Obituary for Frans Nieuwstadt

April 8, 1946 - May 18, 2005

Frans Nieuwstadt of TU Delft, who died suddenly under tragic circumstances on May 18, 2005, made profound contributions to research in turbulent shear flows, first in meteorology, and then in engineering. Frans was the first editor in chief of the journal Flow Turbulence and Combustion and his passing away is a great loss to the journal. He negotiated the important transformation of this journal with the publishers and through his editorial skills and efforts made it into the periodical that is now so widely appreciated by the international scientific and engineering community in this field. As the Editor, as a contributor and as a working scientist he had a mind that led to the sharpest questioning that anyone might experience, but it was always done with a genial twinkle in his eye and a gentle laugh. He was a great communicator, who spoke English perfectly and also enjoyed conversing in other European languages.

He is greatly missed professionally for his leadership and friendship to fluid dynamicists around the world. He was recognised as an outstanding teacher with a special award from the students of TU Delft; he organised many conferences, some of which are well remembered for their innovative themes and his forceful chairmanship as he urged delegates to address the key issues; he was an effective chairman and colleague in the Dutch Research Foundation of Matter (FOM) where, most unusually as a fluid dynamicist, he gained the respect of physicists, so much so that in FOM's budget there is now a significant money stream to research in fluid dynamics - a unique feature of The Netherlands scientific scene! At TU Delft he has been a remarkable director of the Fluid Dynamics Laboratory at the Faculty of Mechanical Engineering. He had a strategic plan for the research that he pursued over 15 years, bringing in new staff and funds so that the lab now has 4 post-doc researchers, 4 assistant/associate and visiting professors, and 15 PhD students, and 5 support staff. His strategy also involved extensive collaboration with laboratories and individuals in The Netherlands, Europe and the rest of the world.

He saw the value to his laboratory of the new networks that have sprung up in Europe including Euromech, ERCOFTAC, and the European Turbulence Conferences (which he chaired 1990-1996). He also supported conferences of the International Union of Theoretical and Applied Mechanics. He was one of the founders of the J M Burgers Centre with its academic and industrial research and training network that is a unique contribution of The Netherlands and is now being copied elsewhere in Europe.

In the laboratory he was meticulous in holding regular planning meetings for the research and support staff, so that everyone knew what was happening and what was expected. These often ended up as great coffee parties in the centre of the lab with cakes and cookies celebrating someone's birthday or some academic success. This leadership was essential in a period when his laboratory had to move and when restructuring of the university led to great uncertainty about future plans.

He took the ambassadorial role of being a lab director seriously, working with industrial and governmental laboratories and encouraging collaboration with a small consulting company, FlowMotion, set up in the same laboratory building. He participated very actively on university boards and committees, including those dealing with the serious financial and organisational issues facing the university. He had a delightfully light touch when entertaining the families of prospective students; taking great pleasure in turning on the flying pink cow that circled above

the lab with flapping wings. This sense of fun imbued all his teaching that was both thorough and highly innovative. His course on turbulence led to his text book on turbulence written in Dutch and widely used in The Netherlands.

Frans was born in 1946. He was a brilliant student at school and university where he specialised in theoretical aerodynamics. After his university education he spent two years at the California Institute of Technology. He very much enjoyed this period, and he always encouraged his students to spend some time at a foreign college. On his return he joined the boundary layer research team at the Royal Dutch Meteorological Institute at De Bilt, which was famous not only for the excellence of the theoretical ideas and models, but also for taking detailed profiles of the airflow over very flat terrain. At the same time he undertook research at the Free University of Amsterdam under the supervision of Prof. Henk Tennekes. The subject of his doctoral thesis in 1981 was the Nocturnal Boundary Layer. He built his international reputation with his new model of the stable boundary layer that (with a few modifications) has been regarded as the standard model. With Bert Holtslag he formulated the overall concept of how the structure of the pbl depends on the critical ratio the boundary layer depth to the Monin-Obukhov length (which he summarised in the recently published Encyclopaedia of Atmospheric Science). He collaborated with his close friend and colleague Han van Dop in modelling turbulent diffusion using both stochastic and analytic eddy diffusion methods. They co-chaired an international conference whose very well edited proceedings together with cartoons of the chairmen and speakers continues to be sold – a most unusual accomplishment. Frans and Han together with other colleagues were instrumental in encouraging Henk Tennekes to return to Europe in 1978 to become director of research at KNMI and later chairman of the scientific committee at ECMWF.

In 1986 the famous 'Hinze' chair at Delft fell vacant following the departure of Gijs Ooms to Shell. Frans and his family moved to 's Gravenzande near the beach, and he threw himself into the task of energising the laboratory in new directions, as well as reinforcing the traditional strength of mechanical engineering fluid mechanics. He and his students developed the latest measurement techniques especially laser Doppler anemometry and PIV, which they are now applying to many problems.

In a very long pipe they tackled Reynolds' transition problem using these techniques to explore how the growth of finite amplitude disturbances depends on the type of initial disturbance. Several students wrote important theses on the hydrodynamic stability theory. It was something of a triumph when the experimental results agreed with weakly non-linear theory developed by USA and European collaborators and were published by Science in 2004. The champagne flowed! Two phase flow in a more controlled form was also a major theme of his research, as were related studies of non-Newtonian flows, combustion, acoustics, porous media and thermal convection. He followed in the footsteps of Lumley in recognising that one learns most about turbulences when one gives it a 'kick'. It would not be an exaggeration to say that his laboratory was certainly in the top 10 on any world listing!

An integral part of this programme was to develop numerical simulation techniques first using LES and then DNS. He joined with other meteorologists in comparing and validating LES for accurate calculation of turbulence in the atmospheric boundary layer. There was latterly much exchange in the studies of DNS with Stanford and other laboratories, with students and staff contributing greatly to summer programmes in the US and Europe.

Frans was a great believer that engineers should also be able to gather and work in pleasant

surroundings with good company; these perks should not only go to physicists and pure scientists!

Frans was a great companion to everyone in his laboratory and took great pride in having a family atmosphere, and dealing gently but firmly with the managerial and personal difficulties that arise in any organisation.

At his funeral they played his favourite guitar music together with the Beatles and a moving song in French.

Julian Hunt
May 2005