issues brought on by or made worse by work, and

'Incident', 'Near Miss' or **'Dangerous Occurrence' -** Any event or situation where no personal harm or injury occurred but which could have led to injury or fatality. In response to comments received, the terms 'incident' or 'Near Miss' replace 'Dangerous Occurrence' throughout the report although are synonymous. Identification of the grade(s) of personnel involved is not required for 'Near Miss' events.

In dealing with accidents, the following terms are used:

'Fatality' - Death within one year as a result of an accident or illness at work or caused by work.

'Major Injury' - Injuries that meet criteria common to most European agencies and other countries and as listed in IRATA reporting arrangements. 'Major' injuries would include, for example, broken major bones, amputations, major dislocations, loss of eyesight and need for resuscitation. There is no associated criterion for 'days off work'.

'Over 7 Day Injury' or **'Serious Injury' -** Not a 'Major' injury but an injury requiring more than seven days away from normal work irrespective of cause. 'Serious Injury' is synonymous with 'Over 7 Day Injury' and may be used to minimise confusion with:

'Less than 7 Day Injury' or **'Minor Injury' -** The criterion for a non-reportable accident is now 'less than 7 days off work' (although required to be recorded in the UK by duty-holders). If any injury is incurred, no matter how trivial, the minimum reporting level is 'Less than 7 Day Injury' and, in this report, includes all incidents of ill-health and sprains/strains (see below) unless resulting in 'Over 7 Day Injury' or 'Serious Injury'. 'Less than 7 Day Injury' is synonymous with 'Minor Injury'.

'Medical Condition' - A medical condition that leads to interruption or suspension of work due to non-injurious causes e.g. psychological, heat - or cold-stress, taken unwell (headache, stomach upset) or other non-trauma medical condition brought on by or made worse by work. Reported as either 'Over 7 Day/Serious Injury' or as 'Less than 7 Day/Minor Injury' or, if death occurs within 12 months, fatality.

'Sprains/Strains' - Muscular injuries that result in prevention or cessation of work. As above, reported as 'Over 7 Day/Serious Injury', otherwise as 'Less than 7 Day/Minor Injury'.

'Reportable Accidents' - For comparative purposes, this term is the total of all 'Fatalities', 'Major Injuries' and 'Over 7 Day/Serious Injuries'. Thus, 'Less than 7 Day/Serious Injury' and 'Incidents' are excluded when comparisons are made with international statistical data, although Eurostat and BLS data are based on different criteria of time off work.

Appendix III • Summary Table of RAC Hours by Location

RAC	'Onshore' on rope	'Onshore' other	'Offshore' on rope	'Offshore' other	Training	Total 2021	Total 2020
Australasia	503,202	235,124	262,290	222,501	30,627	1,253,744	1,752,290
Benelux	204,085	115,123	56,398	9,241	6,822	391,669	448,157
Brazil	64,586	90,180	92,159	73,811	145,496	466,232	344,665
D-A-CH	16,531	48,762	8,842	3,615	2,161	79,911	77,035
Eastern Europe	69,519	131,248	73,645	88,584	48,100	411,096	586,935
Far East Asia	36,993	33,804	24,842	61,901	10,899	168,439	339,948
Mediterranean	162,561	147,286	37,112	27,827	30,193	404,979	285,928
MECASA	2,184,289	1,974,693	415,119	504,502	112,015	5,190,618	4,418,123
North America	867,822	403,403	31,919	14,660	62,730	1,380,5334	1,299,043
North Sea Ops	180,978	534,890	771,488	1,356,959	7,626	2,851,941	2,512,745
Other	503,202	235,124	262,290	222,501	30,627	1,253,744	1,223,319
Scandinavia	53,646	93,654	37,205	77,593	3,316	265,4134	236,756
South Africa	61,026	183,516	256,679	271,387	24,816	797,424	695,056
South East Asia	179,731	315,115	197,788	252,281	38,827	983,742	1,315,813
UK	2,502,616	962,669	1,123,383	632,066	97,058	5,317,792	3,876,408
Total	**7,590,787**	**5,504,591**	**3,651,159**	**3,819,429**	**651,313**	**21,217,279**	**19,412,219**

Appendix IV • Summary Table of RAC Employment by Grade

RAC	Managers	Level 3	Level 2	Level 1	Others	Total 2021	Total 2020
Australasia	96	767	394	918	107	2,282	1,828
Benelux	40	193	88	151	39	510	477
Brazil	44	239	134	332	78	828	612
D-A-CH	12	34	8	18	12	84	132
Eastern Europe	46	212	79	173	40	549	611
Far East Asia	22	53	41	54	12	181	412
Mediterranean	40	122	60	165	37	423	347
MECASA	149	729	688	1,188	434	3,187	2,557
North America	106	546	228	756	97	1,733	1,571
North Sea Ops	34	627	313	768	241	1,983	1,720
Other	47	227	187	318	116	894	581
Scandinavia	22	119	45	57	17	260	232
South Africa	39	171	102	225	73	611	577
South East Asia	52	277	159	436	63	986	1,253
UK	237	1,394	634	1,507	247	4,019	3,480
Total	**985**	**5,709**	**3,160**	**7,062**	**1,611**	**18,535**	**16,390**

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