

# Nationaal Lucht- en Ruimtevaartlaboratorium

National Aerospace Laboratory NLR



Exel Oyj Kivara Factory  
Attn. Mr. J. Martikainen  
Airport Products  
Muovilaaksontie 2  
FI-82110 HEINAVAARA  
FINLAND

from  
H.J. ten Hoeve/th  
telephone  
+31 527 24 82 87  
our order number  
0320410  
our reference  
AVMS/1165  
Please refer in your reaction to our reference  
date  
25 June 2008

subject  
ICAO's and FAA's frangibility requirements for approach light support structures

To whom it may concern,

International Civil Aviation Organisation (ICAO) initiated the Frangible Aids Study Group (FASG) in 1981. The task of the FASG was to define the design requirements, to develop guidelines for frangibility of approach light structures and to develop test procedures.

As a minimum requirement, it was defined that a small commuter aircraft of 3000 kg, impacting the approach light structure at 140 km/h during landing or take-off, should be able to continue to fly safely.

Several full-scale experiments have been carried out in accordance with the FASG recommendations. Complementary tests have been carried out with certain variations in impact velocity, differing impactors, absence of electric cables etc. Based on the work of FASG, Aerodrome Design Manual Part 6, Frangibility was published in 2006 by ICAO. The design manual covers issues like:

- items to be made frangible at airport environment
- frangibility requirements for various support structures
- design criteria for frangibility
- testing procedures
- acceptance/rejection criteria
- maintenance procedures

Most of these tests have been witnessed by Dr. J.F.M. Wiggenraad of the National Aerospace Laboratory (NLR) in the Netherlands, on behalf of the Netherlands Department of Civil Aviation.

Exel masts, both tubular and lattice masts have been tested in a full scale impact test as defined in Aerodrome Design Manual Part 6. As representative of the National Aerospace Laboratory of the Netherlands Dr. J.F.M. Wiggenraad has witnessed a full scale test of Exel lattice masts in 1991. A test report is available from Exel in the English language. (Ref. 1)



**Postal address**  
P.O. Box 90502  
1006 BM Amsterdam  
The Netherlands

**NLR Amsterdam**  
Anthony Fokkerweg 2, 1059 CM Amsterdam  
Telephone +31 20 511 31 13, Fax +31 20 511 32 10

**NLR Noordoostpolder**  
Voorsterweg 31, 8316 PR Marknesse  
Telephone +31 527 24 84 44, Fax +31 527 24 82 10

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Based on the data measured on these tests as well as numerical analysis performed by NLR (Ref. 2) Exel masts conform to the requirements set forth in Aerodrome Design Manual Part 6, Frangibility – First Edition, 2006.

The FAA design and test requirements for low-impact resistant structures, as defined in AC 150/5345-45C, April 2007, are identical to the ICAO design and test requirements for frangible structures, and therefore Exel lattice masts also comply with the FAA requirements.



**NATIONAAL LUCHT- EN RUIMTEVAART**  
**LABORATORIUM (NLR)**  
**VOORSTERWEG 31**  
**8316 PR MARKNESSE**

H.J. ten Hoeve  
Business Manager Aerospace Vehicles Division

Ref. 1

J. Hanka, M. Vahteri, Impact tests of EXEL approach light masts-test report NESTE, October 1991

Ref. 2

J.F.M. Wiggeraad, A. de Boer and R.H.W.M. Frijns (2000): Impact simulation of a frangible approach light tower by an aircraft wing section. NLR-TP-2000-618.