wall to assist in alignment. Damage to the baggage dollies is therefore expected, and drivers do not actively avoid driving in ways to prevent damage.

In order to prevent the baggage trains being subjected to excessive damage, baggage dollies in particular are designed to withstand impacts and scrapes. This is achieved through choice of materials, such as steel, as well as providing each dolly as a large structure that is capable of absorbing impacts, by providing thick sides and corners. All of this contributes to the mass of the baggage dolly, resulting in typical baggage dollies having a mass of the order of 1 ton. This of course increases the power required to pull the train of baggage dollies, increasing fuel usage and costs.

Impacts will also cause damage to infrastructure within the baggage handling system. Occasionally it will therefore be necessary to provide repairs to infrastructure or stationary objects such as concrete pillars, kerbs, and walls, in response to damage caused by baggage dollies.

The use of baggage trains also restricts the efficiency of use of each individual baggage dolly. For example, baggage trains are semi-permanently joined such that they operate with set lengths. This means that if only a single baggage dolly is required, a full baggage train will still be used to transport the baggage. It takes time and manpower to uncouple baggage dollies from a train and so they are habitually left coupled even when they are not needed for any particular task. Thus, one or two baggage dollies will lack utilisation, decreasing efficiency of the system as whole.

In the baggage hall itself, the fact that baggage trains consist of a baggage tractor and a plurality of baggage dollies, each being towed via a lengthy tow bar, in order to provide reasonable cornering ability of the baggage trains, means that a substantial amount of the length of each baggage train cannot be used for loading. Thus, areas of the baggage hall adjacent to these parts of the train are not used to their potential and space is wasted.

SUMMARY

According to a first aspect of the present invention, there is provided a self-propelled airside dolly, comprising:

a cargo portion configured to hold baggage or cargo;

a drive system for driving the self-propelled airside dolly;

a controller configured to control the drive system in response to control signals; and

a processor configured to provide control signals to the controller; wherein

the self-propelled airside dolly is operable in a normal operation mode in which it is capable of travelling in a longitudinal direction, generally parallel to the direction of a length of the dolly, and wherein the self-propelled airside dolly is further operable in a lateral movement docking mode in which it is capable of travelling in a sideways direction, generally transverse to its longitudinal length so as to approach a loading bay from a direction generally perpendicular to the loading bay, as opposed to approaching the loading bay tangentially.

According to a second aspect of the present invention, there is provided an airside dolly having a rear to front longitudinal extent with a first set of normal driving wheels for driving distances between places on an airport and a normally undeployed deployable ground engaging means capable of being deployed for sideways movement of the dolly, the deployable ground engaging means being disposed generally perpendicularly to the longitudinal direction of the dolly and when deployed in place of the normal driving wheels enabling the dolly to move sideways to dock against other dollies or laterals by approaching them sideways generally perpendicularly to the extent of the other dolly or lateral.

According to a third aspect of the present invention, there is provided a method of positioning a self-propelled baggage dolly at a lateral, the method comprising: finding a space large enough for only a single self-propelled baggage dolly; and positioning the self-propelled baggage dolly within the space.

According to a fourth aspect of the present invention, there is provided a method of directing a single self-propelled baggage dolly, the method comprising directing the single self-propelled baggage dolly to a free space along a lateral that is too small for a conventional baggage tractor pulling a single conventional baggage dolly.

According to a fifth aspect of the present invention, there is provided a baggage handling system comprising:

a baggage hall comprising:

a roadway having a first roadway portion and a second roadway portion;

at least one lateral interposed between the first roadway portion and the second roadway portion;

at least one loading bay on or adjacent to each of the at least one lateral; and

a baggage delivery system configured to transfer baggage from a baggage source to the at least one loading bay; and

at least one self-propelled baggage dolly comprising:

a cargo portion configured to hold baggage;

a drive system for driving the self-propelled baggage dolly;

a controller configured to control the drive system in response to control signals; and

a processor configured to provide control signals to the controller;

wherein each self-propelled baggage dolly is configured to be received at each loading bay and to receive baggage in its cargo portion from the baggage delivery system and to deliver baggage to a baggage receiver, wherein each self-propelled baggage dolly is operable in a lateral movement docking mode to approach each loading bay from a direction generally perpendicular to the loading bay, as opposed to approaching the loading bay tangentially.

According to a sixth aspect of the present invention, there is provided a method of operating a baggage handling system or providing increased operational capacity of a baggage handling system, the baggage handling system comprising:

a baggage hall comprising:

a roadway having a first roadway portion and a second roadway portion;

at least one lateral interposed between the first roadway portion and the second roadway portion;

at least one loading bay on or adjacent to each of the at least one lateral; and

a baggage delivery system configured to transfer baggage from a baggage source to the at least one loading bay; and

at least one self-propelled baggage dolly comprising:

a cargo portion configured to hold baggage;

a drive system for driving the self-propelled baggage dolly;

a controller configured to control the drive system in response to control signals; and

a processor configured to provide control signals to the controller; the method comprising:

delivering baggage to the cargo portion of the at least one self-propelled baggage dolly using the baggage delivery system when the self-propelled baggage dolly is received within one of the at least one loading bay, wherein each self-propelled baggage dolly is operable in a lateral movement docking mode to approach the one of the at least one loading bay from a direction generally perpendicular to the loading bay, as opposed to approaching the loading bay tangentially; and

causing the self-propelled baggage dolly to deliver baggage to a baggage receiver.

According to a seventh aspect of the present invention, there is provided a method of arranging self-propelled baggage dollies at a lateral of a baggage hall, the method comprising:

positioning a first self-propelled baggage dolly and a second self-propelled baggage dolly at the lateral, each of the first and second self-propelled baggage dollies comprising:

a cargo portion configured to hold baggage;

a drive system for driving the self-propelled baggage dolly;

a controller configured to control the drive system in response to control signals; and

a processor configured to provide control signals to the controller; wherein

when positioned, a distance between the platform of the first self-propelled baggage dolly and the second self-propelled baggage dolly is less than a predetermined distance.

According to an eighth aspect of the present invention, there is provided a method of arranging self-propelled baggage dollies at a lateral of a baggage hall, each self-propelled baggage dolly comprising:

a cargo portion configured to hold baggage;

a drive system for driving the self-propelled baggage dolly;

a controller configured to control the drive system in response to control signals; and

a processor configured to provide control signals to the controller;

the method comprising:

positioning a first one of the self-propelled baggage dollies at the lateral, the first self-propelled baggage dolly being configured to deliver baggage to a first destination; and

positioning a second one of the self-propelled baggage dollies at the lateral, the second self-propelled baggage dolly being configured to deliver baggage to a second destination; wherein

the first destination and the second destination are different.

According to a ninth aspect of the present invention, there is provided a method of operating a plurality of autonomous baggage dollies, comprising:

causing the plurality of autonomous baggage dollies to travel together in a predetermined formation, wherein the formation comprises a line comprising a lead baggage dolly followed by a succession of following baggage dollies, wherein the space between autonomous baggage dollies in the predetermined formation is less than the space required for a person to pass between the baggage dollies.

According to a tenth aspect of the present invention, there is provided a method of manoeuvring a self-propelled baggage dolly, the self-propelled baggage dolly comprising:

a cargo portion configured to hold baggage;

a drive system for driving the self-propelled baggage dolly;

a controller configured to control the drive system in response to control signals; and

a processor configured to provide control signals to the controller; and

a sensing system configured to provide at least one sensing output to the processor, the processor being configured to process the at least one sensing output to produce control signals to the controller, to enable operation of the autonomous baggage dolly in an autonomous mode;

the method comprising detecting an obstacle and automatically sensing an alternative route around the obstacle.

According to a first ~~aspect~~ example of the invention, there is provided a self-propelled baggage dolly, comprising: a cargo portion configured to hold baggage;

a drive system for driving the self-propelled baggage dolly;

a controller configured to control the drive system in response to control signals; and

a processor configured to provide control signals to the controller.

In this ~~aspect~~first example, and all the following ~~aspects,~~ embodiments and examples, the self-propelled baggage dolly may refer to a cargo dolly or any other airside dolly. For brevity and clarity "baggage dolly" or simply "dolly" is predominantly used and is not intended to limit the claimed invention to only baggage dollies, but, in addition to meaning conventional baggage dollies, also includes cargo dollies and airside dollies in general

Airside dollies comprise various types of dollies; the two most common types are cargo dollies and baggage dollies, with each type available in various configurations. Baggage dollies are typically

smaller than cargo dollies and may be configured to carry a ULD (or other container system) or be configured as a cart, with raised sides to form a containing portion, and not usable with a ULD, for example a cage with open or openable sides, possibly closed with a curtain. In both configurations the baggage dolly is configured to carry passenger baggage. In the ULD carrying configuration baggage is loaded into the ULD, which is retained on to the top of the baggage dolly. In the cart configuration baggage is loaded onto the dolly itself, within the contacting portion.

Cargo dollies are typically larger than baggage dollies and may be configured to carry a wider array of goods. ULDs may still be used with cargo dollies, although the cargo dolly will typically be able to carry two or more ULDs at a time. Loose fitting, or oddly shaped cargo may also be more readily used with cargo dollies. Hook points and similar may be provided on the cargo dolly to allow for strapping, netting, webbing or other retaining means to be used to secure cargo on top of the cargo dolly.

The self-propelled baggage dolly will be able to drive under its own power during operation. Therefore, it will not be necessary to provide a baggage tractor or a baggage train. Independent operation of a self-propelled baggage dolly will be possible, saving space and increasing efficiency of any baggage handling system including such a baggage dolly.

The baggage dolly may further comprise a sensing system configured to provide at least one sensing output to the processor, the processor being configured to process the at least one sensing output to produce control signals to the controller, to enable operation of the autonomous baggage dolly in an autonomous mode.

Providing a sensing system allows the self-propelled baggage dolly to provide data to enhance its own operation or the operation of external systems such as a baggage handling system.

The sensing system in conjunction with the drive system may allow the baggage dolly to manoeuvre in ways that are otherwise impossible in a conventional baggage dolly. For example, when an obstacle is detected, the baggage dolly is able to automatically sense an alternative route around the obstacle, including the option of reversing in order to find such a route. Conventional baggage dollies, especially those that are part of a baggage train, are incapable of manoeuvring in this manner, e.g. they cannot reverse.

According to another ~~aspect~~ example of the invention there is provided a self-propelled airside dolly having a length and having in a normal operation mode in which it is capable of travelling in a longitudinal direction generally parallel to the direction of its length, and a lateral movement docking mode in which it is capable of travelling in a sideways direction, generally transverse to its longitudinal length so as to approach a loading bay from a direction generally perpendicular to the loading bay, as opposed to approaching the loading bay tangentially.

Traversing in a lateral direction may be known as “crabbing”. Crabbing may be characterised as the dolly moving in a non-longitudinal direction through the means of wheels of the dolly being orientated in a same, non-longitudinal direction.

In various ~~aspects~~examples and embodiments the dolly may comprise a first set of wheels. The first set of wheels may comprise at least one steerable wheel, or at least one pair of steerable wheels. The steerable wheels may be ground engaging wheels. All of the ground engaging wheels of the dolly may be steerable.

The steerable wheels may be steerable between 0° and 360°. The steerable wheels may be steerable at angles greater than 30°. The steerable wheels may be steerable between angles between 0° and 180°. The steerable wheels may be steerable up to angles of between 45° and 135°, optionally between 80° and 110°, and preferably substantially 90°. Each of these angles may be measured as +/- from the straight ahead position, i.e. a position of the wheels in which they are running parallel to the length of the dolly.

In these embodiments the wheels may not be arranged on an axle, but may instead be independently steerable by a respective steering means. The steering means may be a controllable motor. Each controllable motor may be configured to steer its respective wheel from a straight ahead position (i.e. 0°) to any of the aforementioned ranges and limits as referred to above.

In various other ~~aspects~~examples and embodiments the dolly may comprise a second set of wheels (in addition to the “normal” wheels used for driving significant distances). The second set of wheels may be intended to be used for a specific manoeuvring operation (in the main example moving laterally sideways to get close to a lateral, another dolly, or the like) and be a deployable set of wheels. The deployable set of wheels may be deployable from a stowed position to a deployed position. When deployed the second set of wheels may become the ground engaging wheels instead of the normal driving wheels. For example the first set of wheels may be caused to be lifted from contact with the ground. The deployable wheels may be deployable using a deployment means. The deployment means may be a jacking system comprising a jack or plurality of jacks, e.g. one or more hydraulic pistons. The jacking system, deployable wheels and a deck/cargo platform of the dolly may form a sub-assembly. The jacks may incorporate a weight sensors, wherein the weight sensor is configured to provide a weight measurement for cargo or goods located on the deck. The deployable wheels may comprise one or more driven wheels. The deployable driven wheels may be driven by a separate motor or by the same motor as drives the driven main first set of wheels.

The steering system and/or the deployable set of wheels are options for enabling the lateral movement docking mode. This increases the range of operation conditions of the dolly and allows for increased utilisation of space in loading areas and increased throughput of dollies. Manoeuvrability is also increased generally, allowing the dolly to navigate its way out of positions or situations that it would otherwise be unable to without the increased agility provided by either the steering system or deployable set of wheels.

The operator output may include an output to a human operator.

The processor may be configured to react to an operator input provided in response to its operator output.

When in the SAE Level 5 autonomy mode, the processor may act completely autonomously. For example, there may be no need for human intervention with or control of the baggage dolly.

The one or more mode triggers may be predetermined mode triggers. By "predetermined mode triggers" it is meant that the timing and/or position of the mode triggers is/are predetermined and therefore entirely predictable to the baggage dolly and/or operator. This is in contrast to event triggers, which may relate to unforeseen or unpredictable events or issues that may occur at random or in response to unexpected circumstances.

By providing predetermined mode triggers, the change of operating mode of the baggage dolly will be predictable. This means, for example, that an operator of one or more baggage dollies will be able to plan to be in a position to assist the baggage dolly when required, such as when the baggage dolly is forced to operate in a semi-autonomous or manual mode.

The one or more mode triggers and/or one or more event triggers may include at least one of a geospatial trigger, a temporal trigger, a visual trigger, and/or an electronic trigger.

Predetermined mode triggers may include a geospatial mode trigger. The geo-spatial mode trigger may change the autonomy mode of the baggage dolly based on a predetermined safety level of a given geographic area. For example, a geographical area that is populated mainly with autonomous vehicles may be determined to have a higher safety level, and therefore allowing a higher autonomy level, than a geographical area that is populated mainly with aircraft and/or people.

Predetermined mode triggers may include a weather-responsive mode trigger. The weather-responsive mode trigger may change the autonomy mode of the baggage dolly based on a predicted weather event. For example, if the weather forecast is for an electrical storm, the baggage dolly may be forced to operate in a lower autonomy mode or even a manual mode, to prevent electrical discharges interfering with the sensing system.

Predetermined mode triggers may include an expected pedestrian density trigger. The expected pedestrian density trigger may change the autonomy mode of the baggage dolly based on an expected pedestrian density of an area. The expected pedestrian density may change based on time, location, or other variables, but will be predictable to an operator.

The geospatial trigger may include the entry to or exit from a geo-fenced zone.

of the dolly following a shut down event. If the dolly or a remote controller determines that the dolly passes the automatic calibration checks it may be registered for active service available to move luggage and cargo. If it fails the checks it may not be registered for active service at that time for the movement of luggage or cargo, and may even be sent for maintainance.

Throughout the present application, it should be understood that although the term baggage dolly is used, this should not be considered to be limiting to the scope of the disclosure. The concepts discussed herein are considered equally to apply to personal baggage dollies and other forms of cargo dolly.

Moreover, many of the concepts and systems described in the present disclosure may also be applicable to other self-propelled and autonomous vehicles, such as land vehicles including road vehicles such as passenger road vehicles, sea vehicles, and aircraft. Therefore, the skilled person will be aware that although discussed in relation to baggage dollies and baggage handling systems, many of the concepts may be applied more broadly to other vehicles.

According to a second ~~aspect~~ example of the invention, there is provided a method of retro-fitting a baggage dolly to transform the baggage dolly into a self-propelled baggage dolly, the method comprising the steps of:

fitting a drive system for driving a baggage dolly to a baggage dolly; and

fitting a controller and processor to the baggage dolly, the controller being configured to control the drive system in response to control signals provided by the processor.

Retro-fitting of baggage dollies to become self-propelled can lower the cost of providing such a baggage dolly and effectively recycle baggage dollies that may already be present within baggage handling systems. It may also reduce the potential environmental impact of manufacturing self-propelled baggage dollies from scratch.

The method may further comprise the step of fitting a sensing system to the baggage dolly, the sensing system being configured to provide at least one sensing output to the controller to enable operation of the autonomous baggage dolly in an autonomous mode.

The sensing system may be as provided for in the first ~~aspect~~ example of the claimed invention.

The processor of a retro-fitted baggage dolly or of an original equipment baggage dolly may be operable in a plurality of different autonomy modes and may be configured to provide control signals to the controller dependent on the autonomy mode in which is operating; and the method may further comprise the step of fitting a warning system to the baggage dolly, the warning system being configured to indicate a current autonomy mode of the autonomous baggage dolly, the warning system being configured to operate in a plurality of different warning modes, each warning mode being indicative of one or more of the different autonomy modes and automatically changeable in response to the controller changing between the plurality of different autonomy modes.

The warning system may be as provided for in the first ~~aspect~~example of the claimed invention.

The processor of the retro-fitted baggage dolly may be operable in a plurality of different autonomy modes, the processor being configured to provide control signals to the controller dependent on the autonomy mode in which it is operating.

The processor may be configured to change between the plurality of different autonomy modes in response to one or more mode triggers sensed by the sensing system.

The autonomous baggage dolly can therefore be enabled to operate in an autonomy mode that is most suitable for the circumstances in which the autonomous baggage dolly is operating.

The plurality of different autonomy modes may be as provided for in the first ~~aspect~~ example of the claimed invention.

The method may further comprise the step of fitting a weighing system to the baggage dolly, the weighing system being configured to weigh cargo within the cargo portion.

The weighing system may be as provided for in the first ~~aspect~~ example of the claimed invention.

The method may further comprise the step of fitting a locking or restraining system for locking or securing cargo, such as a ULD, within the cargo portion, such that it cannot slide or move relative to the baggage dolly.

The locking system may be as provided for in the first ~~aspect~~ example of the claimed invention.

The method may further comprise the step of fitting a guiding means to the baggage dolly, the guiding means being configured to be manipulated by a user for directing a drive direction and/or speed of the drive system to guide the baggage dolly.

The guiding means may be as provided for in the first ~~aspect~~ example of the claimed invention.

The method may further comprise the step of fitting a cargo moving system for assisting with the loading and/or unloading of cargo from the cargo portion.

The cargo moving system may be as provided for in the first ~~aspect~~ example of the claimed invention.

The method may further comprise the step of fitting a tow bar that can be stowed when not in use.

The tow bar may be as provided for in the first ~~aspect~~ example of the claimed invention.

The retro-fitted baggage dolly may have any or all features of the baggage dolly of the first ~~aspect~~ example of the claimed invention.

According to a third ~~aspect~~ example of the invention, there is provided a kit for retro-fitting a baggage dolly to transform the baggage dolly into a self-propelled baggage dolly, the kit comprising:

a drive system for driving the baggage dolly; and

a controller configured to control the drive system.

The kit may further comprise a sensing system configured to provide at least one sensing output to the controller to enable operation of the autonomous baggage dolly in an autonomous mode.

The kit may further comprise any system described in relation to the first ~~aspect~~ example of the claimed invention.

The retro-fitted baggage dolly produced from the kit may therefore have any or all features, singularly or in combination, of the baggage dolly of the first ~~aspect~~ example of the claimed invention.

According to a fourth ~~aspect~~ example of the invention, there is provided an autonomous baggage dolly comprising:

a cargo portion configured to hold baggage;

a drive system for driving the autonomous baggage dolly; and

a controller configured to control the drive system in response to control signals;

a processor, operable in a plurality of different autonomy modes and changeable between said plurality of different autonomy modes, configured to provide control signals to the controller dependent on the autonomy mode in which it is operating;

a sensing system configured to provide at least one sensing output to the processor, the processor being configured to process the at least one sensing output to produce control signals to the controller;

wherein the processor is configured to change between the plurality of different autonomy modes in response to one or more mode triggers sensed by the sensing system.

The autonomous baggage dolly can therefore be enabled to operate in an autonomy mode that is most suitable for the circumstances in which the autonomous baggage dolly is operating.

The plurality of different autonomy modes may each relate to an SAE autonomy level.

The plurality of different autonomy modes may define a variable autonomy level.

The plurality of different autonomy modes may include an SAE Level 3 autonomy mode, and SAE Level 4 autonomy mode, and/or an SAE Level 5 autonomy mode.

Predetermined mode triggers may include an expected pedestrian density trigger. The expected pedestrian density trigger may change the autonomy mode of the baggage dolly based on an expected pedestrian density of an area. The expected pedestrian density may change based on time, location, or other variables, but will be predictable to an operator.

The geospatial trigger may include the entry to or exit from a geo-fenced zone.

The baggage dolly may therefore be configured to operate differently in a first geo-fenced zone than in a second geo-fenced zone, perhaps dependent on the level of severity of any incident that may occur within such zones.

The visual trigger may include the detection of a road sign, traffic light, pedestrian crossing zone, hazard, pedestrian, human, or unexpected event.

The electronic trigger may include a signal receivable from a control centre.

According to a fifth ~~aspect~~ example of the invention, there is provided an autonomous vehicle comprising:

a drive system for driving the autonomous vehicle; and

a controller configured to control the drive system in response to control signals;

a processor, operable in a plurality of different autonomy modes and changeable between said plurality of different autonomy modes, configured to provide control signals to the controller dependent on the autonomy mode in which it is operating;

a sensing system configured to provide at least one sensing output to the processor, the processor being configured to process the at least one sensing output to produce control signals to the controller;

wherein the processor is configured to change between the plurality of different autonomy modes in response to one or more mode triggers sensed by the sensing system.

The autonomous vehicle can therefore be enabled to operate in an autonomy mode that is most suitable for the circumstances in which the autonomous baggage dolly is operating.

The autonomous vehicle may be an autonomous land vehicle.

The autonomous land vehicle may be an autonomous road vehicle.

The autonomous land vehicle is an autonomous baggage dolly.

The plurality of different autonomy modes may each relate to an SAE autonomy level.

The plurality of different autonomy modes may include an SAE Level 3 autonomy mode, and SAE Level 4 autonomy mode, and/or an SAE Level 5 autonomy mode.

When in the SAE Level 3 autonomy mode, the processor may be configured, in response to one or more event triggers, to request an operator input in order to continue providing control signals.

The operator input may include a human input from a human operator.

When in the SAE Level 4 autonomy mode, the processor may be configured, in response to one or more event triggers, to provide an operator output.

The operator output may include an output to a human operator.

The processor may be configured to react to an operator input provided in response to its operator output.

When in the SAE Level 5 autonomy mode, the processor may act completely autonomously.

The one or more mode triggers and/or one or more event triggers may include at least one of a geospatial trigger, a temporal trigger, a visual trigger, and/or an electronic trigger.

The geospatial trigger may include the entry to or exit from a geo-fenced zone.

The vehicle may therefore be configured to operate differently in a first geo-fenced zone than in a second geo-fenced zone, perhaps dependent on the level of severity of any incident that may occur within such zones.

The visual trigger may include the detection of a road sign, traffic light, hazard, pedestrian, human, or unexpected event.

The electronic trigger may include a signal receivable from a control centre.

According to a sixth ~~aspect~~ example of the invention, there is provided an autonomous baggage dolly comprising:

a cargo portion configured to hold baggage;

a drive system for driving the autonomous baggage dolly;

a controller configured to control the drive system in response to control signals;

a processor, operable in a plurality of different autonomy modes and changeable between said plurality of different autonomy modes, configured to provide control signals to the controller dependent on the autonomy mode in which it is operating; and

The third light mode may comprise the showing of a third colour of light that is different to the first and second colours of light.

Any types of warning may be used, such as, but not limited to, lights and sounds.

According to a seventh ~~aspect~~ example of the invention, there is provided an autonomous vehicle comprising:

a drive system for driving the autonomous vehicle;

a controller configured to control the drive system in response to control signals;

a processor, operable in a plurality of different autonomy modes and changeable between said plurality of different autonomy modes, configured to provide control signals to the controller dependent on the autonomy mode in which it is operating; and

a warning system for indicating a current autonomy mode of the autonomous baggage dolly, the warning system being configured to operate in a plurality of different warning modes, each warning mode being indicative of one or more of the different autonomy modes and automatically changeable in response to the controller changing between the plurality of different autonomy modes.

By indicating the current autonomy mode of the autonomous vehicle, observers or bystanders may be more aware of the likely movements of the vehicle and adjust their behaviour accordingly, if necessary.

The autonomous vehicle may be an autonomous land vehicle.

The autonomous land vehicle may be an autonomous road vehicle.

The autonomous land vehicle may be an autonomous baggage dolly.

The plurality of different autonomy modes may include a first autonomy mode associated with a first warning mode and a second autonomy mode associated with a second warning mode.

Observers may therefore distinguish between the autonomy modes by noting a difference in the warning. Differences in the warning may, for example, be a difference in a colour of light or pitch, tone, or frequency of sound.

The first and second autonomy modes may relate to different SAE autonomy levels.

The first and second autonomy modes may relate to an autonomous mode and a manual mode, respectively.

The warning system may comprise a light system, the first warning mode being a first light mode and the second warning mode being a second light mode.

The first light mode may comprise the showing of a first colour of light and the second light mode comprises the showing of a second colour of light that is different to the first colour of light.

The plurality of different autonomy modes may include a third autonomy mode associated with a third warning mode. The third warning mode may be a third light mode.

The third autonomy mode may relate to a manual mode.

The third light mode may comprise the showing of a third colour of light that is different to the first and second colours of light.

Any types of warning may be used, such as, but not limited to, lights and sounds.

According to an eighth ~~aspect~~ example of the invention, there is provided a baggage dolly, comprising:

a cargo portion configured to hold baggage; and

a weighing system configured to weigh cargo present within the cargo portion.

Cargo present in the cargo portion can then be weighed when in position on the baggage dolly and this information utilised by the baggage dolly or other systems.

The baggage dolly may further comprise:

a drive system for driving the self-propelled baggage dolly;

a controller configured to control the drive system;

a sensing system configured to provide at least one sensing output;

a processor configured to receive and process the at least one sensing output and to produce control signals in response to the at least one sensing output, the control signals being provided to the controller.

The baggage dolly may therefore operate autonomously, using information from the weighing system to modify the operation of other systems of the baggage dolly, if required or desired.

The weighing system may be configured to output a weight signal to the processor, the processor being configured to modify the control signals in response to the weight signal.

The weighing system may be configured to output a weight signal to a central controller of a baggage handling system.

The central controller may then modify control signals sent to the baggage dolly or any other baggage dolly in the baggage handling system in response to the weight signal, in order to, for example, change the order of delivery of baggage to a destination.

The weighing system may be configured to measure the total weight of the cargo present within the cargo portion. Alternatively or additionally, the weighing system may be configured to calculate a weight distribution of the cargo present within the cargo portion.

The weighing system may measure cargo weight using one or more weight sensors. The weight sensors may be provided as load cells. The weight sensors may instead or additionally be provided as part of a jacking system. The jacking system may comprise one or more jacks, wherein the or each jack comprises a weight sensor. The weight sensors in the jacking system may be pressure sensors.

Calculating a weight distribution may enable baggage or other cargo to be packed within the cargo area to achieve a desired weight distribution, such as an even weight distribution. The calculation of a weight distribution may also be used to automatically or manually manage the loading of an aircraft by loading the baggage or other cargo from the baggage dolly to the aircraft in a way to achieve a desired weight distribution within the aircraft.

According to a ninth ~~aspect~~ example of the invention, there is provided a swarm system, comprising:

a plurality of autonomous baggage dollies, each autonomous baggage dolly comprising:

a cargo portion configured to hold baggage;

a drive system for driving the autonomous baggage dolly;

a controller configured to control the drive system in response to control signals;

a sensing system configured to provide at least one sensing output;

a processor configured to receive and process the at least one sensing output and to produce control signals in response to the at least one sensing output, the control signals being provided to the controller; and

a communication system configured to provide a communication link between the autonomous baggage dollies;

wherein each autonomous baggage dolly is configured to operate in a transmitting mode whereby it is configured to communicate at least one assistance signal to at least one other autonomous baggage dolly in the swarm system using the communication system;

wherein the processor of each autonomous baggage dolly is further configured to operate in a receiving mode whereby it is configured to receive at least one assistance signal from at least one other autonomous baggage dolly in the swarm system and to selectively utilise the at least one assistance signal, the processor being configured to produce control signals from the at least one assistance signal.

The swarm system can therefore provide improved operation of tasks, in particular where a baggage dolly would otherwise become disabled through failure of a system such as a sensing system and/or allocation of tasks to dollies in dependency on criteria that results in improved efficiency of carrying out the tasks over current solutions.

The at least one assistance signal may include the at least one sensing output provided by the sensing system and/or assistance control signals produced by the processor for providing to the controller of an autonomous baggage dolly operating in the receiving mode.

Each autonomous baggage dolly may be configured to operate simultaneously in the transmitting mode and the receiving mode.

The sensing output of the sensing system of each autonomous baggage dolly may include at least one of position data, orientation data, image data, speed data, direction data, diagnostic data, and error data relating to itself. Any of these types of data may also be provided in relation to another baggage dolly as determined by processing data relating to another baggage dolly obtained from its sensing system

The sensing output of the sensing system of each autonomous baggage dolly may be related to each autonomous baggage dolly and optionally the sensing output of the sensing system of each autonomous baggage dolly may be related to another one or more of the at least one other autonomous baggage dolly.

In the event of a fault in the sensing system of each autonomous baggage dolly, the processor of the said autonomous baggage dolly may be configured to produce control signals based on the at least one assistance signal received from an autonomous baggage dolly in the swarm system that is operating in the transmitting mode.

In the event of a fault in the sensing system of each autonomous baggage dolly, the processor of the said autonomous baggage dolly may be configured to transmit control signals received as a part of the at least one assistance signal received from an autonomous baggage dolly in the swarm system that is operating in the transmitting mode.

The processor may include a memory for storing mission data relating to a task to be completed by the swarm system.

The processor may be configured to produce control signals in response to the at least one sensing output and the mission data.

The at least one assistance signal may be responsive to the mission data.

The mission data may be receivable from a central controller.

According to a tenth ~~aspect~~ example of the invention, there is provided a swarm system, comprising:

a plurality of autonomous vehicles, each autonomous vehicle comprising:

a drive system for driving the autonomous baggage dolly;

In the event of a fault in the sensing system of each autonomous vehicle, the processor of the said autonomous vehicle may be configured to produce control signals based on the at least one assistance signal received from an autonomous vehicle in the swarm system that is operating in the transmitting mode.

In the event of a fault in the sensing system of each autonomous vehicle, the processor of the said autonomous vehicle may be configured to transmit control signals received as a part of the at least one assistance signal received from an autonomous vehicle in the swarm system that is operating in the transmitting mode.

The processor may include a memory for storing mission data relating to a task to be completed by the swarm system.

The processor may be configured to produce control signals in response to the at least one sensing output and the mission data.

The at least one assistance signal is responsive to the mission data.

The mission data may be receivable from a central controller.

According to an eleventh ~~aspect~~ example of the invention, there is provided a baggage handling system comprising:

a baggage hall comprising:

a roadway having a first roadway portion and a second roadway portion;

at least one lateral interposed between the first roadway portion and the second roadway portion;

at least one loading bay on or adjacent to each of the at least one lateral; and

a baggage delivery system configured to transfer baggage from a baggage source to the at least one loading bay; and

at least one self-propelled baggage dolly according to the first ~~aspect~~ example of the claimed invention;

wherein each self-propelled baggage dolly is configured to be received at each loading bay and to receive baggage in its cargo portion from the baggage delivery system and to deliver baggage to a baggage receiver.

By using self-propelled baggage dollies, the baggage handling system can operate more effectively than known baggage handling systems. Space may be optimised for use with baggage dollies that are not part of a train and/or are not associated with a baggage tractor.

The self-propelled baggage dollies may be programmed to park in line at a lateral closer to each other than the length of a conventional tow bar that conventionally extends between baggage dollies of a baggage train.

Baggage loading means may also be provided on baggage receivers such as aircraft. Thus, the loading and unloading of baggage or other cargo may be automated from a baggage source, to a baggage dolly, and on to a baggage receiver. The reverse operation may also be provided, from a baggage receiver, to a baggage dolly, and on to a baggage collection facility, such as a baggage carousel.

The baggage delivery system is therefore not limited to delivering baggage with the same destination to adjacent loading bays, as it would be were a baggage train to be being used.

The baggage delivery system may be configured to provide baggage destined for different baggage receivers at adjacent loading bays on the same lateral. This cannot be accomplished with a conventional baggage tractor and dolly arrangement as all dollies in the train will be destined for the same baggage receiver, and baggage dollies on adjacent trains will necessarily be separated by a baggage tractor.

The number of different loading bays and number of different baggage receivers may be at least three.

Thus, every loading bay in a row may be used by any baggage dolly, taking baggage to any destination, this not being dependent on the destination of any other baggage dolly. No loading bays are blocked or their use restricted by the presence of a baggage tractor.

Each of the three loading bays may be adjacent to at least one of the other two of the three loading bays.

The baggage handling system may be an aircraft baggage handling system.

The baggage receivers may include aircraft.

The baggage handling system may further comprise a calibration station. The calibration station may provide a location whereby a baggage dolly may calibrate its sensing system or check the calibration of its sensing system,

Calibration and calibration checks of the dolly may be able to be carried out automatically by the dollies at the calibration stations. The calibration stations may be portable such that an operator may be able to recalibrate or check the calibration of a dolly in the field.

According to a twelfth ~~aspect~~ example of the invention, there is provided a method of providing increased operational capacity of a baggage handling system comprising: a baggage hall comprising: a roadway having a first roadway portion and a second roadway portion; at least one lateral interposed between the first roadway portion and the second roadway portion; at least one loading bay on or adjacent to each of the at least one lateral; and a baggage delivery system configured to transfer baggage from a baggage source to the at least one loading bay; the method comprising:

delivering baggage to the cargo portion of at least one self-propelled baggage dolly according to the first ~~aspect~~ example of the claimed invention using the baggage delivery system when the self-propelled baggage dolly is received within one of the at least one loading bay; and

causing the self-propelled baggage dolly to deliver baggage to a baggage receiver.

The step of causing the self-propelled baggage dolly to deliver baggage to the baggage receiver may be carried out once either the cargo portion of the self-propelled baggage dolly is full or there is no more baggage available to be delivered to the said baggage receiver, whichever is first.

Alternatively, the step of instructing the self-propelled baggage dolly to deliver baggage to the baggage receiver may be carried out in response when it is known that another self-propelled baggage dolly is available to transport some or all of the remaining baggage to be delivered to the said baggage receiver.

The method may further include the step of, prior to delivering baggage to a cargo portion of the self-propelled baggage dolly, determining whether a loading bay is vacant or will be vacant by an arrival time of the self-propelled baggage dolly and causing the self-propelled baggage dolly to travel to the loading bay if it is determined that the loading bay is vacant or will be vacant.

A higher throughput of baggage dollies can be achieved in this way by ensuring that a baggage dolly can be directed to a loading bay when it is empty or before it is empty, minimising the time during which the loading bay is not operating to load baggage onto the baggage dolly.

The method may further include the step of, prior to arrival of a baggage dolly at a loading bay, directing baggage to the loading bay such that the baggage can be loaded at or soon after the arrival of the baggage dolly at the loading bay. The baggage may be loaded into a ULD prior to being loaded onto the baggage dolly.

The baggage may be auto-loaded onto the baggage dolly once the baggage dolly is at the loading bay.

The baggage dolly may be caused to deliver baggage to the baggage receiver independently of any other baggage dollies.
Baggage dollies are therefore able to operate in the most efficient manner possible at any time.

The method may further comprise the step of instructing each self-propelled baggage dolly to proceed to an available loading bay.

An available loading bay to which a baggage dolly may be directed may be a loading bay with no other empty loading bays adjacent to the available loading bay. It is therefore possible for a baggage dolly to arrive at a loading bay on its own and take any available loading bay without requiring a plurality of loading bays to be available at the same time.

The step of providing baggage to the cargo portion of each self-propelled baggage dolly when the self-propelled baggage dolly is received within one of the at least one loading bay may be carried out automatically upon the receipt of the self-propelled baggage dolly within the loading bay.

The step of instructing the self-propelled baggage dolly to deliver baggage to a baggage receiver once either the cargo portion of the self-propelled baggage dolly is full or there is no more baggage available to be delivered to the said baggage receiver may be carried out automatically as soon as the cargo portion of the self-propelled baggage dolly is full or there is no more baggage available to be delivered to the said baggage receiver.

Each self-propelled baggage dolly may comprise a sensing system configured to provide at least one sensing output to the processor, the processor configured to process the at least one sensing output to produce control signals to the controller, to enable operation of the autonomous baggage dolly in an autonomous mode.

A cargo portion is provided as a part of each baggage dolly described in any ~~aspect~~ example of the claimed invention. In any of the ~~aspects~~ examples of the claimed invention, the cargo portion may occupy at least 50%, at least 60%, at least 70%, at least 80%, at least 90%, or substantially all of a plan area of the baggage dolly. By plan area, it is meant the area of the baggage dolly viewed from directly above the baggage dolly.

According to a thirteenth ~~aspect~~ example of the invention, there is provided a method of arranging self-propelled baggage dollies at a lateral of a baggage hall, the method comprising:

positioning a first self-propelled baggage dolly according to the first ~~aspect~~ example of the claimed invention at the lateral; and

positioning a second self-propelled baggage dolly according to the first ~~aspect~~ example of the claimed invention at the lateral;

wherein, when positioned, a distance between the platform of the first self-propelled baggage dolly and the second self-propelled baggage dolly is less than a predetermined distance.

The predetermined distance may be less than the typical length of a tow bar of a conventional baggage dolly.

Where the predetermined distance is less than the spacing required to manoeuvre a baggage dolly away from a lateral, for example where baggage dollies are positioned at a lateral with zero spacing between them, the method may further comprise the step of the baggage dollies being configured to coordinate movement to increase the spacing around one or more baggage dollies in order to allow them to leave their respective loading bays and may then return to their initial positions. This tactic could also be used in order to allow a baggage dolly to manoeuvre into a loading bay.

The predetermined distance may be less than 1500 mm, less than 1000 mm, less than 500 mm, or less than 250 mm. The predetermined distance may be zero or approximately zero.

The method may further comprising the steps of positioning further self-propelled baggage dollies at the lateral, each self-propelled baggage dolly being spaced from an adjacent self-propelled baggage dolly by less than the predetermined distance.

According to a fourteenth ~~aspect~~ example of the invention, there is provided a method of arranging self-propelled baggage dollies at a lateral of a baggage hall, the method comprising:

positioning a first self-propelled baggage dolly according to the first ~~aspect~~ example of the claimed invention at the lateral, the first self-propelled baggage dolly being configured to deliver baggage to a first destination; and

positioning a second self-propelled baggage dolly according to the first ~~aspect~~ example of the claimed invention at the lateral, the second self-propelled baggage dolly being configured to deliver baggage to a second destination;

wherein the first destination and the second destination are different.

The first and second self-propelled baggage dollies may be positioned immediately adjacent each other on the same side of the same lateral.

The method may further comprise the step of positioning a third self-propelled baggage dolly according to the first ~~aspect~~ example of the claimed invention at the lateral, the third self-propelled baggage dolly being configured to deliver baggage to a third destination.

The third destination may be different to one or both of the first and second destinations. The first, second, and third baggage dollies may be in a contiguous line at the same side of the same lateral.

Each destination may be an aircraft.

According to a fifteenth ~~aspect~~ example of the invention, there is provided a method of loading, or of organising loading, of an aircraft, the method comprising the steps of:

weighing the cargo of at least two baggage dollies according to the ~~eighth aspect~~ example of the claimed invention; and

causing the at least two baggage dollies to arrive at the aircraft in an order determined by the weight of the cargo of each baggage dolly and at least one requirement of the aircraft.

The at least one requirement of the aircraft may be a desired weight distribution of the aircraft.

The at least two baggage dollies may be autonomous baggage dollies and may be caused to arrive at the aircraft in the order by receiving instructions from a controller.

The controller may be a central controller for managing the baggage dollies.

The controller may be a processor of one or more of the baggage dollies.

According to a sixteenth ~~aspect~~ example of the invention, there is provided a baggage dolly comprising:

a cargo portion configured to hold cargo; and

a locking system configured to automatically lock or secure cargo within the cargo portion.

The baggage dolly may comprise a self-propelled baggage dolly, an autonomous baggage dolly, and/or a conventional baggage dolly. The conventional baggage dolly may form part of a baggage train and/or may be pulled by a baggage tractor.

The cargo may comprise a ULD.

For example, the locking system may include sensors that detect the presence of a ULD and initiate the application of locking or retaining means, for example latches. A processor may process information received from the locking system and may initiate automatic locking of the locking system. The locking system may be mechanical, for example using a sprung latch mechanism.

In this way, the ULD may be prevented from falling off the baggage dolly during use, without requiring the intervention of any operator.

The locking system may include an alert for indicating that a ULD on the baggage dolly is not secured by the locking system, i.e. when the locking system has failed to lock due to misalignment of the ULD or some malfunction of the locking system.

The locking system may be configured to alert the operator of a baggage train containing the baggage dolly that the cargo is not secured correctly. The operator of the baggage train may be a baggage tractor driver. The alert may be configured to be provided to a cab or driving position of a baggage tractor.

The alert may include a visible or audible alert for alerting an operator of the baggage dolly. The alert may additionally or alternatively include a movement prevention means for preventing movement of the baggage dolly when cargo or a ULD is present but not secured. The movement prevention means may include the generation of a signal that acts to prevent movement of the drive system, or may include a brake or other means that physically prevents movement of the baggage dolly.

According to a seventeenth ~~aspect~~ example of the invention, there is provided a baggage dolly comprising: a cargo portion configured to hold cargo; a locking system for locking or securing cargo within the cargo portion; and an alert for indicating that cargo on the baggage dolly is not secured by the locking system.

The locking system may be configured to alert the operator of a baggage train containing the baggage dolly that the cargo is not secured correctly. The operator of the baggage train may be a baggage tractor driver. The alert may be configured to be provided to a cab or driving position of a baggage tractor.

The alert may include a visible or audible alert for alerting an operator of the baggage dolly. The alert may additionally or alternatively include a movement prevention means for preventing movement of the baggage dolly when cargo or a ULD is present but not secured. The movement prevention means may include the generation of a signal that acts to prevent movement of the drive system, or may include a brake or other means that physically prevents movement of the baggage dolly.

According to an eighteenth ~~aspect~~ example of the invention, there is provided a method of operating a plurality of autonomous baggage dollies, comprising:

causing the plurality of autonomous baggage dollies to travel together in a predetermined formation.

The formation may comprise a line, wherein the line comprises a lead baggage dolly followed by a succession of following baggage dollies.

The baggage dollies may be configured to communicate sensing data with one another in order to respond as a unit to triggers or events.

The gap between autonomous baggage dollies in the predetermined formation may be less than the space required for a person to pass between the baggage dollies.

The baggage dollies in the predetermined formation may be configured to share electrical power between adjacent dollies.

Each baggage dolly may therefore include at least one electrical connector that enables power-sharing between baggage dollies.

The predetermined formation may be termed a “platoon”, each baggage dolly being configured to operate in a platoon mode.

According to a nineteenth ~~aspect~~ example of the invention, there is provided a baggage train comprising:

an internal combustion-powered baggage tractor; and

at least one self-propelled baggage dolly according to the first ~~aspect~~ example;

wherein the internal combustion-powered baggage tractor is configured to provide electrical power to recharge the self-propelled baggage dolly.

The electrical power may be provided by an electrical connector extending between the internal combustion-powered baggage tractor and the self-propelled baggage dolly.

The internal combustion-powered baggage tractor may further be configured to guide the self-propelled baggage dolly via a guiding system of the self-propelled baggage dolly.

The internal combustion-powered baggage tractor may further be configured to transmit a motive force to the self-propelled baggage dolly in a situation where the self-propelled baggage dolly is not providing its own motive force. For example, the internal combustion-powered baggage tractor may provide a motive force where the self-propelled baggage dolly cannot provide its own driving force, such as in extreme temperature conditions or when a fault has occurred that prevents self-propulsion.

The electrical power may be transferred during movement of the baggage train and/or whilst the baggage train is stationary.

The motive force may be transmitted to the self-propelled baggage dolly through the guiding system. The guiding system may include a guiding arm.

The electrical power may additionally or alternatively be transmitted through the guiding arm, which may operate as an electrical connector.

According to a twentieth ~~aspect~~ example of the invention, there is provided a method of positioning a self-propelled baggage dolly at a lateral, the method comprising:

finding a space large enough for only a single self-propelled baggage dolly; and

positioning the self-propelled baggage dolly within the space.

The self-propelled baggage dolly can therefore position itself in any space at a lateral that is large enough for itself. This is in contrast to conventional baggage dollies that are part of baggage trains, where the space must be large enough to fit the baggage dolly, a baggage tractor, and any other baggage dollies attached to the baggage train.

The space may be a loading bay.

According to a twenty first ~~aspect~~ example of the invention, there is provided an airside dolly having a rear to front longitudinal extent with a first set of normal driving wheels for driving distances between places on an airport and a normally undeployed deployable docking set of wheels capable of being deployed for sideways movement of the dolly, the docking set of wheels being disposed generally perpendicularly to the longitudinal direction of the dolly and when deployed in place of the normal driving wheels enabling the dolly to move sideways to dock against other dollies or laterals by approaching them sideways generally perpendicularly to the extent of the other dolly or lateral.

According to a twenty second ~~aspect~~ example of the invention, there is provided an airside dolly comprising a user interface. The user interface may comprise a display and a user input means. The user interface

may enable an operator to enquire as to the current status of the dolly. The current status of the dolly may comprise information relating to at least one of a cargo currently being carried by the dolly, an intended destination of the dolly, a current task of the dolly, a next task of the dolly, a route the dolly is intending to follow, and a state of charge of the dolly. The user interface may enable an operator to confirm or modify a set task of the dolly.

According to a twenty third ~~aspect~~ example of the invention, there is provided an airside dolly comprising a display. The display may be operable to display information relating to at least one of cargo currently being carried by the dolly, an intended destination of the dolly, a current task of the dolly, a next task of the dolly, a next turning the dolly maybe planning to take, a manoeuvre the dolly may be making or be about to make, and a state of charge of the dolly.

The airside dolly of each of the preceding three ~~aspects~~ examples may be a self-propelled airside dolly, and may further be a self-propelled airside dolly operable in at least one autonomous mode.

According to a twenty fourth ~~aspect~~ example of the invention, there is provided an airside dolly configured to operate in a start-up mode. The start-up mode may determine a calibration status of at least one sensor of the dolly. The start-up mode may allow the dolly to enter service if a positive calibration status is determined. The start-up mode may not allow the dolly to enter service if a negative calibration status is determined. The start-up mode may implement recalibration of the at least one sensor if a negative calibration status is determined. The start-up mode may be implemented through or make use of a calibration station.

The present invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic plan view of a baggage handling system according to the disclosure;

Figure 2 is a side view of a baggage dolly according to the disclosure;

Figure 3 is a block diagram of the systems and controls of the baggage dolly of Figure 2;

Figure 4 is a flow diagram of a method of retro-fitting a baggage dolly to provide a self-propelled or autonomous baggage dolly;

Figure 5 is a flow diagram of a method of increasing operational capacity of a baggage handling system according to the disclosure;

Figure 6 is a method of providing blended autonomy of an autonomous baggage dolly according to the disclosure;

CLAIMS

1. A self-propelled airside dolly, comprising:

a cargo portion configured to hold baggage or cargo;

a drive system for driving the self-propelled airside dolly;

a controller configured to control the drive system in response to control signals; and

a processor configured to provide control signals to the controller.

2. A self-propelled airside dolly according to claim 1, further comprising a sensing system configured to provide at least one sensing output to the processor, the processor being configured to process the at least one sensing output to produce control signals to the controller, to enable operation of the self-propelled baggage dolly in an autonomous mode, optionally wherein the sensing outputs of the sensing system include at least one of position data, orientation data, image data, speed data, and direction data.

3. A self-propelled airside dolly according to claim 2, wherein the sensing system includes at least one of cameras, radar, LIDAR, gyroscopes, magnetic field sensors, distance measuring devices/sensors and global positioning satellite systems, optionally including differential GPS.

4. A self-propelled airside dolly according to claim 2 or claim 3, wherein the processor is operable in a plurality of different autonomy modes and is changeable between said plurality of different autonomy modes, the processor being configured to provide control signals to the controller dependent on the autonomy mode in which it is operating, optionally wherein the processor is configured to change between the plurality of different autonomy modes in response to one or more mode triggers sensed by the sensing system.

5. A self-propelled airside dolly according to claim 4, wherein the plurality of different autonomy modes include an SAE Level 3 autonomy mode, an SAE Level 4 autonomy mode, and/or an SAE Level 5 autonomy mode.

6. A self-propelled airside dolly according to claim 5, wherein, when in the SAE Level 3 autonomy mode, the processor is configured, in response to one or more event triggers, to request an operator input in order to continue providing control signals, optionally wherein the operator input includes a human input from a human operator.

7. A self-propelled airside dolly according to claim 5 or claim 6, wherein, when in the SAE Level 4 autonomy mode, the processor is configured, in response to one or more event triggers, to provide an operator output, optionally wherein the operator output includes an output to a human operator, further optionally wherein the processor is configures to react to an operator input provided in response to its operator output.

~~8. A self-propelled airside dolly according to any of claims 5 to 7, wherein, when in the SAE Level 5 autonomy mode, the processor acts completely autonomously.~~

~~9. A self-propelled airside dolly according to any of claims 4 to 8, wherein the one or more mode triggers are predetermined mode triggers.~~

~~10. A self-propelled airside dolly according to any of claims 4 to 9, wherein the one or more mode triggers and/or one or more event triggers include at least one of a geospatial trigger, a temporal trigger, a visual trigger, and/or an electronic trigger.~~

~~11. A self-propelled airside dolly according to any of claims 2 to 10, further comprising a warning system for indicating a current autonomy mode of the self-propelled airside dolly, the warning system being configured to operate in a plurality of different warning modes, each warning mode being indicative of one or more of the different autonomy modes and being automatically changeable in response to the controller changing between the plurality of different autonomy modes.~~

~~12. A self-propelled airside dolly according to claim 11, wherein the warning system comprises a light system, the first warning mode being a first light mode and the second warning mode being a second light mode, optionally wherein the first light mode comprises the showing of a first colour of light and the second light mode comprises the showing of a second colour of light that is different to the first colour of light.~~

~~13. A self-propelled airside dolly according to claim 13 wherein the self-propelled dolly is operable in a normal operation mode in which it is capable of travelling in a longitudinal direction, generally parallel to the direction of a length of the dolly, and wherein the self-propelled dolly is further operable in a lateral movement docking mode in which it is capable of travelling in a sideways direction, generally transverse to its longitudinal.~~

~~14. A self-propelled airside dolly according to any preceding claim further comprising steerable wheels.~~

~~15. A self-propelled airside dolly according to claim 14 wherein the dolly comprises ground engaging wheels and wherein the steerable wheels comprise all of the ground engaging wheels of the dolly.~~

~~16. A self-propelled airside dolly according to claim 14 or claim 15 wherein the steerable wheels are steerable through a range of angles including +/- 90° from a position parallel to the length of the dolly.~~

~~17. A self-propelled airside dolly according to any preceding claim further comprising a deployable set of wheels, wherein the deployable set of wheels are orientated transverse to, preferably perpendicular or generally perpendicular to, a length of the dolly.~~

~~18. A self-propelled airside dolly according to claim 17 further comprising a jacking system, wherein the jacking system is configured to deploy the deployable wheels.~~

~~19. A self-propelled airside dolly according to any preceding claim, further comprising a weighing system configured to weigh cargo within the cargo portion, optionally wherein the weighing system is configured to output a weight signal to a central controller of a baggage handling system.~~

~~20. A self-propelled airside dolly according to claim 19, wherein the weighing system is configured to measure the total weight of the cargo present within the cargo portion and/or is configured to calculate a weight distribution of the cargo present within the cargo portion.~~

~~21. A self-propelled airside dolly according to claim 19 or claim 20 when dependent upon claim 18, wherein the jacking system is connected to the cargo portion, and wherein the jacking system further comprises weighing sensors for use in the weighing system.~~

~~22. A self-propelled airside dolly according to any preceding claim, further comprising a locking or retaining system for locking or securing cargo, such as a ULD, within the cargo portion, such that it cannot slide or move relative to the airside dolly.~~

~~23. A self-propelled airside dolly according to any preceding claim, further comprising a guiding means configured to be manipulated by a user for directing a drive direction and/or speed of the drive system to guide the airside dolly, optionally wherein the guiding means comprises a handheld controller, or is provided as a part of the airside dolly, such as a strut, bar, guiding arm, or tow-bar like structure.~~

~~24. A self-propelled airside dolly according to any preceding claim, wherein the cargo portion is a part of a platform, the platform including:~~

~~(1) a plurality of rollable elements for assisting with the movement of cargo onto or off the platform; and/or~~

~~(2) a cargo moving system for assisting with the loading and/or unloading of cargo from the cargo portion, optionally wherein the cargo moving system includes one or more cargo wheels that can be driven to cause movement of cargo onto or off the cargo portion.~~

~~25. A self-propelled airside dolly according to claim 24, wherein the cargo moving system operates to automatically load and unload cargo in response to an instructing signal from the airside dolly or from a part of a baggage handling system within which the airside dolly is operating.~~

~~26. A self-propelled airside dolly according to any preceding claim, further comprising a tow bar that can be stowed when not in use.~~

~~27. A self-propelled airside dolly according to any preceding claim, wherein the self-propelled airside dolly has a mass of less than 1 ton, less than 900 kg, less than 800 kg, or less than 700kg.~~

~~28. A self-propelled airside dolly according to any preceding claim, wherein the self-propelled airside dolly is suitable for carrying one fully laden ULD, optionally wherein the self-propelled airside dolly is suitable for carrying a load of at least 1,000 kg, at least 1,250 kg, or at least 1,500 kg.~~

~~29. A self-propelled airside dolly according to any preceding claim, further comprising a guiding means configured to be manipulated by a user for directing a drive direction and/or speed of the drive system.~~

~~30. A self-propelled airside dolly according to any preceding claim, further comprising a power source for providing power to the drive system, the power source optionally comprising an electrical power source, for example at least one lead acid battery.~~

~~31. A self-propelled airside dolly according to claim 30, further comprising a power monitoring system for monitoring a power level of the electrical power source and causing the self-propelled airside dolly to proceed to a charging point for charging the electrical power source.~~

~~32. A self-propelled airside dolly according to any preceding claim, further comprising a locking system for locking a ULD within the cargo portion, optionally wherein the operating system automatically locks the ULD within the cargo portion.~~

1. A self-propelled airside dolly, comprising:

a cargo portion configured to hold baggage or cargo;

a drive system for driving the self-propelled airside dolly;

a controller configured to control the drive system in response to control signals; and

a processor configured to provide control signals to the controller; wherein

the self-propelled airside dolly is operable in a normal operation mode in which it is capable of travelling in a longitudinal direction, generally parallel to the direction of a length of the dolly, and wherein the self-propelled airside dolly is further operable in a lateral movement docking mode in which it is capable of travelling in a sideways direction, generally transverse to its longitudinal length so as to approach a loading bay from a direction generally perpendicular to the loading bay, as opposed to approaching the loading bay tangentially.

2. A self-propelled airside dolly according to any preceding claim, wherein the self-propelled airside dolly is suitable for carrying one fully-laden ULD.

3. A self-propelled airside dolly according to claim 1 or claim 2, wherein the drive system is configured to control the self-propelled airside dolly to move forwards, backwards, and steer, providing full control of the motion of the self-propelled airside dolly.

4. A self-propelled airside dolly according to any preceding claim, comprising two or more wheels and a motor provided for each wheel that provides motive power to the respective wheel, wherein steering is provided by differential control of the motor of each wheel.

5. A self-propelled airside dolly according to any preceding claim, comprising at least one steerable wheel.

6. A self-propelled airside dolly according to claim 5, wherein all of the ground engaging wheels of the self-propelled airside dolly are steerable.

7. A self-propelled airside dolly according to claim 6, wherein each of the ground engaging wheels is steerable to an angle of substantially +/- 90° as measured from a position in which the ground engaging wheel is running parallel to the length of the self-propelled airside dolly.

8. A self-propelled airside dolly according to any of claims 5 to 7, wherein the steerable wheel, at least one of the steerable wheels, or all of the steerable wheels is/are steerable to a non-zero angle measured from a position in which the ground engaging wheel is running parallel to the length of the self-propelled airside dolly, wherein the non-zero angle is less than or equal to +/- 360°.

9. A self-propelled airside dolly according to any of claims 5 to 8, wherein the steerable wheel, at least one of the steerable wheels, or all of the steerable wheels is/are independently steerable by a respective steering means.

10. A self-propelled airside dolly according to any of claims 5 to 9, wherein the steerable wheel, at least one of the steerable wheels, or all of the steerable wheels is/are powered.

11. A self-propelled airside dolly according to claim 10, comprising a motor provided for the steerable wheel, at least one of the steerable wheels, or each of the steerable wheels that provides motive power to the respective wheel.

12. A self-propelled airside dolly according to any of claims 5 to 11, comprising other ground engaging means used with the one or more steerable wheel.

13. A self-propelled airside dolly according to claim 12, wherein the other ground engaging means comprises one or more rollers.

14. A self-propelled airside dolly according to any preceding claim further comprising a deployable ground engaging means, wherein the deployable ground engaging means is orientated transverse to, preferably perpendicular or generally perpendicular to, a length of the dolly.

15. An airside dolly having a rear to front longitudinal extent with a first set of normal driving wheels for driving distances between places on an airport and a normally undeployed deployable ground engaging means capable of being deployed for sideways movement of the dolly, the deployable ground engaging means being disposed generally perpendicularly to the longitudinal direction of the dolly and when deployed in place of the normal driving wheels enabling the dolly to move sideways to dock against other dollies or laterals by approaching them sideways generally perpendicularly to the extent of the other dolly or lateral.

16. A self-propelled airside dolly or airside dolly according to claim 14 or claim 15 further comprising a jacking system, wherein the jacking system is configured to deploy the deployable ground engaging means.

17. A self-propelled airside dolly or airside dolly according to any of claims 14 to 16, wherein the deployable ground engaging means comprises rollers.

18. A self-propelled airside dolly or airside dolly according to any of claims 14 to 17, wherein the deployable ground engaging means comprises a deployable set of wheels.

19. A self-propelled airside dolly or airside dolly according to claim 18, wherein the deployable set of wheels comprises one or more driven wheels; and/or wherein the deployable wheels comprise one or more wheels which are not driven, or wherein all of the deployable wheels are driven.

20. A method of positioning a self-propelled baggage dolly at a lateral, the method comprising:
finding a space large enough for only a single self-propelled baggage dolly; and
positioning the self-propelled baggage dolly within the space.

21. A method of directing a single self-propelled baggage dolly, the method comprising directing the single self-propelled baggage dolly to a free space along a lateral that is too small for a conventional baggage tractor pulling a single conventional baggage dolly.

22. A baggage handling system comprising:
a baggage hall comprising:
a roadway having a first roadway portion and a second roadway portion;
at least one lateral interposed between the first roadway portion and the second roadway portion;
at least one loading bay on or adjacent to each of the at least one lateral; and

a baggage delivery system configured to transfer baggage from a baggage source to the at least one loading bay; and

at least one self-propelled baggage dolly comprising:

a cargo portion configured to hold baggage;

a drive system for driving the self-propelled baggage dolly;

a controller configured to control the drive system in response to control signals; and

a processor configured to provide control signals to the controller;

wherein each self-propelled baggage dolly is configured to be received at each loading bay and to receive baggage in its cargo portion from the baggage delivery system and to deliver baggage to a baggage receiver, wherein each self-propelled baggage dolly is operable in a lateral movement docking mode to approach each loading bay from a direction generally perpendicular to the loading bay, as opposed to approaching the loading bay tangentially.

23. The baggage handling system of claim 22, wherein the baggage handling system is configured to provide baggage destined for different baggage receivers at different loading bays on the same lateral, such as different adjacent loading bays; and/or wherein the baggage handling system is configured to provide baggage destined for different baggage receivers at adjacent loading bays on the same lateral.

24. A method of operating a baggage handling system or providing increased operational capacity of a baggage handling system, the baggage handling system comprising:

a baggage hall comprising:

a roadway having a first roadway portion and a second roadway portion;

at least one lateral interposed between the first roadway portion and the second roadway portion;

at least one loading bay on or adjacent to each of the at least one lateral; and

a baggage delivery system configured to transfer baggage from a baggage source to the at least one loading bay; and

at least one self-propelled baggage dolly comprising:

a cargo portion configured to hold baggage;

a drive system for driving the self-propelled baggage dolly;

a controller configured to control the drive system in response to control signals; and

a processor configured to provide control signals to the controller; the method comprising:

delivering baggage to the cargo portion of the at least one self-propelled baggage dolly using the baggage delivery system when the self-propelled baggage dolly is received within one of the at least one loading bay, wherein each self-propelled baggage dolly is operable in a lateral movement docking mode to approach the one of the at least one loading bay from a direction generally perpendicular to the loading bay, as opposed to approaching the loading bay tangentially; and

causing the self-propelled baggage dolly to deliver baggage to a baggage receiver.

25. The method of claim 24, comprising directing the at least one self-propelled baggage dolly to an available loading bay with no other empty loading bays adjacent to the available loading bay and causing the at least one self-propelled baggage dolly to be received within the available loading bay; and/or wherein the baggage handling system comprises more than one loading bay and more than one self-propelled baggage dolly, the method comprising causing one of the self-propelled baggage dollies to leave a respective loading bay without waiting for an adjacent one of the self-propelled baggage dollies to complete their loading or unloading in a respective loading bay.

26. A method of arranging self-propelled baggage dollies at a lateral of a baggage hall, the method comprising:

positioning a first self-propelled baggage dolly and a second self-propelled baggage dolly at the lateral, each of the first and second self-propelled baggage dollies comprising:

a cargo portion configured to hold baggage;

a drive system for driving the self-propelled baggage dolly;

a controller configured to control the drive system in response to control signals; and

a processor configured to provide control signals to the controller; wherein

when positioned, a distance between the platform of the first self-propelled baggage dolly and the second self-propelled baggage dolly is less than a predetermined distance.

27. A method according to claim 26, wherein the predetermined distance is less than the typical length of a tow bar of a conventional baggage dolly.

28. A method of arranging self-propelled baggage dollies at a lateral of a baggage hall, each self-propelled baggage dolly comprising:

a cargo portion configured to hold baggage;

a drive system for driving the self-propelled baggage dolly;

a controller configured to control the drive system in response to control signals; and

a processor configured to provide control signals to the controller;

the method comprising:

positioning a first one of the self-propelled baggage dollies at the lateral, the first self-propelled baggage dolly being configured to deliver baggage to a first destination; and

positioning a second one of the self-propelled baggage dollies at the lateral, the second self-propelled baggage dolly being configured to deliver baggage to a second destination; wherein

the first destination and the second destination are different.

29. The method of claim 28, wherein the first and second self-propelled baggage dollies are positioned immediately adjacent each other on the same side of the same lateral

30. The method of claim 28 or claim 29, wherein at least one of the self-propelled baggage dollies is operable to position itself a predetermined distance away from the lateral.

31. The method of claim 30, wherein the predetermined distance is set between 10 mm and 200 mm, or between 50 mm and 150 mm, or between 90 mm and 110 mm, or approximately 100 mm.

32. A method of operating a plurality of autonomous baggage dollies, comprising:

causing the plurality of autonomous baggage dollies to travel together in a predetermined formation, wherein the formation comprises a line comprising a lead baggage dolly followed by a succession of following baggage dollies, wherein the space between autonomous baggage dollies in the predetermined formation is less than the space required for a person to pass between the baggage dollies.

33. A method of manoeuvring a self-propelled baggage dolly, the self-propelled baggage dolly comprising:

a cargo portion configured to hold baggage;

a drive system for driving the self-propelled baggage dolly;

a controller configured to control the drive system in response to control signals; and

a processor configured to provide control signals to the controller; and

a sensing system configured to provide at least one sensing output to the processor, the processor being configured to process the at least one sensing output to produce control signals to the controller, to enable operation of the autonomous baggage dolly in an autonomous mode;

the method comprising detecting an obstacle and automatically sensing an alternative route around the obstacle.

34. The method of claim 33, comprising reversing the self-propelled baggage dolly in order to find the alternative route.