Prof. Dr. Hans-Reinhard Meyer-Piening (1937 – 2013)

in Kenntnis zu setzen. Er verstarb am 12. März 2013 in seinem 77. Lebensjahr.
Der Verstorbene wurde 1937 in Bremen geboren. Er studierte von 1956 bis 1962 Flugzeug- und Leichtbau an der Universität Braunschweig und promo- vierte 1970 am Institut für Flugzeugbau der Deutschen Forschungs- und Versuchsanstalt für Luft- und Raumfahrt (DFVLR) in Braunschweig. Seine Doktorarbeit wurde später ausgezeichnet mit dem Hugo-Junkers-Preis der DFVLR. Im selben Jahr wechselte er in die Firma Erno-Raumfahrttechnik und übernahm dort alsbald die Leitung der Abteilung für Dynamische Stabilität und Festigkeit. 1981 wurde er schliesslich vom Bundesrat zum ordentlichen Professor für Leichtbau der ETH Zürich gewählt.

Hans-Reinhard Meyer-Piening war über mehr als zwanzig Jahre Vorsteher des Instituts für Leichtbau und Seilbahntechnik der ETH Zürich. Er war ein weltweit anerkannter Experte im Bereich der Stabilität, Integrität und Kon- struktion von neuartigen Leichtbausystemen. Als begeisterter Ingenieur, Lehrer und Forscher hat er mit viel Engagement und Erfolg die Ausbildung im Bereich des Leichtbaus an der ETH Zürich geprägt.

Seine ruhige Art, sein feiner Humor und seine Warmherzigkeit werden die Angehörigen der ETH Zürich, seine ehemaligen Studierenden wie auch sei- nen Kolleginnen und Kollegen dankbar in Erinnerung behalten und ihm ein ehrendes Andenken bewahren.

Der Präsident der ETH Zürich (Swiss Federal Institute of Technology Zurich)
Ralph Eichler

Selected Publications:

Rao, K. M. and Meyer-Piening, H.-R., “Buckling Analysis of FRP Faced Cylindrical Sandwich Panel under Combined Loading”, Composite Structures, Vol. 14, 1990, pp. 15-34.

H.-R. Meyer-Piening (1), B. Geier (2) and K. Rohwer (2)
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“Remarks on the effective-width concept for orthotropic thin shells”, in Buckling of shell structures on land, in the sea and in the air, edited by J. F. Jullien, Elsevier Applied Science Publishing Co., Inc., New York, 1991
ABSTRACT: Thin-walled stiffened panels tend to buckle under compressive and/or shear loads with resulting redistriution of stresses in the structure. Provided that the stiffeners are capable of sustaining the additional load, such conditions are acceptable in many structures. Since a complete postbuckling analysis for each state of loading is prohibitive, simple approximations are in use. With the appearance of orthotropic panels it is deemed desireable to extend such approximations to panels with orthotropic properties. A short review of available recommendations is given and a one term approach is used to demonstrate the effect of orthotropy. Further, recent panel test results from ETH Zurich are reviewed accordingly, and two different FE-based postbuckling analyses (postbuckling at Zurich and initial postbuckling at Braunschweig) are performed to provide confirmation that the quality of a crude and simplifying formula is acceptable.

H.-R. Meyer-Piening and R. Anderegg, “Buckling and postbuckling investigations of imperfect curved stringer-stiffened composite shells. Part A: Experimental investigation and effective width evaluation”, Thin-Walled Structures. Vol. 23, No. 1-4, 1995, pp. 323-338, Special Issue: Buckling Strength of Imperfection-sensitive Shells, doi:10.1016/0263-8231(95)94360-6
ABSTRACT: A box-like stringer-stiffened thin-walled CFRP structure was subjected to load cases well beyond the limits of local buckling. The development of the deflection pattern was recorded via optical means and analysed numerically. In addition, the structure was modelled and analysed using the MARC FE program in the nonlinear deflection range. The geometrical imperfections of the test structure were recorded by mechanical scanning and optical methods and introduced into the mathematical model. For the perfect (‘ideal’) and the geometrically imperfect (‘real’) structural model, the results of the FE analyses were compared and used to judge the effect of geometric imperfections on the postbuckling behaviour of the structure. The effective axial stiffness for the various postbuckling states was evaluated and related to analytical estimates of effective width values for orthotropic sheet-like panels.

H.-R. Meyer-Piening, M. Farshad, B. Geier, R. Zimmermann, Buckling loads of CFRP composite cylinders under combined axial and torsion loading- experiment and computations, Composite Structures 53, 427-435, 2001

B. Geier (1), H.-R. Meyer-Piening (2) and R. Zimmermann (1)
(1) DLR, Institut für Strukturmechanik, Lilienthalplatz 7, D-38108 Braunschweig, Germany
(2) ETH Zürich, Institut für Mechanische Systeme, Leonhardstrasse 25, CH-8092 Zürich, Switzerland
“On the influence of laminate stacking on buckling of composite cylindrical shells subjected to axial compression”, Composite Structures, Vol. 55, No. 4, March 2002, pp. 467-474, doi:10.1016/S0263-8223(01)00175-1
ABSTRACT: The buckling loads of laminated cylinders can strongly depend on the position of the differently oriented layers within the shell. This paper deals with two different laminated orthotropic cylinders with opposite stacking sequence of the laminate layers. Cylinders of this construction had been thoroughly tested within a BRITE EURAM project. Analytical and semi-analytical methods have been used to predict the buckling loads, and the results are reported in this paper as well as test results for comparison. An explanation of the striking influence of stacking sequence is given. With some more examples the findings are verified. It is suggested that the presented results can be used for benchmarking purpose.

L. Wullschleger and H.-R. Meyer-Piening (ETH Zurich, Institute of Mechanical Systems, Zurich, Switzerland), “Buckling of geometrically imperfect cylindrical shells — definition of a buckling load”, International Journal of Non-Linear Mechanics, Vol. 37, Nos. 4-5, June 2002, pp. 645-657, Special Issue: Stability & Vibration in Thin-Walled Structures, doi:10.1016/S0020-7462(01)00089-0
ABSTRACT: On the basis of extensive buckling tests and analytical and numerical buckling analyses for composite cylinders it became desirable to provide a recommendation for the most reliable evaluation of stability limits for imperfect CFRP cylinders subjected to axial compression. This paper reports on different approaches including linear, non-linear and dynamic non-linear FE analysis results and discusses the related effects and potential difficulties.

H.-R. Meyer-Piening (ETH Zurich, IMES, CH 8092 Zurich, Switzerland), “Sandwich Plates: Stresses, Deflection, Buckling and Wrinkling Loads - A Case Study”, Journal of Sandwich Structures and Materials, Vol. 8, No. 5, pp. 281-394, September 2006, DOI: 10.1177/1099636206064825
ABSTRACT: This article deals with the linear static and buckling analysis of an asymmetric square sandwich

plate with orthotropic stiffness properties in the face layers. Two analytical formulations related to thin and thick face layers, respectively, have been taken from (Zenkert, D. (1995). An Introduction to Sandwich Construction, Chameleon Press Ltd, London, UK (ISBN 0 947817 77 8)), slightly modified to account for unequal faces, orthotropic properties in the face layers, and individual Poisson's ratios, and applied to square sandwich plates of 1 m lateral dimension and a variety of different face layer thickness. All cases assume simply supported edges. The obtained deflections and buckling loads are compared with the results of a 3D analysis (Meyer-Piening, H.-R. (2004). Application of the Elasticity Solution to Linear Sandwich Beam, Plate and Shell Analyses, J. of Sandwich Structures & Materials, 6(4): 295-312) and of finite element calculations. The objectives of this study are to gain insight into the limits of validity of the published formulas in view of unequal thick face layers and orthotropic properties. The obtained results are meant to serve as a benchmark for further studies.