CLAIMS

1. An aerial vehicle based damage avoidance system, comprising:

a) a plurality of aerial vehicles, each flying along a unique flight path and comprising a body, at least one lift generator provided with the aerial vehicle body, a lift generator deactivation unit and a plurality of flight systems;

b) parachute deployment apparatus interactable with an undeployed parachute which is retained in a chamber attached to said aerial vehicle body;

c) one or more servers; and

d) a base station in data communication with said plurality of aerial vehicles and said one or more servers, wherein said base station is in data communication by means of an Application Programming Interface (API) and a corresponding continuously established communication channel with each of said one or more servers,

wherein each of said aerial vehicles comprises safety apparatus for mitigating damage to nearby bystanders or aerial vehicles when the aerial vehicle is experiencing an unanticipated failure, said safety apparatus comprising:

i. one or more on-board sensors including a location detector which are configured to detect flight related characteristics;

ii. a processing unit configured to process outputs of each of the on-board sensors and to detect a critical failure;

iii. a remote communication unit configured to transmit an instantaneous location identifier to said base station and to generate and transmit an aerial vehicle specific critical failure alarm signal to said base station following detection of the critical failure; and

iv. an activation unit configured to activate a lift generator deactivation unit and the parachute deployment apparatus following detection of the critical failure, in order to initiate a descent operation along a descent path,

wherein said safety apparatus is operational independently of said flight systems one of which is liable to be malfunctioned due to the critical failure,

wherein said base station is configured to calculate the descent path of the failed aerial vehicle and to transmit another failure indicating alert signal to said one or more servers for alerting, by an application or a wireless message, a corresponding electronic device accessible to all entities in communication with any of said two or more servers

that are predicted to be within a danger range of the failed aerial vehicle relative to the calculated descent path,

wherein said remote communication unit is in electrical communication with said activation unit and is operable to command activation of said parachute deploying apparatus and said lift generator deactivation unit following determination of the critical failure,

wherein said parachute deployment apparatus comprises:

a manifold positioned within an interior of, and fixed to, the chamber, with said manifold is releasably coupled a single vessel within which pressurized gas is generated;

a gas generator which cooperates with said vessel;

a plurality of hollow tubes which extend distally from, and are in fluid communication with, said manifold; and

a plurality of projectiles, each of which formed with a rod that is receivable in a corresponding one of said tubes and to each of which is connected a cord that is also connected to a corresponding portion of the undeployed parachute;

wherein the pressurized gas which is generated upon triggering of said gas generator is flowable through each of said tubes to propel said plurality of projectiles in different directions and to cause the parachute to become deployed,

wherein said parachute deploying apparatus is configured to cause the parachute to achieve a desired canopy diameter simultaneously with ejection of the parachute from the chamber.

2. The system according to claim 1, wherein the one or more servers are configured to transmit an emergency alert, by an application or a wireless message, to the corresponding electronic device that is accessible to bystanders as to an approach of the failed aerial vehicle.

3. An aerial vehicle based damage avoidance system, comprising:

a) a plurality of aerial vehicles, each flying along a unique flight path and comprising a body and a plurality of flight systems;

b) parachute deployment apparatus interactable with an undeployed parachute which is retained in a chamber attached to said aerial vehicle body;

c) one or more servers; and

d) a base station in data communication with said plurality of aerial vehicles and said one or more servers, wherein said base station is in data communication by means of

an Application Programming Interface (API) and a corresponding continuously established communication channel with each of said one or more servers,

wherein each of said aerial vehicles comprises safety apparatus for mitigating damage to nearby bystanders or aerial vehicles when the aerial vehicle is experiencing an unanticipated failure, said safety apparatus comprising:

i. one or more on-board sensors including a location detector which are configured to detect flight related characteristics;

ii. a processing unit configured to process outputs of each of the on-board sensors and to detect a critical failure;

iii. a remote communication unit configured to transmit an instantaneous location identifier to said base station and to generate and transmit an aerial vehicle specific critical failure alarm signal to said base station following detection of the critical failure; and

iv. an activation unit configured to activate a lift generator deactivation unit and the parachute deployment apparatus following detection of the critical failure, in order to initiate a descent operation along a descent path,

wherein said safety apparatus is operational independently of said flight systems one of which is liable to be malfunctioned due to the critical failure,

wherein said base station is configured to calculate the descent path of the failed aerial vehicle and to transmit another failure indicating alert signal to said one or more servers for alerting, by an application or a wireless message, a corresponding electronic device accessible to all entities in communication with any of said two or more servers that are predicted to be within a danger range of the failed aerial vehicle relative to the calculated descent path,

wherein one of the one or more servers is an unmanned aircraft traffic management system (UTM) server which is configured to allocate an airspace to each of said plurality of aerial vehicles and to thereby grant authorization to fly along the unique flight path,

wherein said UTM server is configured to simultaneously transmit an update signal to all neighboring aerial vehicles that are predicted to cross the descent path of the failed aerial vehicle, said update signal being indicative of an aerial vehicle specific updated flight path that causes each of said neighboring aerial vehicles to urgently change its flight path to avoid collision with the failed aerial vehicle.

4. An aerial vehicle based damage avoidance system, comprising:

a) a plurality of aerial vehicles, each flying along a unique flight path and comprising a body and a plurality of flight systems;

b) parachute deployment apparatus interactable with an undeployed parachute which is retained in a chamber attached to said aerial vehicle body;

c) one or more servers; and

d) a base station in data communication with said plurality of aerial vehicles and said one or more servers, wherein said base station is in data communication by means of an Application Programming Interface (API) and a corresponding continuously established communication channel with each of said one or more servers,

wherein each of said aerial vehicles comprises safety apparatus for mitigating damage to nearby bystanders or aerial vehicles when the aerial vehicle is experiencing an unanticipated failure, said safety apparatus comprising:

i. one or more on-board sensors including a location detector which are configured to detect flight related characteristics;

ii. a processing unit configured to process outputs of each of the on-board sensors and to detect a critical failure;

iii. a remote communication unit configured to transmit an instantaneous location identifier to said base station and to generate and transmit an aerial vehicle specific critical failure alarm signal to said base station following detection of the critical failure; and

iv. an activation unit configured to activate a lift generator deactivation unit and the parachute deployment apparatus following detection of the critical failure, in order to initiate a descent operation along a descent path,

wherein said safety apparatus is operational independently of said flight systems one of which is liable to be malfunctioned due to the critical failure,

wherein said base station is configured to calculate the descent path of the failed aerial vehicle and to transmit another failure indicating alert signal to said one or more servers for alerting, by an application or a wireless message, a corresponding electronic device accessible to all entities in communication with any of said two or more servers that are predicted to be within a danger range of the failed aerial vehicle relative to the calculated descent path,

wherein the one or more servers are configured to transmit an emergency alert, by an application or a wireless message, to the corresponding electronic device that is accessible to bystanders as to an approach of the failed aerial vehicle,

wherein said base station is also in data communication with a local cellular base station that is in communication range of the descent path of the failed aerial vehicle, and is thereby configured to determine which one or more mobile phones held by corresponding users are located in the vicinity of the descent path of the failed aerial vehicle and to transmit an alert signal to the one or more mobiles phones over a cellular network to allow the corresponding users to find immediate shelter.

5. The system according to claim 2, wherein the corresponding electronic device is a receiver of an on-ground siren, so that a warning sound will be immediately emitted thereby, to indicate to bystanders located in damage range of the descent path of the failed aerial vehicle that they must immediately significantly change their location or seek shelter.

6. The system according to claim 1, wherein the processing unit is additionally configured to additionally process the outputs of each of the on-board sensors, to detect a flight abnormality in the aerial vehicle in which the processing unit is mounted, and to initiate generation of another aerial vehicle specific updated flight path that forces the aerial vehicle to fly to a specified ground station and to undergo a repair or maintenance operation, a flight abnormality being a failure of a lower degree than the critical failure.

7. The system according to claim 3, wherein each of the aerial vehicles additionally comprises:

at least one lift generator provided with the aerial vehicle body; and

the lift generator deactivation unit,

wherein the communication unit is in electrical communication with the activation unit and is operable to command activation of the parachute deploying apparatus and the lift generator deactivation unit following determination of the critical failure,

wherein deactivation of each of the at least one lift generator by the lift generator deactivation unit ensures that the parachute that is being expanded by the parachute deploying apparatus will not become entangled with a rotating lift generator.

8. The system according to claim 7, wherein the parachute deployment apparatus comprises:

a manifold positioned within an interior of, and fixed to, the chamber, with said manifold is releasably coupled a single vessel within which pressurized gas is generated;

a gas generator which cooperates with said vessel;

a plurality of hollow tubes which extend distally and upwardly from, and are in fluid communication with, said manifold; and

a plurality of projectiles, each of which formed with a rod that is receivable in a corresponding one of said tubes and to each of which is connected a cord that is also connected to a corresponding portion of the undeployed parachute;

wherein the pressurized gas which is generated upon triggering of said gas generator is flowable through each of said tubes to propel said plurality of projectiles in different directions and to cause the parachute to become deployed,

wherein the parachute deploying apparatus is configured to cause the parachute to achieve a desired canopy diameter simultaneously with ejection of the parachute from the chamber.

9. The system according to claim 1, wherein each of the aerial vehicles additionally comprises a landing mechanism, maneuvering apparatus, and a controller, wherein the controller is configured to control landing of the aerial vehicle in conjunction with the landing mechanism and the maneuvering apparatus.

10. The system according to claim 9, wherein the controller is operable to command deployment of an airbag for reducing impact with an existing surface during a landing procedure.

11. The system according to claim 9, wherein the landing mechanism is operable in conjunction with at least one LiDAR sensor for detecting obstacles.

12. The system according to claim 1, wherein the activation unit comprises one or more warning devices configured to generate an alert signal for alerting bystanders as to an approach of the failed aerial vehicle when the failed aerial is at a specific height above ground level.

13. The system according to claim 7, wherein each of the aerial vehicles additionally comprises a battery configured to power the at least one lift generator and a voltage sensor or a serial communication unit provided with the remote communication unit for determining voltage of the battery, and wherein the safety apparatus further comprises a backup power unit that is independent of the battery and that is employed when the battery voltage is less than a predetermined value.

14. The system according to claim 1, wherein the remote communication unit is configured to transmit an instantaneous location identifier to said base station and to generate and transmit an aerial vehicle specific critical failure alarm signal to said base station following detection of the critical failure when the failed aerial vehicle is suffering from a guidance-preventing failure selected from the group consisting of a drop in the battery voltage of less than the predetermined value, a loss in flight dependent communication, a failure to an autopilot, and a failure in a positioning system of the aerial vehicle.

15. The system according to claim 13, wherein the backup power unit is configured to power the safety apparatus, including the remote communication unit and the one or more on-board sensors, and is continually connected to the processing unit.

16. The system according to claim 3, wherein the one or more servers are configured to transmit an emergency alert, by an application or a wireless message, to the corresponding electronic device that is accessible to bystanders as to an approach of the failed aerial vehicle, wherein the corresponding electronic device is a receiver of an on-ground siren, so that a warning sound will be immediately emitted thereby, to indicate to bystanders located in damage range of the descent path of the failed aerial vehicle that they must immediately significantly change their location or seek shelter.

17. The system according to claim 4, wherein the one or more servers are configured to transmit an emergency alert, by an application or a wireless message, to the corresponding electronic device that is accessible to bystanders as to an approach of the failed aerial vehicle, wherein the corresponding electronic device is a receiver of an on-ground siren, so that a warning sound will be immediately emitted thereby, to indicate to bystanders located in damage range of the descent path of the failed aerial vehicle that they must immediately significantly change their location or seek shelter.

18. The system according to claim 1, wherein each of the aerial vehicles additionally comprises a battery configured to power the at least one lift generator and a voltage sensor or a serial communication unit provided with the remote communication unit for determining voltage of the battery, and wherein the safety apparatus further comprises a backup power unit that is independent of the battery and that is employed when the battery voltage is less than a predetermined value.

19. The system according to claim 4, wherein each of the aerial vehicles additionally comprises:

at least one lift generator provided with the aerial vehicle body;

the lift generator deactivation unit;

a battery configured to power the at least one lift generator; and

a voltage sensor or a serial communication unit provided with the remote communication unit for determining voltage of the battery,

wherein the safety apparatus further comprises a backup power unit that is independent of the battery and that is employed when the battery voltage is less than a predetermined value,

wherein the communication unit is in electrical communication with the activation unit and is operable to command activation of the parachute deploying apparatus and the lift generator deactivation unit following determination of the critical failure.

20. The system according to claim 1, wherein the plurality of hollow tubes extend obliquely from the manifold.