Clarifications and Updates for:

Practical Analysis or Aircraft Composites

February 10, 2023

Each item is classified by the: **PRIORITY-ITEM NUMER**, where:

PRIORITY

H = High M = Medium L = Low

For example, a heading of **L-1** is the first clarification (or update) that has a **Low** priority.

The highest priority items are listed first. This document contains clarifications and updates. A companion document contains corrections.

*NOTE: Only technical issues are considered. Grammar is not considered.

L-1	CLARIFICATION	Priority: Low	Date Added: October 1, 2018	
	On p. 665, for Table F.2, t is not explicitly defined. " t " is the thickness of the laminate and the			
	"thinner" dimension of	the element in question	(for either the flange or the web).	

L-2 CLARIFICATION	Priority: Low	Date Added: October 1, 2018
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p. 656, Section E.7

Current:

"Current NDI methods are incapable of indentifying *weak bond interfaces* that are in intimate contact with the adhesive."

Clarification:

"Current NDI methods are incapable of indentifying *weak bond interfaces* where there is *intimate contact* at the interface."

L-3 CLARIFICATION

Priority: Low

Date Added: October 1, 2018

p. 661 and 666

The Category 3 section may be unsymmetric about the vertical axis (such as a C-channel), but the properties will be calculated about the *Y*-axis as shown in Figure F.3. The distinction (for an unsymmetric section about the vertical axis) is that the principal axis will not be aligned with the *Y*-axis.

L-4 CLARIFICATION

Priority: Low

p. 120, 121, 122, 123, 634 Carpet plots (general)

For carpet plots, the vertical title specifically refers to the *laminate*.

L-5	CLARIFICATION	Priority: Low	Date Added: October 1, 2018	
	p. 120, 121, 634			
	Carpet plots (general)			
	The indicator with an arrow	<i>w</i> :		
	Current:			
	"Percent Fibers in Direction	n of Interest"		
	Clarification:			
	"Percent Fibers/Plies in Dir	rection of Interest"		

L-6 UPDATE Priority:	Low Date Added: October 1, 2018
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p. 319 Reference title is incorrect

Current:

Volkersen, O., Die Niektraftverteilung in Zugbeanspruchten mit Konstanten Laschenquerschritten. Luftfahrtforschung, Vol. 15, 1938, pp. 41–47.

Correct:

Volkersen, O., Die Nietkraftverteilung in zugbeanspruchten Nietverbindungen mit konstanten Laschenquerschritten, Luftfahrtforschung, Vol. 15, 1938, pp. 41–47.

L-7 CLARIFICATION

Priority: Low

p. 634

Section B.5 and Figure B.3 CTE carpet plot valid range

As stated in Section 5.4, carpet plots are only valid if the laminate is balanced. Also, they are most valid when the laminate is symmetric (or restrained from curvature when an in-plane load is applied). Figure B.3 should have a caption similar that used for the infinite plate, orthotropic stress concentration factor as shown in Figure 10.2.

Figure 10.2 Carpet plot for the infinite plate, orthotropic stress concentration factor for a specific material system. Laminate is symmetric and balanced; also appropriate for an unsymmetric laminate that is restrained from curvature in all directions.

L-8 CLARIFICATION	Priority: Low	Date Added: February 1, 2019
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p. 684 and p. 687 Unbalanced laminate allowables

When viewing the laminate from the $+45^{\circ}$ and -45° directions, the laminate is not balanced. In general, the allowables (as shown in Equations G.13 and G.19) are developed for laminates that are balanced. This is because unbalanced coupons may have unrepresentative failure modes due to grip restrain of in-plane shearing and edge effects.

One possible approach is to recognize that the degree of unbalance is relatively minor and is expected to be a small secondary effect. Therefore, the max strain criterion (laminate-based) is still expected to be applicable. To validate this assumption, testing at the higher levels is performed (building block testing). Provided the higher level testing does not produce unanticipated failures, the basic assumption is acceptable. From p. 607, "Sub-component

and/or component testing is necessary to discover and address unanticipated failure modes, which may not be present in lower-level testing.

M-1	CLARIFICATION	Priority: Medium	Date Added: February 1, 2019	
	p. 64, Section 2.7			
	p. 65, Section 3.8			
	p.108, Section 4.8			
	Transverse shear stiffness			
	There is a clarification to the	following statement a	nd statements similar to it:	

"Note that for the *stiffness* response, a state of plane stress is appropriate since the localized 3D stresses do not affect the overall stiffness."

The transverse shear stiffness (the stiffness related to the shear stresses τ_{xz} and τ_{yz}) are not always localized. They sometimes occur at a more global level with respect to the laminate. Although the secondary effect of transverse shear stiffness is not usually significant for solid laminates (more common for sandwich structures) the degree of significance will depend on the type of structure and problem being analyzed. See the term "Transverse shear stiffness" in the Index for relevant information.

M-2 CLARIFICATION Priority: Medium Date Added: February 10, 2023

p. 180 (Section 9.10.2: Truncated Max Strain Criterion (TMS)—Laminate Based) and (Eqn 9.10)

Current: v_{LT} is stated to be the Poisson's ratio of the *laminate* in the long transverse direction.

Correction: *v*_{LT} should be Poisson's ratio of a *unidirectional ply* as per: Hart-Smith, L.J., "The First Fair Dinkum Macro-Level Fibrous Composite Failure Criteria," Proceedings of ICCM–11, Gold Coast, Australia, 14th-18th, July, 1997. More specifically, per Steve Ward, per CMH-17,

V3, Ch8, 8.6.2.2, v_{LT} is believed to be the Poisson's ratio of a ply for a unidirectional carbon fiber polymer composite (not for a fabric ply and not for a laminate).

NOTE: The Poisson's ratio of a *unidirectional carbon fiber ply* is about 0.30. The Poisson's ratio of quasi-isotropic *laminate* is about 0.30. A bias in a laminate will change its Poisson's ratio, but many well-designed laminates have a Poisson's ratio that is not dramatically different than that of 0.3.

NOTE: This item appears in both the "Corrections" and "Clarifications" documents.