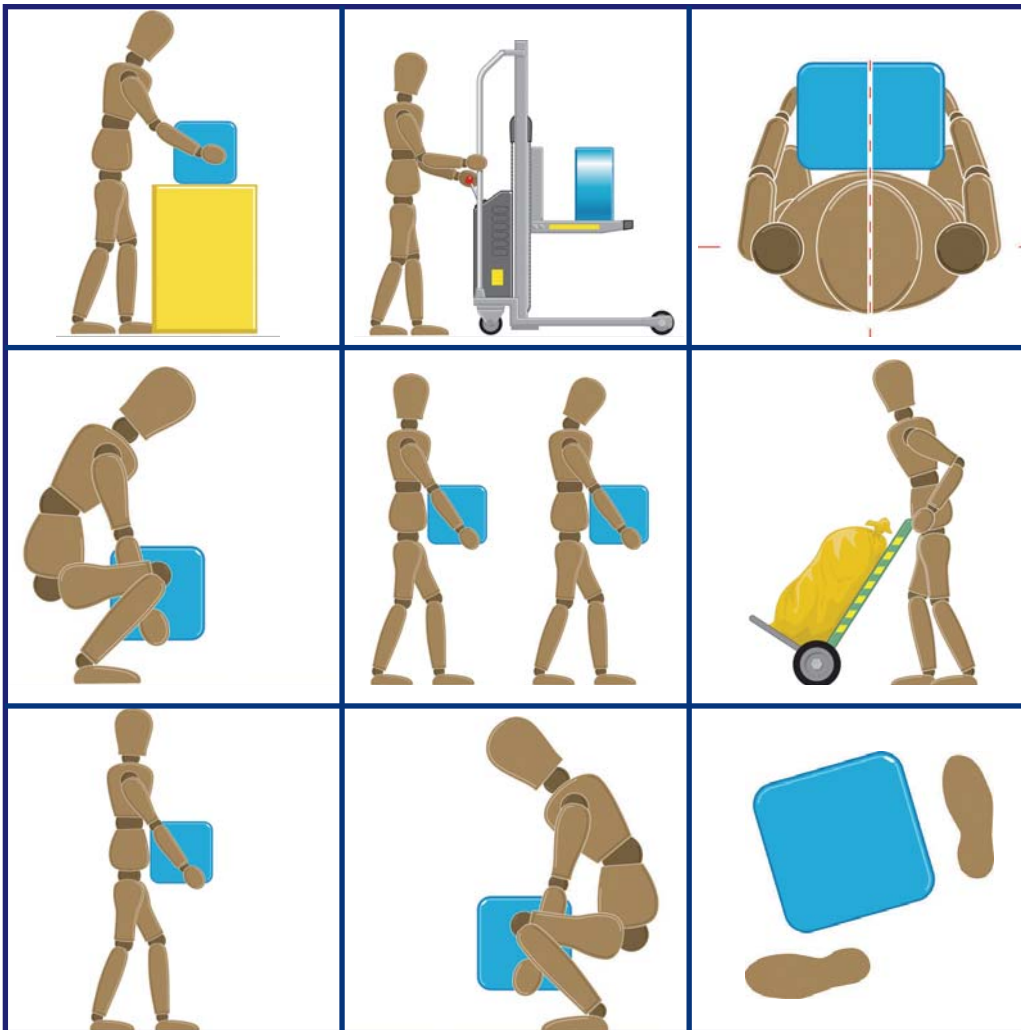




HEALTH AND SAFETY
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Best Manual Handling Practices at Dublin Airport

EXECUTIVE SUMMARY



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BEST MANUAL HANDLING PRACTICES AT DUBLIN AIRPORT

AUTHORS

C.A. Duignan B.NS, M.Sc.

E. F. Fallon B.E., M.Eng.Sc., M.Erg.S, FIES

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Abstract

This report is an executive summary of the project “Best Manual Handling Practices at Dublin Airport”. It outlines the rationale and background to the project. Reference is made to previous research and its implications for manual handling in airports. Recommendations derived from primary and secondary research, and airport benchmarking are presented under the following headings: check-in work, baggage handling work, the handling of a person with reduced mobility, and the musculoskeletal health of passengers. These recommendations are categorised under the following four headings: building infrastructure and design, mechanical aids / assistive devices, operational procedures and guidelines, and people behaviour. The main conclusion from the project is that solutions to reducing manual handling related injuries among airport workers are, in the short term, to be found in the introduction of mechanical aids, but in the long term, through the implementation of higher levels of automation.

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1. Executive Summary

Since 2000, manual handling has been the primary cause of all reportable workplace injuries to the Health and Safety Authority (HSA 2000-2003). The predominant body part affected is the back/spine with sprain/torn ligaments the most common type of injury suffered. This trend in back injury occurrence directly attributable to manual handling activities at work is evident worldwide and airport workers are one occupational grouping not immune to such injuries. In an effort to address the large proportion of work-related manual handling injuries in Ireland, the Health and Safety Authority (HSA) have implemented several projects over the past three years to address the issue industry wide. In 2001, an alliance was formed between the Health and Safety Authority, the Irish Airports Authority (Aer Rianta) and the National University of Ireland, Galway (NUI, Galway) to investigate manual handling practices in the aviation industry. A research project entitled “Best Manual Handling Practices at Dublin Airport” evolved with the primary focus on manual handling of baggage by airport workers, and the handling of a person with reduced mobility (PRM); baggage handling by passengers was also explored. This project coincides with the 4-year Manual Handling Programme currently being implemented by the Health and Safety Authority since 2001 (HSA 2001). This programme involves activities such as a manual handling inspection programme across five sectors, development of guidelines for inspectors, research, and the review of existing guidance on manual handling. It is anticipated that the findings and recommendations from this project will contribute to the overall efforts of the Health and Safety Authority to combat the problem of manual handling related workplace injuries.

Technological and industry-wide advances may reduce, in the long term, the level of manual handling at airports. The evolution of the self-service check-in system has had a positive impact on the work of check-in agents as it effectively reduces their repetitive computer work and handling of passenger baggage. Baggage handling technology such as containerised loading and fully automated baggage handling systems are, to a certain extent, eliminating tasks ordinarily performed by baggage handlers. The manual handling associated with embarking and disembarking a person with reduced mobility has also been addressed as a motorized hoist system, which eliminates manual handling inside the aircraft, arrived on the market earlier this year. Musculoskeletal strain imposed on passengers by their baggage has to a certain extent been reduced due to improvements in baggage design such as the addition of wheels to suitcases and lumbar support belts to rucksacks. Although all of these advances are gradually becoming the norm, in the interim, it is necessary that measures be taken to address the current health and safety risks associated with manually handling baggage and handling a PRM at Dublin Airport.

Ergonomic research has highlighted the extent of the baggage handling problem. Check-in agents demonstrate high levels of musculoskeletal disorders primarily of the back and neck, which cause a significant level of interference with their work (Roskam 2003). The musculoskeletal health of baggage handlers is also affected as this group have high prevalence rates of low back and knee conditions (Rückert and Rohmert 1991). The consequences of these conditions such as high levels of absenteeism, transfer or termination of employment, and personal injury claims, must be highlighted as the catalyst for improving the working life of these two groups of airport workers. In terms of the most hazardous baggage handling postures, research has identified the task of unloading and loading baggage inside the hold of narrow-bodied aircraft as imposing the greatest biomechanical and physiological strain (Rohmert et al., 1989, Rückert et al., 1992, Dell 1997). The use of in-plane loading systems has been shown to reduce the extent of the strain imposed by the geometry of the baggage

compartment workspace (Dell 2000). No research exists on the adverse effects of handling passengers with reduced mobility. The main manual handling activity associated with a PRM is embarking and disembarking aircraft. Evidence of the musculoskeletal strain of transferring a PRM from a wheelchair into an aisle chair and into an aircraft seat, can be extrapolated from healthcare research. Similar transfers performed regularly in the hospital environment, such as transferring from a wheelchair into a chair, have been identified as contributing to the development of musculoskeletal disorders (Hignett 1996, Ore 2003). The use of assistive devices and proper transfer techniques are two strategies shown to decrease musculoskeletal strain (Elford et al., 2000, Zhuang 2000).

The handling of baggage by passengers is a topic greatly under-explored therefore research is imperative to reiterate the importance of passengers packing baggage that they themselves can handle safely i.e. baggage weights should be no greater than 25-30% of the passengers body weight.

A benchmarking exercise involving the three Irish international airports, at Dublin, Shannon, and Cork, and three European airports, at Birmingham, Düsseldorf, and Frankfurt, highlighted where improvements could be made at Dublin Airport regarding the manual handling of baggage and also the handling of PRMs. Aspects of airport infrastructure, ground handling operations, and specialist PRM handling operations at the airports were deemed best practice e.g. job rotation for check-in staff in Frankfurt Airport, and the use of mobile baggage conveyor systems for all bulk loaded aircraft at Düsseldorf Airport. The findings from both a literature review and the benchmarking exercise were the determinants of the primary research conducted as part of this project. Each study was categorised into a Primary Research Package.

The necessity to minimise manual handling related injuries among airport workers is now being recognised by several national authorities for workplace health and safety. The Irish Health and Safety Authority commissioned this project in 2000 due to the lack of research-based manual handling guidelines for airport workers. The American Occupational Safety and Health Administration (OHSA) in 1996 produced ergonomic guidelines relating to the performance of baggage handling tasks and also the handling of a PRM; these have been updated in 2003 (OHSA 1996 and 2003). Similar to OHSA, the UK Health and Safety Executive (HSE) in the summer of this year produced guidelines derived 'from experience' (HSE 2004). This HSA / Aer Rianta / NUI, Galway research project has been in progress since 2001 and the recommendations made in this report are research-based as they are derived from the findings of primary and secondary research and airport benchmarking. A holistic approach was adopted to aid in reducing the occurrence of musculoskeletal disorders. This incorporated acknowledgement of the cause of musculoskeletal disorders as being multi-faceted and thus advocating that an improvement in manual handling procedures through ergonomic operational guidelines should be complimented with efforts to improve the general health and lifestyle of the workers through health promotion programmes. This approach involved establishing the extent of the baggage handling problem i.e. the prevalence of musculoskeletal conditions among baggage handlers, and thus the contributing factors e.g. work and lifestyle. Once an insight was gained into the possible causative factors of musculoskeletal conditions, recommendations could thus be made regarding ergonomics-based manual handling practices and occupational health / health promotion services.

Solutions to the problem of manual handling injuries are dependent on the concerted action of passengers, the airport authority, the relevant airport workers i.e. those performing the manual handling tasks, and their employers which includes airlines, ground handling companies, and specialist handling companies.

2. Evidence-based Recommendations

This section outlines the specific evidence-based recommendations that have been derived from findings of the secondary research (the literature review), the airport benchmarking, and the primary research (original studies conducted as part of this project).

A. CHECK-IN WORK

1. **For the ground handling companies (self-handling airlines and third-party handlers)**
 - 1.1. Building infrastructure design and layout
 - 1.1.1. Adopt a participatory approach to any design aspect of check-in workstations
 - 1.2. Operational procedures and guidelines
 - 1.2.1. Implement task rotation on every shift for each check-in agent
 - 1.2.2. Provide ergonomics training on computer workstations (e.g. workstation layout, and stretching exercises)
 - 1.2.3. Revise procedural guidelines to incorporate ergonomics issues such as the elimination of the need to move passenger baggage and the elimination of over-reaching when returning passengers documentation
 - 1.3. People behaviour
 - 1.3.1. Conduct pre-employment medical assessments on potential check-in staff
 - 1.3.2. Implement a multidimensional musculoskeletal disorder prevention programme (e.g. ergonomics programme, health education, back and abdominal muscle strengthening exercises, back school)
 - 1.3.3. Implement health promotion programmes tailored to check-in agents i.e. the Happy Heart at Work Programme, which incorporates advice on healthy eating, smoking cessation, and exercise in the workplace and at home. Provide health information sessions and healthy food options in work canteen
2. **For the airport operator**
 - 2.1. Building infrastructure design and layout
 - 2.1.1. Provide self-service check-in systems for all airlines

B. BAGGAGE HANDLING WORK

1. **For the ground handling companies (self-handling airlines and third-party handlers)**
 - 1.1. Building infrastructure design and layout
 - 1.1.1. Ensure participation of baggage handlers in any infrastructure design concerning baggage handling e.g. design and layout of baggage hall
 - 1.1.2. Conduct regular ergonomics audits at key decision points in the design process of any new system introduced and used by baggage handlers
 - 1.1.3. Conduct risk assessments throughout any design process
 - 1.1.4. In the baggage hall: designate a specific section along the baggage conveyor as the loading bay i.e. all lifting of baggage must be performed in this area thereby minimising unnecessary carry distances.
 - 1.2. Mechanical aids / assistive devices
 - 1.2.1. In the baggage hall: provide mobile non-powered roller conveyor units to assist in transferring baggage between baggage conveyors and baggage carts used for loose-loaded aircraft

- 1.2.2. On the ramp: use both standard size and small-scale mobile baggage conveyors for unloading and loading all aircraft
- 1.2.3. Install in-plane loading systems in suitable aircraft (self-handlers)
- 1.3. Operational procedures and guidelines
 - 1.2.1. Ensure ongoing task specific risk assessments of baggage handling in the baggage hall, on the ramp and in the baggage compartments of aircraft. Implement the appropriate controls including safe work practices. Consideration must be made of the risk assessments conducted in the design phase of building infrastructure
 - 1.2.2. Regularly rotate baggage handlers between the baggage hall and the ramp
 - 1.2.3. In the baggage hall: revise procedural guidelines in conjunction with the baggage handlers for the loading of baggage into carts and containers to include good ergonomic principles i.e. eliminate the need for unnecessary carry distances
 - 1.2.4. On the ramp: provide operational guidelines on the optimal use of mechanical aids for unloading and loading narrow-bodied aircraft e.g. adjusting the mobile baggage conveyor to an optimal working height and the strategic parking of baggage carts in relation to the conveyor
 - 1.2.5. Implement a strict protocol on adherence to a heavy bag tag policy
 - 1.2.6. Implement a preventive maintenance programme for all baggage carts, containers, and mobile baggage conveyors
 - 1.2.7. Purchase baggage carts that have hinged side panels to facilitate easier loading and unloading of baggage
- 1.3. People behaviour
 - 1.3.1. Conduct pre-employment medical assessments of all potential baggage handling staff
 - 1.3.2. Conduct medical check-ups on each baggage handler every three years
 - 1.3.3. Implement a multidimensional musculoskeletal disorder prevention programme (e.g. ergonomics programme, health education, back and abdominal muscle strengthening exercises, back school)
 - 1.3.4. Implement health promotion programmes tailored to baggage handlers i.e. the Happy Heart at Work Programme, which incorporates advice on healthy eating, smoking cessation, and exercise in the workplace and at home. Provide health information sessions and healthy food options in work canteen
 - 1.3.5. Provide task-specific manual handling training at induction i.e. training on working in the baggage hall, on the ramp, and in the baggage compartments of aircraft
 - 1.3.6. Provide refresher manual handling training three years after induction training
 - 1.3.7. Implement a formal Return-To-Work Programme for injured baggage handlers
- 2. **For the airport operator**
 - 2.1. Building infrastructure design and layout
 - 2.1.1. Adopt a participatory approach to the design of any aspect of baggage handling e.g. design and layout of the baggage hall

- 2.2. Operational procedures and guidelines
 - 2.2.1. Promote the use of in-plane loading systems in narrow-bodied aircraft
 - 2.2.2. Explore the feasibility of Airports Council International (ACI) – Europe introducing a policy on airport baggage item weight limits
 - 2.2.3. Implement a policy on a baggage item weight limit irrespective of whether or not it becomes an ACI-Europe recommendation i.e. no one single baggage item either entering or departing from the airport can weigh greater than 32kg
 - 2.2.4. Implement a policy on the application of heavy bag tags i.e. all baggage items weighing 20kgs and over are tagged with a heavy bag tag
- 2.3. People behaviour
 - 2.3.1. Provide task-specific manual handling training for airport operator staff working at oversize baggage belts. Advise not to perform any manual handling of passenger baggage
3. **For ground service equipment manufacturers:**
 - 3.1. Re-design baggage carts in order to minimise over-reaching.

C. HANDLING OF A PERSON WITH REDUCED MOBILITY (PRM)

1. **For companies providing handling assistance to a PRM**
 - 1.1. Mechanical aids / assistive devices
 - 1.1.1. Use ambu-lifts for all lift-on / lift-offs of a PRM for aircraft not interfaced with the terminal building via an airbridge
 - 1.1.2. Use motorised hoist systems, similar to the ErgoPort, when providing assistance to paraplegics with transfers between wheelchair, aisle chair, and aircraft seat and vice versa. If systems not available, transfer boards should be used.
 - 1.2. Operational procedures and guidelines
 - 1.2.1. Conduct pre-employment medical assessments of all potential staff
 - 1.2.2. Implement a multidimensional musculoskeletal disorder prevention programme (e.g. ergonomics programme, health education, back and abdominal muscle strengthening exercises, back school)
 - 1.2.3. Implement health promotion programmes tailored to baggage handlers i.e. the Happy Heart at Work Programme, which incorporates advice on healthy eating, smoking cessation, and exercise in the workplace and at home. Provide health information sessions and healthy food options in work canteen
 - 1.2.4. Implement a preventive maintenance programme for all wheelchairs
 - 1.2.5. Conduct weekly maintenance checks on the ambu-lift
 - 1.2.6. Comply with the lease agreement for the ambu-lift by providing the vehicle to the leaser for maintenance at the predetermined intervals.
 - 1.3. People behaviour
 - 1.3.1. Provide task-specific manual handling training on the handling of a PRM
 - 1.3.2. Provide disability awareness training for all staff at induction and every three years thereafter

2. **For the airport operator**
 - 2.1. Building infrastructure design and layout
 - 2.1.1. Provide a wheelchair-friendly check-in desk and information desk
 - 2.1.2. Consider a universal design approach for any airport extensions or modifications
 - 2.1.3. Maintain flooring of airbridges in good condition
 - 2.2. Mechanical aids / assistive devices
 - 2.2.1. Provide a lease of an appropriate ambu-lift to the company providing passenger assistance at the airport. This should incorporate a preventive maintenance programme with which the handling company must comply
 - 2.3. Operational procedures and guidelines
 - 2.3.1. Implement the Airports Council International (ACI) Special Protocol for the Handling of PRMs
 - 2.3.2. Appoint a Complaints Resolution Officer to deal with complaints made by PRMs regarding the airport infrastructure and services
 - 2.3.3. Implement a policy on compulsory use of ambu-lifts to perform all lift-on / lift-offs for all aircraft not interfaced with the terminal building via an airbridge
 - 2.3.4. Liaise with the National Disability Authority and the Department of Transport in order to devise a Code of Practice on the handling of a PRM at Dublin Airport
 - 2.4. People behaviour
 - 2.4.1. Provide disability awareness training for all airport operator staff at induction and every three years thereafter
3. **For the airlines**
 - 3.1. Provide moveable arm-rests on all seats on a minimum of two rows of seats on every aircraft
4. For the government (Department of Transport)
 - 4.1. Produce regulations on the provision of services to a PRM at Irish airports; this should include the use of ambu-lifts, and recommended personnel training of persons providing the assistance
 - 4.2. Liaise with the National Disability Authority and Dublin Airport Authority to produce a Code of Practice on the handling of PRMs at Dublin Airport

D. MUSCULOSKELETAL HEALTH OF THE PASSENGER

1. **For the air traveller**
 - 1.1. Business travellers should use a suitcase on wheels that can also support a laptop bag (thereby eliminating the one-shoulder load carriage)
 - 1.2. Purchase suitcases that have appropriate retractable handles and rucksacks that have both a lumbar waist belt and wide padded shoulder straps
 - 1.3. Pack baggage weighing no greater than 33% body weight for males and 25% for females and passengers should reduce the weights if they have any pre-existing musculoskeletal or cardiac condition
 - 1.4. Take care when lifting and lowering baggage items as these activities cause the back and shoulder muscles to exert the greatest muscular forces

- 1.5. Avoid one-shoulder load carriage by changing the load carriage method to a suitcase or to two shoulder carriage (i.e. via a rucksack, or even dividing the load in two, and wearing two shoulder bags thereby distributing the load across the both shoulders)
- 1.6. Use baggage trolleys at airports (to eliminate the carrying of loads)
2. For the airport authority
 - 2.1. Building infrastructure design and layout
 - 2.1.1. Provide self-service check-in systems (SSCI) for all airlines operating at the airport
 - 2.1.2. Provide posters throughout the airport including car-parks, bus-stops, taxi-ranks, advising passengers to use baggage trolleys, to be cautious when lifting baggage, and to pack lighter bags for their subsequent trips
 - 2.1.3. Provide signage at the front of each check-in desk, SSCI, and at the oversize baggage counter indicating how check-in baggage should be safely placed on baggage conveyors
 - 2.2. Mechanical aids / assistive devices
 - 2.2.1. Ensure a sufficient number of baggage trolleys are placed at strategic locations throughout the airport car parks, taxi-ranks, bus stops and in the terminal building. Provide hand-baggage trolleys in the departures area
 - 2.2.2. Provide hand baggage trolleys in the departure lounge
 - 2.3. Operational procedures and guidelines
 - 2.3.1. Include advice on weights of bags, use of trolleys, and safe manual handling techniques in airport media advertisements regarding travel through the airport
 - 2.3.2. Maintain car park terrain and all walking areas around the airport in good condition
 - 2.3.3. Implement a preventive maintenance programme for all baggage trolleys
3. **For the travel agencies, airline companies, and bag manufacturers**
 - 3.1. Initiate a public awareness campaign on the health effects of heavy baggage. Provide information regarding packing baggage, acceptable baggage weights, and safe manual handling of baggage. This advice could be provided on the relevant web sites, holiday brochures, and issued along with tickets
 - 3.2. Airlines should strictly enforce individual baggage weight limits to deter over-packing
 - 3.3. Bag manufacturers should provide sports bags etc. made of lightweight material such as canvas. Retractable handles on suitcases should be height adjustable and suitable for both pushing and pulling. The option of purchasing suitcases on four wheels should be provided.
4. **For other organisations:**
 - 4.1. The Irish Health Promotion Unit should provide advice relating to the safe weights of baggage for air travel in their Back Care information booklet
 - 4.2. The National Disability Authority should produce travel advice documents for persons with reduced mobility, and continue to liaise with the Department of Transport and also Dublin Airport Authority in order to devise a Code of Practice on the handling of a PRM at Dublin Airport.

3. Conclusion

The primary aim of this section is to justify the evidence-based recommendations derived from this 3-year research project, which will ultimately facilitate “Best Manual Handling Practices at Dublin Airport”. A brief overview of the project will also be provided.

Manual handling can be classed as an occupational hazard of work performed in several industries. The aviation industry, in particular airport work, necessitates the performance of diverse manual handling activities, however, the handling of passenger baggage and the handling of persons with reduced mobility are two specific activities that may cause or exacerbate a musculoskeletal condition. High absenteeism, personal injury claims and staff turnover can collectively act as the catalyst for employers to eliminate or minimise musculoskeletal disorder risk factors.

The *raison d'être* of this ergonomics project was to identify the risk factors of baggage handling and the handling of persons with reduced mobility and thus through the avenue of research devise best practices in the form of evidence-based recommendations. Such recommendations would then aid in reducing the risk of musculoskeletal injury associated with both manual handling activities. In order to achieve this project objective work was conducted in accordance with a structured programme from the commencement of the project in November 2001 until its completion in November 2004. Phase 1 of the project yielded literature review and airport benchmarking findings that ultimately prescribed the primary research for Phase 2. The overall conclusion of the project is that in order to reduce the risk of specific airport workers incurring a manual handling related injury or developing a musculoskeletal disorder, both long and short-term solutions are imperative.

Solutions should be based on the health and safety “General Principles of Prevention” with the predominant focus on Principle 1: the avoidance of risks (HSA 1999). With reference to long-term solutions for improving check-in work, the avoidance of risk is feasible by introducing self-service check-in systems (SSCI) for all airlines at the airport. This would eliminate the awkward body postures associated with performing elements of the check-in procedure as determined via a postural analysis conducted for this project. Combating the risks at source could be achieved through a re-design of the check-in desk workstation such as raising the height of the computer screen to eye-height and by using a flat-panelled display. An increase in the slope of the baggage conveyor would facilitate tagging the baggage at optimal working height. Also the use of a sit / stand workstation would be of benefit. The long-term solution to eliminating specific baggage handling tasks is the use of containerised loading, however this is only feasible for wide-bodied aircraft. For narrow-bodied aircraft, mechanical in-plane loading systems such as the Telair Sliding Carpet Loading System should be used to combat the risks at source, and this is a recommendation derived from the research conducted as part of this project (Telair 2004). For the handling of a PRM, the use of a motorised hoist system such as ErgoPort would eliminate the risks associated with the lift-on / lift-off of PRMs (KS ApS 2004).

The evidence-based recommendations from this project are primarily short-term solutions to the problem. With particular reference to the primary research, the focus of interest was on the two main measures recommended by EU manual handling legislation, which reduces the risk of incurring a manual handling related injury i.e. organisational operations and procedures, and the use of mechanical aids. The necessity for considering both measures simultaneously was identified via each of the ergonomic research studies conducted and categorised as Primary Research Packages. An

example of this approach as the foundation for an evidence-based recommendation is evident when considering two interlinked research packages and the airport benchmarking findings. It was established from the postural analysis work package that on the ramp, the use of a mobile baggage conveyor system is more ergonomically satisfactory than the non-use of the system. However, from the ergonomic assessment of the use of the system it was determined that effective use of the system, in biomechanical, physiological, and psychophysical terms, is dependent upon its correct use, which involves adjusting the height of the conveyor to an optimal working height and strategically parking baggage carts in relation to the conveyor. The airport benchmarking findings revealed that standard size mobile baggage conveyor systems were used in all six airports involved in the project, however, equivalent small-scale systems were also in use in Düsseldorf Airport. Therefore, based on the findings of both the primary research and airport benchmarking it can be recommended that ground handling companies at Dublin Airport use both standard size and small-scale mobile baggage conveyor systems on the ramp to improve the baggage handling task of unloading and loading all aircraft types. Similar to the aforementioned example, all recommendations are derived from the primary and secondary research and the airport benchmarking findings.

It can be concluded, therefore, that short-term solutions to the problem of manual handling injuries among specific groups of airport workers are both practical and feasible, and if implemented would improve compliance with EU manual handling legislation.

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-Together*

HEALTH AND SAFETY
AUTHORITY HEADQUARTERS
10 Hogan Place, Dublin 2

Tel. 1890 289 389

Fax. (01) 614 7020
website: www.hsa.ie



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AUTHORITY

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