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# NASA TECH BRIEF

*Ames Research Center*



## Integrated Flight Controller For Light Aircraft

### The problem:

Over half of all accidents involving small fixed-wing aircraft occur during approach and landing maneuvers. Because safe landings require the utmost in skill and unswerving attention on the part of the pilot, NASA is investigating the use of devices or aids which simplify the pilot's tasks. Research has been conducted on the application of spoiler/dive brakes to small fixed-wing general aviation aircraft so as to improve performance and handling qualities during the typical landing maneuvers of approach, flare, touchdown, and rollout as well as during go-around phases of operation. It was found that spoiler/dive brakes offer significant improvements in the performance and handling qualities of small aircraft, but a suitable means of safely controlling the performance of these aerodynamic surfaces must be provided, for the aircraft is incapable of climbing satisfactorily at any time when the spoiler/dive brakes are fully deployed, even at full power.

### The solution:

An integrated controller-throttle which engages the spoiler/dive brake system when the throttle setting is below a fixed power setting and gradually increases the effect of the spoiler/dive brake as the throttle is moved toward the idle position; since action is automatically reversible, a sudden application of power (as in an aborted landing maneuver) abruptly terminates the aerodynamic effects of the spoiler/dive brake system.

### How it's done:

1. The required aerodynamic modifications for control of lift-to-drag ratio (L/D control) are added to the basic design of the aircraft.

2. The throttle lever is redesigned to accommodate connections to the added surfaces. This is the integrated flight controller.

3. Controls are rigged and adjusted to coordinate the functions as desired. The normal functions of the throttle are maintained for power settings greater than the specific setting called the L/D engage point. As power is reduced below this point, control of the L/D devices is blended with throttle control, increasing L/D alteration to optimize approach and landing performance. Blending continues to the point of engine idle. Movement of the integrated controller beyond the normal idle stop is possible to command additional L/D alteration while engine power remains at idle.

For many years, spoilers and dive brakes have been used successfully on sail planes for landing operation. Preliminary test results indicate that an integrated controller significantly improves the potential of applying spoilers and dive brakes to small aircraft. Spoilers coupled by the integrated flight controller improve handling qualities of small aircraft to the point where the level of skill required for landing is considerably reduced; as a result, landing accidents may be reduced.

### Notes:

1. Research to date on integrated controllers has been limited to application for spoiler/dive brakes. Potential exists for adoption with other L/D alteration devices, such as boundary layer control systems, flaps, spoilers alone, dive brakes alone and/or negative thrust on propellers.

(continued overleaf)

2. Requests for further information may be directed to:

Technology Utilization Officer
Ames Research Center
Moffett Field, California 94035
Reference: TSP 72-10213

**Patent status:**

No patent action is contemplated by NASA.

Source: John W. Olcott, David R. Ellis, and Edward Seckel of Aeronautical Research Associates of Princeton, Inc. under contract to Ames Research Center

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