

## Memorandum

U.S. Department of Transportation  
Federal Aviation Administration

<b>Subject:</b>	<b>Action:</b> Review and Concurrence, Equivalent Level of Safety Finding for the Aviation Partners Boeing Winglet modification to a Model 737-300 FAA Project Number SA6508SE-T	<b>Date:</b>	February 13, 2003
		<b>Reg. Ref:</b>	§25.303
<b>From:</b>	Manager, TSS Airframe Branch, ANM-115	<b>Reply to Attn of:</b>	Howard Hall Airframe, ANM-120S
<b>To:</b>	Manager, Seattle Aircraft Certification Office, ANM-100S	<b>ELOS Memo #:</b>	SA6508SE-T-A-1

### Background

Aviation Partners Boeing (APB) has evaluated the 737-300 wing structure with APB blended winglets for flight loads that included various speed brake deflections, up to the full flight detent speed brake deflection of the production 737-300. Because of increased structural loading, the 737-300 with APB blended winglets would require extensive structural modification of the production wing to meet the requirements of §§ 25.303, 25.331, 25.333, 25.335(f), 25.337, and 25.373. Such extensive structural reinforcement of the wing after original production is considered impractical because of the disassembly required for installation of additional structural elements. To reduce the structural loading of the 737-300 with APB blended winglets; APB designed a load alleviation system (LAS) that limits the speed brake deflection when the airplane gross weight is above 125,000 LB (trigger weight) and the airspeed is above 320 knots indicated airspeed (KIAS). The speed brake deflection is limited to 50% of the flight detent of the production airplane. This is accomplished by an actuator in the flight deck aisle stand that moves a cam follower into a position to limit the travel of the speed brake handle when both the gross weight and airspeed values are exceeded. The gross weight and airspeed logic are included in a new computer. The new limited 50% position is indicated on the revised control stand light plate, next to the speed brake lever, by the term "50%" to provide appropriate cue to the pilots. Similar equivalent safety findings have been FAA approved for the 737-700 and 737-800 models incorporating Supplemental Type Certificate (STC) ST00830SE. The trigger weights are different for the three models.

### Applicable regulation(s)

§§ 25.203, 25.305, 25.307, 25.331, 25.333, 25.337, 25.373

### Regulation(s) requiring an ELOS

§§ 25.303

### Description of compensating design features or alternative standards which allow the granting of the ELOS (including design changes, limitations or equipment need for equivalency)

APB designed a load alleviation system (LAS) that limits the speedbrake deflection of the winglet airplane to 50% of the flight-detent of the production airplane.

## **Explanation of how design features or alternative standards provide an equivalent level of safety to the level of safety intended by the regulation**

The LAS reduces wing loading in the critical cases by limiting the speedbrakes to 50% deflection if the gross weight is above 125,000 LB and the airspeed is also above 320 knots indicated airspeed (KIAS). APB provided data demonstrating that the protection provided by the speedbrake LAS meets the system reliability and structural margins of safety requirements prescribed in the draft NPRM to revise § 25.302.

The system has been configured to provide flight crew annunciation in a failed state as prescribed in the draft NPRM. In the event the flight crew is not alerted to a failed condition, the aircraft can be safely operated in all regimes of the flight envelope with the possibility of reduced structural margins only under certain high gross weight, high speed, high "G-force" pitch up maneuvers, with speedbrakes deployed

## **FAA approval and documentation of the ELOS**

The FAA has approved the aforementioned Equivalent Level of Safety Finding in issue paper A-1. This memorandum provides standardized documentation of the ELOS that is non-proprietary and can be made available to the public. The Transport Directorate has assigned a unique ELOS Memorandum number (see front page) to facilitate archiving and retrieval of this ELOS. This ELOS Memorandum number should be listed in the Type Certificate Data Sheet under the Certification Basis section (TC's & ATC's) or in the Limitations and Conditions section of the STC Certificate.

[E.g., Equivalent Safety Findings have been made for the following regulations:  
§25.303 Factor of Safety (documented in TAD ELOS Memo SA6508SE-T-A-1)]

/Original Signed by Franklin Tiangsing/		2/13/03
Manager, Airframe & Cabin Safety Branch, ANM-115		Date

ELOS Originated by Seattle ACO:	Project Engineer Howard Hall	Routing Symbol ANM-120S
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