Abstract of original user's manual for BOSOR4:
Bushnell, D.: "**BOSOR4: Program for Stress, Buckling, and Vibration of Complex Shells of Revolution**," Structural Mechanics Software Series – Volume 1, Edited by N. Perrone and W. Pilkey, University of Virginia Press, Charlottesville, VA, 1977, pp. 11 – 143.
See 1974.abs.basic.pdf for a view of Table 1, which is referred to in the following text.

(This is an abridged version. See the full-length paper for more: bigbosor4.papers/1974.usersmanual.pdf. Also see the following: bigbosor4.abstracts/1974manual.capability.pdf, bigbosor4.abstracts/1974manual.cases.pdf, bigbosor4.abstracts/1974manual.input.pdf, bigbosor4.abstracts/1974manual.pitfalls.pdf.)

INTRODUCTION

A comprehensive computer program, designated BOSOR4, for the analysis of the stress, stability, and vibration of segmented, ring-stiffened, branched shells of revolution and prismatic shells and panels is described. (2011 NOTE: BOSOR4 is now superseded by BIGBOSOR4, which will handle many more shell segments.) The program performs large-deflection axisymmetric stress analysis, small-deflection non-axisymmetric stress analysis, modal vibration analysis with axisymmetric nonlinear prestress included, and buckling analysis with axisymmetric or with non-axisymmetric prestress.

One of the main advantages of the code is the provision for realistic engineering details such as eccentric load paths, internal supports, arbitrary branching conditions, and a "library" of wall constructions.

The program is based on the finite difference energy method, which is very rapidly convergent with increasing numbers of nodal points.

Overlay charts and core storage requirements are given for the CDC 6600, IBM 370/165, and UNIVAC 1108/1110 versions of BOSOR4. (2011 NOTE: BIGBOSOR4 runs on LINUX.)

Several examples are included to demonstrate the scope and practicality of the program. Some hints are given to help the user generate appropriate analytical models. An appendix contains the user's manual for BOSOR4.

Table 1 shows the characteristics and status of BOSOR4. The program is currently in widespread use and is maintained by the developer. Notices of any bugs found are promptly circulated to all known users and data centers that have acquired BOSOR4.

The BOSOR4 program was developed in response to the need for a tool that would help the engineer to design practical shell structures. An important class of such shell structures includes segmented, ring-stiffened, branched shells of revolution. These shells may have various meridional geometries, wall constructions, boundary conditions, ring reinforcements, and types of loading, including thermal loading.

An example is shown in Fig. 1. The meridian of the shell of revolution consists of six segments with various geometries and wall constructions. The first segment (nearest the bottom, end "A") is a monocoque ogive with variable thickness; the second is a conical shell with three layers of temperature-dependent, orthotropic material; the third is a layered, fiber-wound cylinder; the fourth is a toroidal segment with eccentric rings and stringers; the fifth is a spherical segment with eccentric rings and stringers; and the sixth is a flat plate with

sandwich construction and eccentric meridional stiffeners. The reference surface is indicated by the dark dash-dot line. It is seen that the meridian of the composite shell structure is discontinuous between the first and second segments, the second and third segments, and the third and fourth segments. In the analysis these discontinuities are accounted for. The shell is supported at the end "A" by a ring that is restrained as shown. etc., etc.; read the full paper for more text. Sample figures follow.

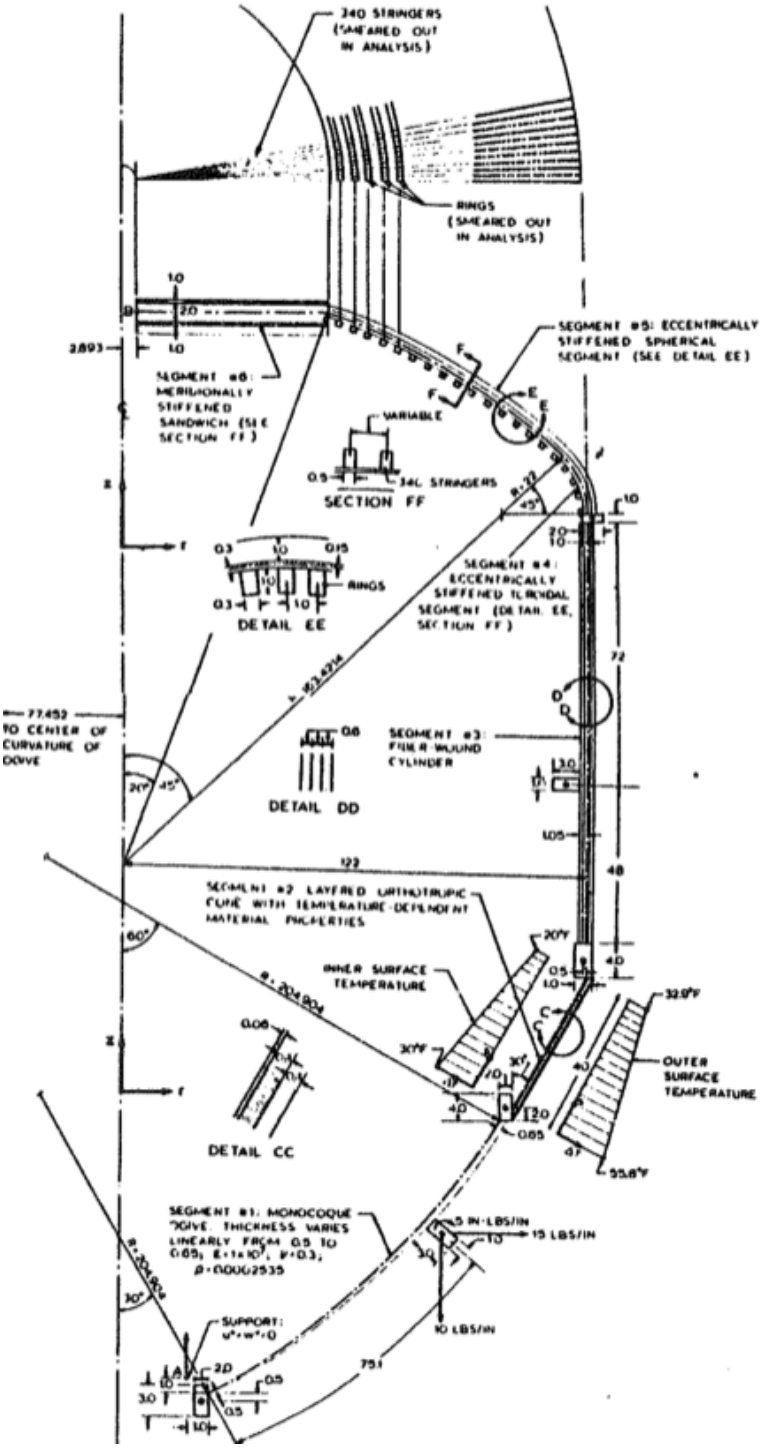

Fig. 1 Segmented composite shell for analysis by BOSOR4 (or BIGBOSOR4).

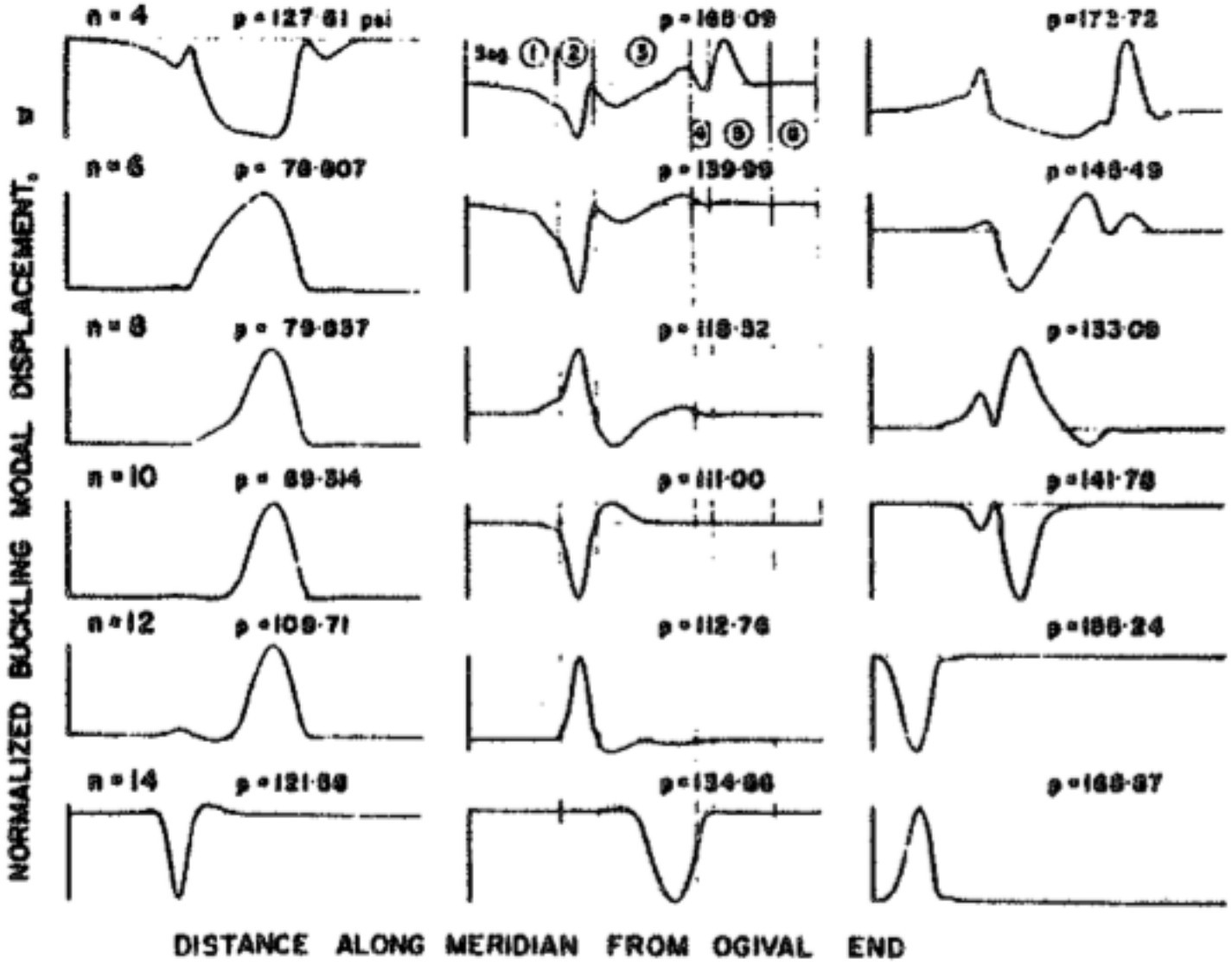

Fig. 2 w-components of eigenvectors for linear buckling analysis of the externally pressurized, six-segment shell shown in Fig. 1. (from the original 1974 BOSOR4 user's manual)

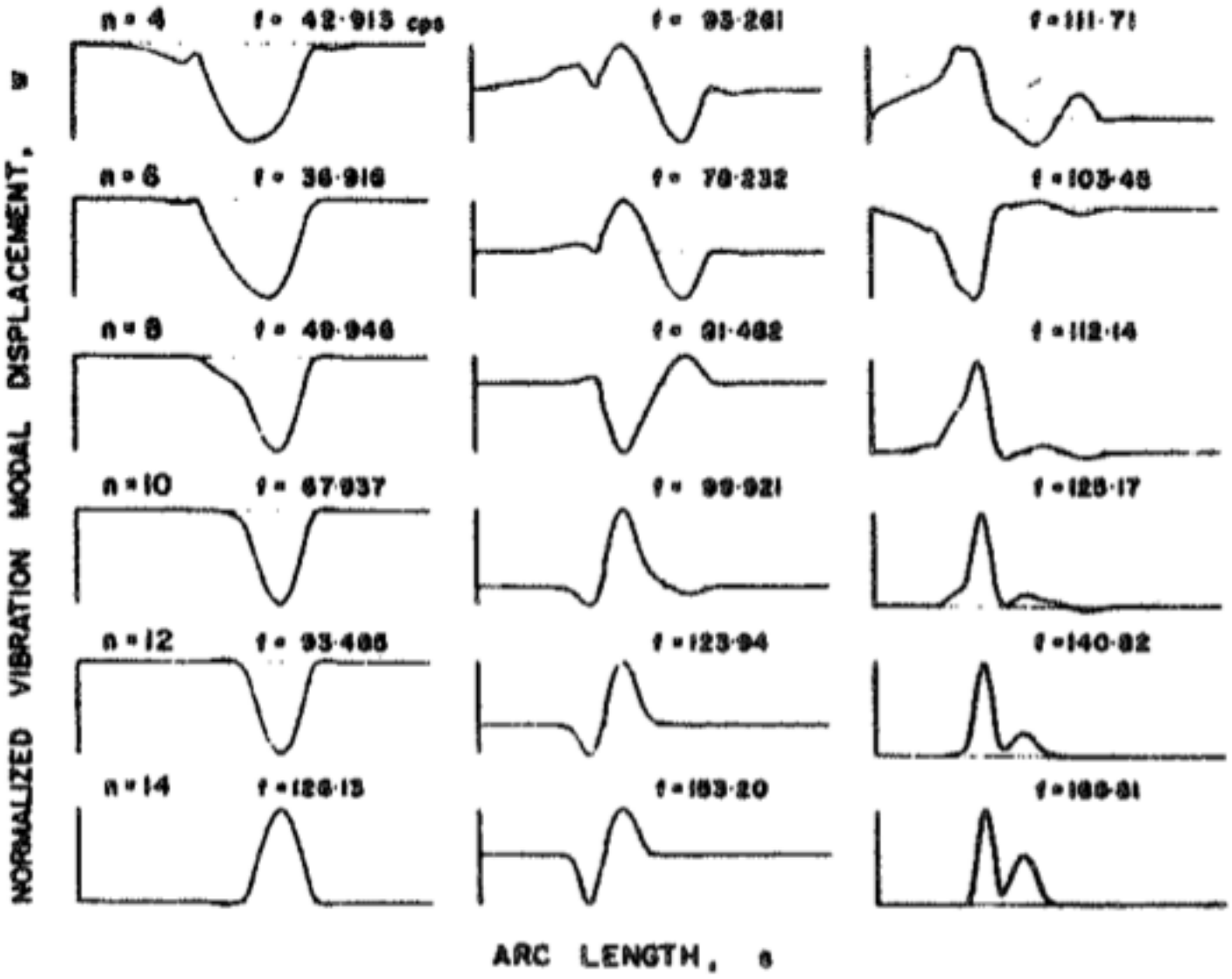

Fig. 3 w-components of eigenvectors for the free vibration analysis of the six-segment shell shown in Fig. 1. (from the original 1974 BOSOR4 user's manual)

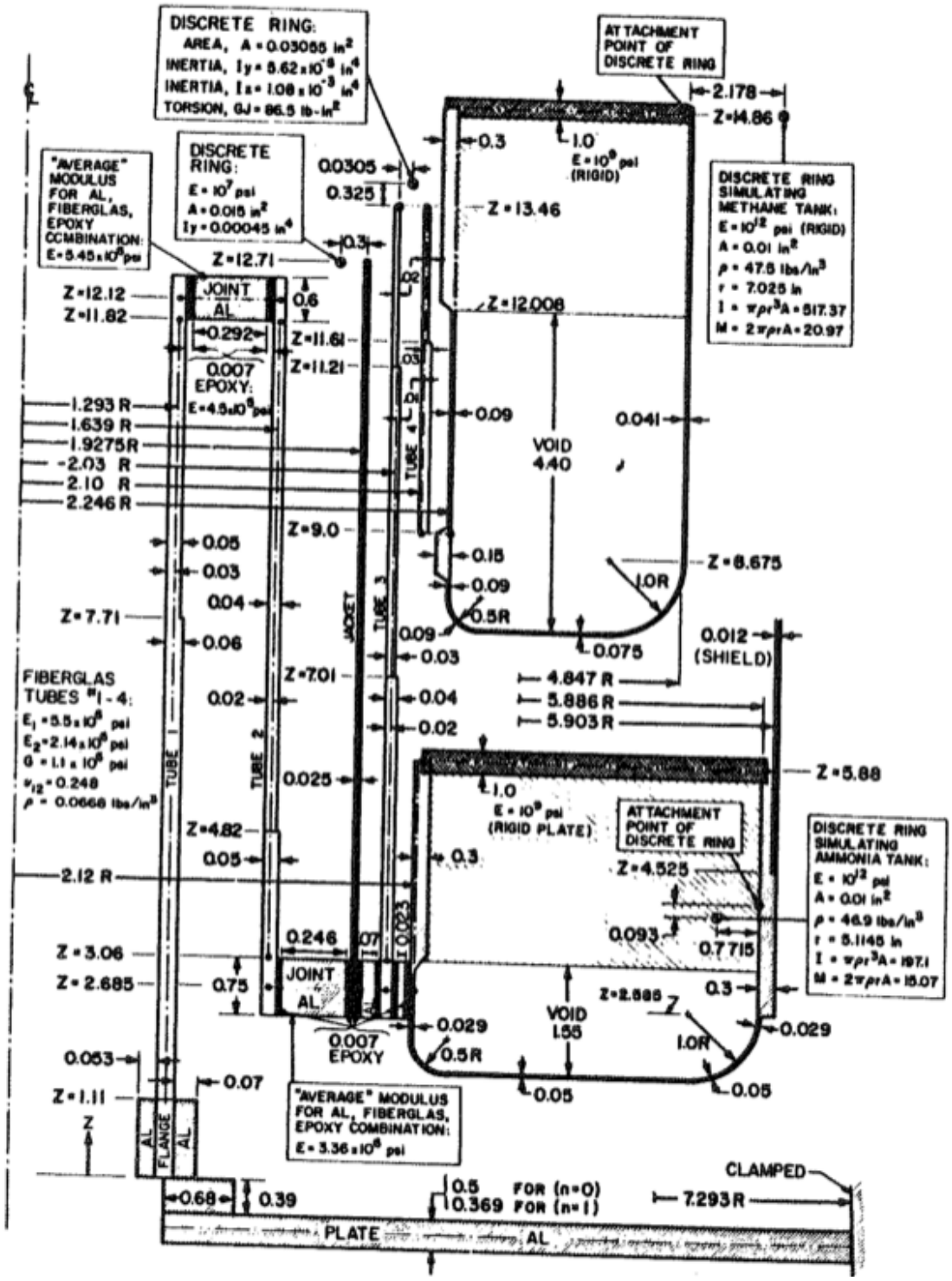

Fig. 4 Cryogenic cooler model for BOSOR4 (or BIGBOSOR4). (from the original 1974 BOSOR4 user's manual).

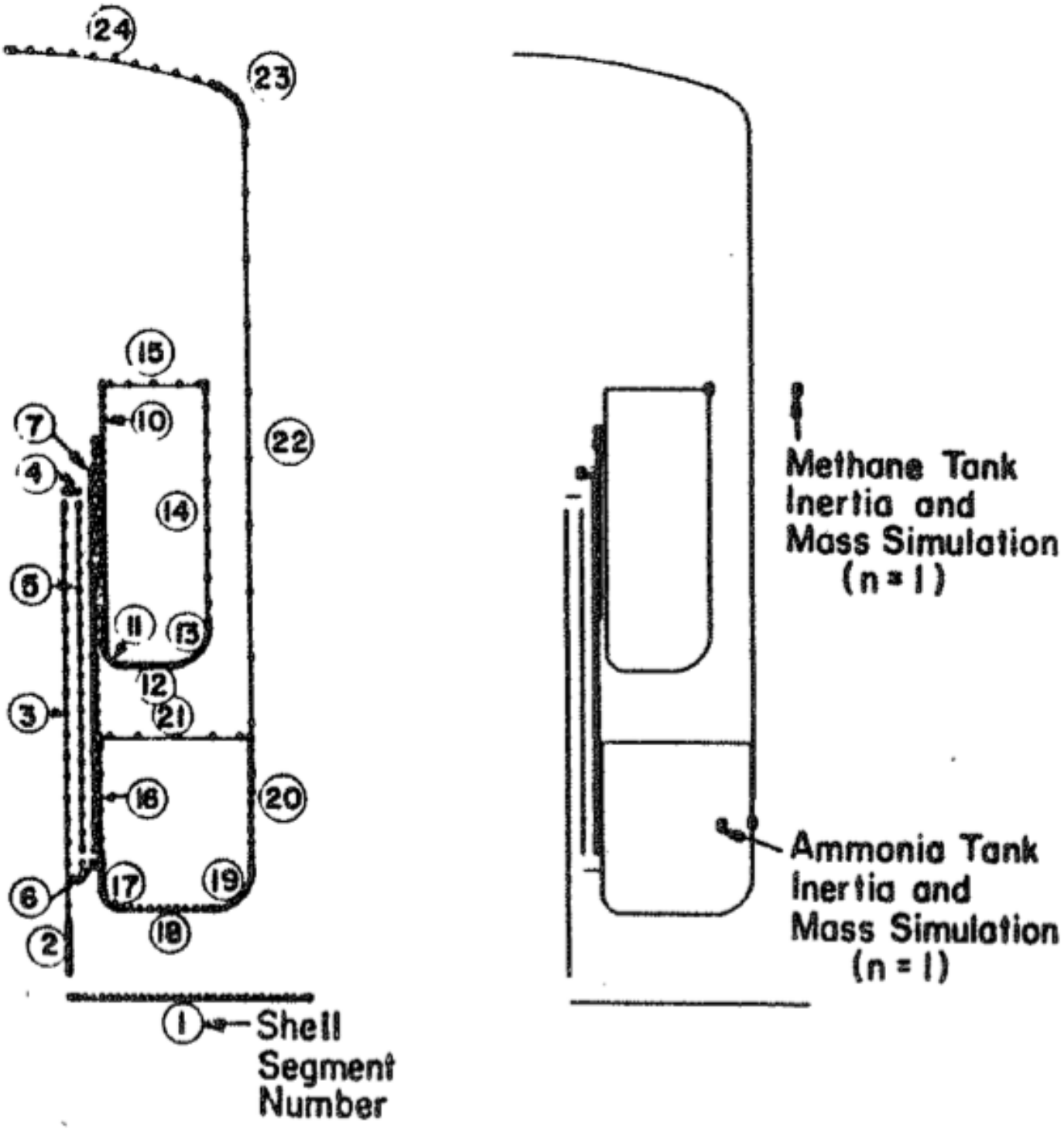

Fig. 5 BOSOR4 model for lateral (n=1) vibration, showing shell segments, nodal points, and locations of the centroids of the discrete rings that simulate the mass and moment of inertia of the methane and the ammonia tanks. (from the original 1974 BOSOR4 user's manual)

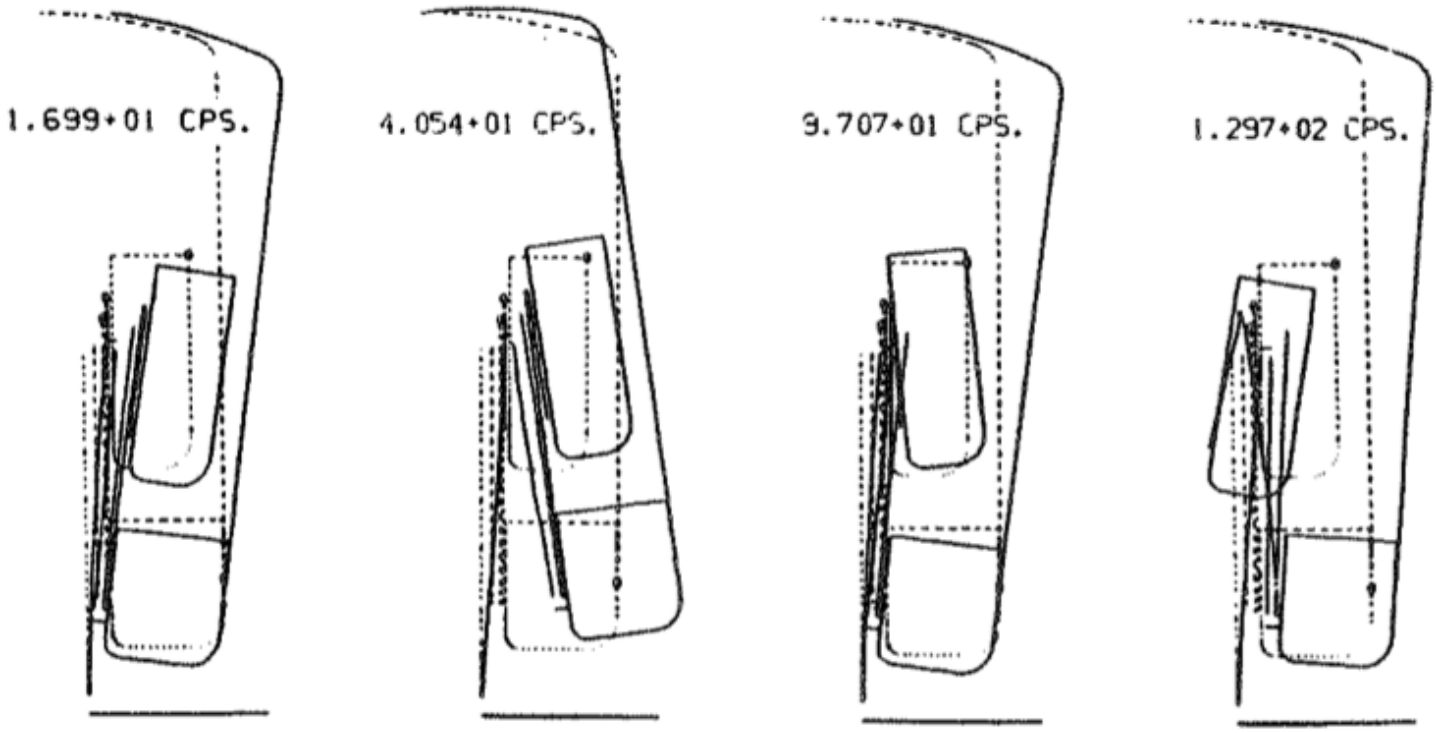

Fig. 6 First four lateral (n=1) vibration modes obtained with the BOSOR4 model. (from the original 1974 BOSOR4 user's manual)