It is another optional, non-exclusive object of the present invention to provide mechanisms and techniques for supplying human pilots with information in manners designed to assist the pilots in coping with probable degradation of ground deceleration performance of their associated vehicles.

It is also an optional, non-exclusive object of the present invention to provide display units with visual indicators designed to illuminate in the normal peripheral fields of view of the pilots.

It is a further optional, non-exclusive object of the present invention to provide aural alerts to pilots.

It is, moreover, an optional, non-exclusive object of the present invention to provide colored cues to vehicle operators, with different colors signifying different levels of required action.

It is an additional optional, non-exclusive object of the present invention to provide display indicators in which individual or sets of red and amber pixels may flash or be illuminated steadily depending on actual or anticipated conditions.

It is another optional, non-exclusive object of the present invention to provide an option for an alert as described above to signal an automatic flight control response designed to mitigate the landing risk such as, but not limited to, automatic employment of maximum wheel brake effort, ground spoilers, or thrust reverse.

According to a first aspect of the present invention, there is provided a method of ~~displaying, to an operator of a vehicle having at least one generally forward-facing window, information relevant to hazards existing or expected in connection with ground deceleration of the vehicle, the method comprising: a. electronically processing information relating to vehicle performance hazards existing or expected in connection with ground deceleration of a vehicle; and b. displaying the processed information in the normal forward-looking field of vision of the operator through the window.~~

~~According to a second aspect of the present invention, there is provided an alerting device for a vehicle, comprising: a. a display configured to provide (1) flashing amber pixels, (2) flashing red pixels, (3) alternating flashing amber or red pixels or both amber and red pixels, (4) steady illumination of amber pixels, and (5) steady illumination of red pixels; and b. means for positioning the display in a field of vision of an operator of a vehicle.~~

~~According to a third aspect of the present invention, there is provided an aircraft configured for operation by an operator and comprising: a. a cockpit; and~~

~~b. an alerting device comprising means for displaying, in the normal forward-looking field of vision of the operator, information relevant to hazards existing or expected in connection with ground deceleration of the vehicle as it travels along a runway.~~ controlling a vehicle in the form of an aircraft having a cockpit and at least one generally forward-facing window through which an operator of the vehicle peers while preparing to perform at least some of a first set of actions as the vehicle is travelling on a runway surface during landing, the method comprising:

a. using a first machine, electronically processing output data from the anti-skid controller of the vehicle in connection with ground deceleration of the vehicle travelling on the runway surface during landing;

b. using a second machine, electronically displaying the processed information within the cockpit in the normal forward-looking field of vision of the operator through the window so as to alert the operator that performing the first set of actions will not result in effective ground deceleration of the vehicle travelling on the runway surface during landing; and

c. controlling the vehicle by pursuing a second set of actions based on the electronically-displayed information so as to result in effective ground deceleration of the vehicle travelling on the runway surface during landing, the second set of actions including at least one action selected from the group consisting of (i) employing maximum wheel brake effort, (ii) employing ground spoilers, (iii) employing thrust reverse, or (iv) engaging one or more of ailerons, rudder, elevator, or throttle of the vehicle.

Other objects, features, and advantages of the present invention will be apparent to those appropriately skilled in the art with reference to the remaining text and drawings of this application.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a simplified, operator's-eye view of a runway or similar surface along which a vehicle may travel together with exemplary alerting devices.

FIG. 2 is a front view of an alerting device of FIG. 1.

FIG. 3 is a side view of the alerting device of FIG. 2.

FIG. 4 is a flow diagram identifying exemplary conditions affecting presentation of information by the alerting device(s) of FIGS. 1-3.

What is claimed is:

1. A method of controlling a vehicle in the form of an aircraft having a cockpit and at least one generally forward-facing window through which an operator of the vehicle peers while preparing to perform at least some of a first set of actions as the vehicle is travelling on a runway surface during landing, the method comprising:
a. using a first machine, electronically processing output data from the anti-skid controller of the vehicle in connection with ground deceleration of the vehicle travelling on the runway surface during landing;

b. using a second machine, electronically displaying the processed information within the cockpit in the normal forward-looking field of vision of the operator through the window so as to alert the operator that performing the first set of actions will not result in effective ground deceleration of the vehicle travelling on the runway surface during landing; and

c. controlling the vehicle by pursuing a second set of actions based on the electronically-displayed information so as to result in effective ground deceleration of the vehicle travelling on the runway surface during landing, the second set of actions including at least one action selected from the group consisting of (i) employing maximum wheel brake effort, (ii) employing ground spoilers, (iii) employing thrust reverse, or (iv) engaging one or more of ailerons, rudder, elevator, or throttle of the vehicle.

2. A method according to claim 1 in which the act of electronically displaying the processed information comprises illuminating at least one red or amber light source of a display comprising multiple red and amber light sources.

3. A method according to claim 2 in which the act of electronically displaying the processed information comprises illuminating multiple red or amber light sources of the display.

4. A method according to claim 2 in which the act of electronically displaying the processed information comprises causing at least one red or amber light source of the display to flash.

5. A method according to claim 4 in which the act of electronically displaying the processed information comprises causing at least one red and at least one amber light source to flash alternately.

6. A method according to claim 1 in which the act of electronically displaying the processed information comprises illuminating a display positioned above a main glare shield of the cockpit of the aircraft.

7. A method according to claim 1 further comprising generating an aural signal based on the processed information.

8. A method according to claim 1 in which the display is mounted to or incorporated into a pillar of the window.

~~What is claimed is:~~

1. A method of displaying, to an operator of a vehicle having at least one generally forward-facing window, information relevant to hazards existing or expected in connection with ground deceleration of the vehicle, the method comprising:

a. electronically processing information relating to vehicle-performance hazards existing or expected in connection with ground deceleration of a vehicle; and

b. displaying the processed information in the normal forward-looking field of vision of the operator through the window.

2. A method according to claim 1 in which the information relevant to hazards existing or expected in connection with ground deceleration of a vehicle comprises one or more of the following types of information: (a) a difference between commanded and delivered wheel brake forces as the result of the actions of a vehicle anti-skid system, (b) the failure of a vehicle spoiler system to apply downward forces to a wheel brake system, (c) degraded or absence of vehicle thrust reverser forces, (d) a vehicle braking performance significantly different than selected by an automatic braking system, (e) a failure of a pneumatic tire of a vehicle, (f) the failure of a vehicle hydraulic braking force delivery system, or (g) a tire to ground interaction for which an anti-skid system of a vehicle significantly reduces delivered braking forces.

3. A method according to claim 1 further comprising revising the electronic processing to account for information relating to vehicle conditions already known to the operator.

4. A method according to claim 1 in which the act of displaying the processed information comprises illuminating at least one red or amber light source of a display comprising multiple red and amber light sources.

~~5. A method according to claim 4 in which the act of displaying the~~ processed information comprises illuminating multiple red or amber light sources of the display.

6. A method according to claim 4 in which the act of displaying the processed information comprises causing at least one red or amber light source of the display to flash.

7. A method according to claim 6 in which the act of displaying the processed information comprises causing at least one red and at least one amber light source to flash alternately.

8. A method according to claim 1 in which the act of displaying the processed information comprising illuminating a display positioned above a main glare shield of a cockpit of an aircraft.

9. A method according to claim 1 in which the vehicle providing the information that is electronically processed is operated by the operator.

10. A method according to claim 1 in which the operator operates a vehicle other than the one providing the information that is electronically processed.

11. A method according to claim 1 further comprising generating an aural signal based on the processed information.

12. An alerting device for a vehicle, comprising:

a. a display configured to provide (1) flashing amber pixels, (2) flashing red pixels, (3) alternating flashing amber or red pixels or both amber and red pixels, (4) steady illumination of amber pixels, and (5) steady illumination of red pixels; and

b. means for positioning the display in a field of vision of an operator of a vehicle.

13. An alerting device according to claim 12 in which the display is configured also to provide illumination of pixels so as to present one or more letters, words, or symbols.

14. An aircraft configured for operation by an operator and comprising:

a. a cockpit; and

b. an alerting device comprising means for displaying, in the normal forward-looking field of vision of the operator, information relevant to hazards existing or expected in connection with ground deceleration of the vehicle as it travels along a runway.

15. An aircraft according to claim 14 in which the displaying means is configured to provide (a) flashing amber pixels, (b) flashing red pixels, (c) alternating flashing amber or red pixels or both amber and red pixels, (d) steady illumination of amber pixels, and (e) steady illumination of red pixels.

16. An aircraft according to claim 15 in which the display is configured also to provide illumination of pixels so as to present one or more letters, words, or symbols.