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Real time color holographic interferometry devoted to 2D unsteady wakes flows

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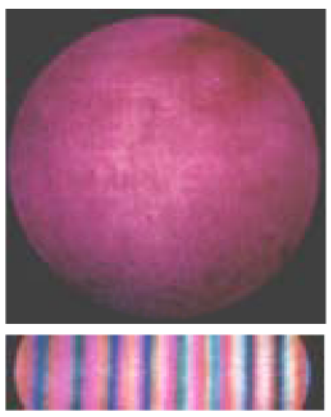

Fig. 1. Uniform background and straight fringes

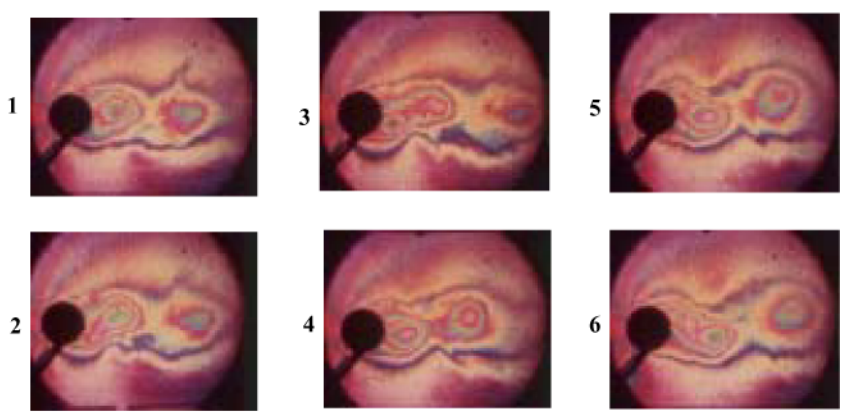

Fig. 2. High speed holographic interferograms

A new optical technique based on real time holographic interferometry in trues colors has been developed at the Institut de Recherches de Saint-louis and implemented around the transonic wind tunnel of the ONERA-Lille center to analyze 2D unsteady wake flows. Tests realized in color interferometry, real time and double exposure, simultaneously use three wavelengths of a continuous waves laser (argon and krypton mixed) and holograms are recorded on silver-halide single-layer panchromatic Slavich PFG03c plates. The very principle of real-time true color holographic interferometry uses three primary wavelengths (red, green, blue) to record, under no-flow conditions, the interference among the three measurement beams and the three reference beams simultaneously on a single reference hologram. After the holographic plate is developed, it is placed on the test setup again in the position it occupied during exposure and the hologram is illuminated again by the three reference beams and three measurement beams. A flat, uniform color can then be observed behind the hologram (see Fig.1). So a horizontal, vertical, or even circular fringe pattern can be formed and the achromatic central white fringe can be made out very clearly. This single color is used to determine the zero path difference on the interferograms (Fig.1). The flow studied was the unsteady flow downstream of a cylinder of diameter D = 20 mm placed crosswise in the test section. Fig. 2 gives a sequence of six interferograms shifted of 100 μs of flow around the cylinder at Mach 0.37. The vortex formation and dissipation phases can be seen very clearly, along with the fringe beat to either side of the cylinder.