Minutes of the Transport Stresses Working Group of the Committee for European Environmental Engineering Societies Held on 21st August 2000 At Karlsruhe, Germany

Present at the Meeting of the Transportation Stresses Working Group (TSWG) were;

Dr U. Braunmiller	GUS
Mr C Broussy	ASTE
Mr A V Dorp	PLOT
Mr M. Dumelin	SSEE
Mr J Frith	GUS
Mr M. Juntunen	SEEF
Mr. D. Richards	SEE (Chairman)
Mr G Rudding	SEES
Mr T. Trost	SEES
Mr B Wouters	SSEE
Dr K. Zieghan	GUS

Matters Arising

Apologies were received from Harro Jansen, J. Moriceau and Dr P. Dehombreux.

A list of TSWG members, including corresponding members, was circulated. As usual this list is attached to the minutes as Attachment No 1. The Chairman apologised that the circulation of the minutes of the last meeting had occurred only by E-mail. Whilst, it had been the intent to also circulate paper copies, this had not occurred.

As the meeting was only scheduled for a period of only 2 hours, the agenda was truncated and a number of items, intended to be included, were deferred.

Systematisation of Measurement Methodologies

CEN TC 261 . The last meeting of this group occurred in April. Thomas Trost reported that the EU was still deciding whether the CEN standard meets their requirements in meeting the directive. Agreement or rejection is expected shortly

CEN TC 320 (Transport Quality). Karl Ziegahn reported a new draft was in preparation.

DIN 30787. Karl reported that part 6 (on using measurement black boxes) was complete. It was intended that all six parts would be put on a CD.

IEC TC104. David Richards reported on the TC 104 meeting that had occurred the previous week.

> **Testing of Soft Packages.** The chairman reported that that the second report of this Swedish led work was presented to the meeting . The second report made a number of recommendations for changes to existing test procedures. These were to be addressed by the maintenance working teams. In addition new guidance on shock testing was proposed as well as modifications to the bounce test to allow it to be performed on vibration generators.
>
> **Working Group 15.** This working groups was created to establish databases on dynamic environments for inclusion in IEC 680721. The databases that need to be identified include transportation (by road, rail, sea and air) as well as deployment in such vehicles. The gave a presentation on progress of this work based upon that made at the TC 104 meeting. The presentation is included as attachment No 2.

ISO TC 108. The chairman reported (at the last meeting) that two new working groups (WG25 and 26) had been proposed to set out methods of vibration and shock analysis. Although the work proposal had yet to be

submitted for national approval, the TC had provisionally agreed to go ahead. However, attempts to contact the chairman of these groups had not proved fruitful.

SRETS. Thomas Trost presented a "flier" produced by Packforsk for colour copies of the final report (subsequently E-mailed by Thomas).

Standards Report. At the last meeting it was suggested that the TSWG attempt to produce an overview of European and international work currently underway relating to transportation stresses. Mainly due to lack of time this item was not progressed at the meeting.

Plot Measurement Programme. Harro Jansen had sent in a report no further progress had been made on this project..

Monograph on Round Robin Methodologies. The chairman apologised that this was not yet complete. A copy of the draft had been circulated before the previous meeting for discussion. However, time did not permit this. Work continues on this topic. The chairman agreed to get a final version out for the next meeting.

Miscellaneous. At the last meeting Karl reported had reported that the "committee of experts" of the UN Dangerous Goods Organisation had proposed an additional vibration test. The proposal was almost identical to that made some time ago by the US and was essentially a crude bounce test. Since the last meeting several countries had made strong arguments against this test.

Round Robin Exercise

No time was available to discuss the Round Robin exercise. In consequence the discussion was deferred till the next meeting.

Future Work

At the last meeting a discussion paper on future transportation testing methods, had been tabled by the chairman. Unfortunately, time limitations prevented discussion on this. (The following day copies of the Quarterly Journal of BSMEE were circulated containing the paper). In the time remaining a brief discussion occurred, an overview of that discussion is included as Attachment 3. Effectively it was suggested that the TSWG was in a good position to take an overview of data and acquisition procedures relating to transportation stresses. An example of this was work to establish databases on dynamic environments for inclusion in IEC 680721. Information on conditions encountered during transportation was required by numerous standards organisations. CEEES was in a better position than most organisations to verify such data.

Any Other Business

In the few minutes remaining Markku Juntunen outlined a paper he is proposing to present at the next IEST (abstract attached as Attachment 4).

Next Meeting

The date of the next meeting of the TSWG is planned for.

Attachments

1 Names and Addresses of TSWG Members
2 IEC TC 104 WG 14 and 15 presentation
3 Discussion on Future Work
4 Abstract of VTT paper for IEST.

Distribution

As attachment 1 plus CEEES President and Secretariat

Attachment 1
Names and Addresses of TSWG Members

Attachment 3
Discussion on Future Work

Attachment 4
Abstract of VTT paper for IEST.

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IEC TC 104
Working Group 14 & 15
Climatic & Dynamic Field Data Including Validation

Convenors
Jacques Moriceau & David Richards

Terms of Reference of WG's 14 and 15

To define acceptable techniques for climatic / dynamic field data processing and to collate field data

Data Collection

- Initially intended to collect source or raw data.
- The collection of source data, as initially hoped, proved very difficult as:
  - Older data not available electronically.
  - Raw data was proving difficult to find and was frequently not releasable. Whilst, some data was proprietary the main difficulty appeared to be that raw data was rarely sufficiently documented to be released to a third party.
  - It was proving difficult (if not impossible) to reproduce the analysis process as neither working group had the resources to undertake analysis of their own.

Validation

- Working Group 15 realised fairly early that accumulating only fully “validated” data was probably not going to be realistic.
- Instead WG 14 and 15 had concluded that validation would have to be practically achieved by comparison of data from independent sources.
- However, the quality of the data should have some degree of tracability.

Data Analysis

- A view voiced by members of TC 104 was that WG 14 & 15 should identify the most “appropriate” method of data analysis.
- Having seen the effort that went into DIN 30787 (which makes recommendations for most modes of transportation), this was clearly not realistic.
- Decided the group should describe analysis process but not prescribe it.
- However, documents such as DIN 30787 should simplify future data comparison exercises.

Revised Intent

- After 18 months of effort little source data had been collected. In consequence the objectives were revised.
- The output of Working Groups 14 & 15 should be to focus on the original purpose of providing environmental information to permit the updating 60721-3-#.
- The groups should concentrate on collating data that could be put in the public domain or could be reviewed by the working groups. This will undoubtedly mean using data which has been part analysed or reduced.

Proposed New TOR

- To collect field data and to collate the validated data into a form suitable for comparison with 60721
- To make traceable recommendations for updating 60721
- To ensure traceability of the comparison processes
- To describe the utilised data comparison techniques

Progress

- Since the change of strategy a reasonable amount of data has been collected and further data are still been identified.
- However, a lot of the data are part analysed and / or paper based.
- Format of deliverables identified and implimentation of an electronic report initiated.

Technical Report Structure

- Part 1 – Presentation of classes of conditions
- Part 2 – Index of available data source and summary of data
- Part 3 – Comparison of available data including a review of validity
- Part 4 – Recommendations of WG's and validity of 60721 conditions

Electronic Report (1)

	Dynamic environment	Vibration	Shocks	Impact	acceln
60721-3-1	Storage				
	Handling	2	2		
60721-3-2	Transportation				
	Road	4	2		
	Rail	2	2		
	Sea	2			
	Air(Jet)	3			
	Air (Prop)	3			
	Air(Helicopter)	2			
60721-3-3	Stationary use at weatherprotected locations				
60721-3-4	Stationary use at non-weatherprotected Sites				
60721-3-5	Ground vehicle installations				
	On-Road	2			
	Off-Road				
	Rail				
60721-3-6	Ship environment				
60721-3-7	Portable and non-stationary use				

Electronic Report (2)

1. Test Report on Lockheed L-1011 Airborne Linear and Angular Vibration. (Restricted Distribution Data)
2. Vibration Environment Description for Containers Transported in VC10 Aircraft. (Restricted Distribution Data)
3. Mechanical Stresses on Products During air Cargo Transportation. (General Distribution Data)
4. GAM-EG-13 Annexe 6 Modeles et Donnees D'environnement Mecanique. (General Distribution Data)
5. Transportation Dynamic Environment Summary. (General Distribution Data)

A1. Assessment Vibration and Shock of Equipment Carried in Fixed Wing Jet Aircraft

Electronic Report (3a)

ENVIRONMENTAL DATA SOURCE IDENTIFICATION	
Linear and Angular Vibration Measurements on Lockheed Tristar	
OWNER / PROVIDER (COMPANY or ORGANISATION)	**NAME :** **Address :**
Point of Contact	**NAME :** **Phone :** **Fax :** **Email** :
Permitted use of the source	❑ **Unlimited** ❑ **Restricted to WG14-15 needs without referencing**

Electronic Report (3b)

REFERENCE OF THE SOURCE (Title, Edition, Author and date)	**Test Report on Lockheed L-1011 Airborne Linear and Angular Vibration Measurements, AFFDL Report AFFDL/FBG/79-7, May 1979**
TECHNICAL CONTENT	**Natural climatic data** **Induced climatic data** **Induced dynamic data**
REMARKS COMMENTS	Although the report print quality is poor the information seems to be of high quality. The main reservation is that it relates to a single flight on a single aircraft.
ABSTRACT (aim of the data collection, identification of the platform, geographical areas, etc.)	A flight vibration measurement program was, conducted on a Lockheed L-1011 aircraft in Support of the Airborne Laser Laboratory II (ALL 11) program at the Air Force Weapons Laboratory. Linear and angular vibration measurements were made at two fuselage stations for a full spectrum of aircraft flight conditions. These measurements will be used to develop a vibration baseline for the design of the ALL 11 Advanced Electro-Optical Systems and possibly to construct dynamic models of the aircraft to predict vibration responses due to modifications.

Electronic Report (4)

1. Test Report on Lockheed L-1011 Airborne Linear and Angular Vibration. (Restricted Distribution Data)
2. Vibration Environment Description for Containers Transported in VC10 Aircraft. (Restricted Distribution Data)
3. Mechanical Stresses on Products During air Cargo Transportation. (General Distribution Data)
4. GAM-EG-13 Annexe Modeles et Donnees D'environnement Mecanique. (General Distribution Data)
5. Transportation Dynamic Environment Summary. (General Distribution Data)

A1. Assessment Vibration and Shock of Equipment Carried in Fixed Wing Jet Aircraft

Electronic Report (5)

TC104/WG15(Report)/01

For IEC use only

2000-08

INTERNATIONAL ELECTROTECHNICAL COMMISSION
TECHNICAL COMMITTEE No. 104: ENVIRONMENTAL CONDITIONS, CLASSIFICATION AND METHODS OF TEST
WORKING GROUP No. 15: DYNAMIC FIELD DATA INCLUDING VALIDATION
Vibration and Shock of Equipment Carried in Fixed Wing Jet Aircraft

Scope

This assessment reviews the available dynamic data relating to equipment transported in fixed wing jet transport aircraft. For each of the sources identified the quality of the data is reviewed and checked for self consistency. The intent is that from all the available data an environmental description will be generated and compared to that set out in IEC 60721.

Example Assessment

- A database of dynamic environmental information is only a means to an end. The ultimate requirement is to update 60721-3-#
- An example assessment has been prepared to
  - determine whether paper based, part analysed data could be used to make valid recommendations to update 60721-3-#.
  - determine whether information from diverse sources could be coherently (and practically) combined.
  - Demonstrate, to potential data suppliers, how their data was to be used.
  - Establish a format into which future data could be included.

Data Assessment

- An example assessment is complete for the air carriage environment in fixed wing jet aircraft.
- This assessment undertakes;
  - a review of data source and quality,
  - an intra and inter data comparison of the available information,
  - a comparison with 60721-3
  - a comparison with other test specifications
  - makes recommendations.
- Sufficient information exists to undertake similar assessments for a number of other induced dynamic environments.

Data Used in Assessment

- Main data sources from
  - Lockheed Tristar, BAe VC10 and Boeing 747.
- Reasonable data validity can be established for these three sources.
- Intra data source comparison undertaken for each source i.e. effects of flight condition, position in aircraft and axis.
- Supplementary data from
  - McDonnell Douglas DC8, Lockheed C5A & C-141and Boeing NC-13
- Supplementary data from reputable sources but data quality cannot be verified
- Test Specification values included from;
  - ASTM D4728-91, Mil Std 810F, AECTP 400 & Def Stan 00-35

Summary

- Since the change of strategy a reasonable amount of data has been collected and further data are still been identified.
- Example assessment indicates data is capable of been used to make valid recommendations to update 60721-3-#.
- Tracability of any recommendations is essential.
- Electronic format proposed will increase confidence in 60721 information, allow contributors to follow progress of work as well as having the potential to enhance feedback of information

- Overview / Relationship
- Coordination < Defense
  Commercial
- Background
- Technical expertise
- Introduction of
  new technologies
- Analysis of procedures,
  new measurements,
  data processing, ...
- discussion forum

IEST

Design, Test, and Evaluation

ABSTRACT

Development of Shock and Vibration Test Specifications for Telecommunication Equipment in Automotive Environments.

Markku Juntunen, VTT Manufacturing technology

Kalle Vehvildinen, VTT Manufacturing technology

Kybsti Vdkevdinen, Nokia Research Center

Kari Ojala, Nokia Research Center

Results of the development of shock and vibration test specifications for telecommunication equipment on the basis of field measurements are presented. Telecommunication products can be installed into different locations in vehicles and therefore vibration and shock loads can be different for different products. Thus, the measurements were conducted from several possible mounting locations of telecommunication equipment. In addition, different road types and situations giving impact loads were studied. In practice, the life cycle profiles of telecommunication equipment may vary considerably. In this work the emphasis was on the study of the operational phase and therefore information of different users were collected. On the basis of the most important life cycle profiles the measured environmental conditions were combined in order to obtain the final shock and vibration test requirements.

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